DESIGN FOR PRODUCT CARE
THE DEVELOPMENT OF A DESIGN TOOL FOR PRODUCT LIFETIME EXTENSION

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The development of a design tool for product lifetime extension

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To realize the shift towards a Circular Economy, products should stay usable as long as possible. Maintaining products is the most efficient way of retaining their desired level of performance. This is called Product care. Product care can be understood as any action that helps to prolong the lifetime of a product. The aim of this thesis is to explore how designers can stimulate users to perform product care activities. This goal has been reached through a practice-based approach and connecting it with strategies from existing literature. This took place at the University of Technology Delft.

The context of Product care and the product care behavior of end-users have been researched through a diary study, a micro-emotion scan, creative sessions with design students and literature regarding repair and maintenance. This revealed two things, there are 7 types of product care and each user has a different profile regarding their skills, motivations and barriers. This shows that analyzing which type of product care you are aiming for and defining your specific user are essential requirements.

To develop design strategies for Design for Product care various methods were used. A brainstorm session with designers was held to develop product solutions that stimulate product care. An ideation session was held by myself and real product examples were collected that already stimulate Product care. The product solutions were used to cluster into design strategies. The clustering process led to 8 design strategies: experiences, enabling, informing, change, reflecting, social, control and appropriation. These can be linked to existing strategies and theories regarding Circular, Emotion-centered and Behavioral design.

To transfer the knowledge about the design strategies to designers a design tool was developed. The process was iterative and the 2 biggest iterations were tested with design students and designers. These tests showed that a few important criteria for the test were that it should teach the designer about the different types of product care, the design strategies and they should take the type of user and product into consideration. The tool needs to provide a sense of structure, and still be flexible to fit everyone’s process. It should provide examples of how a design strategy is implemented into a design.

The final tool is the Product Care Kit, a set of magnetic cards used for brainstorming, ideating and discussing. It presents the most important factors which influence Product care. The set consists of the following cards: persona cards, product cards, product care type cards, design strategy cards and example cards with product solutions for each design strategy. This tool helps to analyze and understand the context which you are designing for. It helps to create conceptual design ideas for product care.

In the future this tool should be further evaluated with designers in practice and taught to design students. The outcomes of the tool should be validated by end-users. The tool can potentially lead to sustainable care behavior and lead to physically and emotionally durable products.

Design for Product care
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This chapter elaborates on the goal and main research questions of this research. It will elaborate on some background information to illustrate the need for Design for Product Care.
1.1 Background
Over the years, multiple studies and reports have tried to make us consumers face the facts: our materialism has put a strain on the resources that are delivered by the world that we live in (The Guardian, 2011). The scarcity of resources will be a huge problem in the future for production and it will become more and more valuable to bring back these resources into production. With 7 billion people on the planet and more on the way, the demand and need for resources will grow as well. The truth is, whether we like it or not, that we cannot continue this all-consuming behavior and our behavior needs to change.

‘But how could I do anything about an issue so great?’ you may think. The most powerful people in this matter are people controlling the big industries. Their decisions on design, production, and marketing of the products they sell will have a big impact on (or will determine) the sustainability of these products. In this thesis, I will try to convince you that you, as a designer or as a user can also have an impact. You decide the way you live, the choices you make and the behaviors you perform. And I am not expecting you to completely turn around the way you live or to only buy recycled or biodegradable products. That’s unrealistic to ask of anyone. What I’m asking you is to slightly change your habits when it comes to the products you own. To take an extra minute a day, to ensure that the products you have, stay in the circular loop a little longer.

This graduation project started with the PhD research of Laura Ackermann (Ackermann, 2018). To contribute to this project, I set myself the challenge of developing design strategies and a design tool for Product Care. Later in this chapter, I will elaborate on Product Care.

1.2 Circular economy
The world we know currently runs as a linear economy (Government of the Netherlands, n.d.; Sariatli, 2017). A linear economy is defined by a ‘make, use, throw’ mentality, where raw materials are made into products, are used by consumers and eventually thrown away to end up in landfills or incinerators (Sariatli, 2017). The result of this linear economy is that increasing quantities of resources are necessary to support the production, the amount of waste is piling and pollution has met an all-time high. When humanity achieved the industrial revolution there was a shift in the way products were produced.
and treated and this had a revolutionizing effect on people’s lifestyles and comfort in a positive way. But this also brought along the concepts of disposable products, fast fashion and planned obsolescence (Guiltinan, 2009; London, 1932). This planned obsolescence was preached by London to fight the great depression in the thirties and to create work power and bring back the standard comfort that he felt everyone should have. Even though it might have helped pull countries out of depression and create jobs and change lives, this type of economy cannot stand with the rapid increase in population and growing need for more resources.

The European Commission published a list of 27 critical materials (European Commission, 2017), that are being strained under the current system.

As early as 1966 (Boulding, 2011; Sauvé, Bernard & Sloan, 2016) systems similar to the circular economy were spoken of. Of open loop (circular) systems instead of closed-loop systems (linear). The circular economy focuses on slowing down the resource flow, and closing and narrowing down material loops (The Ellen MacArthur Foundation, 2015. See Fig. 1.1.). This can be achieved through maintenance, repair, reuse, remanufacturing, refurbishing and

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**Fig 1.1.1. Butterfly diagram by Ellen MacArthur Foundation**
recycling. But completely changing the system of how our economy works and realizing this shift to a durable and sustainable economy is a difficult and long process. Industries over the world together, have to change the way they work, to make this possible. So knowing this, what is already possible to contribute to this shift?

One person, a consumer, a user, can already look into their own habits and behaviors and see how they can behave more sustainably. For a circular economy, the world not only needs sustainable production and products, it also desperately needs sustainable behavior (Green, Ryder, Monaghan & Levett, 2006).

1.3 Product Care
To realize the shift towards a Circular Economy, products should stay usable as long as possible. Not only products should be produced in a sustainable way but also consumers’ behavior towards products should be sustainable. Maintaining products is the most efficient way of retaining products’ their desired level of performance, according to the Circular Economy System Diagram.

The throwaway culture that we live in has made it often far easier to throw away products and buy new ones, instead of maintaining and repairing the things we have. But by evoking behavior of the consumer that persuades or stimulates them to maintain or repair their belongings, the lifetime of products can be extended and thus can be considered more sustainable. Therefore, if we want to be able to gradually move towards a circular system it is vital to include in this strategy the way products are being cared for. This is Product care.

Product care can be understood as any action that helps to prolong the lifetime of a product, such as maintenance or reparation (Ackermann, 2018; Ackermann, Mugge & Schoormans, 2018). These product care activities can be conducted by the consumer itself or by a service, like a garage, or a bike shop. Product care is the smallest loop of the butterfly diagram of the Ellen MacArthur Foundation and is the most effective way to keep resources in the loop.

1.4 Design challenge
Laura Ackermann’s PhD research centers the topic of Product care. It led to this Graduation Project for the master Design for Interaction at the Technical University of Delft. Our standpoint is that Product care should play an essential part in the shift towards a Circular Economy and that design plays an essential role in facilitating consumers to perform more product care.

As you may understand, the responsibility of product care does not fully lie with the consumer. Consumers have the power of performing Product care behavior. The design however, could be the underlying force which stimulates that behavior. Designers should design products in a way so that users are able and willing to perform product care activities, replace parts, clean it, repair it and more. The final force that ensures that the product receives
care is the user, but designers can facilitate the user in doing so.

This brings us to the following: in general, industrial designers are not trained in designing for Product care. There is limited data available about Product care, but there exist many strategies that relate to designing for durable products, be it through circular design or emotion-centered design strategies. There are however a few downsides, the first is that these design strategies are often still new and haven’t been implemented in the standard design cycle (van Boeijen, Daalhuizen, Zijlstra & van der Schoor, 2013; Eger & Bonnema, 2010) of designers yet. Another problem is that these design strategies often exist on a theoretical basis, but are currently not being implemented in practice. This may be partially due to the format in which this information exists. I believe that designers need concrete information and strategies to be able to implement these new insights and information in their designing process.

My aim is to enable designers to design products and/or services that stimulate product care behavior by the consumer. I want to do this by developing a tool that designers can use during their design process. This tool should give them the necessary knowledge regarding Product care and the ability to implement this in their design. With this, I hope that consumers are made aware of the way they treat their products and feel encouraged to make their belongings last longer.

Main research question:
How can a designer stimulate a user to perform Product care activities?

This can be answered by answering the following sub-questions:
• What is Product care?
• How can Product care behavior be stimulated through design?
• What do designers need to be able to implement Product care into their design?
This chapter will present existing design strategies, theories and dimensions that can have an impact on designing for Product Care. Strategies from Circular Design, Emotion centered-design and Behavioral design will be discussed. Finally, some insights will be given regarding design education and its role in sustainable design which will have an influence on the development of the Product care design tool.
2.1 INTRODUCTION

In this chapter, I delve into literature for answers on the main research question: How can a designer stimulate a user to perform Product care activities?

During the literature review, attention is payed to all sub-questions:

- What is Product care?
- How can Product care behavior be stimulated through design?
- What do designers need to be able to implement Product care into their design?

To answer these questions I will delve into the after-effect of Product care, product lifetime extension. To be able to extend or optimize this product lifetime, many researchers have already come with interesting strategies.

Product care itself is not yet a popular topic, but many strategies relate to circular design and specific product care behaviors such as repair and maintenance. These strategies may prove to be fruitful for Design for Product care.

To answer the last question, ‘What do designers need to be able to implement Product care into their design?’ this chapter will also take a brief look at design education. This will be important during the development of the design tool in Chapter 5. To be able to develop a design tool that fits into the design process of a designer, it is important to know how designers work and which methods they are familiar with.

The overarching strategy between eco- or circular design and emotion-centered design is emotionally durable design (Chapman, 2015), which describes the strive for a physical and emotional extension of a products’ lifetime. I will briefly dive into the two directions before diving into Emotionally Durable Design.

In this literature review, I will be looking at strategies from three different branches:

- Circular design strategies and eco-strategies that focus on physical durability
- Emotion-centered strategies that focus on emotional durability
- Behavioral design that focuses on designing for behavioral change

Design for Product care
Most effective and least energy-consuming loop
Looking into existing literature can help understand the topic of Product care: the benefits, the bottlenecks and strategies that might support designers in successfully designing for product care. As said before, Product care is part of the smallest loop of the Circular Economy Model (The Ellen MacArthur Foundation, 2015) which proposes to keep products as long in the loop as possible. This means a product will go through multiple cycles of maintenance, repair, reuse, distribution, refurbishment, manufacturing and eventually recycling. By making the product go through these loops multiple times, the resource use flow can be slowed down, waste can be minimized, a product’s lifetime can be extended and its resources can be utilized more efficiently. The smallest loop represents maintenance: maintenance is the most effective and least energy-consuming loop of the Butterfly diagram.

The success of the inner circles depends heavily on the consumer’s behavior and perception towards the product. Durability, ease of maintenance, long-life guarantee, modularity, variability, classic design and a strong person-product relationship can help when developing product lifetime extension strategies (Mugge, Schoormans & Schifferstein, 2005). At the moment, design is not focused on ease of repair and maintenance. If designs would facilitate repair and maintenance, it might be easier for consumers to do so.

Usage phase
Another thing that needs to be considered is the active use-phase. Product lifetime extension is desirable when this means that the resources are kept in the loop longer, but also that users keep using it longer. What often happens, is that users replace their still functioning products with newer versions. The old one is stashed away and its resources are not brought back into the loop. Macleod (2017) created an overview that shows what the consumer-product lifecycle looks like. It starts with the consumer getting to know the product, where the engagement rises and it ends with the engagement declining and the consumer disposing of the product. For Macleod’s graph, see Fig. 2.2.1. What I aim for in this Graduation project is that the usage phase in between on- and off-boarding is extended and that when Product care is no longer an option, the product’s resources are brought back into the loop.
Although it is important to consider the end-of-life behaviour, in this study I will focus on the earlier phases and how to evoke product care. Therefore, this end-of-life (Wikipedia, 2019) behavior will not be taken into account during this thesis.

It is interesting to look at how the experience of the first part of the consumer-product experience can be re-created. It is also interesting to make the user see their relationship with their belongings as something that can evolve and continue to grow into something new, ensuring that the off-boarding phase is postponed.

**Product lifetime optimization**

Earlier, product lifetime extension was mentioned (Bakker, Wang, Huisman & den Hollander, 2014; Bocken, de Pauw, Bakker & van der Grinten, 2016). What should also be taken into consideration is that this is not the case for all products, some products such as refrigerators should be replaced at a certain point of time since their replacements are often far less energy consuming (Bakker, Wang, Huisman & den Hollander, 2014). What should be strived for is product lifetime optimization (van Nes & Cramer, 2006), prolonging the use-phase of a product until replacing becomes more sustainable than extending lifetime.

**Key insights**

Even though product lifetime optimization is the most desired outcome, it is out of the scope of this thesis. However, it is interesting to look at in future researches. Literature about product lifetime gives a clear understanding of why product care is a useful and vital force. After diving into product lifetime extension, a first few ideas for possible design strategies to evoke Product care arose. A possible strategy that might be derived from this is to create a new high in their user-product experience, that postpones the decline of engagement. For example, by creating a user-product relationship and/or experience that evolves and changes over time.
Design for product longevity from the book Products that Last

There are some good examples of sustainable design strategies that focus on maintaining value over a longer period of time and prolonging product life. In this chapter six strategies will be touched upon which are all proposed by Bakker & den Hollander in their book Products that Last (2014).

The following strategies are presented:

- Design for Durability
- Design for Standardization and Compatibility
- Design for Upgradeability and Adaptability
- Design for Dis- and Reassembly
- Design for ease and repair
- Design for Attachment and trust

Design for Durability sounds to be an obvious strategy. It is defined as designing products that can handle wear and tear. Products are usually tested a numerous amount of times before and after they are released on the market. During these tests researchers can already make an assumption of how for example an IKEA dresser will perform even after opening and closing its drawers for 20,000 times. This is very hard to test though since one must be able to predict beforehand what kind of workload the product will go through during its lifetime. This is a possible strategy, but there are downsides to it: it will take time and is done when the designing process is in its later stages. There is a risk that it does not hold up against the demands of use and designers have to go back to the drawing board. It is an interesting strategy if it is possible to make a simulation of regular use but also peak and unexpected use. Unfortunately this is not always possible to simulate digitally. This strategy may be difficult to substantiate in a design tool.

Design for Standardization and Compatibility is looking at what is already designed and making your product compatible. Instead of designing every little screw or using new resources, make use of existing parts and products. This also makes it easier for users to replace or fix parts when necessary. See Fig 2.3.1. This toolkit is a basic toolkit that contains the most common needed tools for repairs or maintenance. An ideal design based upon this strategy should be able to be fixed by using this kit. This is an important strategy to keep in mind, especially for the design of more complex products where spare parts are needed for product care, these need to
be easy to obtain.

The strategy Design for Upgradeability and Adaptability allows a product to be modified and expanded on in the future. Change is happening and being able to respond to those changes can make a product last longer in this world. Designers will have to develop scenarios for what a product’s lifespan is going to look like. Possible reactions to these changes could, for example, be software updates, changeable, addable modules or a complete change of use and functionality due to the change of needs of users over time. A nice example of a product for this strategy is Phoneblocks, see Fig 2.3.2. This modular phone is easy to upgrade and customized according to the user’s changing needs.

It can be a very important strategy for product care. A consumer changes over time and it is very beneficiary if the product is able to change with them or is handed down to the next generation or user after a few adjustments. This strategy focuses not only on the physical durability of the product, where worn out or outdated parts are replaced, it also focuses on the emotional durability of a product, where people see a product as an entity with growing and evolving possibilities.

Another strategy is Design for Dis- and Reassembly. As the name suggests it proposes designs that are easy to disassemble and reassemble. The important part from an eco-design perspective here is the result of the disassembly. For eco-design, it is important that after disassembly parts will always be able to be put together again, again and again and
that they will always fit. This should not be confused with products that are easy to assemble and disassemble.

Many IKEA pieces, when disassembled, feature ugly holes where once screws sat and it cannot be reassembled as firmly as it was before. IKEA beds and couches are probably the only exception to this issue. If it is necessary to disassemble it to perform a certain type of product care, Design for Dis- and Reassembly can be very important.

*Design for Ease of Repair and Maintenance*, targets the same niche that this thesis targets with Design for Product Care. When properly applied, this strategy should enable the user to maintain the product in an excellent condition. It proposes that product design currently often limits repair and maintenance. Designers ought to design the product in a way that enables users to open up their products and clean and replace parts. Whereas before there would be a big warning sticker saying not to touch anything. An extreme example is regenerative plastics, see Fig 2.3.4. These plastics regenerate themselves when damaged. This would be the ultimate solution to product care: a product that would heal itself. But this is not realistic, and not applicable for all products. Most products will still need a form of human product care.

Design for Ease of Repair and Maintenance is an essential strategy for Product care and every design should comply to this. Every consumer product that is vproduced
should be easy to maintain or repair if possible. What this theory lacks is that even if the product allows repair and maintenance it is not guaranteed to happen from the user’s side.

The book *Products that Last* also presents a strategy that is seen as a strategy of Circular Design, but is also a strategy for Emotion centered design. This is *Design for Attachment and trust*. It focuses on creating an emotional bond between the user and product. This shows that in the world of Circular Design they are aware of the importance of the user’s emotional connection with the product. Examples of products that rely on this strategy are products that people become personally attached to, which encourages them to handle it more carefully, and results in people often not replacing it. A personal example of a product that complies to this strategy is my smartphone, a Huawei. It supports me in so many ways, keeping in contact with friends, being my alarm clock and calendar, my entertainment, my camera, my news channel. For many people a smartphone is something that they want to upgrade and get a new one every year. I however, would not want to replace it. It is not the physical form which I have grown attached to, but to the services it provides and how easy the interactions have become.

**Key insights**
The book *Products that Last* (Bakker & den Hollander, 2014) explains the different strategies from the Circular Design viewpoint. All of the previously mentioned strategies are beneficial for Product care.

The very first step of product care should be making it possible and accessible to perform product care. One way or another these strategies all focus on this.

Design for Durability, as said before, may be a bit difficult to combine in a design tool together with the other strategies. It can be a strategy that is already interesting on itself, something that a designer should always take into consideration. *How to make a product that can take wear and tear?* This is also very dependent on the user’s behavior, their intended and unintended use of the product. Design for durability is something that should be taken into account in all cases.

All strategies, apart from Design for Attachment and Trust, have a thing in common. They do not take the intricate user-product relations and interactions into account. They are targeting product design but are not taking the consumer’s emotions and behaviors into consideration. Product lifetime extension is not a product design that can be designed, it is what the designer tries to facilitate and the user is invited to act upon.
Design for Product care can only be successful if the design not only makes it able for users to perform Product care and persuades or motivates the user to do so. In other words, a behavioral change.

**Fogg’s behavioral model**

One of the starting points for the research about this was Fogg’s Behavior Model (Fogg, 2009), see Fig. 2.4.1. Fogg shows in his behavioral model the three main factors that influence behavior change: *Motivation*, *Ability* and a *Trigger*. All three parts are necessary for a user to be able to make a change in their behavior.

He mentions the core motivators for the factor *Motivation*, which have a positive or negative influence on the person’s willingness to perform a certain behavior: pleasure/pain, hope/fear, and social acceptance/rejection.

The factors that make up *Ability* are time,
money, physical effort, brain cycles, social defiance and non-routine. Ability factors are seen as the simplicity of the behavior. The simpler the behavior is perceived, the higher a person rates on ability. For every person the simplicity profile differs. For example, a retired citizen may score high on time and money and have difficulty with physical effort and non-routine, while a high school student may score very low on the first two, but will not be stopped by physical effort or non-routine behaviors.

The third factor *Triggers* exists of sparks (heightening motivation), facilitators (heightening ability) and signals (a reminder). Without a trigger, no matter how high the motivation and ability, a person will not act and change their behavior.

Fogg advises to use his behavioral model because it may help to systematically dissect behavior and to discover which factor is lacking when targeting a certain behavior change. This model may be a simplified version of the mental processes that happen in the user’s mind. It can be an accessible and understandable tool for designers to understand the key ingredients of behavioral change without having to have in-depth knowledge of the human mind.

Ackermann (2017) expands on Fogg’s model through a study on people’s product care behavior and proposes an expansion on the determinants provided by Fogg, see Fig 2.4.2. Some determinants will not be easy to incorporate into a design tool, since they are difficult to influence by the designer, such as financial aspects or intrinsic motivation. Those determinants can still be inspirational factors to keep in mind when tackling product care behavior.
Bhamra and colleagues (2011) already explored design intervention strategies for a field called Design for Sustainable Behavior, which tries to influence consumers’ behavior in order to reduce negative social and environmental impacts. Essentially, this is what Design for Product care is.

Design intervention strategies presented by Bhamra and colleagues were:

- Eco-information
- Eco-choice
- Eco-feedback
- Eco-spur
- Eco-steer
- Eco-technical intervention
- Clever design

The interventions range in the control they give to the consumer over their behavior, from Eco-information being purely informative, to Eco-technical intervention forcing the desired behavior upon the user, see Table 2.4.1.

To get an idea of how these strategies are expressed in a design I will provide a few existing product examples. The first is the *Never Hungry Caterpillar*, it is an extension cable for electrical devices with a standby mode. When, for example, a TV is on, the caterpillar moves slowly, as if breathing. When the device is turned off and left in standby mode it writhes and moves as if in pain. If the TV is unplugged, the caterpillar is still, as if in sleep. It makes the user think about their energy behavior and touches upon the tendency to be kind and caring towards a ‘living’ being. It is a nice example of the intervention strategy Eco-choice. The user is encouraged to think about their behavior, provided with options and has to take responsibility themselves.

Another example, that would fit for this intervention strategy is the design *Keymoment*. When the bike key is taken, nothing happens. When the car key is taken, it drops the bike key to the ground. The user is left with the choice, pick it up or leave it? Take the car or take the bike instead? This design was originally developed to encourage users to be more physically active, but it is also a good encouragement to be more sustainable and environmentally conscious.
Eco-information - design oriented education

**Aim:** to make consumables visible, understandable and accessible to inspire consumers to reflect upon their use of resources

**How it works:**
1. Product expresses the presence and consumption of resources e.g. water, energy etc.
2. Product encourages the user to interact with resource use.

Eco-choice - design oriented empowerment

**Aim:** to encourage consumers to think about their use behaviour and to take responsibility of theirs actions through providing consumers with options.

**How it works:**
Users have a choice and the product enables sustainable use to take place.

Eco-feedback – design oriented links to environmentally/socially responsible action

**Aim:** to inform users clearly about what they are doing and to facilitate consumers to make environmentally and socially responsible decisions through offering real-time feedback.

**How it works:**
The product provides tangible aural, visual, or tactile signs as reminders to inform users of resource use.

Eco-spur – design oriented rewarding incentive and penalty

**Aim:** to inspire users to explore more sustainable usage through providing rewordings to ‘prompt’ good behaviour or penalties to ‘punish’ unsustainable usage.

**How it works:**
The product shows the user the consequences of their actions through ‘rewarding incentives’ and ‘penalties’.

Eco-steer – design oriented affordances and constraints

**Aim:** to facilitate users to adopt more environmentally or socially desirable use habits through the prescriptions and/or constraints of use embedded in the product design.

**How it works:**
The product contains affordances and constraints which encourage users to adopt more sustainable use habits or reform existing unsustainable habits.

Eco-technical intervention – design oriented technical intervention

**Aim:** to restrain existing use habits and to persuade or control user behaviour automatically by design combined with advanced technology.

**How it works:**
The product utilises advanced technology to persuade or control user behaviour automatically.

Clever design

**Aim:** to automatically act environmentally or socially without raising awareness or changing user behaviour purely through innovative product design.

**How it works:**
The design solution decreases environmental impacts without changing the user’s behaviour.
use the bike more.

The last design intervention in this paper was Clever Design; this strategy proposes innovative product design that does not need for the consumer to change their behavior. This has similarities with the example I provided for the strategy Design for Ease of Maintenance and Repair in Chapter 2.3, in which I told about regenerative plastics. For this, see Fig. 2.3.4. It is interesting to consider how much control a consumer should perceive over their product care behavior. In some cases it might be more beneficial to actively nudge or push the consumer to perform product care, while in other cases a mere explanation could suffice and nudging would merely irritate the user.

**Dimensions of behavior change**

Daae & Boks (2014) tested in their work 55 dimensions in a design that have an influence on the user’s behavior. They categorized these into 9 main sustainable behavior principles from Information to Automatic, see Fig 2.4.5. They researched which dimensions were considered the most relevant by design professionals for different ways of altering behavior. These relate to the design intervention strategies presented by Bhamra and colleagues. They concluded that it was difficult to prioritize one principle over the other, since it was very dependent on the designers’ preference and the product that was to be designed. When developing the design strategies for Product care, it can be interesting to reflect back on these sustainable behavioral design strategies to see how they connect.

Tromp and colleagues (2011) discuss how design can change behavior and potentially lead to sustainable behavior. They take a different angle than Daae&Boks though; they look at how users view the design’s influence. Depending on the user, an influence design can have on the experience of a user can range from weak to strong (force) and from implicitly to explicitly (salience). Based on these two dimensions, force and salience, the following four types of influence can be distinguished: **Decisive, Coercive,**
Seductive and Persuasive, see Fig 2.4.6. A product that I would consider Decisive is the Puzzle switch, see Fig 2.4.7. This design makes use of human tendencies for symmetry and order. It may not be a very apparent nudge, but the automatic behavioral response we have towards asymmetrical objects is very strong. Tromp and colleagues propose in their paper 11 strategies that are likely used for the four quadrants.

**Key insights**

Fogg’s behavioral model will function as a first way to analyze data during the empirical research. It can help designers to direct their thinking, although I believe the factors may be too broad and therefore difficult to use during designing itself. The same counts for the other strategies mentioned in this sub-chapter. During the design strategy development I will reflect on existing strategies and see how they link to the strategies found for Product care to be able to validate if these strategies are useful for a Product Care design tool.

These behavioral design strategies show that sustainable behavior can be nudged and promoted in multiple ways. All of the mentioned strategies should be considered valuable. I believe that the link with attachment and emotion is still missing as is the insight in how desired behaviour is or could be experienced by the user. Tromp and colleagues already touch upon these through some of their design strategies, but they are still quite abstract for a designer. When applying the design intervention strategies proposed by Bhamra and colleagues, it seems that sometimes there will still be need for or a trigger, or the heightening of motivation, as mentioned by Fogg.

What needs to be taken into account when reading Daae&Boks’ study is that they concluded that using the dimensions had a negative effect on the amount of product ideas. This does not necessarily mean that these design dimensions, or directions or strategies in general, will have a limiting impact on the idea generation of designers. However, during the development of the toolkit it is wise to keep the amount of output from the tool in mind.
2.5 EMOTION-CENTERED DESIGN STRATEGIES

Emotional longevity
Emotion centered design and product attachment theories reach for emotional longevity. Emotional longevity is the creation of a long lasting relationship between the user and the product. Through their emotional attachment to the product users tend to use and maintain it for a longer time than usual. This is highly interesting for the topic of Design for Product care, which is essentially that as well.

One of the strategies that was proposed in the book *Product that Last is Design for Attachment and Trust* (Bakker & den Hollander, 2014): “the creation of products that are loved, liked and trusted for a longer period of time.”

It looks at how users develop an emotional bond with their products and how to strengthen the bond that users experience. This strategy is complex and perhaps difficult to obtain since this is not fully controlled by the designer and is user and situation dependent. However, it does cover an interesting part of design which may have a great effect on lifetime extension. If a consumer is attached to their product, they will likely keep and maintain it, no matter if it is fully functioning or not, out of style or shows wear and tear.

In this section I will present determinants and strategies for emotional longevity. During the development of the design strategies for Product care, it will be interesting to reflect on how these developed strategies connect with product attachment theories and to what extent product care behavior can be evoked through emotional attachment.

Determinants of emotional attachment
Mugge and her colleagues (2008) mention the following 4 factors that can promote attachment:

- **pleasure**: providing the owner with pleasure
- **self-expression**: expressing the owner’s identity
- **group affiliation**: expressing the owner’s belonging to a group
- **memories**: reminding the owner of the past

To illustrate the 4 factors, I will introduce a few example, including some of my own belongings.

The Wacom drawing tablet, seen in Fig 2.5.1, is for me a clear example of a product that brings me *pleasure*. I used to draw traditionally, but being able to draw traditionally, but being able to use a drawing tablet has extended the
Design for Product care

possibilities for my creativity. A big benefit of this particular tablet over other drawing tablets is that it is travel size, making it easy to carry along and draw wherever and whenever I want.

Backpacks are a nice example for self-expression and also for memories, see Fig 2.5.2. Many backpackers personalize their backpack, making it able to not only express themselves but also to capture memories. What is often seen on backpacks are patches from specific locations attached to the backpack, reminding the user of their travels.

For me, a simple product that represents group affiliation to me is my Domoor mug. It was a present given to all graduating Industrial Design students of the University of Twente during my year. It represents me being part of all these designers originating from Twente and connects me to the other designers that I graduated with. The mug is also a well known Dutch design, so it also makes me feel part of the Dutch design community.

All these examples are of products that I, or others, feel emotionally attached to. In my case, this results in being motivated to keep and maintain my belongings if necessary. This product attachment is hard to predict though, since some of these products have gained the emotional attachment due to the specific situation and context or because of their owner. There is a big chance that other people who have the Domoor mug do not have the same attachment to it as I and my fellow students have.
Symbolic meaning
Symbolic meaning is an extension of product attachment. Yang & Galak (2015) explain symbolic meaning as follows: “Belongings with a symbolic meaning have the ability to resist adaptation and remain relevant throughout the user’s life.”

Symbolic meaning serves as the starting point of Casais and her colleagues their research (2016). They present a framework of 6 types of happiness related symbolic meaning in products.
- positive relations with others
- personal growth
- purpose in life
- environmental mastery
- autonomy
- self-acceptance

They state in their conclusions that the lack of a product responding to the user’s evolving aspirations lead to premature discarding of it. They advise on focusing on creating higher quality interactions, which could create an extension of the products’ lifetime and a more meaningful relationship between product and user. The core of this research, the user’s evolving aspirations, can be inspirational for Designing for Product Care. A barrier for performing Product care can be the user’s wish for something new or different. If the product were able to create that sense of something new, then the desire for a new gadget might be diminished.

Design for savoring
Another interesting approach is Design for savoring (Pohlmeyer, 2014). Design for savoring tries to sustain and optimize positive emotions from a positive experience. It does not necessarily focus that much on creating pleasure itself, but more on appreciating experiences. It can be interesting to look at Product care from a different angle, since Product care may be viewed by many as tedious tasks or unpleasant activities. But if it were possible to appreciate the experience, and to prolong positive feelings, Product care can be enjoyed and results savored.
A nice example is a student project of the TU Delft, *Relove your shoes* by Felix Marschner. He developed a toolkit that make users put a lot more attention into the cleaning of their favorite shoes. This was strengthened by the design being a very small brush for your fingers, making the act feel intimate and committed.

**SLOW design principles**

The Slow Design Principles (Fuad-Luke, 2002; Strauss & Fuad-luke, 2008) try to orientate design practices more towards social, cultural and environmental sustainability. This tool proposes to raise the well-being of people and the planet. It is seen as a step towards sustainable design. These design principles are:

- *reveal*
- *expand*
- *reflect*
- *engage*
- *participate*
- *evolve*

These might be very helpful in creating a long and living form of a design, that evolves with the user.

An example of the principle *evolve*, resides in the municipality I grew up in Friesland, the Netherlands. *Evolve* understands that the maturation of artifacts, systems and environments over time can lead to richer experiences. The *Ecokathedraal* in Mildam, is an ongoing land-art project by Louis Le Roy. The *Ecokathedraal* demonstrates the potential of human effort interacting with the forces of nature. He placed stones and rubble with his bare hands and let nature continue growing around and through it. This experiment started in the seventies, and has led to the start of a living *cathedral*. The goal is to continue this experiment until the year 3000, this timespan is necessary to be able to study these never-ending and evolving processes of interactions between nature and humans.

**Key insights**

While the circular design strategies I spoke of focused more on making it easier or more accessible for the user to perform product care, the emotion-centered strategies touch more upon on heightening the motivation of the user for possible product care. These strategies do not incorporate the act of product care, but they do provide the user with an underlying driver to be willing to perform product care. In combination with strategies from circular and sustainable behavioral design they could form a strong combo of providing the user with the ability and motivation for product care behavior.

Fogg proposed that for a behavioral change to take place, ability, motivation and a trigger was necessary. The discussed strategies do not mention any concrete form of triggers. During the empirical research and brainstorm session with designers I will pay more attention to Triggers.

*Fig 2.5.6. Ecokathedraal in Mildam, the Netherlands*
Overlapping circular design and product attachment

An interesting field to look at is Emotionally durable design. Chapman explains in his books (2009, 2015) that it does not focus on the design of durable products, but the design of durable meaning and value that products deliver. It’s more about making meaningful interactions or connections and achieving a sustainable relationship between user and product. Emotional durable design essentially is the overlap between sustainable design and product attachment.

Chapman (2015) presents a framework that serves to increase the emotional bond between a person and product. It is a 6 point experiential framework existing of the following points:

- narrative
- detachment
- surface
- attachment
- fiction
- consciousness.

In a tool composed by Haines-Gadd and colleagues (Haines-Gadd et al., 2018) they show how eco-design strategies and emotion-centered strategies can almost all be connected to this 6 point experiential framework. This framework is a good summary of the interesting strategies presented in the fields of circular design and emotion-centered design. These 6 points will be reflected upon when developing the design strategies for Product Care.

**Key insights**

Emotionally durable design aims for product longevity but with the user as its focus. This is a good focus for Designing for Product care because with Product care the user, and especially their behavior, is one of the biggest focus points during designing.
2.7 DESIGN EDUCATION

The importance of teaching Circular design in education
It would be very fruitful, according to the Ellen MacArthur Foundation (The Ellen MacArthur Foundation, 2015) if designers amongst others would learn this skill set, of designing sustainably, to realize the shift towards a Circular Economy. I believe that when design students are educated in the standard design cycle, they should also be educated in the circularity of a design. By learning it early designers may automatically incorporate Design for Sustainable behavior, Circularity or Product Care into their design process.

Design education related to Circular design and Sustainable design
Currently, designers receive little education regarding sustainable or Circular Design, let alone Design for Product Care. I myself have followed the bachelor curriculum of Industrial Design Engineering at the University of Twente and a Master’s curriculum at the Industrial Design Engineering Faculty, University of Technology Delft.

When looking at the basic educational books, Productontwerpen (Eger & Bonnema, 2010) and the Delft Design Guide (Van Boeijen, Daalhuizen, Zijlstra, van der Schoor, 2014), of the two universities, they provide little to no information about sustainability or circularity. This does not mean students are not educated in the field of sustainability, but students have to seek out the courses and sustainability-related education themselves, in the form of a Minor or electives. TU Delft does have one sustainability course in the bachelor called Design for Sustainability. This means that designing for sustainable and durable products is not something that designers inherently learn or have experience with.

My experience during my design education
Reflecting back on the way I have been taught the standard design cycle, it becomes apparent to me that designers are not taught to think about the impact of their design on the environment, about the end of life, or about the user maintaining and repairing it. Sustainability was a factor that would be ‘attached’ to the end of the designing process, by for deciding to use recycled materials.

In Chapter 5 during the development of the design tool I will take into consideration how the design tool can align with the standard design cycle or can be implemented in the future in a design process or in education.
Combining different fields
As could be read in the past sections, a lot of design strategies exist that can lead to longer and durable product-user relationships. The Circular design strategies touch upon how to support the user in their potential Product care behavior and the Emotion centered strategies on heightening the drive, or motivation, of the user to perform Product care behavior. Knowledge of both is needed. In some design cases, it will turn out that the user’s ability needs to heighten, in other cases the user’s motivation and sometimes a combination. What is left, is how the user will be triggered to perform the desired behavior. Based on this research I aim to create a design tool that educates the designer in both fields.

A product care design tool
One of the major challenges that designers will face when designing for Product care is to know the different possibilities. Whether they will let themselves be inspired by product attachment, circular design or sustainable behavior strategies, they need to know which design strategy or directions they can choose. After reading about the extent of the different directions a designer can take it becomes clear that perhaps it is not possible to combine all strategies into one or a few perfect strategies. I assume that it is more fruitful for designers to learn about the different possible strategies that exist and to have the choice to experiment with one or a few. Daae&Boks concluded that too many strict dimensions may lead to fewer idea solutions. When using the design tool designers should experience freedom for creativity, instead of having to force-fit a design to match a Frankenstein combination of strategies. In Chapter 4 I will look into the design strategies that design students and designers can already imagine and how they are connected with strategies that have been proposed by experts in literature.

Design education
Mainstream design education is limited considering the circular economy and sustainable design strategies that exist. Even after building an inspiring design tool that incorporates all the necessary information, it will not be used if it does not fit how designers work. The risk is that it will be another design tool that designers briefly use at the use of the process, while it should be part of its core. During the development of the design tool, I will research what designers need and how they prefer to use their acquired knowledge.
Requirements
After this Chapter, a few requirements can already be set. These are:

- A product care design tool has to teach the designer about product care.
- A product care design tool has to teach the designer about possible design strategies for product care.
- The design tool should fit into or match the standard design process.
This chapter elaborates on the explorative techniques used to get an overview of the context of Product care. Methods such as a micro-emotion scan, creative sessions with design students, the clustering of product care activities and photo diaries with end users were used. These resulted in tangible requirements for the product care design tool.
3.1 INTRODUCTION

In this chapter the focus lies on the first sub-question:

- What is product care?

To be able to design for Product care, I first need to have a better understanding of the context. When the context around Product care becomes clear, it will also become clearer which factors influence it. This will help to understand what designers need, to be able to target and stimulate product care behavior.

To understand the context, I set the following questions:

- What are the barriers and motivations for the user to perform product care?
- What are the important factors that influence product care?

To get insights into the context of Product care, I researched the context through a variety of explorative techniques. The first was by doing a micro-emotion scan. This consisted of performing a Product care activity myself, to get a first feeling and grasp of possible motivations, barriers and emotions a user may experience. The second was by asking Industrial Design master students through creative sessions what product solutions they would come up with to stimulate Product care. The third was by clustering the variety of product care activities to be able to distinguish different types of product care behavior. The fourth method was handing out diaries to consumers in which they recorded their own product care behavior and their underlying reasons and motivations.
3.2 MICRO EMOTION SCAN

3.2.1 Goal
To get a feel for the behaviors that are expected of the consumer in this thesis, I performed a product care activity myself and tracked and analyzed my own thoughts and emotions. This gave an idea of the emotions that emerge within the user when confronted with having to (unexpectedly) repair a product. It gave some first insights in the motivations and barriers that I, and perhaps other users, face.

3.2.2 Method
The product care activity that was chosen was the replacement of a pedal of a city bike. Without replacing it the bike is still operational, however would be uncomfortable and could still break later on. From the moment that the defect was discovered until a few hours after it was fixed I noted down all micro-emotions I felt at each action, the corresponding thoughts and the strength (positive/negative) of the emotions. These were noted down on post-its when they were happening. This is called a micro emotion scan, they are called ‘micro’ because their impact on the user’s experience and behavior is small and not necessarily lasting. They do point out what is relevant to the user and can help understand how a design can be improved.

3.2.3 Key findings
A few examples of moments of the study can be seen on the pictures on the next page. For a schematic overview of the Micro emotion scan, see Fig 3.2.4 on the next pages. For the full analysis, see Appendix 2.

A vast range of emotions:
When looking at Fig 3.2.4, a variety of emotions can be seen. I expected beforehand that the negative emotions would take the upperhand. Looking at the micro-emotions, it becomes apparent that there are already many positive (or neutral) emotions present, which could be interesting to exploit. Such as:

- Pride (after finishing)
- Joy (from being able to do something unexpected)
- Optimistic/confident (due to tips from social contacts)

The negative emotions give an indication which moments to tackle and overcome, such as:

- Insecurity (not knowing if you have the skills)
- Annoyance (the thought of having to put time and effort into the activity)
Reflecting on Fogg’s factors
For a complex product such as a bike, ability factors play a big role. In the end it did not lead to strong postponing behavior, since the function of the bike is too important. My motivation was there for very high and based on the fear of not being able to use the bike. With a product that has a less significant role, there could be a chance that product care will easily be postponed. Its significance pushed me to perform product care even though I had no experience with this type of activity. Very few positive emotions were felt before, during and after the activity.

In this case the trigger was the crooked feeling and sound that the pedal was making. The motivation was already high, however, without this sound and feeling, it would have never even come to mind that the pedal needed replacing. This shows that Fogg’s theory was in this case correct when it comes to the necessity of a trigger.

Conclusions
In this case, through high motivation, I was able to heighten my own ability through online research and conversations. With a high enough motivation, people will probably educate themselves. Also, the trigger seemed to have the most crucial role, since this problem existed for weeks, but was never noticed. Once noticed the trigger could not be ignored for long since it was very obvious and continuous. This means that thinking about how your design will trigger product care behavior will be very important.

I believe that it would be good to emphasize the positive moments of product care, trying to achieve and magnify these positive moments.

Overall, it seems that there is an interaction between ability and motivation. For future situations, it is advised that the designer analyzes the user’s ability and motivation when designing for a specific product care behavior.
Fig 3.2.4. Micro emotion scan of the replacement of bike pedals
3.3 CREATING SESSIONS
DESIGN STUDENTS

3.3.1 Goal
For the course of Creative Facilitation at the TU Delft, three students tackled the problem statement that I gave to them:
• How can you stimulate and trigger users to perform care-taking activities on the ordinary products that they own?
The goal was to gain inspiration for what might be interesting to focus on during this Graduation project and to see what design students already know about Product care and how they would tackle it without a Product care design tool.

3.3.2 Method
Three students held creative sessions with other IDE Master students. They used creative methods to develop small product solutions of how product care can be stimulated and what they thought would be possible strategies for Product Care.

3.3.3 Key findings
For the detailed results, see Appendix 3. The concrete strategies created were:
• personalization
• personal connection
• added functionality
• reward systems
• identity (style over trends)
Some of the strategies have also been recommended by literature about strategies for product attachment, such as personalization and identity (Mugge, Schoormans & Schifferstein, 2008).

Conclusions
The strategies such as personalization could be interpreted as that it is an obvious strategy and not very novel. It could also mean that designers already have a feel for it and therefore it is easy to use as strategy. Some design student already mentioned the significance of an emotional attachment to stimulate Product care. From the lack of concrete examples produced in the session, of how to stimulate the user, it seems that design students still do not have enough insights on how to stimulate Product care or how to apply the strategies they do know. A Product Care design tool could provide them with examples on how to incorporate these strategies into design. One group used a metaphor for explaining Product care, namely: taking care of your pet. They discussed the variety of acts pet owners do. This made me realize that it can be very helpful to make a distinction between the different types of product care. The next step is to make groups of different types of product care.
Fig 3.3.1 A few examples of results of the creative sessions
3.4 PRODUCT CARE TYPES

3.4.1 Goal
During the literature research and the creative sessions of design students it became apparent that there is a variety of different types of product care. A distinction should be made to make the process of designing for Product care more structured. With the design tool in mind, I made the assumption that it would be easier for users and designers to think and talk about Product care if there were different categories within Product care.

3.4.2 Method
To make categories of product care activities a large quantity of product care activities were needed. Data from Laura Ackermann’s research and examples from my own experiences were clustered. These can be found in Appendix 4. The activities were analyzed based on the moment/frequency of the activity, the perceived effort and type of action. The product care activities were clustered.

3.4.3 Key findings
These clusters became the 7 product care types that can be seen in Fig 3.4.1.

These may support users, in being able to differentiate between the different product care acts. And they may support designers in targeting specific behavior, since Product care in its whole, is too broad.

These Product care types will be used in later stadia of empirical research, during the development of the design strategies and for the design tool.
1. **Repair.** The product or a part of it is broken, preventing it from performing a function or performing poorly. The user performs product care activities that will make the product be able to function again. This can be the repair of existing parts of the product, or the replacement of parts.

2. **Creating something new/different.** The user creates a product themselves, lets something be made for them, or they rebuild/remodel/reform an existing product so it feels like a new, different or unique product.

3. **Product revival.** The user tries reviving the product to a certain standard again. This could be to get it functioning better again or to regain a certain look.

4. **Small care.** Nothing of the product is broken. Small activities are performed consciously to liven up the product again or to prevent it from deteriorating.

5. **Preventive measures.** These are measures taken to make sure a product won’t break as quickly. These measures often contain external products that equip or protect the product against its environments.

6. **Instructed & mindful handling.** The user knows or feels which behaviors would be bad for the product. This could be by having read a manual, learning about it from others or just by experience. The user tries to prevent deterioration by abstaining from bad behavior/only performing the proper behaviors.

7. **Routine acts.** The user performs routine activities unconsciously. These are activities that they have learned to do and have never thought about doing differently or activities that were made into habits.

*Fig 3.4.1 The 7 product care behaviors*
3.5 DIARY STUDY

3.5.1 Goal
A photo diary study was done with non-designers to answer the following questions:

- What are the most/least performed product care activities?
- What are the most common motivations for product care?
- What are the most common barriers for product care?

The answers give insights into why users fail or succeed to perform care. This might also give insights into how to tackle this.

3.5.2 Method
6 participants with ages varying between 25 and 92 were given a booklet to fill in over the course of 10 days, for an example of the photo diary see Fig 3.5.2. They were asked to report the product care activities they performed during that period or had done in the past, and were asked which product care activities they failed to perform. For each care activity, the participants were questioned about why they did it, how they executed it, how often and were asked to provide pictures.

Fig 3.5.1 An example of one of the filled-in diaries
3.5.3 Key findings

The 6 booklets were analyzed based on the questions stated earlier. They were analyzed per participant. After that, overarching patterns were found, or answers that were unusual. For each participant a visual abstract was made, see Fig 3.5.2. The other participants’ abstracts can be found in Appendix 5. The data of the booklets can be found in Appendix 6 and 7.

The type of activity depends on how the user or designer classifies it

The most often performed type of activity was Routine acts, then Repair and after that Preventive measures. It seem that activities that fit into Routine acts could also fit in other product care categories and therefore does not give a clear image of the most common type of activities. One participant disconnected the cord of her laptop charger when packing her bag, see Fig 3.5.3. It was defined as Routine act, because it was habitual and unconscious. But the activity could also be considered Mindful Handling if it were not done unconsciously. The same applies for Small care and Mindful & Instructed handling, the activities could fit in either type. This shows that activities are not strictly set, but the categorization depends on how the user (or designer) classifies it.
Most common activities are dependent per user
It differs per participant which type of activities they perform most. For example, the participant of Fig 3.5.3 mostly did low-effort activities, such as cleaning earrings, making sure the adapter of her laptop was rolled up properly and washing her clothes less. While another participant did just as many high-effort activities such as Repair and Product revival, such as repairing the steer of his motorcycle, replacing wooden planks of a bar and fully cleaning and oiling the parts of a shaver. One thing that was distinctive was that older participants performed more Routine acts compared to the two youngest participants who had no Routine acts.

Least common type of activity
The only care activity that was hardly mentioned was Creating something new/different. Only 2 out of 6 people performed Creating something new/different activities, with a total of 3 times.

Fear and appearance
Every participant mentioned something in their motivations related to their fear for the product breaking down. Every participant performed Preventive measures to ensure this fear would not come true or performed other care activities with ‘fear’ as the motivation.

“I’m afraid it might break someday if I don’t do it.”
(about getting her daughter’s bike checked at the bike repair shop)

Another important motivation for people (which can also be seen as a trigger) is the appearance of the product. 5 out of 6 people mentioned motivations related to upkeeping the appearance of the product, or shame for dirty products.

Barriers
The main reasons given for postponing or failing to perform Product care were the lack of time and the lack of necessity. There were or alternative products or it was not urgent.

Triggers
Participants were often triggered by the physical appearance of products, the loss of a function (or poorly functioning) and
habitual behavior. What sticks out is that many of the products that were failed to be maintained/repaired were also products that did have changes in their appearance (looking dirty). People still failed to perform the desired behavior, the trigger was not enough. As a result of procrastination, insecurity about how to do it or the lack of time or interest, people still failed.

**Emotional value**
What was notable was that (almost) no products were mentioned that were maintained due to their emotional value.

**Pleasure**
The two youngest participants also saw some of their Product care activities as fun, relaxing or pleasant. Pleasure was derived from the act of working with your hands or the activity being considered fun.

"I would feel bad about my guests seeing my badly maintained things."
*(about her dinner table lamp)*

"The weather was nice and it was also fun to do."
*(about fixing a wooden bar on the balcony)*

**Conclusions**
There was no clear pattern between participants’ Product care behavior. This is in line with the simplicity profile I spoke of in Chapter 2.3. Where a retired citizen scores high on time and money and has difficulty with physical effort and non-routine, a high school student scores bad on the first two, but will not be stopped by physical effort or non-routine behavior. This means that when designing for Product care, for each user you may need to target different motivations or barriers. For a design tool for Product care, defining the user will have an essential role.

Another important thing learned during this study is that even though I defined the different types of Product care, it depends on the user and designers how they interpret the categories and how they would classify the different activities.
Research questions
The sub-questions for this thesis are:

- What is product care?
- How can Product care behavior be stimulated through design?
- What do designers need to be able to implement Product care into their design?

It was expected that the empirical research would help with the first sub-question, but in the end it also benefitted the second and third sub-question.

“What is product care?”
The definition that was given for Product care in Chapter 1 was: ‘Product care can be understood as any action that helps to prolong the lifetime of a product, such as maintenance or reparation (Ackermann, 2018; Ackermann et al, 2018). These product care activities can be conducted by the consumer itself or by a service, like a garage, or a bike-shop.’

Product care is not one single type of behavior. Product care is a variety of different types of activities that vary in time and effort. In the degree of skill that is needed, consisting of different actions and is perceived differently by each user.

This partially answers the third research question. Since every Product care act for each product, for each user and for each context is different, a designer for Product care needs to have an understanding of the type of product, user and context he or she will be designing for.

Provide concrete examples
Through the creative sessions with design students I aimed to already find answers on the second sub-question. They came up with some strategies, a few of which were also found in the literature research. It also became clear that it was difficult for them to come up with concrete examples of how that would be implemented in product design. It will be beneficial to the process if they are provided with examples to get a better understanding of how the translation can be made from a design strategy to a strategy embodied into a design.

Product care behaviors
Often there was not a clear distinction between the Product care behaviors during the photo diary study. This is because it depends on the product and type of person, as said before.

Even though Product care types sometimes merged together I decided to keep the product care behaviors as they are. They can still provide the designers with
inspiration in different directions and it also can help designers to differentiate between the types of behavior that they can target and which possibilities exist.

Another important insight is, that designers need not think of the user, the product and the product care behavior separately. They need to think about the combination of those three together. Each combination brings different motivations, barriers, interesting opportunities and such.

Who’s my user?

One of the most important takeaways for the rest of the process is that the success of performing Product care is strongly connected to the user. Because there is no clear pattern between the users, it means that when designing for Product Care, designers have to analyze their targeted user.

During the tool development phase, I will delve into how to take the user into consideration when designing for Product care.

Requirements

After this Chapter, a few requirements can be set.

- The design tool should give concrete examples of how it can be applied to design
- A product care design tool should present the different types of product care to the designer.
- It should incorporate the user and the product, which impact design for Product care
This chapter elaborates on the development of the design strategies. The goal of this phase is to develop product solutions in which product care stimulation is implemented. The three methods used to reach these product solutions are explained. The solutions have been created through individual ideating by myself, by facilitating an ideation workshop with other designers and by looking at existing products that intentionally or unintentionally stimulate product care. These product solutions are clustered into specific design strategies for Product care. At the end of the chapter I will reflect on the strategies found during the Literature review.
In Chapter 2 I presented strategies from the field of Circular design, Emotion-centered design and Behavioral design which is relevant for the topic of designing for Product Care. This chapter focuses on the sub-question:

- How can product care behavior be stimulated through design?

Picking the right strategies and translating them from literature into a concrete tool is not a straightforward process. Many of the theories were not empirically based, too theoretical to be used in practice and not easily combined. I have defined which strategies are important by deriving it from practice. In other words, by designing product solutions that stimulate Product care and translating those product solutions into design strategies.

I have done this in three ways:

- by facilitating an ideation workshop with designers
- by designing product solutions myself
- by looking at existing products that incorporate product care

At the end of the chapter the design strategies for Product Care will be presented and discussed and I will reflect on the design strategies that were found in literature.
4.2 BRAINSTORM SESSION

4.2.1 Goal
I assumed that designers already have some basic knowledge through their education on how to design for product care. The goal for the brainstorm session was to know what product solutions and which design strategies they would come up with. For this brainstorm the problem statement was:

- How can a product (or service) stimulate Product care by the user?

4.2.2 Method
A brainstorm session was held with 4 Industrial Design Master students from the tracks Design for Interaction, Strategic Product Design and Integrative Product Design of the University of Technology Delft and 1 UI/UX designer. The session plan can be found in Appendix 8. The participants were sensitized beforehand. They received a short introduction a few days prior to the session about the 7 product care types and were asked to think of 2 examples of products that they manage to repair or maintain and 1 example in which they fail or postpone. The session lasted between 2 and 3 hours, it consisted of purging on the topic Product care, brainstorming abstract solutions for the 7 types and brainstorming on 6 specific products, based on the participants’ examples. These fit into the 6 product categories mentioned by Ackermann (2017).

4.2.3 Key insights
At the end of the brainstorm session the group of designers came up with approximately 120 conceptual solutions for product care. At the end of the session they clustered these into design strategies:

- Showing value
- Consequences
- Service
- Heightening knowledge
- Emotions
- Product changes
- Giving tools
- Matchmaking
- Enthusiasm
- Others are involved
- Making it fun
- Reminders
- Miscellaneous

The explanations of the clusters and a list of all product solutions can be found in Appendix 9. The product solutions have been used to cluster into design strategies for Product care. The clusters defined during the brainstorm were also taken into account during my own clustering process.
Fig 4.2.1. The setting of the brainstorm session
4.3 INDIVIDUAL IDEATION SESSION

4.3.1 Goal
I assume that the results of the brainstorm with designers was dependent on their knowledge about repair and maintenance activities, existing products and design strategies in general. I have been sensitized by the strategies from the literature research. Therefore it is possible that I can develop different types of product solutions compared to those of the brainstorm session.

The goal for the individual ideation was to develop around 70 product solutions that can be used for the clustering into design strategies. The second goal is to ensure that these product solutions vary as much as possible.

4.3.2 Method
Designers are familiar with ideating, so I first let my inspiration roam free. To ensure that the product solutions would vary, I varied between products from all 6 product categories (consumer electronics, means of transport, furniture and interior design, clothes shoes and fashion accessories, sport equipment) mentioned by Ackermann and colleagues (2018) and between the 7 Product care types.

Whenever the ideation process went slow, I made use of a forced fit method.

I made a list with 3 mandatory variables:
- 6 product categories (Ackermann, 2018)
- 7 product care types (see Chapter 3.4)
- 5 sensory senses

And an extra variable when I needed extra inspiration:

Through the use of a random generator I would get one of each variable and force myself to develop an idea inspired on the given variables. At first I wanted to incorporate the Fogg drivers but noticed those were too broad to incorporate. I used the SLOW design principles because these relate to emotionally durable design, and would touch upon both physical and emotional durability.

4.3.3 Key insights
The ideation led to approximately 70 small product solutions that are expected to stimulate product care behavior. See Appendix 10 for the product solutions. An example of a few product solutions can be seen to the right.
Fig 4.3.1. A few results of my own ideation
4.4 EXISTING PRODUCTS AND SERVICES

4.4.1 Goal
Many existing product and service ideas/designs stimulate product care. These are useful to use in the clustering process.

Relevant research questions:
- What kind of products exist that intendedly or unintendedly evoke product care behavior?
- What kind of services exist that intendedly or unintendedly evoke product care behavior?

4.4.2 Method
There was not a set source for information for these products and services. Most of these were found by browsing on the internet, asking other people and looking at products and services that I was familiar with.

4.4.3 Key insights
Around 70 existing products/services have been found that intendedly or unintendedly evoke, stimulate or support product care. For the list of product examples, see Appendix 11. In Fig 4.2.1 a few product examples are presented.
New materials have been developed that can repair themselves.

Personalizable templates for sneakers make the user part of the creation process and makes the product fit their identity better. They will probably feel more attached to the product.

The municipality of Rotterdam has placed bicycle pumps and tools next to bicycle paths. This makes the act of Product care much more accessible and flexible.

IKEA hackers is a website that promotes customizations and alterations of standard IKEA products.

Repair cafés give people the opportunity to seek help with repairing their belongings and brings people in contact with experts or other people. The social connection between people is an added value of this concept.

Some materials, such as white fabrics, figuratively scream that they get dirty quickly. Users are in this way made aware that they should be prepared with a coating beforehand or be used carefully.

Fig 4.4.1. A few existing product examples that stimulate product care.

Design for Product care
4.5 CLUSTERING INTO DESIGN STRATEGIES

4.5.1 Goal
To find common themes I analyzed the product solutions developed in chapters 4.2, 4.3 and 4.4. Clustering these, based on the type of solutions, made it possible to formulate design strategies for Product care.

Relevant research questions:
- What are overlapping themes when looking at the product solutions?
- What design strategies can be derived from these themes?
- How do they overlap with strategies found during in literature?

4.5.2 Method
The product solutions were collected in one place on pieces paper, around 250-270 product solutions in total. I made use of spontaneous clustering, where I randomly pick a product solution and place it next to a similar one, or form a new group, see Fig 4.5.1. This went on until all product solutions were placed somewhere. The clustering process consisted of a few rounds. For one round I asked another IDE student to cluster it with me. A fresh pair of eyes looking at it helped see if I missed any links. By doing it together we had fresh ideas but still with my experience with product care present. This resulted in better-defined clusters and combined groups.

4.5.3 Key insights
Clustering resulted in 8 clusters. These clusters also had multiple sub-clusters. From now on, I will call these the design strategies and sub-design strategies. See Fig. 5.4.2 on page 66 and 67 for a short description per strategy.

The developed design strategies:
- Experiences
- Enabling
- Change
- Informing
- Reflecting
- Social
- Control
- Appropriation

After the initial clustering phase the sub-design strategies have been altered, in this paper only the final version is presented. For the sub-design strategies see Fig. 5.4.3 on the pages 68 and 69.
Fig 4.5.1. The clustering process
Experiences
Think about how you want product care activities to be experienced by the user. Make use of the emotions that can be felt beforehand due to the user’s expectations and look into the experiences and emotions experienced during and after Product care activities.

Enabling
Think about how you can make product care behaviour easier for the user to perform, how to provide them with the necessary tools, means or help and thus lower the threshold for them to perform product care behavior.

Change
Think about how the design can create a change or disruption in the day to day routines of the user to bring attention to product care.

Informing
Think about how you can heighten the knowledge of the user, through traditional forms of information, through interactive sources of information and through information hidden in your design.

Fig 4.5.2. The developed design strategies
**Reflecting**  
Think about how to make the user reflect on what value a design has to them, through the meaning of the design, or the memories or stories they contain.

**Social**  
Think about making use of the user’s social connections. Think about product care leading to social connections or product care as the facilitator of product care.

**Control**  
Think about if your design played the dominant role in the relationship, if it would make decisions itself, steer the user unconsciously or even force the user to perform product care.

** Appropriation**  
Think about creating appropriation possibilities for the user; by providing personalization possibilities, changeable products or by stimulating the user’s creativity.
<table>
<thead>
<tr>
<th>Experiences</th>
<th>Enabling</th>
<th>Change</th>
<th>Informing</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Anticipating effects</strong></td>
<td><strong>Providing flexibility</strong></td>
<td><strong>Motivational triggers</strong></td>
<td><strong>Static info</strong></td>
</tr>
<tr>
<td>making the user associate</td>
<td>making the design compatible with standard</td>
<td>pushing users to perform product care or</td>
<td>using traditional forms of information to</td>
</tr>
<tr>
<td>product care with desired</td>
<td>tools and making them more accessible</td>
<td>making them want to perform the desired</td>
<td>heighten the knowledge of the user such as</td>
</tr>
<tr>
<td>effects or emotions, or</td>
<td></td>
<td>behavior</td>
<td>manual or tutorials</td>
</tr>
<tr>
<td>postponing product care</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>with negative effects</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>The experience of the</strong></td>
<td><strong>Providing necessary means</strong></td>
<td><strong>Awareness triggers</strong></td>
<td><strong>Interactive info</strong></td>
</tr>
<tr>
<td>activity</td>
<td>providing the necessary means or tools</td>
<td>indicating to the user what type of</td>
<td>using interactive forms of information,</td>
</tr>
<tr>
<td>creating a more pleasurable</td>
<td>with your product</td>
<td>product care is needed and notifying them</td>
<td>that evolve or adjust themselves to the</td>
</tr>
<tr>
<td>experience during product</td>
<td></td>
<td>when it is needed</td>
<td>user, to provide them with the necessary</td>
</tr>
<tr>
<td>care</td>
<td></td>
<td></td>
<td>knowledge</td>
</tr>
<tr>
<td><strong>After-effects</strong></td>
<td><strong>Providing help</strong></td>
<td><strong>Product changes</strong></td>
<td><strong>Physical information</strong></td>
</tr>
<tr>
<td>creating an afterflow</td>
<td>supporting the user with product care</td>
<td>changing the product's appearance or</td>
<td>explaining what kind of product care is</td>
</tr>
<tr>
<td>feeling after having</td>
<td>activities or providing the product care</td>
<td>behavior to bring attention to product</td>
<td>necessary through its physical form/</td>
</tr>
<tr>
<td>performed product care,</td>
<td>to them</td>
<td>care</td>
<td>appearance such as affordances</td>
</tr>
<tr>
<td>making the experience last</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>or making the effects</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>apparent</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Sub-design strategies**

- Anticipating effects: making the user associate product care with desired effects or emotions, or postponing product care with negative effects.
- The experience of the activity: creating a more pleasurable experience during product care.
- After-effects: creating an afterflow feeling after having performed product care, making the experience last or making the effects apparent.
- Providing flexibility: making the design compatible with standard tools and making them more accessible.
- Providing necessary means: providing the necessary means or tools with your product.
- Providing help: supporting the user with product care activities or providing the product care to them.
- Motivational triggers: pushing users to perform product care or making them want to perform the desired behavior.
- Awareness triggers: indicating to the user what type of product care is needed and notifying them when it is needed.
- Product changes: changing the product’s appearance or behavior to bring attention to product care.
- Change in functionality / performance: changing the functionality or performance to indicate product care is needed.
- Static info: using traditional forms of information to heighten the knowledge of the user such as manual or tutorials.
- Interactive info: using interactive forms of information, that evolve or adjust themselves to the user, to provide them with the necessary knowledge.
- Physical information: explaining what kind of product care is necessary through its physical form/appearance such as affordances.
### sub-design strategies

<table>
<thead>
<tr>
<th>Reflecting</th>
<th>Social</th>
<th>Control</th>
<th>Appropriation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Meaningful memories</strong>&lt;br&gt;making the design hold, represent or stimulate making memories, to make the user feel emotionally connected to the design</td>
<td><strong>Social connections as a results</strong>&lt;br&gt;making social interactions part of the product care activities or making it lead to social interactions</td>
<td><strong>Product takes initiative</strong>&lt;br&gt;making the design take the first step of product care and pushing the user to continue</td>
<td><strong>Personalization</strong>&lt;br&gt;providing the user with the possibility to alter their product before/after purchase making it fit their identity</td>
</tr>
<tr>
<td><strong>Traces</strong>&lt;br&gt;making the design tell a story, showing the beauty in the wear/traces and making them reflect on their interactions with the design</td>
<td><strong>Social connections as a facilitator</strong>&lt;br&gt;making social interactions support the act of performing product care, or even necessary so succeed</td>
<td><strong>Product handles product care itself</strong>&lt;br&gt;making the design update or fix itself, ensuring that the user does not need to perform product care</td>
<td><strong>Ever-changeable products</strong>&lt;br&gt;providing the possibility to alter the design during the user-phase, making it adjust themselves to the changing needs of the user</td>
</tr>
<tr>
<td><strong>Unconscious takeover</strong>&lt;br&gt;making the act of product care fit into daily habits or routines, making the user unconsciously perform the desired behavior</td>
<td></td>
<td><strong>Forcing product care</strong>&lt;br&gt;forcing the user to perform product care, refusing to work if product care is postponed</td>
<td><strong>Creative change</strong>&lt;br&gt;triggering the user to tap into their creative side, inspiring and enabling the user to appropriate the design</td>
</tr>
</tbody>
</table>

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*Fig 4.5.3. Sub-design strategies with examples*
4.6 CHAPTER CONCLUSIONS

4.6.1 Reflecting on literature
In the next part I will reflect on the developed strategies, to understand how they connect with existing strategies or if they are novel. On the page 70 and 72 you can see an overview of the connected strategies.

Experiences
The first sub-strategy anticipating effects, which relates to expectations for the consequences, is related to Fogg (2009) and mainly its motivational factors: pleasure/pain, hope/fear and social acceptance/rejection. This is similar to Eco-spur presented by Bhamra and colleagues (2015). Eco-spur tries to make the user explore more sustainable behavior by rewarding good behavior and punishing bad behavior. These expectations of rewards and punishment fit the sub-strategy well.

The two other sub-strategies, the experience of the activity and after-effects relate to theories from Emotion-centered design. Those theories focus on creating a pleasurable experience, such as Design for savoring (Pohlmeyer, 2014) and for pleasure (Mugge, Schoormans & Schifferstein, 2008). The SLOW design principle Reveal looks similar to the experience of the activity, since it focuses on revealing everyday experiences that are lost or forgotten. This sub-strategy also sees Product care as something that can be enjoyable, if users were to slow down and experience it.

Enabling
This cluster can, partially, be explained by the ability factors of Fogg’s behavior model. These relate to the simplicity of the desired behavior. Most of the solutions from the strategy Enabling relate to accessibility or ease of product care. Enabling has ties to the Circular design strategy Design for Standardization & Compatibility and Design for Ease and Repair (Bakker & den Hollander, 2014). All sub-strategies of Enabling focus on making product care easier or accessible, which match the strategies by Bakker. Eco-choice by Bhamra and colleagues (2011) links to this strategy because it focuses on providing the user with options or choices for sustainable use to take place.

Change
The factor triggers, as mentioned by Fogg (2009) can almost in its entirety explain this group. The strategy Change focuses on causing a disruption in the routines and daily life of the user. The solutions all differed greatly in which manner. This was for example by sending reminders, flashing lights, sudden sounds or change in appearance. Change can point at direct triggers such as reminders, or signals (notifications), but also a change in the form of the product changing its appearance and/or behavior or a change in the functionality or performance. The behavioral design strategy Eco-feedback by Bhamra and colleagues is about informing the user of their behavior by providing tangible aural, visual or tactile reminders.
Fig 4.6.1. Connections between strategies and literature
**Informing**

Informing has ties to the *Ability* factors from Fogg (2009). All three sub-strategies focus on heightening the knowledge, or in other words the ability of the user. It also has ties with *Eco-information* and *Eco-feedback* presented by Bhamra and colleagues (2011). *Eco-information* is mainly focused on making it visible how product, services or systems work, without the push of behavior change, but making the user aware and reflect on their use. As said in the previous paragraph, *Eco-feedback* is about showing the user through signs or reminders what they are doing and facilitate them in how they could make more responsible decisions. The difference between *Eco-information* and *Eco-feedback* is that *Eco-information* merely makes the user aware of how systems works and that *Eco-feedback* also relates it to the use and interaction of the user and shows more directly how they could alter their behavior. The sub-strategy *Physical information* can in some products seem similar to sub-strategies from *Change*, because they both focus on informing the user through the physical form of a product. These type of solutions are also called affordances in design.

**Reflecting**

Many strategies link to *Reflective*. The sub-cluster *Meaningful memories* relates *Design for Attachment & Trust* (Bakker & den Hollander, 2014) which proposes an emotional connection to the product. It relates to Product attachment theories such as *Aging gracefully*, *Memories* (Mugge, Schoormans & Schifferstein, 2008), *Personal growth* (Casais, Mugge & Desmet, 2016) and the SLOW design principle *Reflect*. All these strategies make the user reflect on the journey they or their product has gone through. *Attachment* is a strategy mentioned by Chapman’s book *Emotionally Durable Design* (2015). For *Attachment* it is relevant that the user has a strong emotional connection to the product, which can also come due to the meaning it conveys which is similar to *Meaningful memories*. The sub-strategy *Traces* focuses on telling a story through showing the beauty of wear. This also relates to product attachment theories, such as the strategy *Aging gracefully*. It also relates to one of the SLOW design principles *Reflect*. One of the examples of this principle mentions showing the traces of the relation between the product and the user. This strategy also relates a lot to the strategy *Narrative* (Chapman, 2015). Narrative is when users share a unique personal history with the product. This is very much the same as the two sub-clusters which both focus on the history of the relationship between product and user. Traces can also relate to *Eco-information* by Bhamra which proposes to make processes more visible and understandable so it inspires the user to reflect. This theory focuses on reflection in general, not specifically on reflecting on one’s own relationship and interactions with a product.

**Social**

This strategy sees social connections as a result or as a facilitator of Product care. The ties for this strategy were a little less obvious to find. These are not yet mentioned in Circular design strategies.
Design for Product care

Reflecting

- Design for Attachment & Trust

Social

- Eco-information
- Aging gracefully
- Reflect
- Memories
- Personal growth

Control

- Eco-steer
- Eco-technical intervention
- Clever design
- Positive relations with others
- Engage
- Participate

Aging gracefully

Eco-driven & circular design strategies

Eco-technical intervention

Clever design

Behavorial design strategies

Eco-steer

Consciousness

Emotion-centered design strategies

Participate

Self-expression

Group affiliation

Emotionally durable design strategies

Participate

Co-experience

Alternative design strategies

Bakker & den Hollander (2014)
Fogg (2009)
Bhamra et al (2011)
Mugge et al (2008)
Casais (2016)
Pohlmeyer (2014)
Chapman (2015)
Battarbee (2004)

Fig 4.6.2. Connections between strategies and literature

Design for Product care
and the link with Behavioral design strategies were also scarce. It did link to a few Emotion-centered design strategies. The SLOW design principles Engage and Participate seem the closest link to Social. Engage proposes that processes should be more collaborative and rely on sharing. This could have ties with the sub-strategy Social connections as a facilitator. They both propose that processes should make use of shared human knowledge or effort. Participate is described as follows by Strauss & Fuad-Luke (2008): “Slow Design encourages users to become active participants in the design process, embracing ideas of conviviality and exchange to foster social accountability and enhance communities.” The last part of this statement is interesting. This seems similar to the sub-strategy Social connections as a result of product care. Processes, services or products that result in new or deeper social connections. The last product attachment strategy which also relates to this sub-strategy is positive relations with others, by Casais and colleagues (2016).

A strategy that was not discussed but could also explain why Social is strategy for Product care is the strategy Co-experience with others by Battarbee (2014). Co-experience is a blend of user experience of products and of social interaction. It also relates to creativity and collaboration and how this can positively impact someone's or the collective's experience. This principle may explain how social connections can positively influence the user's willingness and ability for Product care.

**Control**

Control has many ties with strategies from Bhamra and colleagues (2011), such as: Eco-steer, Eco-technical intervention and Clever design. They vary in the degree in which the product or service has control in the user-product relationship. For example, the sub-strategy Forcing product care is almost the same as Eco-technical intervention: they both propose to force a behavior change upon the user. Product handles product care itself can be compared to Clever design, where the user does not even have to think about the act of product care. This strategy also relates to the strategy Consciousness from Emotionally Durable Design (Chapman, 2015): “the product is perceived as autonomous and in possession of its own free will; it is quirky and often temperamental, and interaction is an acquired skill that can be fully acquired only with practice.”

** Appropriation**

The sub-strategy Personalization relates to strategies proposed by Mugge and colleagues (2008), such as self-expression and group affiliation. These strategies all relate to the expression of one's identity in the product. The sub-strategy Ever-changeable products has ties with the Circular strategy Design for Adaptability and Upgradeability (Bakker & den Hollander, 2014). They both relate to products that can change and be upgraded when the user desires so.

These two sub-strategies also relate to SLOW design principles. For example the principle Participate, which was explained
in earlier.
And the principle Evolve: “Slow Design recognizes that richer experiences can emerge from the dynamic maturation of artifacts, environments and systems over time. Looking beyond the needs and circumstances of the present day, slow designs are (behavioural) change agents.”

And also the principle Expand: “Slow design considers the real and potential “expressions” of artifacts and environments beyond their perceived functionalities, physical attributes and lifespans.” (Strauss & Fuad-luke, 2008)
These principles all discuss how the user should be involved in the making of a process or product and how their relationship can evolve and grow over time.

The only sub-strategy that does not have any clear ties to existing strategies is Creative change. This strategy has some weak connections to the previously mentioned strategies for Appropriation, but there is no clearly defined strategy that proposes the same thing: to inspire the user to appropriate their belongings.

4.6.2 Conclusion
All strategies can be linked back to strategies or principles that were found during the literature research of this thesis. The only sub-strategy where no existing literature could be linked to was Appropriation, Creative change.

During this Chapter the focus lay on the sub-question: “How can Product care behavior be

stimulated through design?”
The answer to this question, for now, is through using the strategies proposed in this chapter:
- Experiences
- Enabling
- Change
- Informing
- Reflecting
- Social
- Control
- Appropriation

The final version of the strategies however needs to come in a format which allows the designer to learn about the various design directions and that makes them understand how they can use the acquired knowledge.

The advantage of these strategies over the strategies found in literature is that these strategies combine knowledge and insights from different fields, but are conveyed in a compact way. Because they are based on existing/conceptual product solutions, designers can also get more insight into which strategies can be successful for a specific type of product care or how a certain strategy can be embodied in a design.

Some design strategies from literature already provide examples of how a strategy is made use of. The strategies that I developed are all based on real (or conceptual) solutions. These examples can help designers greatly, who (almost always) require inspiration. The design tool for Product care can provide these examples and thus give a more complete and comprehensive understanding of the design strategies that exist.
This chapter elaborates on the development of the design tool. The goal of this phase is to develop a product care design tool that can be tested and further iterated. Two versions of the design tool will be presented, the first is a walkthrough template, the second is a further developed iteration of the template, which is the brainstorm card set. After the testing of the second version, recommendations for the final design of the design tool will be presented.
5.1 INTRODUCTION

In the previous chapter I presented and discussed the design strategies that lie at the core of the Product care design tool. In this chapter I will explain the process of the development of the design tool, which can be considered the embodiment of the design strategies.

The last sub-question which will be answered in this chapter is:

• **What do designers need to be able to implement product care into their design?**

This is done through an iterative ideation process and testing with designers and design students.

The steps taken during the development of the design tool consist of:

• **looking into existing design tools and methods**
• **finalizing requirements for the design tool**
• **developing paper prototypes**
• **testing the different design tool iterations**

At the end of the chapter recommendations for the final version of the design tool will be presented. Here I will also reflect on the research question.
5.2 PROCESS

5.2.1 Method
In this chapter the development of the design tool for product care is presented. In this process 2 mayor iterations have been developed, with smaller in-between iterations. These iterations are tested with Bachelor and Master students from the Industrial Design Engineering Faculty of the University of Technology Delft, from the University of Twente and with UI/UX designers.

During the tests the following research questions were set which relate to the use:

- When in the designing process is a product care design tool useful?
- Which knowledge or information is essential for a designer when designing for product care?
- What is the process like, that a designer goes through with the design tool?
- How would designers prefer to use such a design tool?

And research questions related to the overall goal of the tool:

- How can a design tool inspire designers?
- How can a design tool teach designers how to implement this knowledge to their design?

Through observing how participants use the design tool iterations and by interviewing them afterwards I was able to get insights in what a Product care design tool should offer. In this chapter the two main iterations are presented, with the main elements of that tool and the insights from testing that iteration. The in-between iterations will not be presented in this paper. The two iterations that will be presented are the two biggest steps, the in-between iterations are variations leading up to those two iterations.

5.2.2 Existing tools and methods
To gain insights in which format would work for a Product care design tool, I looked into existing design tools and methods. The tools and methods were not limited to tools meant for designers, but were also exercises or methods used for other fields. Most of the tools that were used as inspiration were looked at superficially.
During the process of developing a design tool, I found inspiration by asking myself the following questions and by the way existing methods or tools tackled this.

- How can the concept of Product care and its different facettes be explained?
- How to communicate which design strategies exist and how to apply them?
- Which format would best suit a tool for product care?

**Explaining Product Care**

The global concept of Product Care is quickly explained. "Product care can be understood as any action that helps to prolong the lifetime of a product, such as maintenance or reparation." (Ackermann, 2018; Ackermann, Mugge & Schoormans, 2018) Understanding how to design for it is difficult though. Chapter 3 showed that there are many types of Product care. To figure out how the tool can best help and support designers into understanding how to design for product care I looked into familiar methods and tools and into the standard design cycle that design students are taught at the University of Twente, through the book *Productontwerpen*, (Eger & Bonnema, 2010) and at the TU Delft, through the Delft Design Guide (Van Boeijen, Daalhuizen, Zijlstra & van der Schoor, 2014). Industrial Design students in the Netherlands are taught the standard design cycle. According to Eger and colleagues, the standard design cycle exist of the following phases: Analysis, Ideageneration, Conceptualization, Detailing and Evaluation. This designing process is being taught through practice. Practicing the use of the design cycle in design projects allows design students to grasp this elementary process so they can incorporate it in their daily design projects by heart. Like riding a bicycle, the knowledge about how it is done is tacit. People become unconsciously competent and do not think about how it works any longer.

The same should count for learning about Product care. If this tool has to make an impact, the best way is to implement it in at the beginning of designer’s education and practicing it often through projects. This way, future designers will unconsciously master it and be able to implement it in their designing process.

This tool should not just be applied somewhere at the end of the design process where one follows a tool’s steps and reaches a redesign. By practicing, a designer is able to first understand Product care and later apply it into his/her project. This means that the main purpose for the design tool will be to teach designers about Product care so they will understand it, and will find useful and sensible to implement in their standard design process, even though their main focus may not necessarily be to Design for Product care.

**Communicating the design strategies**

Because the main purpose for the tool is to supply designers with knowledge, an important question is: How to teach designers which design strategies are possible for Product care and how can they be applied to a design.

For this, I looked into other design tools that aim to communicate design strategies. An example is the SIM toolkit by Mafalda Casais, see Fig 5.2.2.1. The SIM toolkit aims to inspire designers to create design
that makes use of symbolic meaning and supports subjective wellbeing. The interesting thing about this design tool is that the tool consists of 6 dimensions that are each presented briefly on the cards. For each dimension, a few design directions are advised. What makes them more tangible and easier to understand is that for each design direction one or a few questions are asked, to make the user think deeper about the subject. Why this is interesting for a Product care design tool is that the design strategies are still very abstract. By asking the designer questions and directions to think in, it may be easier to understand what the core message of each strategy is. What I miss in using the SIM-card set is the connection with actual design. It is hard to imagine the effect on designs due to the usage of the card set. For a Product care design tool I aim for tangible examples of how the strategies can be implemented.

**Format**

Most designers are used to apply many different tools and methods in different formats. I aim to make a tool that can be implemented in current designing processes, therefore it should not be intrusive and be adaptable to current ways of working. Methods and tools exist in many formats. Tools and methods which format have been an inspiration for this tool are:

- creative sessions
- personas
- board of innovation card set
- triggers cards

I have seen the potential of creative session, through the course Creative Facilitation at the Technical University of Delft.
Through a group’s interactions, discussions and hitch-hiking on each other’s ideas, an ideation session can really speed up and improve. This is interesting for a Product care design tool, because with this tool I aim to move away from the mainstream solutions of informing users of necessary product care through a manual, but strive for novel and innovative ideas as well. The field of creative facilitation offers many exercises, see Fig. 5.2.2.2, and insights that can be beneficial for this tool.

The making of personas, see Fig. 5.2.2.3, is a well-known technique which can help a designer create empathy for the user they are designing for. These can be in-depth, based on behavioral patterns and user research. For this tool it can already be sufficient to have a superficial idea of the user and which motivations and barriers you may face.

Two card sets that also provided inspiration for this tool are the board of innovation card set (Board of innovation card set, n.d.) and the triggers card set (Triggers card set, n.d.), see Fig. 5.2.2.4 and Fig 5.2.2.5. These are both card sets meant for brainstorming. The card sets ask the user ‘what if’ questions and in the case of board of innovation also relate it to an existing service or company. This is similar to the HKJ (Hoe Kun Je) technique which is taught to design students at the TU Delft, where you ask yourself: ‘How can I...?’ Such formulation of questions tend to work inspiring and can help people in their way of thinking.

**Requirements**

The following requirements have been drawn from the research into existing design tools:

- *It should fit into the standard design process*
- *The process of using the tool should provide a sense of structure to the designer*
- *It should provide inspiration for design solution(s) that take product care into account*
- *It should incorporate the user and the product, which impact design for Product care*
- *The strategies should be explained in such a way that the user understands them without having to read/search extra information*
- *It should be clear to the user of the tool what the main message of each strategy is and have an idea of how that can be translated into a design*
5.3 ITERATION
WALKTHROUGH TEMPLATE

5.3.1 Elements

Format
The first iteration is a template that can be printed and filled in, the detailed pages of the concept can be found in Appendix 12.

It consists of 1 A3 information sheet regarding Circular Economy, Product Care and the purpose of the tool. 4 A3 worksheets complete the template. These should be filled in by the designer and will lead to a conceptual design in the end. The template set comes with a two sets of cards. The first set explains the design- and sub-design strategies and a set of smaller cards shows product solutions for each sub-design strategy. And example of the sheets and these cards can be seen on pages 82 and 84.

Process
In the figure on page 83 you can see the process/steps of this tool. The process is linear, with each step creating a solid base to fulfill the next one successfully. This iteration focuses mainly on the content. To see if the process is understandable and logical. The focus is less on the format.
The steps of the template:

- Receiving an introduction about Product care through reading the info page
- Defining the product
- Defining the user
- Defining the desired product care behavior
- Choosing a design strategy
- Reading example product solutions
- Developing a product solution
Fig 5.3.2 Examples of the worksheet in use and the design strategy and example cards
5.3.2 Testing

Participants
4 individual participants:
• an Industrial Design Engineering bachelor student
• a DFI master student from University of Technology Delft
• an IDE master student from University of Twente
• an UX/UI designer

Method
The participants were questioned individually. A set of prepared questions were asked during open conversation about the tool. The participants were asked to analyze and try out the tool. After analyzing each page they were asked for their thoughts and questions relating to the comprehensibility of the tool, the process, the information given in the tool and how inspiring it was.

5.3.3 Discussion
The results were documented and recorded and analyzed.

"I would do step 3 till 4b more at the same time, this is more of ‘going back and front in between steps’ for me, a creative process where all information influences each other.”  
~ a participant

Linear or open process
One important remark given to the tool was that even though it was meant for ideation and brainstorming, which are very open and often chaotic processes, the process of the tool was linear and participants therefor felt that they did not have much freedom to adapt to their way of working and their usual design process. The participants found that an expected downside was that it might lead to a less inspiring process, because they felt restricted.

Linking product care and design strategies
All participants wanted to know if there was a link between the Product care types and the Design strategies. The participants thought it would give some guidance on which combinations could be useful.

Introduction text
Participants found the introduction that was given on the first page was understandable but too extensive. The participants suggested that this type of information could be given through an explanation from someone else. This suggestion might be considered providing that the expected setting, in which a product care design tool will be used, is probably a workshop or lecture. Information that is provided with the design tool could take that into consideration.

Overwhelming amount of questions
One participant said the questions asked were overwhelming. The amount of questions asked and the difficulty of them were demotivating. More participants had multiple questions during this part of the design tool. It seems that the questions in general should be rethought, to determine
which questions are essential or which questions should be formulated differently.

Conclusions
After these test I focused on the following things with the next iteration:

- **Making the process more flexible**
- **Trying to find a connection between product care types and design strategies**
- **Making the introduction easier and more pleasant to read**
- **Focusing on the essential questions and how they should be presented**

Those focus points are very concrete. Another important change was the overall purpose of the tool. At the beginning of this Graduation thesis the purpose of the tool was to enable a designer to develop a redesigned product or several concrete redesign directions. After the discussion with the participants and reflecting on the design tools and methods, I concluded that designers are actually able to design for complicated matters because they have learned the process by practicing, by doing it over and over and by informing themselves. I realized I cannot expect that with a single tool, a designer is able to successfully redesign a product. Product care is a complex matter where multiple factors influence each other; the user, the type of product, the context and the type of product care. I decided to readjust the requirements for the tool.

The main takeaway was, that to make designers able to design for Product care I would first have to teach them about it and about the different design strategies. Once they have learned about it and have practiced it a few times, they will be able to apply it to their own design projects. The test showed that the content and the process was good, but the format has to change to make it more flexible for the designer to alter it to their liking, and to grant them the freedom to use methods that have their preference.

Because the planned setting for the design tool would be a learning environment or a workshop, the format should also be made available to use with a few people at the same time, since most workshops and projects are team-based. This is also beneficiary for the outcome of the design tool because working with multiple people often leads to more discussion and thus different insights and more inspiration.

Requirements
After this Chapter, a few requirements can already be set. These are:

- **The design tool’s process should be flexible for the designer to alter to their liking.**
- **It should be useable for an individual and small groups of designers.**
5.4 REQUIREMENTS

During the whole research I collected requirements by looking at current design tools, methods, field research and testing. These requirements were finalized after the testing of the walkthrough template.

Purpose:
- Teaching designers about product care
- Teaching designers about design strategies for Product care
- Give concrete examples of how it can be applied to design

Information:
- It should present the 7 types of Product care to the user
- It should present the 8 strategies that can be used for designing for product care
- It should incorporate the user and the product, which impact design for Product care

Strategies:
- It should be clear to the user of the tool what the main message of each strategy is and have an idea of how that can be translated into a design

Process:
- The process of using the tool should provide a sense of structure to the designer
- The design tool’s process should be flexible for the designer to alter to their liking.
- It should fit into the standard design process

Tool in general:
- It should provide inspiration for design solution(s) that take Product care into account
- It should be useable for an individual and small groups of designers
5.5 Iteration Brainstorm Card Set

5.5.1 Elements

Format
In Chapter 5.3 the first iteration was presented. The second iteration is a card set that supports the designer in mapping all important factors that influence Product care. For the cards, see Appendix 13.

It consists of:
- 7 Product care cards - These cards describe the different types of Product care activities.
- 8 Design strategy cards - These describe the different design directions a designer can think in.
- 8 Persona cards - These can be used as inspiration for designing for a specific user.
- 6 Product cards - These can be used as inspiration for designing for a specific product.
- Around 50 example cards - These are examples for the sub-design strategies to derive inspiration from.

Process
When testing the walkthrough template it became clear that it really depends per designer (and their expertise) what kind of process and focus they prefer. After the previous test it was decided that the main purpose for this tool is to teach them about Product care, about the design strategies...
and about all factors that influence the context of Product Care. When the tool succeeds at this, the designer will also be able to apply it on other projects. This resulted in a card set that can be used in a brainstorm or creative session situation. The process is flexible and can be altered depending on the designer’s preference. It is also no longer a template, but consist of inspirational cards to brainstorm with or to evoke discussion and reflection.

**The steps of the tool:**
- Receiving an introduction about Product care and reading the info page.
- Reading an example of the process
- Brainstorming on a product
- Brainstorming on a user persona
- Brainstorming on multiple product care types
- Brainstorming on multiple design strategies
- Getting example solutions from the
Design for Product care
different design strategies

• Alternate between design strategies/ Product care behaviors/user personas
• Ideating product solutions

The process described here is an example process. This process is advised to follow during the first time use of the tool. It is not mandatory and it is encouraged to use the tool any way the designer prefers.

A big change is the way these cards are used. They are no static sheets which can be used only one time. These cards can lead to a variety of combinations, making the process more flexible and open to the designer.

Another big change is that the cards can be used in multiple ways, as a discussion tool or to brainstorm with. When brainstorming/ideating with the cards designers can draw around the cards on a whiteboard, because the cards are magnetic. It is also possible to use them on paper.

Fig 5.5.1.2 The different elements of the card set
5.5.2 Testing

Participants
3 groups of 2 participants:
- 1 DFI student and 1 UX/UI designer
- 2 IPD students
- 1 IPD student and 1 UX/UI designer

Method
This tool was tested by simulating a short workshop with the card set. The participants were sensitized by receiving a short amount of information about Product care a few days prior to the test.

Before working with the tool the participants were asked questions about their expectations, first thoughts and of the tool on first sight. All questions were prepared beforehand but were asked in an open conversation.

The participants were asked to perform the example process given in the information booklet, for this see page 90. They were asked to first follow those steps and were allowed to continue the process according to their preference. During this I observed their process and behavior. Afterwards they were questioned about the content of the tool and the process.
Fig 5.5.2.1 Examples of the tests of the second design tool iteration
5.5.3 Discussion

**Focus during process**

During the test I looked at how the different teams worked through their process. The group with 2 interaction designers spend more time on describing/drawing the context in detail. They spend a lot of time defining the user persona, the types of behaviors they performed and the environment.

The integrated product design students spend more of their time focusing on defining the product and the type of product care it needed.

The mixed group of IPD and interaction designer spend an equal amount of time on defining the user persona and the product. They however spend more time than the others on defining the most interesting Product care Behaviors, the most interesting Design Strategies and on ideating.

It showed that depending on the designers’ focus they spend time and effort on the part that they found most important or were the most familiar. However, they still paid attention to the other aspects. Their feedback showed that different participants found different aspects of the process more important or interesting. The process was flexible enough for designers to adapt it to their liking.

**Results of process**

The results of the tools varied per team. The team of interaction designers had a detailed visual map of the whole context, but very little concrete product solutions. The group of IPD students only had a small overview of the context, but their result was that they had been discussing everything together and had many fruitful insights into what influenced their desired Product care and which activities exist. The mixed team however had a compact visual map of the context, describing the user, the product, the desired behaviors and had also managed to come up product solutions for multiple Product care behaviors.

> "Perhaps you need a more concrete goal that you're working towards. Like, with Creative Facilitation."  
> ~ an IPD student  
> (about an IDE course)

This shows that one's expertise can have a great influence on the results. This means that the information booklet or the workshop facilitator could propose a more concrete goal that the group can refer to. Usually workshops have a goal, such as being able to present one concept at the end. None of these results were wrong or bad, but if the goal of the tool is to in the end have a few design directions, a clear goal has to be set in the beginning.

**Information booklet**

The participants were asked to follow the instructions in the information booklet.

> "Could you perhaps stimulate designers to pick more than one card? To try different thinking directions?"  
> ~ a DFI student
Participants mentioned that some steps were placed rather late in the process, such as adding a persona card and checking the example cards. The example process in the information booklet also did not present those that prominently. This resulted in some participants not reading it fully during the process, or even forgetting about it. Because they were less focused on the specifics given in the booklet, two groups did not think about alternating the cards at the end, even though it was proposed in the booklet. This became clear after participants asked if they could not have tried more cards, or proposed to stimulate grabbing multiple cards. This shows that the presentation of the information booklet should be more clear, not only in its wording but also visually.

**User persona card**
The user persona card, in each of the three sessions, led to a ‘silly phase’ in the participants’ process. This is a phase, in which participants are able to think very creatively (sometimes unrealistically) and this can have a inspiring and positive influence on a brainstorm or ideation process (Buijs & van der Meer, 2013; Tassoul, 2009). This however happened after most of the context mapping had already been finished. If the silly phase happens at the beginning of the context mapping process, the tool can utilize more of the designers’ creativity. This means that in the next version, the persona has to be introduced earlier in the process.

**Example cards**
The example cards had a positive influence on the ideation process, but the step in the information booklet mentioned it as last. After the participants read the examples, the ideation process received a boost. If these had been presented earlier, that creative boost may have been utilized more.

Two participants mentioned that some examples seem to be similar to each other. For the final version these have to be filtered out and changed into a different product solution to ensure variety.

**Uniformity**
The cards were not fully uniform in their graphic design. For example, the Design strategy cards have a title ‘Design Strategy’, the other cards do not. Participants mentioned that it would help if it would be clearer which cards represent which step. It was also confusing that the Design strategy cards and the Product care cards had the same colour. The participants advised to be more consequent with the graphic design to help communicate the process. Although, even if everything is explained in the information booklet, I should assume that people do not fully read a manual. Therefore I shall try to support them with the graphic design.

“Persona-card could have come earlier. Then we would also have linked it better to the product, and to their type of behaviors and to what the problem is.”

– a UX designer
5.6 CHAPTER CONCLUSIONS

The feedback from other design students, the reflection on existing design tools and the tests of the iterations has enabled me to give recommendations for the final design tool and to answer the sub-research question.

“What do designers need to be able to implement Product care into their design?”

The 5 main things that designers need, based on the requirements and results from the test, are:

- flexibility of process
- a sense of structure
- concise information
- examples
- implementability into standard design process

**Flexibility of process**
After the test of the walkthrough template it became clear that it did not offer enough flexibility for an ideation tool. After improving this for the card set, the flow of brainstorming was better which could be seen in the generation of more variety in output on the questions of the cards.

There is not just one type of designer. Even within one university there are already multiple types; with their own preferences, methods in a design process, focus points and knowledge. One of the requirements of this tool is that it should be usable for small groups of designers, so it should be able to match the different participants in a session.

The format of the tool also impacts the flexibility. The cards from the card set can be used as a discussion-starter, as fragments to focus and draw/write around, it can be used on paper (sitting down) or in a more active session on a white board (while standing up). It can be used individually, but also in small groups. The designer can choose to use cards from all categories, or decide to focus on one or a few. This means that the format of the second iteration is effective.

Also, in this research I have not compared the output of different tools for Product care. I have focused on which requirements a tool has to meet to enable designers to include designing for Product care in their overall designing process. To keep the door open for different ways of Product care, flexibility in the tool is needed.

Some participants mentioned that they would want to use it even before their ideation phase, to get an overview of the context in which their product will be used. Other participants said they want to use it somewhere later in the ideation phase.
when they have an initial concept that can be redesigned or iterated upon.

**A sense of structure**
This can seem contradictory after the previous paragraph, but structure is an important aspect for a design tool. Because this tool focuses so much on flexibility for brainstorming and ideation, it is important that there is still some sense of structure that designers can hold on to. Otherwise the tool might be considered too chaotic.

**Concise information**
Especially during the test of the walkthrough template it became clear that the amount of questions and information presented could be overwhelming to participants. This was tackled in the card set by reducing the amount of questions and text and using separate cards to present pieces of information. This made it more manageable.

The reduction of written information and questions does not mean the designers receive less information or knowledge. The tool does its work when it comes to teaching a designer about Product care, which facettes are important to think about and what possible design strategies could be.

Because it is expected that the tool will be used in group format, whether it is in a lecture or workshop, I expect that additional information can be given externally by a facilitator or lecturer. This means that the tool can be more concise with the amount of information it provided. For example, this means that less space and text needs to be spend on explaining topics such as the Circular Economy or convincing people through the text about the importance of product care.

**Examples**
Examples are very important things for designers to be able to implement Product care. Designers almost always require inspiration or a form of stimuli when ideating and brainstorming.

With this tool the designers receive new information about Product care types and design strategies. It helps designers to get an understanding of how these can be implemented in design if you provide them with examples which they can derive inspiration from. In this tool this is done in three ways, in the design strategies, the example cards and the information booklet. The design strategies are examples of directions that a designer can think in. The example cards present different forms of implementation of the design strategies. And the booklet provides an example of a process with the design tool.

Another important form of examples are the product cards, the persona cards and the product care type cards. These all present the user of the tool with possible products, users, and type of behaviors, in other words, examples. These function as stimuli for the creative process and are at the same time something concrete that the designer can focus on.

**Implementability into standard design process**
Because designers are taught to follow a certain designing process, it is important
for the design tool to be implementable into those processes. Due to the openness and flexibility of the tool, designers have more options of implementing the tool. As mentioned by participants, they saw possibilities for the Analysis phase and Ideation phase.

If a design tool were too intrusive, or fixed in the way it can be implemented, the chance is high that it might not be interesting for designers to use and therefore it misses the whole purpose.

**Requirements**
Reflecting back on the requirements that were presented in Chapter 5.4, the card set fulfills the requirements according to feedback from the participants during the test. Of course, the amount of participants was quite low, so it is unwise to make strong statements about the results. It would be advised to further test it with more designers. Also, some requirements cannot be validated through interviewing the participants. Take for example, a requirement such as: *It should be clear to the user of the tool what the main message of each strategy is and have an idea of how that can be translated into a design.*

Participants may say that they understand the strategies and are able to provide an example of them, it can still be difficult to say for certain that they fully understand it.

This also makes me think. Is the aim, to give designers a good amount of understanding of the topic of Product care, or is the focus to make them understand it in detail.
I believe that, since this is an upcoming topic, that a global understanding will suffice. As long as that helps designers to better reflect on their design and are able to produce some new ideas on how to create this sustainable behavior change.
This chapter presents the result of this Graduation assignment, the Product care kit. This final design tool will be discussed and the different elements of the tool will be elaborated, such as the different sets of cards, the information booklet and what kind of result can be expected. At the end of this chapter recommendations for the further improvement of this tool will be given.
6.1 INTRODUCTION

In Chapter 5 I presented the development and evaluation of the design tool and discovered what designers require for it. In this chapter I will present the final version of the design tool for Product care, the Product care kit, the way it can be used and examples of the outcome of the tool.

This final design is the embodiment of the answers of to the research question:

• **How can a designer stimulate a user to perform Product care activities?**

To show how the answers materialize in the design tool, I will illustrate the final design by talking about how Product care is communicated, how it presents the possible design strategies for Product care, and how it helps a designer to implement it into a design.
6.2 PRODUCT CARE KIT

The tool presented in Chapter 5.5 has evolved into an improved version. The base has remained. Changes have been made in the descriptions and questions on cards, the uniformity of the graphic design and the explanations given about the process. The tool was deemed useful and inspiring in the test, so no drastic changes had to be made.

A summary about each part of the tool and the alterations which have been made, such as the separate cards and the information booklet, follow.

CIRCULAR ECONOMY

Over the years, multiple studies and reports have tried to make us consumers face the facts: our materialism has put a strain on the resources of the world that we live in. The scarcity of resources will be a huge problem in the future for production and it will become more valuable to bring these resources back into production.

The world we currently know runs as a linear economy, with a ‘make, use, throw’ mentality. We need to shift towards a circular economy, where the resource flow is being slowed down and materials are kept in the loop (longer). This can be achieved through timeless design, maintenance, repair, reuse, remanufacturing, refurbishing and recycling.

This design tool focuses on changing the user’s behavior and to make them perform repair, maintenance and care activities to extend a product’s lifetime and creating emotionally durable designs.

These sustainable behaviors can also be called Product Care.

PRODUCT CARE

Product care can be understood as any action that helps to prolong the lifetime of a product, such as maintenance or repair. These product care activities could be conducted by the consumer itself or by a service.

The throwaway culture that we live in has made it often far easier to throw away products and buy new ones, instead of maintaining and repairing the things we have. By evoking behavior within the consumer that persuades or stimulates them to maintain or repair their belongings, the lifetime of products can be lengthened and thus can be considered more sustainable.

Product care is a very efficient and low energy consuming way of keeping resources in the loop. For other actions, such as recycling, energy has to be put into the resources to break them down to be usable for new products. With product care, the user puts energy into the loop in the shape of effort and time.

Card set

This tool was designed to teach designers about Product care and provide inspiration on how to design for it.

The card set consists of:

7 Product care type cards: These describe the different types of product care activities.
8 Design strategy cards: These describe the different design strategies a designer can use.
8 Persona cards: These can be used as inspiration for designing for a specific user.
8 Product cards: These can be used as inspiration for designing for a specific product.
A bunch of example cards: These are examples of the design strategies to derive inspiration from.

The Product care kit will help to get a feeling for the many facets that one needs to take into account when designing for Product care. After using this card set, you should have a better idea on how to make the user perform more repair & maintenance activities!

On the other side of this booklet you can find an example of how this card set can be used! Feel free to try it out, but also feel free to use and be inspired by the cards in any way you want.

Fig 6.2.1 The final design tool
Example: how to use the Product care kit?

There is not one strict way or order to use the cards. However, to get a feeling for how you can use the cards, I’ll give an example of a process.

This example process starts with a product card. It is advised to at least practice this process once before using the kit for your own projects.

Start: what do you need?
1 or a few enthusiastic designers

surface to brainstorm on
(ideally a whiteboard, paper will also work! Did you know that the cards are magnetic?)

Fig 6.2.2 The revised booklet (above), The old version of the booklet (right)

Information booklet

The information booklet is a folded booklet with on one side brief information regarding the topic circular economy, product care and a summary of the contents of the kit. This information booklet was difficult to read, due to a small font and little space. The size of both the booklet and font have been increased.

The backside of the information booklet presents an example of how the cards can be used. This has changed the most compared to the rest of the tool. This side of the booklet was meant to capture the attention of the designer. I restructured the lay-out, defined the individual steps clearer, added examples of the cards per step, and increased the font size which resulted in a clearer and better readable booklet.

Another big change is the order of the steps. The persona card has been moved to an earlier step because that step helped to boost participants’ creativity. The design strategies and examples have now been combined in one step because the examples were sometimes forgotten. This helps to make use of the examples during the process. In the previous version they were mentioned too late and due to this not used at all.
Product care type cards

The product care cards present the 7 different types of Product care.

- repair
- creating something new/different
- product revival
- preventive measures
- small care
- instructed & mindful handling
- routine acts

To clarify the type of cards, these cards have received a title on the front ‘product care type’ and have received a thick blue border to distinguish them from the rest.

The back of the cards present a short explanation about the type of product care, ask one or a few questions to make the designer think about this type of product care.

At the bottom a few design strategies are proposed for this type of product care. These have been used often for this type, in the examples found in Chapter 4.5.
Design strategy cards

The design strategy cards present the 8 different design strategies for Product care.

- experiences
- enabling
- change
- informing
- reflecting
- social
- control
- appropriation

These cards have received a thick border to be distinguished easier.

The front of the cards present a short description of the tool. The back of the cards present the different sub-design strategies. These have been presented through asking questions, mainly through ‘How can you’ - questions, to inspire thinking about how something can be solved.
Persona cards

The persona cards present 8 different inspirational personas. These have been chosen and illustrated in this fashion so the variety of users is so broad, that designers always can pick a persona that is representative for their targeted user or can inspire to think of the variety of users that can be targeted.

To clarify the type of cards, these cards have received a title on the front ‘persona card’ and have received a thick green border to distinguish them from the rest.

The back of the cards ask questions that makes the designer think about who their persona is, what characterizes them and what can be expected of their behavior. These questions are all the same for each persona.
Product cards

The design strategies cards present the 5 different products that can be used for inspiration and 1 card for when designers have a product or service they want to design for.

These cards have received a thick border to be distinguished easier. The front of the cards present a short description of the tool. The back of the cards ask questions that makes the designer think about the product, the interactions that happen between the persona and the product, and the connections between the types of product care and the product. These questions are the same for each product.
6.3 TOOL’S RESULTS

In Chapter 5 it becomes clear that different results are created by using the tool. In the final design tool a step was added to the beginning of the process to make designers think before starting their product care design process, what their goals are of introducing the design tool in their design proces. On the next few pages I will present a few examples of the results of the test from Chapter 5.4. What needs to be kept in mind is that it is expected that a brainstorming process with the tool will take up at least an afternoon, to ensure participants have really been submerged in the topic and can come up with deeper and thought-through ideas. These results have been created in little less than an hour. This means that they cannot be considered as fully developed and of the same depth as results after a 3 hour session.

For each group I will present the uniqueness of their results. This will give a collection of possible results designers can expect or aim for when using this design tool.

Results group 1

The results of the group of a DFI student and a UX/UI designer can be seen in Fig. 6.3.1. This group spend a great portion of their time on the user and the interactions between the user and the product, also see Chapter 5.5. This led to:

- A rich persona, they not only described his personality but they also gave him a short background story. See Fig. 6.3.2.
- A timeline presenting a day out of the life of the persona, and referring to the moments where the persona interacts with the product.
- Many small directions that could be used as inspiration for a conceptual design. They did not pick out a direction in the end due to time restraint, but they had a lot of small ideas for design directions, to continue with, if they would have had the time. See Fig 6.3.4.
Results group 2

The results of the group of 2 IPD students can be seen in Fig. 6.3.5. This group spend a great portion of their time on the product and the desired product care behaviors. This led to:

- **An extensive list of possible care activities and the connection between the different activities.** What benefitted this was that they chose a product that they were familiar with the product.

- **Discussions.** This group may have had the smallest visual map of the three groups, this group communicated and worked mostly through discussing. The results, may thus not seem as much, but they had such extensive discussions that this can also be seen as an interesting result. They discussed specifics related to the product but also many things they had learned about the product through first hand experience. This helped them to also get a better feel for the context and barriers the persona may face.
Results group 3

The results of the group of an IPD student and UX/UI designer can be seen in Fig. 6.3.8. This group spend most of their time understanding the design strategies, the examples and on ideating. This led to:

- **Understanding of the different design strategies for Product care.** They spent less time on mapping the context they had more time to go through each design strategy and the stack of example cards. This led to them discussing a long time about which strategy was interesting for their situation and persona, which strategy had more potential or which was difficult or unexpected but might lead to novel ideas.

- **A few rough conceptual designs.** They spend a great part of their time on translating the design strategies into possible design directions. This led to a rough design that tackled a few product care activities.
6.4 Chapter Conclusions

The results differed per group of participants. This is positive and shows the potential this tool offers in developing a broad spectrum of results. If a specific type of result is aimed for, you should set this at the beginning of the process as a goal.

The results can be clustered in three different types of outcomes:
- **Product-oriented**
- **Research-oriented**
- **Insight-oriented**

The outcomes that are product-oriented are product solutions or concrete design directions. This is an obvious result which you often see during Creative sessions. During creative session organized by the Creative Facilitation course at the University of Delft, the target of a workshop is often a poster or pitch of a conceptual idea. This type of result is especially useful during or at the end of the ideation phase.

Outcomes that are research-oriented are, for example, a clear map of the context. This map presents a story of the targeted user, in their environment and shows which interactions take place between the user, product and its environment. This result is similar to the outcome of Group 1. Such a result is beneficial in the Analysis phase of the designing process, when delving into the context that needs designing for and discovering which areas are interesting for Product care.

The insight-oriented outcome is not a stand-alone result. It is often paired with the other two types. The insight-oriented results refer to the feeling and understanding that designers get for Product care, this may not be seen as a concrete result by designers themselves. Still, they have a lasting impact on designers. Making it possible for them to apply their newfound knowledge to future projects and situations.

During a session with the Product Care Kit the designer or the design team do not have to focus on merely 1 type of result. Their goal can also be to create a map of the context, educate and inform themselves and still reach a concrete product solution. It starts with the goal that is set at the beginning of the process and the design team.
Fig 6.4.1 Example of some results of the test
This chapter offers a reflection on the overall process, the research questions and design goal of this Graduation Assignment. In this chapter, recommendations for the tool will be given and after this I will reflect on my personal goals for this thesis and how I experienced my Graduation assignment.
In Chapter 6 I presented the Product Care Kit, the design tool and final result of this Graduation Assignment. This chapter will reflect on the process of this Graduation Assignment and on the research questions that were posed at the beginning of this thesis. I will offer recommendations for future improvements and some personal reflections on my process.

The main research question was:

- How can a designer stimulate a user to perform Product care activities?

The three questions which derived from the main research questions were:

- What is Product care?
- How can Product care behavior be stimulated through design?
- What do designers need to be able to implement Product care into their design?
The goal of this thesis was to enable designers to design products and/or services that stimulate product care behavior by the consumer. I aimed to do this by developing a tool that designers can use during their design process. This tool should give them the necessary knowledge regarding Product care and the ability to implement this in their design. With this I hope that consumers will be stimulated to perform product care, so that products’ lifetime will be extended. Of course, it depends per strategy if users are in control of their behavior and if it happens consciously or not. In the end, I mainly want people to make their belongings last longer.

To reach this goal I set the following question:

- How can a designer stimulate a user to perform Product care activities?

At the beginning of the process I expected that there would be a fixed answer on this question and that it would lead to only one logical design tool. After reflecting on my process I see that my tool may still be expanded upon and that the design strategies could also have been implemented in a different format and would have still worked. Since I have not tested different formats I cannot validate those conclusions with test results.

**Literature**

I had expected that by researching Circular, Emotion-centered and Behavioral design strategies, all possible design strategies would have been covered. During the development of the strategies in Chapter 4 it became apparent that the strategy Social also had ties to strategies outside of the previously mentioned fields. It may be possible that if we continue to research the field of Product care, we would realize there are more (sub-)strategies to discover. However, I think the current design strategies are open and broad enough to encompass most design ideas.

**Field research**

The research that I performed was qualitative. The diary study with end-users had 6 participants, which means I could only form qualitative and no quantitative conclusions. It is possible that I may have gotten results for 1 participant, and after finding them in 1 or 2 more participants I became victim of confirmation bias. This, I cannot know for sure at the moment. To prevent confirmation bias, it would have been good to also perform a quantitative study to balance the qualitative and quantitative data. However, I do not think it would have been that necessary in this project. Because this was a trial and error process, with a tool and design strategies that can still continue to evolve, I believe a quantitative study would not have been that useful. In this field research I was not aiming for hard evidence and validation, but exploring the different aspects of Product care and
getting new ideas and insights. The Micro-emotion scan and the creative sessions with designers did not contribute any striking conclusions. However, they definitely led to inspiration and insights which helped the process of the research. For example, the product care types were inspired by the results of the creative sessions.

**Development of strategies**
The strategies were based on the combined product solutions from the brainstorm session with designers, existing product solutions and my own ideation. Half of the pool of solutions resulted from the brainstorm session. This means that the participants of the brainstorm had a big influence on the development of the strategies. I believe this was tackled by ensuring that the background of designers was mixed:

- All three Masters of the IDE faculty in Delft were present, and an UX designer.
- The participants had a mixed background of Industrial design bachelors at the TU Delft, the University of Twente and Eindhoven University of Technology.

This ensured different types of solutions would be able to come out as a result from the session.

**Development of design tool**
The design tool consisted of 3 major iterations, one of which is the final design. The first iteration has been tested with 4 participants. The interviews were qualitative and the participants were mixed (1 DFI student, a bachelor student, a UX designer and a MPD student from the University of Twente). Despite the small pool, the participants combined a variety of disciplines and bachelor studies and this lead to a very helpful feedback and it covered all areas, depending on what the designers found important. The second iteration was tested with 3 groups of 2 designers, and the same argument counts for this test. Whereas here I was working with 2 UX designers, 2 IPD students and a DFI student.

During the tests of both iterations the participants were all Dutch. This can mean that some strategies or examples are not automatically understood, some ideas are typically Dutch design or used for typical Dutch situations (such as solutions related to bicycles). For the test of the card set I do believe that this was beneficial, this allowed participants to brainstorm and ideate in their own language. This also meant that during the interviews there were no problems related to translating, or finding the right formulation of words, for participants or interviewer.

**Final design**
The final design has not been tested, since it is the improved version of the 2nd iteration, the brainstorm card set. This version should be further tested, to make the last corrections before it should be produced or be considered for educational purposes.
7.3 RECOMMENDATIONS

A design can always be further improved and the same counts for the final design of this Graduation assignment. There are several recommendations that can be made related to the Product Care Kit.

**Validating the outcome**
Before the Product Care Kit can be used in real situations the results of the design tool need to be analyzed and evaluated.

**Designers brainstorm session**
The design tool has only been tested with design students and designers in a shortened session. It is expected that the tool leads to product ideas, newfound insights and an overview of the context. It is important to test the tool in more realistic sessions, where designers get the opportunity to finish the whole process.

**End-user evaluation**
There were no concrete outcomes of the tool, the focus has been on the development and testing of a tool for designers. The ultimate goal, an increased awareness and stimulation of product care by users, was not in the scope of this thesis. In this thesis however the focus has been on the enabling of designers to contribute to those goals. To validate the tool, it would be advised that a few conceptual solutions were developed by designers in a brainstorm session. And to discuss with end-users in which way those ideas influence their behavior to product care. Prototypes could be developed and tested with end-users.

**Spreading the knowledge**
At the moment, the tool is only available for those who can get their hands on a hardcopy. Ideally, the tool should be more openly available so more designers can implement Product Care into their design.

**Availability**
To ensure that more designers can educate themselves in the field of Product Care, the tool should become easier to access. Online availability of the tool would ensure that the knowledge about how to design for Product Care is digitally accessible. For this, I would advise that a website be build. This website should present the design strategies and present more examples for the different sub-strategies and it could offer a printable version of the kit.

**Education**
The best strategy is teaching students about Product care (and designing for Circular Design in general). If bachelor students learn how they can incorporate Product Care in their first product and practice it multiple times, the chances are high that they will do that automatically in
future products. In this way designing for Product Care will eventually just become ‘designing.’

When teaching design students it includes the opportunity of the testing of prototypes (which incorporate Product care) with end-users to validate the (sub-)strategies.

**Product Care Kit**

To ensure that the Product Care Kit can be used in professional settings, some attention may need to be spend on the styling.

**Cards**

The cards make use of magnetic strips in the paper. This makes the cards a bit uneven and made it difficult for some cards to stick to the whiteboard. Ideally, the cards are smooth and hard, with an even magnetic layer in it. For the final cards, it would be best if the card can be written on (and erased), especially for the Product cards and Persona cards, making it possible to customize it.

Another thing that could be looked into is the stylization of the illustrations. These may be considered feminine. Even though male participants said they did not mind the feminine style, in the theme of gender equality it may be a nice idea to also add male figures in the design strategy cards. Another possibility is adding a few ‘typically masculine’ product care activities.

**Storing the tool**

Some time should be spend on the presentation of the tool. A box where the cards are stored in could make the tool visually more attractive and look more professional. If it were to be used in workshops, it would be smart if the facilitators could bring it along easily.

**Format**

The tool was meant to be used on a whiteboard and this type of use has been tested.

**Horizontal brainstorming**

The cards have only been tested on a whiteboard. This is because the standing up setting of working at a whiteboard can feel more energetic than working sitting down. It is possible however to use the tool horizontally on a table/piece of paper.

This type of setting should be tested to see if it has the same feeling and mood as the whiteboard setting. Based on teaching from Creative Facilitation, there is a big difference in sitting down around a table while brainstorming. The mood and tempo of such a session is often calmer, it may lead to a slower ideation pace.

**Internationally understandable**

As was mentioned in the discussion, all the tests during this thesis have been done with Dutch people. In the future we should check if the strategies and example are also understood by designers with different background. What might be interesting to look at is if there are product examples that can be added from different cultures. If there is an online database with product examples were designers can upload examples. In this way there is more inspiration that designer can derive from and a higher chance designers (from other cultural backgrounds) will understand the strategies.
7.4 PERSONAL REFLECTION

Before I graduated I decided I wanted to learn more about Circular, Behavioral and Positive design. I have been interested in the human side of design since my Minor in Psychology and I expected to increase my in-depth knowledge of specific methods. Instead I achieved a general knowledge and valuable insight in a broad range of theories. I had anticipated a substantial influence in the project from the perspective of Positive design. This turned out not to be the case. In the end, Positive design did not have that much influence in the project as I had expected.

In hindsight I would have liked to further test the final tool and test the results of the tool with end-users, but due to time constraints I could not alter my planning to include this in my research.

I am proud of the results I booked, I wanted to create something that would be useful for designers and contribute to the knowledge pool about sustainable behavior change. With the design strategies and a design tool as results, I feel that I did manage to contribute to this goal and added some steps when it comes to Product care. It does feel like work is not finished yet, and I still want to continue developing the tool and to research the strategies even further.

I do hope this is just the first step of this research and that my tool and research will in the future have a positive impact on the shift towards a Circular Economy.

Looking back, this project has had a meaningful contribution to my own development. It has been an enjoyable experience for me. Although not many students would consider graduating enjoyable, I really did. I got the chance to practice facilitating creative sessions, it gave me the opportunity to use my visual skills and I got to learn more about how to design for behavior change. And most of all, it made me realize that I enjoy doing research, and that I would like to learn and contribute more towards (sustainable) behavior change.
REFERENCES


Green, M., Ryder, B., Monaghan, A., & Levett, R. (2006.). I will if you will. https://doi.org/1 899581 79 0


Macleod, J (2017), Ends. Why we overlook endings for humans, products, services and digital. And why we shouldn’t.


APPENDIX

In the appendix materials are presented which show more detailed results compared to the report itself or explanations of certain methods.
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Appendix 1: Project brief

IDE Master Graduation
Project team, Procedural checks and personal Project brief

This document contains the agreements made between student and supervisory team about the student's IDE Master Graduation Project. This document can also include the involvement of an external organisation, however, it does not cover any legal employment relationship that the student and the client (might) agree upon. Next to that, this document facilitates the required procedural checks. In this document:

- The student defines the team, what he/she is going to do/deliver and how that will come about.
- SSC E&SA (Shared Service Center, Education & Student Affairs) reports on the student’s registration and study progress.
- IDE's Board of Examiners confirms if the student is allowed to start the Graduation Project.

STUDENT DATA & MASTER PROGRAMME

Complete all blue parts of the form and include the approved Project Brief in your Graduation Report as Appendix 1.

family name: Tuimaka
initials: M  
given name: Mahara
student number: 4604342
street & no.: van Hasseltlaan 464
zipcode & city: 2625JD Delft
country: The Netherlands
phone: +31653218127
email: m.tuimaka@student.tudelft.nl

Your master programme (only select the options that apply to you):
IDE master(s):
- IPD  
- DII  
- SPD
2^nd non-IDE master:
individual programme: 
honours programme: 
specialisation / annotation: 

(give date of approval)

Honours Programme Master
Medisign
Tech in Sustainable Design
Entrepreneurship

SUPERVISORY TEAM **

Fill in the required data for the supervisory team members. Please check the instructions on the right!

** chair: Ruth Mugge  
department / section: PIM/MCB

** mentor: Anna Pohlmyeyer  
department / section: ID/DA

2^nd mentor: Laura Ackermann
organisation: Salzburg University of Applied Sciences
city: Salzburg  
country: Austria

comments (optional)

Chair should request the IDE Board of Examiners for approval of a non-IDE mentor, including a motivation letter and c.v.

Second mentor only applies in case the assignment is handled by an external organisation.

Ensure a heterogeneous team. If you wish to include two team members from the same section, please explain why.

IDE TU Delft - E&SA Department /// Graduation project brief & study overview /// 2018-01 v30

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Design for Product care
INTRODUCTION

To realize the shift towards a Circular Economy, products should stay usable as long as possible. But to enable this shift, not only products should be produced in a sustainable way but also consumers' behavior towards products should be sustainable. Maintaining products is the most efficient way of retaining products' their desired level of performance, according to the Circular Economy System Diagram (Ellen MacArthur Foundation, 2013), for see Fig. 1.

The throwaway culture that we live in has made it often far easier to throw away products and buy new ones, instead of maintaining and repairing the things we have. But by evoking behavior within the consumer that persuades or stimulates them to maintain or repair their belongings, the lifetime of products can be lengthened and thus can be considered more sustainable. Therefore, for enabling the shift to a circular economy it is necessary that users perform product care activities. Product care can be understood as any action that helps to prolong the lifetime of a product, such as maintenance or repair. These product care activities can be conducted by the consumer itself or by a service, like a garage, or a bike-shop.

If designers have a clear understanding of how they can persuade users to take care of their products, convince them of the importance of product care or can create a positive care-taking experience, it might be possible to design products that evoke care-taking behavior. But how to spark this kind of behavior is very complex, designers need to be able to obtain clear insights or instructions that help them design or redesign products that can encourage this care-taking behavior.

This research stems from a study that discusses different aspects of product care (Ackermann, Muggge & Schoormans, 2018). This study uses Fogg’s behavioral model (Fogg, 2009) as a theoretic framework, see Fig. 2. During this research, Ruth Muggge will act as my chair. Her expertise on sustainable consumer behavior will be complemented by Anna Pohlmeier, who specializes in, amongst other things, design for happiness and interaction design. Laura Ackermann is an external PhD candidate of the TU Delft, her PhD topic relates to product care and she will act as an expert on the subject and 2nd mentor. Jan Schoormans, specialized in consumer behaviour, acts as Laura’s 2nd mentor.

References:


Design for Product care
introduction (continued): space for images

**Image / figure 1:**  The Butterfly Diagram (Source: Ellen MacArthur Foundation, 2013)

**Fogg model**

**Image / figure 2:**  Fogg's behavioral model (Source: Ackermann, Mugge, Schoormans, 2018)
PROBLEM DEFINITION **
Limit and define the scope and solution space of your project to one that is manageable within one Master Graduation Project of 30 EC (20 full time weeks or 100 working days) and clearly indicate what issue(s) should be addressed in this project.

There is a lot of awareness lately for the impact of consumers’ actions on the environment, whether it’s their food consumption, recycling or purchase behavior. Still, there isn’t a lot of awareness focused on consumers’ product care behavior. There is information available on how behavior arises: Fogg’s behavioral model claims three factors are necessary for someone to take action: motivation, ability and a trigger. The behavior that is desired already occurs in some people: consumers that take care of (some of) their belongings. Data relating the product care activity is made available through Laura Ackermann’s research and can function as the starting point of discovering why and how some consumers are successful in fulfilling this behavior and why others aren’t.

In the standard design cycle, designers focus mostly on the beginning of the relationship between user and product, not necessarily on the interactions over a longer period of time. They aren’t always trained to look at the end of life of a product, or how this end of life can be postponed. All this information is very complex, this is why the designer should have clear and insightful way to learn about the necessary information related to design for product care and to be able to apply that knowledge when designing.

I want to enable designers to design products and/or services that stimulate product care behavior by the consumer. I want to do this by developing a tool that designers can use during their design process. This tool should make it clear to the designer in which ways the desired product care behavior can be evoked and what kind of experiences for the consumer can be created when it comes to these care-taking activities. With this I hope that consumers are made aware of the way they treat their products and feel encouraged to make their belongings last longer.


ASSIGNMENT **
State in 2 or 3 sentences what you are going to research, design, create and / or generate, that will solve (part of) the issue(s) pointed out in “problem definition”. Then illustrate this assignment by indicating what kind of solution you expect and / or aim to deliver, for instance: a product, a product-service combination, a strategy illustrated through product or product-service combination ideas, … In case of a Specialisation and/or Annotation, make sure the assignment reflects this/these.

How can consumers be persuaded to perform product care behaviour?
Create a tool for designers to design products and/or services that will stimulate product care activities from the consumer and exemplify the tool with one or multiple product designs created with this tool.

I want to enable designers to design products and/or services that stimulate product care behavior. The start for this research will be the study of Ackermann, L. & Muggge, R. & Schoormans, J., 2018. To be able to understand how product care behavior can be activated, I will need to get a global understanding of circular economy and sustainability and delve deep into behavioral design methods. I want to research how people currently experience the process of product care, as to get more insights into what kind of emotions and experiences they have. I believe that there are many methods from the field of positive design that can be used to obtain these insights. There are also a lot of existing design tools, frameworks and methods; these can help as inspiration to discover what type of design tools work well for a designer.

With the acquired knowledge I want to develop a tool that enables designers to design for product care. This tool should contain different strategies for the designer to apply in their design. To develop this design tool, I want to generate a large amount of conceptual product ideas. With this wide range of different ideas, I could cluster these and find overarching strategies or themes in groups of products. During this process I will need to work with other designers, for criteria and input when developing the tool and later for testing and evaluation of the tool. Depending on the amount of strategies developed, I want to apply one or more strategies myself. In this way, at the end of the project, I will have a few product concepts that function as examples for the strategies.
I want to plan the Christmas break free, because I’m planning on going on a short holiday and I would like to have time to spend the holidays with my relatives. I think that taking these two weeks off will beneficially to my own functioning and happiness. By taking the holidays off I also hope that during the last few weeks of the project I will feel refreshed and energized again.
I notice myself that I want to be more sustainable in the way that I live, but I also don’t want to feel like I am forced to change my lifestyle drastically. This means I’m conscious of not over-buying and mostly buy second-hand things, am willing to eat less meat and separate waste. These activities are easy to do, and I think that’s essential. But I also think, that instead of just thoughtlessly having to perform these activities just to be more sustainable, these sustainable activities could also become very meaningful small experiences in your daily life.

In the past I’ve done electives such as Sustainable Consumer Behaviour, Design for Emotion and Experiencing Persuasive Environments. I think we could derive many interesting insights from these areas that could stimulate a positive influence on the environment but can also create positive experiences for the consumer. During my bachelor I’ve done a minor in Psychology and I think it would be very beneficiary to use the knowledge from this field about the mental processes we go through and the way we think (Although I do think that we need to use it carefully and responsibly.) What I want from this project is to not only contribute something that is good for the environment, but also something could potentially make people happier.

What I hope to get out of this project:
- Is to get a more global understanding of sustainability and the circular economy.
- Is in depth knowledge of how (positive) behaviours can be triggered.
- Is to get more knowledge about theories and methods from the field of positive design.
- Is to develop something that is actually useful for designers (and consumers) in the future, and in this way, have a positive impact on the world or environment. (Even if it’s miniscule.)

What I want to accomplish personally:
- Is to try generative techniques that I haven’t used for my projects before, such as a cultural probe, creative sessions, ...
- Is to boost my visual skills, I haven’t used them a lot during my Master, but I feel that being able to communicate visually is a great tool and I want to train that skill
- Is to perform well prepared and thought-through (creative) workshops with designers.
Appendix 2: Micro emotion scan

Emotion journey ‘broken pedal’ - detailed analysis of Fig 3.2.4 of the report

1. Unexpected work – Annoyed/Insecure
i. The fact that there was something that broke only surprised me. But the fact knowing that it would take me time and effort to fix it was making me feel annoyed. Mixed in with this annoyance was insecurity. Since it was something that I had never fixed before I felt insecure if I would be able to fix it.
ii. The insecurity also was related to insecurities about being able to use the function, namely the driving of my bike. I was unsure now about being able to cycle to my appointments these days.

2. Enough confidence and knowledge available – Determined/Practical
i. Since it was a product that I had fixed and maintained before, I was confident that or I or a service would be able to fix it. I already had few ideas on how fixing a pedal might work, so it made me feel confident that everything would be alright.
ii. I felt determined because it would have an impact on my daily life if I didn’t fix it, I really need my bike so I was determined to make it work again, no matter what.

3. One and only focus – Unfocused/Insecure/worried
i. Because a broken bike has so much impact on my daily life I couldn’t think about anything else than my bike. Even though I knew I couldn’t do anything at the moment, I still couldn’t let it go. I also started to ‘pieker’ about doom-scenarios. What if I wasn’t able to fix it?

4. Information & soothing comments/tips/advice – Optimistic/determined/open
i. I decided to give into my worries about my abilities to fix it by looking up information on the internet on how to fix it. This made me feel a little bit surer about myself and skills.
ii. After that I asked for tips and advice from my boyfriend and one of my roommates, both people who are very good at fixing bikes. They were being assuring that I would be able to do this, and they gave tips on what was the smartest to do. So borrow their tools, try it myself and if that fails, ask the bike shop to loosen the broken pedal and screwing on the new one myself.

5. Tools are easily attained – Hurried/decisive/practical
i. I didn’t feel like having to think too much about which tools to get. I was decisive & hurried. I quickly bought the replacement part and asked my roommate for the tools. I let him decide which ones I would need. I also wrote down on a post-it which things I needed so I wouldn’t need to think about it in the shop.

6. Out of routine – Stressed/tired/distracted/insecure
i. I started postponing the repararation moment. I felt stressed and a bit tired due to thinking about it, since it didn’t fit into my day/routine. I also didn’t want to start because I was afraid it might fail and then it would take me even more time to fix it.
ii. Also because I didn’t know if I would succeed and how long it would take I couldn’t decide when to fix it. I heard that loosening it could be tough, so there was a
possibility I wouldn’t be able to loosen it. Do I do it before I have to cycle to my training? Should I do it afterward? Are those moments too short and should I do it tomorrow? I felt insecure.

7. Expecting failure – Insecure/anxious/reluctant/shameful
   i. After postponing it for a day I pushed myself to go and fix it. My hopes were low and I was preparing for failing. I noticed that it looked rusty which made me feel even more reluctant and anxious about the task.
   ii. I still felt that I should fix it, because the people around me told me that it shouldn’t be too hard. I felt proud or let’s say ashamed, because I didn’t want to fail.
   iii. I also felt insecure about the fact that I had to fix it in the public bike lot in front of my house, we don’t have our own garden/space to do it so I felt watched.
   iv. I even thought about buying myself some unhealthy snacks afterwards, I was already planning for failure and decided I needed comfort food afterwards.

8. Unexpected success – Hopeful/joyful/energized
   i. Since my hopes were so low about loosening the pedal I expected nothing else than failing to loosen it and that I would need to go to the bike shop, which would take extra time. But then it suddenly loosened and I had a rush of energy and hope.

9. Afraid to get hopes up - Restrained
   i. Afraid that I would be hopeful too soon, I restrained myself a little, just in case it went wrong. Perhaps now the new pedal would not fit in the hole.

10. Super proud! – Proud/daring/adventurous
   i. When the pedal came off in its hole and the new one fit, I almost laughed out loud. I felt so proud and happy. I felt proud and confident about my skills.
   ii. Not only was I happy that I managed to fix it, I even briefly thought about replacing the other one as well, overconfident now with my skills. I thought about doing a check-up on the rest. (But I realized I had other work to do, so I decided not to.)

11. Continuous confidence – Confident/airy/proud/cheerful
   i. I felt good about myself, confident and airy/chill, I didn’t feel the necessity to check the internet what to do next. I sprayed some WD-40 on it, sure that that was probably good.

12. Slight fear for being disappointed – Anxious/nervous
   i. I went to try my bike to see if it worked, I was slightly afraid that I celebrated too early and that it would break.

   i. It didn’t break so I felt glad and joyful. I decided to use it immediately and cycle to the supermarket to buy a nice and healthy lunch.
   ii. The joyful mood stayed with me for a while, I even spoke to someone I knew in the store, even though I usually don’t feel like talking to people when doing grocery shopping.

What stands out is that a large part of the process I felt insecure. This is especially due
to the product having an important role in my daily life. Even though the broken pedal wouldn't restrict me from cycling, it would be highly uncomfortable though and my bike is something that I want to know for sure that it's working. So in this case my motivation to fix it was the fear that I would not be able to get to my appointments easily and also the total breakdown of the pedal if I chose to ignore it.

The main steps and Youtube tutorials were available online, giving me the general knowledge needed to perform the task. It seemed like a task that would not cost too much time and effort. I also have to say that because this task would be part of my research I decided it was worth spending the time, if I didn't have time during the day and would've had to do it in the evening I would have probably waited till the weekend. But the reason why I also decided to perform the care taking behavior (no matter if I succeeded or didn't) is because I had reassurance from external factors that it was (probably) possible for me, a non-expert, to fix. The reason why I felt confident enough were the tips and advice from my boyfriend and my roommate. What also triggered me to do it quickly was that when I drove my bike home I kept on hearing the pedal crack and felt it bend under my foot. Since I was constantly reminded of the broken part I couldn’t ignore it for longer than 1 day.

Interesting negative moments
1. The annoyance or insecurity you feel when something important breaks down can be very strong. In hindsight I rather have maintained it a little every now and then instead of having to plan these hours free to fix it with the insecurity of it possibly being unfixable.
3. Feeling so insecure about my abilities made me not want to fix it.
6. Since it was out of my routine and I had to plan it, it made me postpone it.

Interesting positive moments
2. I was already determined and confident by myself, but that was due to the knowledge that the bike is something that I can often repair by myself or by a service and that these services are available everywhere. The knowledge that there would be manuals/videos on this helped me feel confident.
4. The assurance of an external platform or other people pushed me to do it myself. Getting the tips of 'experts' I knew it would be possible to do.
10. Since my expectations were low, I was extra proud to have fixed it myself. This made me glow from pride and joy for a while.
13. Cycling on it made my joyful and proud and even shone through in my behavior in the hours afterwards and the day after. I proudly told others I had fixed it myself. It made the bike feel a little more like ‘mine’.

Interesting emotions to use as driver/to target:
- Pride (to gain after succeeding/finishing)
- Insecurity (to tackle beforehand, lowering the threshold)
- Joy (during the process, making it joyful/nice to perform the activity, this could also result from being able to do something unexpected)
- Optimistic/confident (to attain beforehand, to lower the threshold)
Appendix 3: Creative facilitation - session results

Summary:

Reasons that prevented users from performing product care:

<table>
<thead>
<tr>
<th>Given reasons not to perform product care</th>
<th>Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>easy to throw away</td>
<td>Time and effort (Ability)</td>
</tr>
<tr>
<td>product care takes too much effort</td>
<td></td>
</tr>
<tr>
<td>low costs</td>
<td>Financial aspects (Motivation)</td>
</tr>
<tr>
<td>not the owner</td>
<td>Shared responsibility (Motivation)</td>
</tr>
<tr>
<td>not repairable</td>
<td>General lack of reparability (Ability)</td>
</tr>
<tr>
<td>product holds no (emotional) value</td>
<td></td>
</tr>
<tr>
<td>upbringing</td>
<td>Social triggers (Triggers)</td>
</tr>
<tr>
<td>to gain a certain status</td>
<td></td>
</tr>
<tr>
<td>lack of knowledge</td>
<td>Knowledge and skills (Ability)</td>
</tr>
<tr>
<td>changing trends</td>
<td>Fit with participant’s identity? (Motivation)</td>
</tr>
<tr>
<td>incentives (new products marketed)</td>
<td>Social triggers? (Triggers)</td>
</tr>
<tr>
<td>Have no love for the product</td>
<td>Irreplaceability? (Motivation)</td>
</tr>
<tr>
<td>products are not build to last forever</td>
<td>General lack of reparability/functionality?</td>
</tr>
<tr>
<td></td>
<td>(Ability/Motivation)</td>
</tr>
<tr>
<td>no feeling of responsibility</td>
<td>Shared ownership/irreplaceability?</td>
</tr>
<tr>
<td></td>
<td>(Motivation)</td>
</tr>
</tbody>
</table>

Reasons that would make users perform product care:

<table>
<thead>
<tr>
<th>Given reasons to perform product care</th>
<th>Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>saving money</td>
<td>Financial aspects (Motivation)</td>
</tr>
<tr>
<td>not willing to invest too much money</td>
<td></td>
</tr>
<tr>
<td>repairing it (by a service) is</td>
<td></td>
</tr>
<tr>
<td>expensive</td>
<td></td>
</tr>
<tr>
<td>can’t afford new one</td>
<td>Irreplaceability (Motivation)</td>
</tr>
<tr>
<td>attached to it</td>
<td></td>
</tr>
<tr>
<td>a new one doesn’t hold the same</td>
<td>Irreplaceability, aesthetics or fit with</td>
</tr>
<tr>
<td>emotional value</td>
<td>participant’s identity (Motivation)</td>
</tr>
<tr>
<td>proud of it</td>
<td></td>
</tr>
<tr>
<td>don’t want to waste it</td>
<td>Intrinsic motivation (Motivation)</td>
</tr>
<tr>
<td>to prevent breaking</td>
<td></td>
</tr>
<tr>
<td>taking care of it for friends</td>
<td>Social triggers (Triggers)</td>
</tr>
<tr>
<td>user rented the product</td>
<td></td>
</tr>
<tr>
<td>really need it</td>
<td>Functionality (Motivation)</td>
</tr>
<tr>
<td>not able to fulfill certain tasks</td>
<td></td>
</tr>
<tr>
<td>without it</td>
<td></td>
</tr>
</tbody>
</table>
There are multiple locations where people perform product care activities:
- in your home
- on the go
- at school
- at work
- at someone else’s place
- a special workplace (like a shed or garage)
- when you’re abroad
- in a hobby room
- while transporting it

There are multiple moments that could be targeted:
- as a ritual (for example, once a week on a Monday, like ‘woensdag-gehaktdag’)
- right after using it, just before storing it
- during usage
- after finding it after a long time
- as a daily activity
- when the product is already broken
- just before it reaches the end of its life
- when the product affects their emotions/mood
- when the product becomes their friend (when they feel attached)
- after receiving the product from someone

Strategies:
- personalization
- personal connection
- added functionality
- reward systems
- identity (style over trends)
Appendix 4: Product care activities

Care activities data - received from Laura Ackermann

Household items
fixed broken mixer (that fell on the ground) with tape
washing machine: control and clean the fluff filter; cleaning; decalcify
decalify the dishwasher and clean its filters
flat iron: follow the instructions (e.g. use only distilled water)
kitchen machine: clean after every use
general careful handling (mixer, kitchen machine)
informed buying decision (own research and ask for consultation in a shop); but
(vacuum cleaner)
vacuum cleaner: buy a well-known brand with long guarantee time and a service
number to call in case of problems; buy suitable bags
kitchen machine: not overstress the product
mini-oven: keep packaging for future transport
Thermomix: pull plug when it is not used
cooking knives: put them not in the dishwasher, but cleaned by hand; resharpen
pans: no cleaning with dish liquid, but only swipe out with a dry towel to build up a
protecting oil film
clean and decalify coffee machine

Electronic Items
washing machine: ask service provider for repair
install anti-virus program (laptop)
software updates, back-ups (laptop)
replace battery and RAM (laptop)
use protective skins / covers for smartphones and laptops
generally careful handling (laptop)
avoid scratches from keys etc when carried in a bag
use sugru to fix macbook charger
brings laptop to service providers (regularly)

Transport
Only annual (legally mandatory) check-up (car)
changes different parts of the bike when broken (and/or keeps them for future bikes)
wash car (at home)
boyfriend / husband takes care (car)
renewed old camper
change tyre, clean and lubricate chain, replace brakes (bike)
attention if car makes unusual sounds
refill water of windscreen washer, check oil (car)

Furniture
replace lightbulb
clean lamp
clean all pieces of furniture
built bed on his own
changed cover of wing chair
paints her furniture
built her own wardrobe
repair drawers
oil for wooden furniture
wax countertop in kitchen
replace mattress every 10 years
select special place for wall clock and arrange it together with matching items
clean mattress with vacuum cleaner
retighten screws (IKEA Poäng)
air bedclothes regularly

clothes
repair jewelry (by jeweller)
mend jeans (by mother)
use shoetrees and shoe polish
wash dress by hand and not with washing machine
use oil for wooden parts of a wristwatch
careful handling (shoes)
use a stapler to repair shoes
cut loose fibres
darn socks
repair salopettes
clean winter shoes after every use
replace shoe sole (shoemaker)
improve / modify clothes (new look, better fit…)
clean and impregnate winter coat
get clothes changed (tailor)

sport & leisure time
clean camping mat (washing machine)
well-informed buying decision (sport shoes)
impregnate sport shoes
use sport shoes only for intended purpose (not for daily use)
use soccer shoes only for soccer, not for running etc.
renew coating and edges (ski)
lacquer piano
lubricate snowboard
remove wax and clean; put at a safe place when not used (surfboard)
tent: clean, let dry, wrap carefully
put favorite book in a special place so it stays „present“ in the room
remove dust from piano
wash according to instructions (sport clothes, sport shoes)
tune piano

**Personal care activities - own brainstorm**

Using phonecover
Installing protective software for laptop
Software updates
Keeping spare parts of products
Informing myself fully when buying running shoes
Empty filter of drying machine
Not overfilling the dishwasher
Bring broken leather shoes to shoemaker
Bringing leather jacket to tailor when necessary
Repairing small damages to clothes myself
Using superglue to fix shoes
Changing parts of bike when (almost) broken
Bringing bike to bikeshop if repair is needed
Asking partner to change bike tires
Replacing flat tire of car
Wash clothes on prescribed setting
Not putting the laptop on the coach/bed (ventilator can get stuffed)
Wash delicate clothes by hand (if stated on label)
Oil/paint/rebuild nightstand
Cut loose fibers of clothes
Tune piano (by professional)
Replace guitar strings (myself or by my partner)
Pump tires every now and then
Blow out ventilator of laptop (by free service at university)
Flip mattras every month
Put newspaper in wet shoes
Remove dust from furniture
Clean, dry and wrap tent after a holiday
Clean sneaker every now and then to make them white again
Appendix 5: Summaries participants diary study

**Activities:**
- 1 x small care
- 2 x routine acts
- 3 x repairs
- 1 x preventive measure

**Motivation:**
- Proper appearance products
- “It bothers me, I don’t like the scratches and untidiness.”
- “I really need the product”

**Characteristics participant:**
- Has a lot of experience when it comes to Product care and all its types
- Familiar with the local Repair café
- Not afraid to try something when repairing/maintaining

**Barriers:**
- Too big of a task, takes time and energy
- “I’ve done it recently. Don’t feel like doing it anytime soon.”

**Participant ‘Frank’** (92 years)

**Activities:**
- 2 x repair
- 4 x routine acts
- 2 x preventive measure
- 1 x product revival

**Motivation:**
- “I want to use product that are nice or new for a longer time.”
- Negative experiences where products broke down
- Appearance (towards others)

**Characteristics participant:**
- Has a lot of experience when it comes to Product care and all its types
- Has many routines/returning activities

**Barriers:**
- “I tried multiple times.” Does not know how to do it, previous attempts failed
- Has alternative products
- Postponing-behavior

**Participant ‘Eva’** (55 years)
Activities:
2 x Product revival
1 x Preventive measures
2 x Repair
4 x Small care

Motivation:
- Many products support his hobbies. Maintaining them enable those hobbies, or are part of the hobby.
- “I need them” (the functions of the products)

Characteristics participant:
- Postpones low-effort activities, until high-effort activities (such as repair) are necessary
- Has a lot of experience with repair and maintenance
- Can find pleasure in repair and maintenance

Barriers:
- Costs of maintenance
- Boring activities (especially small activities that can be postponed)

Participant ‘Jonathan’ (25 years)

Activities:
4 x routine acts
1 x repair
2 x preventive measure
1 x small care
1 x creating something

Motivation:
- Preventing things from breaking
- Appearance, making something look like new again is nice
- Motherly love

Characteristics participant:
- Mostly has routines which she performs often. Taught to her by her parents
- Enjoys it when everything looks tidy and nice again

Barriers:
- “I don’t have the time.” - A shortage of time

Participant ‘Dana’ (38 years)
Activities:
- 2 x mindful handling
- 1 x product revival
- 1 x small care
- 1 x preventive measure
- 1 x repair

Characteristics participant:
- Mostly does low-effort activities frequently.
- Also sees Product care sometimes as enjoyable. (relaxing)

Motivation:
- Proper appearance products
- Actively trying to prevent the products from breaking down

Barriers:
- “There's no rush.”
- It is not urgent at the moment
- Insecurity about how to do it

Participant ‘Emma’ (25 years)

Activities:
- 2 x product revival
- 2 x creating something
- 1 x repair
- 2 x preventive measures
- 1 x routine acts
- 1 x mindful handling
- 1 x small care

Motivation:
- Wants to upkeep the quality
- Listens to advice of experts and environment
- Makes/does things out of motherly love

Barriers:
- Afraid to damage products (herself, or a repair service)

Participant ‘Jody’ (59 years)
<table>
<thead>
<tr>
<th>Deelnemer</th>
<th>Casenummer</th>
<th>Welk product?</th>
<th>Wat voor soort onderhoud?</th>
<th>Waarom besloot je dit te gaan doen?</th>
<th>Was je gemotiveerd om dit te doen?</th>
<th>Was er iets aan het product wat je tot actie zette?</th>
<th>Was er iets aan actie zette?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1</td>
<td></td>
<td>Schoonmaken met schuimpompen</td>
<td>Thee geeft een licht bruine aanslag zonder het in de vaatwasser te gaan doen, het stoorst na een paar keer gebruik. Het leek onfris.</td>
<td>Ja, het leek onfris</td>
<td>Het leek onfris</td>
<td>née</td>
<td></td>
</tr>
<tr>
<td>1.2</td>
<td></td>
<td>Stofvrij maken. Afborstelen</td>
<td>Ongeveer 3 x per jaar is het stoftaagje storend</td>
<td>Ja, het stond slordig</td>
<td>Het is een gewoonte. Ik stof ±.60 modellen af met een aquarellpersenlook nr 14</td>
<td>née</td>
<td></td>
</tr>
<tr>
<td>1.3</td>
<td></td>
<td>In een set drinkglazen, welke bij mijn vrouw in het verzorgingshuis stonden vormden zich lichte kalkringen op het glas waar ’s nachts water stond</td>
<td>De glazen werden meestal geleegd zonder wasen en afdrogen. Ik vond de kalektzetting onfris en wilde de glazen wasen, maar de ringen waren wat verhard.</td>
<td>Ja, het waren mooie glazen maar dit stoorde mij, ik wilde zo bij iemand in de vaatwasser doen of in water met een tablet weken.</td>
<td>Mijn huishoudelijke hulp stelde voor om ze in een sterkere aardappeloplossing. Twee dagen weken waren voldoende</td>
<td>née</td>
<td></td>
</tr>
<tr>
<td>1.4</td>
<td></td>
<td>Een broek</td>
<td>De buurman zei dat ik zo niet op de fiets het dorp in kon</td>
<td>Zie hiervoor</td>
<td>Zie hiervoor</td>
<td>née</td>
<td></td>
</tr>
<tr>
<td>1.5</td>
<td></td>
<td>Houten vloeren</td>
<td>Sommige poten hebben iets scherps en maken krasen op de vloer</td>
<td>Ja, ik hou niet van krasen</td>
<td>Toen wij houten vloeren aanbrachten</td>
<td>née</td>
<td></td>
</tr>
<tr>
<td>1.6</td>
<td></td>
<td>Twee deurtjes (171 x 29.5 x 1.4 cm) vervangen</td>
<td>Ik struikelde over een pantoffel viel en raakte mijn vinger</td>
<td>In beide deurtjes zat een deuk en ze hingen uit de schuif</td>
<td>Zie hiervoor</td>
<td>Eerst was er een vloerbedekking aan te schaffen. Later werden dedeurtjes vervangen.</td>
<td>née</td>
</tr>
<tr>
<td>1.7</td>
<td></td>
<td>Startknop weigerde. Knop zit in bedieningshuisje midden op handvat. Bij indrukken start de motor en dan nemen de handels het over</td>
<td>Ja, mijn gras werd te lang</td>
<td>Zie hiervoor</td>
<td>Mijn normale weg met opwoest steeds in het gras</td>
<td>née</td>
<td></td>
</tr>
</tbody>
</table>

### Appendix 6: Diary data (succeeded)

<table>
<thead>
<tr>
<th>Deelnemer</th>
<th>Casenummer</th>
<th>Welk product?</th>
<th>Wat voor soort onderhoud?</th>
<th>Waarom besloot je dit te gaan doen?</th>
<th>Was je gemotiveerd om dit te doen?</th>
<th>Was er iets aan het product wat je tot actie zette?</th>
<th>Was er iets aan actie zette?</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.1</td>
<td></td>
<td>De oplaadadapter van mijn laptop</td>
<td>Het knippunt van het kabel is niet zo zeker meer dus ik wil voorkomen dat hij gekke hoeken maakt en nog slechter/kapot raakt</td>
<td>Ja, ik wil niet dat mijn lader kapot gaat</td>
<td>Vroeger deed ik dat nooit, maar nu wel omdat ik al wat gevoeter was.</td>
<td>née</td>
<td></td>
</tr>
<tr>
<td>2.2</td>
<td></td>
<td>Laptop</td>
<td>Hij werd weer erg warm en dat is niet goed</td>
<td>Half, ik ga wat voorzichtiger om met mijn laptop lvm oudendom van de laptop. Dus wil geen onnodige risico’s nemen. Maar ik was nog nooit bij de ICT ervicedesk geweest van de TU en wist niet of ze dit wilden doen ik ging de was doen en moet selecteren wat nodig is en wat niet</td>
<td>Harder blazen (geluid alsof hij opstijgt)</td>
<td>née</td>
<td></td>
</tr>
<tr>
<td>2.3</td>
<td></td>
<td>Kleding</td>
<td>Ik waste altijd kleding na 3 dagen dragen te hebben. Maar daardoor slieten ze snel, ik doe nu de gurest. Als het niet strikt te er zitten geen vlekken op, dan hang ik het event. Vooraf brokken en vesten</td>
<td>Ik waste altijd kleding na 3 dagen dragen te hebben. Maar daardoor slieten ze snel, ik doe nu de gurest. Als het niet strikt te er zitten geen vlekken op, dan hang ik het event. Vooraf brokken en vesten</td>
<td>Ook was de mogen voor een selectie voor een selectie</td>
<td>née</td>
<td></td>
</tr>
<tr>
<td>2.4</td>
<td></td>
<td>Telefoon</td>
<td>Mijn telefoon was op fast boot gegaan (een soort fabrieksruim) waarop ik niet uit kon komen. Omdat ik niet goed kon zonder moeite en het moeilijk was om te vinden de knop stuk. Dus ik heb de hoes ervan af gehaald zodat ik beter de knop kan voelen en niet kapot druk</td>
<td>Bij mijn oude telefoon was de onoff knop ook al gevoelig geworden</td>
<td>Vandaag</td>
<td>née</td>
<td></td>
</tr>
<tr>
<td>2.5</td>
<td></td>
<td>Mijn mi-fitbandje (soort van fitbit)</td>
<td>Met secondeilm de houder terug in het bandje geplakt</td>
<td>Ja, omdat ik niet wilde dat het comportertje er bij uit ontmacht het houtdertje los zat</td>
<td>Bij mijn oude telefoon was de onoff knop ook al gevoelig geworden</td>
<td>née</td>
<td></td>
</tr>
<tr>
<td>2.6</td>
<td></td>
<td>Oorbelletjes</td>
<td>Ik zag dat ze wat smoedge werden een een beetje poezen</td>
<td>Zie hiervoor</td>
<td>Zie hiervoor</td>
<td>née</td>
<td></td>
</tr>
</tbody>
</table>

### Deelnemer 3

<table>
<thead>
<tr>
<th>Deelnemer</th>
<th>Casenummer</th>
<th>Welk product?</th>
<th>Wat voor soort onderhoud?</th>
<th>Waarom besloot je dit te gaan doen?</th>
<th>Was je gemotiveerd om dit te doen?</th>
<th>Was er iets aan het product wat je tot actie zette?</th>
<th>Was er iets aan actie zette?</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.1</td>
<td></td>
<td>Tonende</td>
<td>Omdat ik voor de zoveelste keer mijn baard niet kon trimmen en door dit boekje</td>
<td>Nee</td>
<td>Ja, hij deed het heel slecht. Na 2 uur opladen deed hij het pas</td>
<td>née</td>
<td></td>
</tr>
<tr>
<td>3.2</td>
<td></td>
<td>Schoenen</td>
<td>Ik kreeg last van zweetvoeten</td>
<td>Ja, het irriteerde me</td>
<td>Ja, goedkope schoenen hebben slechtere zolen</td>
<td>née</td>
<td></td>
</tr>
<tr>
<td>3.3</td>
<td></td>
<td>Mijn bar</td>
<td>De oude waren aan het rotten</td>
<td>Ja, het werd lekker weer en het was ook plezier om te doen</td>
<td>Ja, door het niet onderhouden in de winter gingen de planken rotten</td>
<td>née</td>
<td></td>
</tr>
<tr>
<td>3.4</td>
<td></td>
<td>Bierbrouwen/producten/instrumenten</td>
<td>Dit moet, omdat er anders een grotere kans is op infecie in ‘t bier</td>
<td>Ja, ik wou een lekker bierhete brouwen voor iedereen</td>
<td>Nee, de instrumenten zagen er al schoon uit, maar volgens mijn boekje moest ik ‘t toch nog extra schoonmaken</td>
<td>née</td>
<td></td>
</tr>
<tr>
<td>3.5</td>
<td></td>
<td>Gietijzeren pan schoonmaken</td>
<td>Omdat ik zuing ben op die pan</td>
<td>Ja, omdat het een fijn pan is</td>
<td>Nee, kaarten en deksel in zijn van gietijzer</td>
<td>née</td>
<td></td>
</tr>
<tr>
<td>3.6</td>
<td></td>
<td>Motorknok</td>
<td>Omdat mijn oude stuur krom staat</td>
<td>Ja, met het ouder stuur reed de motor vervelend</td>
<td>Ik viel en toen was het stuur krom</td>
<td>née</td>
<td></td>
</tr>
<tr>
<td>3.7</td>
<td></td>
<td>Auto</td>
<td>Ik check altijd na 100km een aantal dingen, omdat dat moest bij een oude</td>
<td>Ja, ik vind dat wel leuk</td>
<td>Ja, mijn gezicht komt er wel bij.</td>
<td>née</td>
<td></td>
</tr>
<tr>
<td>Veld</td>
<td>tekst</td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>------</td>
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<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Na enige malen met warm water afwassen</td>
<td>Ik doe dit geregeld na ongeveer 3 keer gebruik</td>
<td>Ervaring</td>
<td>Een vaatwasser aanschaffen</td>
<td>éénpersoonshuishouden</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 x per jaar</td>
<td>Al 10 jaar of meer</td>
<td>Goed nadenken. De modellen zijn wel redelijk teer en de haren van het penseel moeten zacht zijn</td>
<td>Nee</td>
<td>Ik zal het nu wellicht vaker meer toepassen</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Een maand geleden</td>
<td>Nee</td>
<td>Ik had mijn naaimachine aan een vrijwilligers organisatie gegeven en die hebben het uitgevoerd</td>
<td>Ik kan anderen op deze organisatie wijzen</td>
<td>Nee</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vrijbroek niet op de Plusminus drie maanden geleden</td>
<td>Nee</td>
<td>Ik wil het liever minder vaak doen en daarom lijm ik vaak extra bisonkit omdat de aangeleverde kleeflaag minder hechtend is</td>
<td>Ik kijk uit om niet te struikelen dan hoef ik het niet vaker te doen</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30 jaar geleden</td>
<td>30 jaar dus. Soms gaan doppen los of slijten door. Sommigen kunnen jaren mee, zowel, een enkele keer</td>
<td>Uit gebruiksaanwijzing</td>
<td>Ja, ik ben bouwkundig en maak vaker kastjes</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rond Sinterklaas 2017</td>
<td>Ja, ik ben bouwkundig en maak vaker kastjes</td>
<td></td>
<td>ik steun het repair cafe</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>grasmaaier een week 40 dit jaar</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Elke keer als ik hem in mijn tas doe zie hiervoor</td>
<td>Iets van een klein symbooltje wat de suggestie geeft dat het beter is om hem eruit te halen. Een duidelijk stuk om kabel eraf te trekken</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Voordat ik echt zware programma's moest gaan gebruiken zoals illustrator en insdesign voor afstuderen</td>
<td>Ja, ongeveer x per 2 jaar maar het zou vaker kunnen</td>
<td>Melding geven als het te warm wordt of eens per x tijd een melding geven</td>
<td>Vroeger zette ik hem altijd op mijn bed. Dan vangt hij veel stof. Sinds de eerste keer dat ik hem heb laten uitblazen ben ik me er wel bewust van waar ik hem beter wel en niet neer kan/moet zetten</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vandaag, ik was ongeveer 1x per week</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nog niet, maar zou het de volgende keer weer doen</td>
<td>Leek me een goede manier om te zorgen dat ik niet gelijk de telefoon verpest, heb hem nog maar 4 maanden</td>
<td>Ooit heb ik gehoord dat waspen helemaal niet zo goed is voor e kleding. Sindsdien doe ik jeans en vesten minder vaak in de wasmachine omdat die snel verkleuren of minder zacht worden</td>
<td>Een gradmeter met wanneer het acceptabel is het te wassen.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tijdje terug</td>
<td>Nee, maar ik denk wel dat ik het soms nog wel een keertje zal moeten doen</td>
<td>Een soort fabrieksmenu waarop ik een phase. Aug-sep 2018.</td>
<td>Het komt doordat ik veel te vaak met het bandje speelde waardoor het los is geraakt</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Eens in de zoveel tijd als ik eraan denk en het nodig is</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Het scheren voor</td>
<td>9-okt Ja, toen ik dat vloestof had. Altijd na afloop van trimmen. Toen de vloestof op was niet meer</td>
<td>Ja, ervaring en 1e keer door instructie boekjes</td>
<td>Grote pot van die vloestof t onderhoudschema van product was duidelijk. Zodra m'n potje vloestof op was deed ik niks meer</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bij aankoop van schoenen</td>
<td>Ja, bij elke nieuwe schoen</td>
<td>Ja, ervaring plus het is ook heel makkelijk</td>
<td>Weet ik niet</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vlak voor de zomer</td>
<td>Nee, 1e keer onderhoud na het bouwen</td>
<td>Ja, ik had de bar zelf gebouwd dus ik wist hoe deze in elkaar zat</td>
<td>Weet ik niet</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Na koken en eten</td>
<td>Ja, 1x per 2 weken</td>
<td>Ja, veel doen</td>
<td>Minder zwaar zijn/gebruiksvriendelijker. Dan zou ik de pan ook vaker gebruiken. Ik zou het liever niet vaker doen</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Afgelopen weekend</td>
<td>Nee, 1e keer onderhoud na het bouwen</td>
<td>Ja, onderhoudsboekje lezen. Was wel lastig</td>
<td>Het schoonmaken is niet zo leuk, ik zou hem vaker willen gebruiken</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 maand geleden</td>
<td>Ja 2 keer</td>
<td>Ja, m'n vader heeft het uitgelegd is niet nodig</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nummer</td>
<td>Taak</td>
<td>Beschrijving</td>
<td></td>
<td></td>
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<tr>
<td>--------</td>
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<td></td>
</tr>
<tr>
<td>3.5</td>
<td>Gietijzeren pan schoonmaken</td>
<td>Zoveel mogelijk direct na gebruik schoonmaken. Omdat ik zuinig ben op die pan. Boekel moest ik ‘t toch nog extra schoonmaken. Na koken is die vies. Nee.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Nummer</th>
<th>Taak</th>
<th>Beschrijving</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.1</td>
<td>Fleecetrui</td>
<td>zoom gestikt. De zoom was los. De trui is van mijn vader. Leek slordig. Sluitkoord hing los. Vader had het zelf niet goed zien. Was disfunctie, door buigend lood. Het weer wordt maar. Nee.</td>
</tr>
<tr>
<td>4.2</td>
<td>Hanglamp boven eettafel</td>
<td>Doorgebrand kroonsteen vervangen. Laten vervangen door zoon van een kennis. Lamp deed het niet. Ik had staande lamp geleend. Ik wilde lamp zelf repareren, maar durfde het niet goed. Maar door dorie dagen was het nu nodig. Geen licht, waardoor eettafel slecht licht had. In de wintermaan we vaak mensen komt. Ik me toch een idee.</td>
</tr>
<tr>
<td>4.4</td>
<td>Pannen met tellaf laag</td>
<td>Preventief leg ik doen tussen de pannen om beschadiging te voorkomen in de la. Ik wil deze pannen lang en veel gebruiken. Ze zijn fijn in gebruik. Je weet dat je in tefal pannen geen metaal mag gebruiken, dus voorzichtig zijn met stofjes is heel logisch. Ik wil voorkomen anders de pannen doekjes stapel mooie + mooi band + keukenpassie + keukenpassie 2 + mooi band.</td>
</tr>
<tr>
<td>4.5</td>
<td>Staafmixer</td>
<td>Na gebruik direct schoonmaken en opbergen. Ter voorkoming dat de mixer moeilijk schoen te krijgen is en onbruikbaar word. Ik vind het zonde om om zo n knullige reden iets kwijt te raken. In het verleden onnodig hier doorweegden.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Nummer</th>
<th>Taak</th>
<th>Beschrijving</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.7</td>
<td>Onderhoud week(j)an</td>
<td>Routine; eerst spoelen, daarna etersetsten laten losweken, dan spoelen en vervolgens met keukenpapier droog maken om kwaliteit van wok te garanderen. Kwaliteit, uitdaging om onderhoud optimaal uit te voeren. Partner; hij weet hoe een wok te verzorgen. Zie hiervoor. Als gevolg van de aanwezigheid van het andere.</td>
</tr>
<tr>
<td>5.8</td>
<td>(vloeibaar) wasmiddel</td>
<td>Vloeibaar wasmiddel met een actie zet ik voorgoed. Wasmiddel toevoegen aan de wasmachine. Ja / Met behulp van vullige van vorige machines op het netvlees. En de “geen-spiegel-tussen-te-krijgen” redenering van deze monteurs ‘..’ wasmiddel toevoegen op de plaats waar je het wil...” (De nieuwenheid van dit relatief dure product, zo lang mogelijk willen blijven vasthouden). Dus antwoord is “Nee”. Zie hiervoor. Nee.</td>
</tr>
<tr>
<td>Product</td>
<td>Hoe vaak</td>
<td>Uitleg</td>
</tr>
<tr>
<td>---------</td>
<td>----------</td>
<td>--------</td>
</tr>
<tr>
<td>Vaatwasser</td>
<td>1x per 2 weken</td>
<td>Ja, veel doen</td>
</tr>
<tr>
<td>Zilverpoets</td>
<td>6 x per jaar</td>
<td>Ja, weer netjes</td>
</tr>
<tr>
<td>Afwassen</td>
<td>1x per dag</td>
<td>Ja, zelf gedaan</td>
</tr>
<tr>
<td>Fietsband</td>
<td>Naar fietsmaker gebracht</td>
<td>Anders gaat het wiel kapot.</td>
</tr>
<tr>
<td>Onderhoud wok</td>
<td>1x per maand</td>
<td>Hou de toestel schoon</td>
</tr>
<tr>
<td>Hanglamp boven eettafel</td>
<td>1x per week</td>
<td>Het is goed voor het licht.</td>
</tr>
<tr>
<td>Motorfiets</td>
<td>Stuur vervangen</td>
<td>Omdat mijn oude stuur krom staat.</td>
</tr>
<tr>
<td>Oorbelletjes</td>
<td>1x per week</td>
<td>Ja, ik vind dat leuk. Nee. Nee. 1 maand geleden. Ja. 2 keer.</td>
</tr>
<tr>
<td>Houten vloeren</td>
<td>Onderhoud</td>
<td>Door zuinig gebruik te spullen.</td>
</tr>
<tr>
<td>Preventieve maatregel</td>
<td>Leeg geschoten kunststof</td>
<td>Neem de maatregel zodanig voorzichtig en bewust.</td>
</tr>
<tr>
<td>Veiligheid</td>
<td>Hoofd, door meer dan één speler te plaatsen</td>
<td>Het hoofd voor een speler die de vloer moet dragen.</td>
</tr>
<tr>
<td>Oplader</td>
<td>Merk kwaliteit van nieuwe rits</td>
<td>Dit is een handig idee om zowel de vooral broeken en vesten als de vloeistof deel uit te zetten.</td>
</tr>
<tr>
<td>Telescopische ladder</td>
<td>Door ontwerpers bedacht.</td>
<td></td>
</tr>
<tr>
<td>Computer</td>
<td>merk kwaliteit van nieuwe rits</td>
<td>Dit is een handig idee om zowel de vooral broeken en vesten als de vloeistof deel uit te zetten.</td>
</tr>
<tr>
<td>Stapel</td>
<td>Door ontwerpers bedacht.</td>
<td></td>
</tr>
<tr>
<td>Telefoon</td>
<td>merk kwaliteit van nieuwe rits</td>
<td>Dit is een handig idee om zowel de vooral broeken en vesten als de vloeistof deel uit te zetten.</td>
</tr>
<tr>
<td>Telefoon</td>
<td>merk kwaliteit van nieuwe rits</td>
<td>Dit is een handig idee om zowel de vooral broeken en vesten als de vloeistof deel uit te zetten.</td>
</tr>
<tr>
<td>Telefoon</td>
<td>merk kwaliteit van nieuwe rits</td>
<td>Dit is een handig idee om zowel de vooral broeken en vesten als de vloeistof deel uit te zetten.</td>
</tr>
<tr>
<td>5.7</td>
<td>Onderhoud wolk(s)</td>
<td>Routine; eerst spoelen, daarna etensresten laten loswrijven, dan spoelen en vervolgens met keukenpapier droog maken</td>
</tr>
<tr>
<td>5.8</td>
<td>(vloeibaar) wasmiddel</td>
<td>Voorzichtig gebruik spuiten. Het voorkomen dat wasmiddel-restanten zich ophoopt in tevoer vanaf daarom bestemd balje in frontpaneel naar de wastrommel.</td>
</tr>
<tr>
<td>5.9</td>
<td>Rits in vest maakt jas voor op de fiets.</td>
<td>Het creëren van iets anders. Wintervest wordt voorjaars /najaars-jas; geschikt voor op de fiets.</td>
</tr>
</tbody>
</table>

### 6.1 Vaatwasser

<p>| 6.1 Vaatwasser | Vaatwasser schoonmaken, roosters en sproeiarmen poetsen | Dan werkt de machine beter en gaat die langer mee | Nee | Hij was vol bij de zieke lading, eerst schoonmaken | Werd geweken legging |
| 6.2 Kleding | Naaien, gat maken | Lievelingsbroek | Ja, broek zit lekker en naaien vind ik leuk | Er zat een gat in, vastnaaien op de naaimachine | Nee, 6 a 7 x per week |
| 6.3 Auto | Naar garage gebracht | Foutmelding | Ja | Pannen waren vies | Door hoge aanschafprijs en wasmiddel-restanten zich ophoopt in tevoer vanaf daarom bestemd balje in frontpaneel naar de wastrommel. |
| 6.4 Fietsspanol | Naar fietsmaker gebracht | Anders gaat het niet goed | Ja, dan kan Doutzen (dochter) weer fietsen | Deur stond bij het grofvuil. Had een mooie kleur, leuk idee om knutsels op te hangen |
| 6.5 Afwassen | Pan met sop wassen | Deze was vies | Ja | Zodat tijdens het reizen de opdracht van het pensel bijen hangen. | Nee, maar secondelijm leek me beter |
| 6.6 Deur | De deur aan de muur gehangen voor knutselswerk | Ziet er leuk uit | Ja | Omdat ik graag dingen laat vallen. En ja, ik hou mijn spullen graag netjes | Ja, omdat het een fijne pan is. Na koken is die vies. Nee Na koken en eten. |
| 6.7 Kleding | Kleding in de wasmachine | Ze waren vies | Ja, hoor, de wasmachine wast | Er vond geen metaal mag gebruiken, dus | Ja 2 keer spullen, maar door het hoesje voel ik iets anders. Wintervest wordt voorjaars /najaars-jas; geschikt voor op de fiets. |
| 6.8 Telefoonhozen | Hoes open voor telefoon | Omdat ik graag dingen laat vallen. En ja, ik hou mijn spullen graag netjes | Nee | Er vond geen metaal mag gebruiken, dus | Ja, omdat het een fijne pan is. Na koken is die vies. Nee Na koken en eten. |
| 6.9 Zilver | Zilverpoets | Dan glint het weer | Ja, weer netjes | Het werd dof (zwart) | Ja, omdat het een fijne pan is. Na koken is die vies. Nee Na koken en eten. |</p>
<table>
<thead>
<tr>
<th>Vraag</th>
<th>Ja / Altijd</th>
<th>Nee, zelf verzonnen, vanwege het advies van partner om NIET met zeepopp vet op te lossen, maar altijd een soort van vet in de pan te laten trekken.</th>
<th>Misschien gebruiksaanwijzing (heb ik nooit onder aangegaan gehad; bij Chinese Amsterdamse winkel aangeschaft).</th>
<th>Als ik (een) Indonesische ouder(s) zou hebben, zou de wijze waarop, ongetwijfeld door mij gekopieerd zijn.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eigenschappen van het product</td>
<td>Ja / Altijd</td>
<td>Ja / Uiteraard (dit is te simpel voor woorden): doe eersdop vullen met wasmiddel en bij de was doen in de trommel. De monitoren adviseerden eerst de was en daarna het wasmiddel, om spreiding/oplossing zo optimaal mogelijk te laten plaatsvinden (dat wasmiddel niet direct bij eerste spoeling wordt afgevoerd).</td>
<td>Ander antwoord; geen doosdraagbakjes aantrekken, of keuze, dat bij vloeibaar dit de voorkeur heeft ??</td>
<td>‘sodium’ het zou toch simpeler kunnen; ZELF dooien ??</td>
</tr>
<tr>
<td>Advies van verder adviezen verzameld</td>
<td>Ja, vanaf begin. Ongeveer 8 jaar geleden</td>
<td>Ja, levensverlenging</td>
<td>Eenvoudiger toegang tot plafond balk waarin ik het zien doen vroeger beschermende sokken bootjes.</td>
<td>Eenvoudiger toegang tot plafond balk waarin ik het zien doen vroeger beschermende sokken bootjes.</td>
</tr>
<tr>
<td>Elke keer wanneer de vaatwasser gevuld word</td>
<td>Ja, 6 à 7 x per week</td>
<td>Ja, staat als advies in de gebruiksaanwijzing</td>
<td>Vullindicator aangeven</td>
<td>Vullindicator aangeven</td>
</tr>
<tr>
<td>Weekendmiddag</td>
<td>Ja, bij andere kledingstukken</td>
<td>Ja, ervaring</td>
<td>Ja, ervaring</td>
<td>Ja, ervaring</td>
</tr>
<tr>
<td>3 jaar terug</td>
<td>Ja, 1x per jaar apk keuring</td>
<td>Ja, ervaring</td>
<td>Ja, ervaring</td>
<td>Ja, ervaring</td>
</tr>
<tr>
<td>3 jaar terug</td>
<td>Ja elke dag</td>
<td>Ja geleerd</td>
<td>Ja geleerd</td>
<td>Ja geleerd</td>
</tr>
<tr>
<td>Elke week een paar x</td>
<td>Als ik een nieuwe telefoon aanschaf, Ja 3x bij een nieuwe telefoon deze gelijk erbij kopen</td>
<td>Ja van mem (moeder) geleerd</td>
<td>Ja van mem (moeder) geleerd</td>
<td>Ja van mem (moeder) geleerd</td>
</tr>
</tbody>
</table>

**Design for Product care**

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<table>
<thead>
<tr>
<th>Deelnemer</th>
<th>Casenummer</th>
<th>Welk product?</th>
<th>Wat voor onderhoud zou je willen doen?</th>
<th>Waarom heb je dit (nog) niet gedaan?</th>
<th>Was je gemotiveerd om dit te gaan doen?</th>
<th>Zo nee, is er iets aan het product waardoor je de neiging hebt om er wat aan te doen?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lysbet</td>
<td>(38)</td>
<td>6.10</td>
<td>Kozijnen/deuren schilderen</td>
<td>geen tijd</td>
<td>Beetje; niet echt eigenlijk. Het alternatief wordt vaak niet meer geacc.</td>
<td></td>
</tr>
<tr>
<td>Jitske</td>
<td>(55)</td>
<td>4.9</td>
<td>Tapijt op maat snijden.</td>
<td>Nieuw leven inblazen ??? (een soort van), juiste uitsnede/contravorm afrijden van tapijt t.p.v. doorvoer CV-radiator.</td>
<td>Lakt�heit</td>
<td>ja zee; het ziet er niet 100% verzorgd uit. Indertijd afgemaakt, andere dingen aan je hoofd.</td>
</tr>
<tr>
<td>De Fries</td>
<td>(Jasmin)</td>
<td>5.13</td>
<td>bescherm’dog’ o.i.d. om scherpe punt van snoeischaar niet in tas te laten prikken (op weg naar moestuin).</td>
<td>Preventie maatregel, Bescherming van tas waarin ik deze snoeischaar vervoer.</td>
<td>2e juiste antwoord: Folie herstelten.</td>
<td>Beetje; niet echt eigenlijk. Het alternatief wordt vaak niet meer gebruikt.</td>
</tr>
<tr>
<td>Maar</td>
<td>(55)</td>
<td>5.15</td>
<td>Tapijt op maat snijden.</td>
<td>Nieuw leven inblazen. ??? (een soort van), juiste uitsnede/contravorm afrijden van tapijt t.p.v. doorvoer CV-radiator.</td>
<td>ja zeer</td>
<td>Beetje; niet echt eigenlijk. Het alternatief wordt vaak niet meer gebruikt.</td>
</tr>
</tbody>
</table>

Appendix 7: Diary data (unsuccesful)
<table>
<thead>
<tr>
<th>Naam</th>
<th>Alter</th>
<th>Hoogte</th>
<th>Actie</th>
<th>Actie</th>
<th>Actie</th>
<th>Actie</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adrie</td>
<td>59</td>
<td>5.11</td>
<td>Ik maai om de 2 weken</td>
<td>ervaring van jaren</td>
<td>een ruimere doorgaans gras naar opvangbak</td>
<td></td>
</tr>
<tr>
<td>Sebastiaan</td>
<td>24</td>
<td>3.10</td>
<td>Ik heb het rond 2000 ook een grijze met bruiser, maar het snel weer los en kruis de formica plaats sterk</td>
<td>ervaring</td>
<td>Ik denk dat het plastic verouderd is en ik het moet vervangen</td>
<td></td>
</tr>
<tr>
<td>Hanna</td>
<td>24</td>
<td>2.7</td>
<td>Zijvak netje van rugzak</td>
<td>Zelfde soort materiaal meegeven om het mee te stoppen</td>
<td>Zie tekenengetje</td>
<td></td>
</tr>
<tr>
<td>Jan</td>
<td>90</td>
<td>1.8</td>
<td>Deelnemer Casenummer</td>
<td>Welk product?</td>
<td>5.12</td>
<td></td>
</tr>
<tr>
<td>Piano</td>
<td>Toetsen schoonmaken</td>
<td>Geen zin in</td>
<td>Nee, ik vind schoonmaken niet zo leuk</td>
<td>Ja, hij is heel stoffig. Hierdoor speel ik er niet op</td>
<td>Nee 1x per 2 maanden</td>
<td></td>
</tr>
<tr>
<td>Fietsketting</td>
<td>Spannen en invetten</td>
<td>3.13</td>
<td>3.11</td>
<td>Rugby schoenen schoonmaken</td>
<td>Omdat het saai is</td>
<td>Nee, ik doe liever iets anders</td>
</tr>
<tr>
<td>3.10</td>
<td>Nee</td>
<td>Ja, ze gaan namelijk sneller stuk</td>
<td>Ja, dan ik bij m'n ouders woonde</td>
<td>Ja, geleerd van m'n moeder</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.12</td>
<td>naar moestuin)</td>
<td>naar moestuin)</td>
<td>snoeischaar niet in tas te</td>
<td>mekanisch te gebruiken. niet meer; ook niet meer en zoutstel werken beide</td>
<td>niet meer maken jumpsuit</td>
<td></td>
</tr>
<tr>
<td>radiator.</td>
<td></td>
<td></td>
<td>tegen lade.</td>
<td>Repareren. Het kan door een</td>
<td>Het bureau gemaakt rond 1967</td>
<td></td>
</tr>
<tr>
<td>beslag</td>
<td></td>
<td></td>
<td></td>
<td>te过去</td>
<td>Heeft een gelijmd formica blad</td>
<td></td>
</tr>
<tr>
<td>Deur</td>
<td></td>
<td></td>
<td></td>
<td>dat los laat</td>
<td>Heeft een zelfgemaakt bureautje</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Het bureau gemaakt rond 1967</td>
<td></td>
</tr>
<tr>
<td>ee kopen</td>
<td>Nee</td>
<td>Ja, ik koop elke maand een nieuw bijtje leggen</td>
<td>Weet ik niet, ligt meer aan mij dan het product</td>
<td>Ja, na gebruik weer in het bakje leggen</td>
<td>Ja, gekleed van m'n moeder</td>
<td></td>
</tr>
<tr>
<td>e kopen</td>
<td>Nee</td>
<td>Ja, toen ik bij m'n ouders woonde</td>
<td>Misschien als ze nog sneller zit gaan. Nu vind ik het nog betaalbaar, maar als 't elke maand moet zou ik ze beter onderhouden</td>
<td>Ja, gekleed van vrienden en Youtube</td>
<td>Goedkoper en winkel dichterbij</td>
<td></td>
</tr>
<tr>
<td>ee kopen</td>
<td>Ja, ze kunnen nu ook snel knappen</td>
<td>Ja, 1x per jaar</td>
<td>Ik begin mezelf wel gierig te vinden p</td>
<td>Ja, geleerd van vrienden en Youtube</td>
<td>Ik begin mezelf wel gierig te vinden p</td>
<td></td>
</tr>
<tr>
<td>fiets maakt een irritant geluid</td>
<td>Ja 1 keer per jaar</td>
<td>Ja zelf uitgeprobeerd</td>
<td>Dat ik m'n gereedschap beneden kwijt kan</td>
<td>Ja, geleerd van vrienden en Youtube</td>
<td>Ik begin mezelf wel gierig te vinden p</td>
<td></td>
</tr>
<tr>
<td>op t</td>
<td>Nee</td>
<td>1x per 2 maanden</td>
<td>Nee, ik goed er een na doetje over en 't verdwijnt</td>
<td>Niet echt, ik goed er een na doetje over en 't verdwijnt</td>
<td>Nee, ik goed er een na doetje over en 't verdwijnt</td>
<td></td>
</tr>
</tbody>
</table>

### Voorbeeld

<table>
<thead>
<tr>
<th>Naam</th>
<th>Alter</th>
<th>Hoogte</th>
<th>Actie</th>
<th>Actie</th>
<th>Actie</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ja 1 x</td>
<td>tijdens het plaatsen van de nieuwe ramen</td>
<td>Ja geleerd van heit (vader)</td>
<td>Ja een aantal mallen bijveren vanuit tapijt/stoffen-bedrijf</td>
<td>Ja /Eervaring en een beetje durf.</td>
<td>Ja, erbij leveren</td>
</tr>
<tr>
<td>Emotionele waarde (het product bestaat slechts 1 jaar korter dan dat ik leef). En mijn persoonlijke voorkeur (ik ben een echte fan van sixties-design), zorgen dat ik hem niet wil afdoen. In de huidige staat niet bruikbaar. En de fauteuil ooit beetje 'viesig', doordat vulling uit gescheurde naden komt.</td>
<td>Ja, het erbij leveren</td>
<td>Ja, het erbij leveren</td>
<td>Ja, het erbij leveren</td>
<td>Ja, het erbij leveren</td>
<td>Ja, het erbij leveren</td>
</tr>
</tbody>
</table>

### Overzicht

**Design for Product care**

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Appendix 8: session plan Brainstorm with designers

Pre-session

Arrange beforehand
- Setting a date (31 October)
- Asking participants, getting at least 4. Max 6.
- Booking a room (C-1-020)
- Getting materials: so many post-its, flipover sheets, markers, printed out materials (product care activities)?

Sensitizing
- Providing the participants with a limited amount of information about the topic Design for product care. In this way they have an idea beforehand what the topic is about. This should briefly explain what the definition of product care is.
- Send 1 A4 beforehand, with a short explanation about product care, the product care groups and an assignment before the session.
- Ask them to come up with 3 examples before the session. 1 product that you maintain and 1 that you repair, try to come up with a product that probably not everyone would choose (such as a bike), and 1 that you (often) fail to do anything to.

Before the session (20)
- Prepare room/materials/snacks/drinks
- Meebrengen: waterkoker, bekertjes, thee, 2 kommetjes
- Kopen: normale postits, grote postits, markers, nootjes, pure chocola,
- Hang up/laying down papers

Opschrijven:
- Hoe kan een product ontwerp de gebruiker stimuleren om product onderhoud uit te voeren?
- Product Care

Printen:
- De product care behaviors 6 keer
- Een vel met verschillende producten (koffiezetapparaat, stoel, speakers, rugzak, lamp, kastje, gietijzeren pan, oortjes, hardloopschoenen, eettafel)
Creative session

Tijdens sessie

Introduction (10)
- Kleine introductie, mijn afstuderen gaat over Ontwerpen voor Product Care, oftewel product onderhoud. Product care zijn alle activiteiten die een gebruiker kan doen die bijdragen aan de lifetime van een product, dit is reparatie, schoonmaken, hoesjes om je telefoon, niet met een vork in de pan, alles. En de focus ligt dus heel erg op het gedrag van de gebruiker, want je kan een product zo ontwerpen dat het mogelijk is om het te onderhouden, op wat voor manier dan ook. Maar je moet dan nog zorgen dat de gebruiker het ook doet.
- Consent form.
- Snelle introductie: Naam, wat je studeert, en 1 voorbeeld van een product die je wel onderhoud, en 1 die je niet onderhoud.
- All others present themselves and their examples. (Zelf hier de voorbeelden opschrijven/meetekenen)

Problem statement (2)
- De vraag tijdens deze sessie is: Op wat voor manieren kan een product design de gebruiker stimuleren om product onderhoud uit te voeren?
- Tijdens deze sessie is het doel om zoveel mogelijk kleine voorbeeldjes of ideetjes te bedenken van producten die de gebruiker stimuleren, ondersteunen of triggeren onderhoud uit te voeren. En het is compleet open of het product zelf de gebruiker ondersteunt, of dat het een een extern product of service is die mensen hierbij helpen.

Optional: inform about ideation rules
Quantity breeds quality
Postpone judgment + no wrong ideas/answer
Hitchhike
Freewheel
Purge (3) (zittend)
- (On the table is a big paper with product care, let the participants write all thoughts down with a marker on it)
- Get all first ideas out. Write everything down that comes to you. (If people get stuck: Aan wat voor activiteiten denk je, wat voor soort activiteiten doe je? Waarom? Welke niet? Waarom niet? En denk luidop!)

Problem finding
Time for questions (3)
- Top! Ik hoop dat iedereen een beetje een gevoel al heeft nu bij product care. Ik had jullie een pdfje gestuurd met de verschillende varianten van Product Care, die kunnen jullie er straks altijd bij pakken ter inspiratie. Er is dus veel verschil tussen de verschillende typen product care, het varieert in hoeveel moeite het onderhoud kost, hoeveel tijd, of je er skills voor nodig of niet, maar ook hoe gemotiveerd je moet zijn om je ertoe te zetten.
- Dus even terug naar de vraag waar we antwoorden voor gaan proberen te verzinnen.
- Hebben jullie nog vragen over deze problem statement? Denken jullie dat dit een goede formulatie is voor het probleem? Inspirerend genoeg? Of zouden jullie het anders willen zien?
- (Voor het geval dat de vraag iets anders moet, die aanpassen.)

Diverging for ideating
Explanation (3)
- We gaan zometeen in 3 rondes ideaten, dit doen we met z’n allen tegelijk, dus ga ook lekker verder door op andermans ideeën. In de eerste ronde gaan we kijken naar een specifiek type product care, dus eigenlijk focusen op het stimuleren van een bepaald soort gedrag. En dan twee rondes dat we los gaan op de producten die jullie hebben meegebracht als voorbeeld, en dan kijken hoe we zouden kunnen zorgen dat iemand die dingen goed onderhoud.
- Dus in deze eerste ronde gaan we kijken naar hoe je een bepaald soort onderhoud gedrag kan stimuleren, of ondersteunen of triggeren. Dus als je niet meer goed weet wat de groep inhoud, dan kun je het papiertje erbij pakken. Heeft iemand voorkeur voor met welke we beginnen? Oke dus stel je voor je moet iets repareren, op wat voor manieren zou je het makkelijker kunnen maken? Aantrekkelijker? Wat zou je motiveren om het wel te doen?
Hoe wordt de gebruiker erop attent gemaakt? Is er dan iets aan het product wat anders is? Wat opvalt? Wat als er niks aan te zien is, hoe zou het product je kunnen laten weten dat het onderhoud nodig heeft? En praat ook vooral luidop.

*Inspiration round 1 (14) staand*

- (Door elk type onderhoud gaan, 2 min per group.)
- So let’s start with repairing, how could you make a user repair something. Is there a way to make them more motivated to do it? Can you make it easier? How can you push them? Persuade them? Trigger them? Just write everything down that comes to mind. Talk out loud.
  - Repairing
  - Reviving product
  - Creating something new/different
  - Preventive care choices
  - Small care
  - Mindful/instructed handling
  - Routines

*(Bathroom) Break (5)*

*Choosing specific products (3)*

- Oke, in de volgende ronde gaan we producten kiezen die we meer product care friendly willen maken. We kunnen de voorbeelden gebruiken die jullie zelf hadden, dus het product waar je niet goed genoeg voor zorgt. Maar als je een ander of leuker voorbeeld hebt dan kan dat ook.
- (Choose 5 products from the examples they brought. If examples are too similar, they can come up with a new one or i’ll mention one of my own. So I should have a few backup products as example ready.)
- (Even kort bespreken wat voor activiteit uitgevoerd zou moeten worden.)
- Laten we ze even rangschikken van het makkelijkste soort onderhoud, tot het moeilijkste soort onderhoud.

*Ideation round (own products) (15)*

- Laten we beginnen met het product wat in principe het makkelijkst zou moeten zijn om te doen.
- (Beweeg zelf ook actief, plak de post-its op de muur, en laat ze er omheen

*Ideating round (each product category) (12)*
(Same as previous round. For each care activity group I will give a example)
- Household appliances
- Consumer electronics
- Means of transport
- Furniture and interior design items
- Clothes, shoes and accessories
- Sport equipment, accessories for hobbies and leisure

*Mini-break (3)*
- (Take pictures of the results of the ideation)

*Clustering (5)*
- Oke nu wil ik dat jullie in 5 minuten deze ideetjes gaan clusteren.
- Use a separate wall to start clustering. Hand participants random ideas from the ideation, in this way gently push them to just start somewhere. Remind them to talk out loud. Ask them questions about why they think things fit together.

*Wrap-up (5)*
- Look back on what they’ve made together with them.
- Everyone take it in, and write down in a few words what you think, as a designer, are the essentials for product care. The essentials for Designing for product care.
- Vraag kort in de reflective wat zij denken dat zij nodig zouden hebben als ontwerper om ontwerp te kunnen ontwerpen wat goed inspeelt op mensen hun product care behavior.
- Thank them for their help.
### Appendix 9: Brainstorm with designers - results

<table>
<thead>
<tr>
<th>Group name – strategies</th>
<th>Solutions</th>
</tr>
</thead>
</table>
| **Waarde** – Waarde van het product naar voren laten komen, persoonlijke betekenis of waarde eraan toekennen (vertaling: Showing value) | - Product veel persoonlijke waarde geven  
- Waarde tonen. Of het nog dierbaar is.  
- Geef je tas karakter  
- “als nieuw” houden |
| **Consequenties** – Bewustmaking van wat voor effect de gebruiker zijn/haar gedrag heeft op het product (negatief en positief). En ook product care verbinden aan een directe consequentie. (vertaling: Consequences) | - Eerdere problemen voorkomen  
- Beloning na actie  
- Regels (APK)  
- Beloning als je het wel doet  
- Product overdreven duur maken  
- Dure/nieuwe producten  
- Beloning geven  
- Boete/straf als e het niet doet  
- Laat consequentie zien  
- Grenzen aangeven  
- Laten zien wat het product aankan  
- Informeren over hoe goor het eigenlijk is  
- Doem scenario  
- Self destroy, als je het niet doet  
- Andere dingen blijven ook schoner  
- Groot contrast  
- Intense kraak als Schroefjes niet goed zitten  
- Mogelijkheden (zelf, opsturen,etc)  
- Oplappen is goedkoper dan nieuw kopen |
| **Service** – services aanbieden bij het product, op de hoogte stellen van bestaande services. Het toepassen van bestaande type services (zoals een proefperiode) voor andere soorten producten | - Fix it cafe/repair cafe  
- Ifixit.com  
- RepairBee  
- Plek waarcreatievevingen er iets nieuws van maken  
- Waar onderdelen? Info  
- The upcycle store  
- Bijna alles kan een lamp worden  
- 5 keer iets aan je tas laten vervangen (onderhoudsservice)  
- Tweedehands spullen cadeau doen  
- Onderdelen shop  
- Bed service (bij aanschaf)  
- Rent a bag (borg) |
| **Kennis bij het product** – mensen instrueren van hoe iets gedaan moet worden en op de hoogte houden van hoe het gaat tijdens onderhoud en wat er gebeurt. Kennis van de gebruiker vergroten. (vertaling: Heightening knowledge) | - Gebruiks instructie leuk & interessant maken  
- Tutorials  
- Tutorials  
- Tutorials  
- Tijdens gebruik ‘altijd’ een instructie te zien (logoates/plaatjes)  
- Plaatjes bij het product  
- Laten zien hoeveel mooier het kan  
- Track & trace voor service  
- Psychologisch verslavend maken  
- Laten zien waar het stuk is |
| Kennis bij het product – mensen instrueren van hoe iets gedaan moet worden en op de hoogte houden van hoe het gaat tijdens onderhoud en wat er gebeurt. Kennis van de gebruiker vergroot. (vertaling: Heightening knowledge) | - Laten zien hoeveel mooier het kan worden  
- Track & trace voor service  
- Psychologisch verslavend maken  
- Laten zien waar het stuk is  
- Samen met iemand die weet hoe het moet  
- Laten zien hoeveel moeite het kost als je het uitstelt  
- Instructing how to clean |
| --- | --- |
| Emoties – inspelen op de emoties en waardes van de gebruiker (vertaling: Emotions/emotional) | - Creativiteit  
- Smerig  
- Gevoel van verantwoordelijkheid  
- Schuldgevoel  
- Gevoel van accomplishment  
- “opruimwoede”. Gevoel van efficiencie  
- Gezond |
| Product aanpassen/e iets toevoegen – Vanuit het product wordt gedrag gestimuleerd. Het product doet dit door zijn aangepaste uiterlijk, of verandert van uiterlijke kenmerken, of verandert op een andere manier merkbaar. (vertaling: Product changes/product shows) | - Al erin  
- Ontwerp zodat zo min mogelijk onderdelen stuk kunnen gaan  
- “Schoonmaak” functie “stomen”  
- Fabrics  
- Bacteriën laten zien in je matras  
- Zwart matras  
- Super zichtbare zweetplekken  
- Update systeem  
- Lichte binnenvoering  
- Materiaal makkelijk waterdicht → marketing  
- Bed super wankel maken → schroeven  
- Transparant wordende stof (op een bepaalde tijd/bepaalde locatie)  
- Label maken binnenin het product met info/telefoon nummers  
- Life changing experience as trigger  
- Externe trigger  
- Vuil zichtbaar maakt  
- Draaischijf blokkeert |
| Tools bij product – Het meeleveren van benodigdheden voor onderhoud (vertaling: Giving tools) | - WD40  
- Tools geven  
- Hoesje bij telefoon  
- Tools bijleveren  
- Universele repair tools  
- Klein instructie boekje  
- Speciale kleerhanger voor je jas  
- Vakje met schoonmaak/preventie tools  
- Trekker  
- Beschermingsmateriaal meeleveren  
- Klein schoonmaak setje erbij (bij aanschaf)  
- Houten spatel bij pan  
- Makkelijk maken |
| **Tools bij product** – Het meeleveren van benodigheden voor onderhoud (vertaling: Giving tools) | Bij aankoop 1 malig spray meeleveren  
Probleem + tool matchen  
Hoesjes/opbergsysteem  
Borstel voor de deur dat je ze schoon moet maken voor je naar binnen gaat  
Regen/zonbescherming |
|---|---|
| **Matchmaking** – Bij aankoop kijken of je matcht met het product (vertaling: Matching) | Koopadvies  
Proef traject  
Zoals first-time use van app |
| **Enthusiasme** – Op leuke manieren awareness creëren en het verhogen van enthousiasme voor een product door middel van activiteiten (zoals challenges, events, etc.). Mensen enthousiasmeren. | Wedstrijd  
Waar?!  
Gratis producten pimpen  
Tv programma’s  
Event |
| **Anderen involved** – Invloed uitoefenen door social pressure, ander maar ook het leuker maken van product care door het meer een sociale activiteit te maken. | Social pressure  
Geleende spullen  
Influencers  
Hulp vragen/ hulp bieden  
Samen doen/ repair buddy  
Peer pressure  
Kleding inzameling. Behoefte laten zien  
Platform waar tas gebruikers tips aan elkaar kunnen geven  
Product juist opbergen  
Schoonmaak sessies  
Workshops  
Gezelligheid/samen doen  
Social pressure  
Leren van ouders/mee opgroeien  
Gezamelijke producten aanschaffen  
Gewoonte → aanleren vanaf het begin |
| **Leuker maken** – Van product care meer een leuke activiteit maken/in plaats van puur onderhoud | Humor  
Game missie  
Verrassingselement  
Product loopt weg als je het niet doet |
| **Reminders** – Focus op reminders en herinneren aan product care. | Zwaailichten en alarm  
Reminder voor taakjes die maar 1x per jaar hoeven  
Reminders  
Rooster  
Waarschuwing  
Planning, bijhouden voor het laatst gerepareerd  
Alarm  
Reminder krijgen wanneer nodig  
Reminders op het goede moment  
App die een reminder stuurt (zoals Plantsome)  
App erbij met info  
Tijd  
Rood lampje/alarmbel als kapot |
The essentials of designing for Product Care are ....

- Triggers that stimulate the user.
- The behaviour of the user group.
- The available tools.
- The knowledge about certain use.

Reminders — Focus op reminders en herinneren aan product care.

<table>
<thead>
<tr>
<th>Reminders</th>
<th>Notification/pop-up dat je iets moet aanpakken</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overig</td>
<td>- Hoe dan?! - Meten = weten - Verhuizen (nieuwe omgeving = nieuwe routine)</td>
</tr>
</tbody>
</table>
Appendix 10: Ideation results - of myself

A car should be checked every now and then, perhaps oil added, some a windshield wiper stuff. The first time the car goes a long way, it is a warning that oil should be checked. At the same time, a very specific smell (maybe mint) is released. After several times, the smell will be released after (not necessarily a warning) but through smell you associate it with having to check oil.
Design for Product care

An online service that 3D prints spare/broken parts. You just scan your product and a 3D printer can give you a replacement.

"A box that can be sent to your house which you place in a box and return it like a coffee capsule."

"Time for a regular check-up"

Steam of water boiler is turned in other colour. Means it needs maintenance/exchanging of filter.

"The smoke of the page means different things."

"Pollinized clothing, systems where you can adjust like almost anything, making it really fit your identity."

Toolbox as a family heirloom

"It fills up after multiple uses. It is real, you can feel it, it shows the heat and such should be decalcified."

"A thingy for in the wall of your homes."
A product that needs 2 sets of hands to clean it, so you have to ask someone to join you

Product sends a message on your behalf to random friends online if they can help with repairing/fixing something.

You get personal messages of your electronic devices if they need product care/ have an error/etc. It tells you it otherwise becomes unsanitary

Stickers with motivational text coming your way (some people don’t know)

AR app that gives ideas for pumping products you have

Or on a community that you can post pics to and that other people can comment with ideas on how to pimp it.

So that they encourage each other, give tips and perhaps even collaborate

Hey we saw you had a problem?


design for product care
Design for Product care

Teacup with pattern of Pines / or perhaps perennial flowers that only become apparent when the cup is very shaken/daily. The pattern is made of a material coating that becomes more dirty less quickly. You see these 'dirty' things only when the cup isn’t cleaned enough.

A broadminded/geeky—for those who have always wanted or zoned (inches in order of ease in the zone)视角.

An alarm clock that is connected to your calendar. Once every so many days, when it notices you need a calm planning for the day it goes off 15 min earlier, so you can incorporate 10 min that morning into cleaning/small care.

A caterpillar that is plugged to your laptop/phone and starts crawling around the room when it is time for a backup/cleanup.

A cupboard with tools (perhaps for specific product) when repairs/maintenance is needed, its being filled up.

Our weekends did all a week wonders, morning motion (soul), we did deal load extra small vics.

When it needs to be decanted if the area you clean it, sharing its trickle, adding for product care on YouTube & online.

Add for product care on YouTube & online.

The footprint is fragile and can be fractional easily. It can be pretty, but be broad with the unique for every piece, it at the sometime reminds you that it fragile and should be handled mindfully.

The footprint is fragile and can be fractional easily. It can be pretty, but be broad with the unique for every piece, it at the sometime reminds you that it fragile and should be handled mindfully.

<table>
<thead>
<tr>
<th>DECEMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
</tr>
<tr>
<td>2</td>
</tr>
<tr>
<td>3</td>
</tr>
</tbody>
</table>

Perhaps by repair/ at the municipality.

Like the adjustable.

Not just goodby.

Days, but also days that you should do something related to product care.
Design for Product care

Appendix

42335
touch
cracking
something has
parted

in the type of shirt!
every latch
depending on
how its folded/
prepped in/knotted
a new pattern emerges
making you or
have a new shirt
every time after washing

fabric is
similar, making
it able to let you
from new pattern by rubbing yourself when wearing it

54524
Sand
(robotical)
reusing
engage

the projector
antenna
who
has to wipe where

in the game
out of cleaning

projector
made a sort
of twist in game on it

playing it together
and in the process

pursuing through all stars

38126
reusing
engage
right

curtains that after not
washing it for a while
let through more sun
(in the form of images/pattern)
to have it functioning
or darkening curtains you
need to wash it again

perhaps that effect happens through
feeling it (because you open close
it every evening)

phone cover that look
blue bubble wrap, indicating
the contents are fragile

Copper sink, you
see the places you've
touched it, reminds
you of all the
times you've stood
there.

perhaps also
identifying
for stain case

arm support

Dish washer
makes cracking
noises when activated
or when filter
needs to be cleaned

To Do List

-

-

- you set digital
to do list (close to
finish it this week)

- it adds maintenance/
small care activity

- it feels stupid if it's left
unchecked

Design for Product care 167
Appendix 11: existing product solutions

- Customizable templates for sneakers
- Common books that explain repair
- Apps that support/explain memories about the past or hopes for the future
- Tankstations are available everywhere, making filling up your car with gas/fluids/etc accessible
- Each tankstation has machines that help doing things like pumping your tires and cleaning your car
- A self-healing plastics
- Adjustable glasses, they can be altered to your eyes. So you'll never need new ones
- White sneakers where dirt is quickly visible
- IKEA hackers give examples on how IKEA products can be rebuild/made into different product
- Apps exist that give explanations on how to do maintenance/repair of your car
- Car interfaces give signals when there is something that needs checking/maintaining/ replacing/repairing
- Building your own camera module to module, knowing how parts works
- A baby crib which holds memories
- A baby crib which holds memories
- Products that obviously need to sustain rough terrains/use are often better prepared/cared for afterwards
- By making products yourself, people feel more responsible for the product afterwards (DIY)
- Garages exist where people are allowed to try and repair their car themselves and can receive help and tips if they need it
Design for Product care

- it’s socially frowned upon if your toilet is visibly dirty, also it becomes smelly, thus irritating and embarrassing.
- some products remind people of where they come from or of different times.
- some people fit with people’s identity or remind them of times/people.
- this cup Domoer was given to me by my University when I graduated from my bachelor, I still use it every day/clean it.
- many devices are provided with a layout of the product, explaining the different parts and functions.
- the Dopper is made in such a way that it is also easier to open it up and properly clean it.

- the lamp shows the growth of your child over time, being not only a lamp, but also encompasses memories.
- an app that connects you with other people/professionals that can help with repair/maintenance.
- a platform that gives tutorials for repairing almost anything.
- this Auping Arondo bed can be easily dis- and reassembled and be upgraded with other parts.
- Egg helmets can be personalized.
- family heirlooms are often maintained so they can be handed to the next person in line.

- this table can be easily disassembled and reassembled in other ways.
- photoalbums hold many dear memories that people don’t want to look.
- Kintsugi is when dishes are broken and then reassembled with gold glue and considered even more beautiful now.
- Rotterdam now placed pumps for bikes near bikepaths, making it more accessible to pump your tires.
- many products have a warranty on their products, making it possible for consumers to send their products back to fix them.
- if a ceilinglight in your house stops working, you have no light and cannot do other activities (that easily).
Design for Product care

Repairs are possible and even more unique

It's also the small details that make things happen. Down and winding.

Every story has a start

Products that are replaced as they are needed

Access to this service is not always easy for those who might be

Bepety lets you borrow your

peephole lets you borrow your

no gap can be made into a way
to thing. Broken down and being
created offers these simple

Outdoors, rattling noise

The Peeply and mobile

Also, cleverness

Made into something new. It's

The mobile offers these simple
even more unique

Hands-on, these broken

Even more unique

Holding a memory. Once again, an

Memory holds a memory

Rattling noise outdoors

Product that are replaced as

When a broken needs old

Photographs hold memories

Photographs that are user

Design for Product care

Design for Product care

Design for Product care
Design for Product care

Ikea hackers promoting the greatest ideas for altering your products

clothes often provide the user with one or a few extra parts such as buttons

these bike repair poles are placed at many buildings at the TU Delft so students have the necessary tools everywhere

a pocketknife can be carried around whenever you want and has a few basic tools that can be used for quick repairing

APK is a checkup that is compulsory

windows provides a troubleshooting function that helps users to find out what’s wrong with the laptop

if a piano is out of tune it’s less nice to play (the feeling can be less nice, same for the sound, can be annoying)
nissan developed a coating for cars that repels dirt
dirt is repelled by this coating and thus cleaning is made easier

some materials can heal themselves over time if they break

tomado is a shelving system that can be adjusted to your own liking, upgraded, reassembled

many tools/parts are universally compatible

many product come with clear instructions on how they should be used and what things means

some products such as old motorcycles are bought by users that know they will need to maintain them often, otherwise they will break down

swapiets takes over the repair/maintenance task of users, the user pays per month for a bike & gets a new one if broken

when the strings of tennisrackets become less tight you can feel it during use and when feeling the strings
Over the years, multiple studies and reports have tried to make us consumers face the facts: our materialism has put a strain on the resources of the world that we live in. The scarcity of resources will be a huge problem in the future for production and it will become more and more valuable to bring these resources back into production.

The world we currently know runs as a linear economy, with a ‘make, use, throw’ mentality. We need to shift towards a circular economy, where the resource flow is being slowed down and materials are kept in the loop (longer). This can be achieved through timeless design, maintenance, repair, reuse, remanufacturing, refurbishing, recycling, and up-cycling.

But completely changing the system and shifting to a durable and sustainable economy is a difficult and long process. Industries over the world together, have to change the way they work, to make this possible. So knowing this, what could your already do contribute to this shift?

Product care can be understood as any action that helps to prolong the lifetime of a product, such as maintenance or repair. These product care activities could be conducted by the consumer itself or by a service.

Product care is the most efficient and least energy consuming way of keeping resources in the loop.

The next pages present a step-by-step tool to help you design for product care. Apply this tool in your designing process when you already have a conceptual product or service idea, or are planning to redesign it and want to ensure that your design evokes or stimulates product care behavior.

This tool will help you think about your design, the user you are designing for and what kind(s) of product care behavior you desire from them. When you have defined what product care behavior you want to evoke, you gain knowledge about the different design strategies for product care.

If needed, the explanations of these design strategies are available on the cards that were included with this tool. And on the small cards you can find examples of these design strategies incorporated into design.

In the end you shall develop a rough redesign based on the design strategies that were provided to you.
Design for Product Care

Five steps for designing for product care

1. Define your product - what is it, where is it used...
2. Get to know your user - who are they, what drives them, what are barriers for them...
3. Define the desired behavior - what type of product care behavior, the specific activities, what does the user require to do...
4. Choose a design strategy - what strategies are applicable, what product care behaviors are possible, what strategies are effective...
5. Redesign your product - define the new user-product interaction, define how your design has changed, define how the desired behavior evoked...

What is your design/concept? What's the context? (Draw it! Describe it! What is its intended use? Where is it used? Also describe or draw the contexts in which it is used.)

Who is your user? (Draw them! Describe them! What could their motivations to perform product care be? What could possible barriers for them be?)

Timeline

What would the user-product relationship look like now?

What does the user require to do with the product throughout its life? Think about normal activities, good activities (such as product care) but also bad activities (that may impact your design negatively). (Draw the user-product interaction at the top of the timeline.)
Five steps for designing for product care

1. Define your product - what is it, where is it used...

2. Get to know your user - who are they, what drives them, what are barriers for them...

3. Define the desired behavior - what type of product care behavior, the specific activities, what does the user require to do...

4. Choose a design strategy - what strategies are there, possibilities of applying them, behavioral strategies...

5. Redesign your product - define the new user-product interaction, define how your design has changed, define how the desired behavior evoked...

3a

**What type of product care?**
(What type of product care behaviors would be interesting for your product? Think about which types of product care are possible for your product. Read up on the different product care behaviors if needed!)

- **Repair.** The product or a part of it is broken, preventing it from functioning or performing poorly. The user performs product care activities that will make the product be able to function again. This can be the repairation of existing parts of the product, or the replacement of parts.

- **Creating something new/different.** The user creates a product themselves, lets something be made for them, or they rebuild/remodel/reform an existing product so it feels like a new, different or unique product.

- **Reviving product.** The user tries reviving the product to a certain standard again. This could be to get it functioning better again or to regain a certain look.

- **Small care.** Nothing of the product is broken. Small activities are performed consciously to liven up the product again or to prevent it from deteriorating.

- **Preventive measures.** These are preventive measures taken to make sure a product won’t break as quickly. These measures often contain external products that equip or protect the product against its environments.

- **Instructed & mindful handling.** The user knows or feels what behaviors would be bad for the product. This could be by having read a manual, learning about it from others or just by experience. The user tries to prevent deterioration by abstaining from bad behaviors only performing the proper behaviors.

- **Routine acts.** The user performs routine activities unconsciously. These are activities that they have learned to do and have never thought about doing differently or activities that were made into habits.

3b

**Which product care activities? When?**
(Define which specific product care activities can be performed on your design. Also indicate on the timeline when these are done or how often.)

3c

**What is the desired product care behavior?**
(Which product care activities/activities do you want to focus on? Explain what that behavior consists of, what should be done and how often.)
Design for Product care

Five steps for designing for product care

1. Define your product - what is it, where is it used...
2. Get to know your user - who are they, what drives them, what are barriers for them...
3. Define the desired behavior - what type of product care behavior, the specific activities, what does the user require to do...
4. Choose a design strategy - what strategies are there, possibilities of applying them, behavioral strategies...
5. Redesign your product - define the new user-product interaction, define how your design has changed, define how the desired behavior evoked...

Which design strategies could improve your design?

(The aim this step is to gain inspiration for your desired product care behavior. Read through the different design strategies for Product care. Some strategies might fit your situation better than others, check the examples on the cards for more inspiration.)

4a. How can you apply this to your own design?

(In what ways could you apply these strategies to your product? Keep your user in mind. Keep the context of the product in mind. Where are unseen opportunities?)

Enabling.
Make product care behavior easier for the user to perform, by providing the necessary tools, means or help and thus lowering the threshold for product care behavior.

Appropriation.
Create appropriation possibilities for the user; by providing personalization possibilities, changeable products or stimulating the user's creativity.

Change.
The design creates a disruption or change in the day to day routines of the user to bring attention to product care.

Control.
The design plays a dominant role in the relationship, by making decisions itself, by steering the user unconsciously or even forcing the user to perform product care.

Reflecting.
Make the user reflect on what value a design has to them, through the meaning of the design, or the memories or stories they contain.

Informing.
Heighten the knowledge of the user, through traditional forms of information, through interactive sources of information and through information hidden in the form of your design.

Social.
Make use of social connections, with social connections as a result or as the facilitator of product care behavior - what type of behavior - what type of connection - what type of user?

Experiences.
Make use of the emotions a user can experience due to product care itself, of the emotions experienced beforehand due to expectations and of emotions experienced during and after performing product care.

5. Redesign your product -

Design for Product care

Five steps for designing for product care

When designing your product care, ensure the interaction between the product and the user is well thought through and designed to improve user experience.

Design for Product care

Ask yourself:

1. What are you trying to achieve with your product care?
2. How does the user interact with the product care?
3. How does the user benefit from the product care?
4. How can the product care be improved?
5. How does the product care fit into the overall user experience?
Design for Product Care

Five steps for designing for product care

1. Define your product - what is it, where is it used...

2. Get to know your user - who are they, what drives them, what are barriers for them...

3. Define the desired behavior - what type of product care behavior, the specific activities, what does the user require to do...

4. Choose a design strategy - what strategies are there, possibilities of applying them, behavioral strategies...

5. Redesign your product - define the new user-product interaction, define how your design has changed, define how the desired behavior evoked...

What should the redesigned user-product relationship look like?
(In what way will your design stimulate the user to perform the desired product care behavior you chose? Draw/write on the timeline how this interaction between your design and the user unfolds.)

What does your redesign look like?
(What is redesigned, which new interactions will take place? How does the redesign evoke these new interactions and/or behaviors? Explain or draw in what way the product should be redesigned.)
Design for Product care

Social
Design Strategy

Reflecting
Design Strategy

Control
Design Strategy

Enabling
Design Strategy

Informing
Design Strategy

Experieneces
Design Strategy

Appropriation
Design Strategy

Change
Design Strategy
**DESIGN STRATEGY CHANGE**

Possible design directions:

**Reminders**
by making your design noisy and remind users of product care activities that should be done or that they have planned themselves.

**Motivational triggers**
by making your design push or motivate the user to perform product care with motivational messages.

**Signals**
by making your design indicate to the user when a product care is needed, for example visual or auditory messages.

**Product changes**
by making your design alter its appearance or behavior and thus bring a change in the user’s routine daily life, for example making strange noises, changing shape/texture or meaning differently. These changes can show their link to product care very directly, or they can be subtle and ambiguous changes.

**Change in functionality/performance**
by making your design change its functionality and/or performance when product care is needed.

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**DESIGN STRATEGY APPROPRIATION**

Possible design directions:

**Personalization**
by making your design provide the user with the possibility to alter their product before/after purchase, to make it fit their personality and identity more.

**Ever-changing products**
by making your design be able to alter during the use-phase and is therefore capable of withstanding trends and can adjust themselves to the changing needs of the user.

**Creative change**
by making your design trigger or help the user to tap into their creative side.

---

**DESIGN STRATEGY EXPERIENCES**

Possible design directions:

**Anticipating effects**
by making your design try to evoke desired emotions before performing product care. These relate to thoughts the user has about the possible consequences of performing product care or feeling or passing product care. These can be positive and negative emotions.

**Experiences during and after**
by making your design try to evoke desired emotions and experiences during product care. Possibilities for this strategy are creating more pleasurable experience while performing product care behavior, or on creating positive feelings if they did and negative feelings if they didn’t perform the necessary product care.

---

**DESIGN STRATEGY INFORMING**

Possible design directions:

**Static info**
by providing the user with traditional forms of information, such as providing them with static manuals or tutorials that they can consult.

**Interactive info**
by providing the user with interactive forms of information, that are interactive and change according to what the user wants or needs to know.

**Physical information**
by making your design explain what kind of product care would be necessary through the form of the design. This form is not necessarily experienced by the user as a source of information and users are often informed unconsciously through affordances.

---

**DESIGN STRATEGY ENABLING**

Possible design directions:

**Providing flexibility**
by making your design compatible with the standard tools and means that the user has to their disposal or should make the necessary tools accessible.

**Providing necessary means**
by making your design provide the necessary tools or means for performing product care.

**Providing help**
by making your design support the user with their product care activities, or by providing the product care itself.

---

**DESIGN STRATEGY CONTROL**

Possible design directions:

**The product takes initiative**
by making your design push or require users to perform product care by taking the first step itself.

**The product handles product care itself**
by making your design update or fix itself so the user does not need to perform product care.

**Unconscious takeover**
by making your design try to fit into the users routine or play with unconscious psychological processes resulting in the user unconsciously performing, wanting to or feeling obliged to perform product care.

**Forcing product care**
by making your design stress the user perform the desired product care behaviors by enforcing the product care activity/relaxation to perform if product care is not performed.

---

**DESIGN STRATEGY REFLECTING**

Possible design directions:

**Meaningful memories**
by making your design hold, represent or stimulate making memories as a connecting personal meaning to it. This strategy focuses on creating a strong emotional connection between user and design. In this way product care is stimulated because users feel attached to your design.

**Traces**
by making your design hold a story and show beauty by showing the wear or traces on your design, making the user reflect on the meaning of these traces and their relation with your design.

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**DESIGN STRATEGY SOCIAL**

Possible design directions:

**Social connections as a result of product care**
by making your design evoke social connections or interactions by making social activities part of product care activities.

**Social connections as a facilitator for product care**
by making social connections or interactions support the act of performing product care.
Appendix 13: card set iteration

CIRCULAR ECONOMY

Over the years, multiple studies and reports have tried to make us consumers face the facts: our materialism has put a strain on the resources of the world that we live in. The scarcity of resources will be a huge problem in the future for production and it will become more valuable to bring these resources back into production.

The world we currently live in as a linear economy, with a ‘make, use, throw’ mentality. We need to drift towards a circular economy, where the resource flow is being closed down and materials are kept in the loop (longer). This can be achieved through timeless design, maintenance, repair, reuse, remanufacturing, refurbishing and recycling.

This design tool focuses on changing the user’s behavior and to make them perform repair, maintenance and care activities to extend a product’s lifetime and creating emotionally durable designs.

These sustainable behaviors can also be called Product Care.

PRODUCT CARE

Product care can be understood as any action that helps to prolong the lifetime of a product, such as maintenance or repair. These product care activities could be conducted by the consumer itself or by a service.

The throwaway culture that we live in has made it often far easier to throw away products and buy new ones, instead of maintaining and repairing the things we have. By existing behavior within the consumer that persuades or stimulates them to maintain or repair their belongings, the lifetime of products can be lengthened and thus can be considered more sustainable.

Product care is a very efficient and low-energy consuming way of keeping resources in the loop. For other actions, such as recycling, energy has to be put into the resources to break them down to be usable for new products. With product care, the user puts energy into the loop in the shape of effort and time.

This tool will help to get a feeling for the many possibilities that one needs to take into account when designing for Product care. After using this card set, you should have a better idea on how to make the user perform more repair or maintenance activities!

On the other side of this booklet you can find an example of how this card set can be used! Feel free to try it out, but also feel free to use and be inspired the cards in any way you want.

CARD SET

This card set was designed to gain inspiration from in the idea generation phase of a designing project.

The card set consists of:

7 Product cards - These cards describe the different types of product care activities.
6 Design strategy cards - These describe the different design directions a designer can think in.
8 User persona cards - These can be used as inspiration for designing for a specific user.
6 Product care cards - These can be used as inspiration for designing for specific products.
10 Miniature cards - These are examples of the design strategies to derive inspiration from.

This tool will help to get a feeling for the many facets that one needs to take into account when designing for Product care. After using this card set, you should have a better idea on how to make the user perform more repair or maintenance activities!

On the other side of this booklet you can find an example of how this card set can be used! Feel free to try it out, but also feel free to use and be inspired the cards in any way you want.
This design process is when the design you can use the cards, I’ll give a small visual example!

1 or a few enthusiastic designers might use the cards, I’ll give a small visual example!

What do you need?

1. Setting a starting point
- Think about this product: What is it intended use?
- Why do you use it?
- Where and when do you use it?
- Think about how it is used:
  - What interactions does the user have with it?
  - From pre-purchase to disposal.
  - In what non-intended ways is it also used?
  - Which forms of product care can be applied to this product?

2. What do I know?
- Read up on the different design strategies.
- Different users have different influence their behavior.
- One? Think creatively!

3. What kind of product care do I want to accomplish?
- What interactions does the user have with it?
- From pre-purchase to disposal.
- In what non-intended ways is it also used?
- Which forms of product care can be applied to this product?

4. What do I want to learn about it, check the different cards the set contains.
- Information about your product, your user or could be an interesting idea.

5. Design strategies
- These cards describe the different types of product care activities.
- These can be used as inspiration for designing for a specific user.
- Different users have different influence their behavior.
- One? Think creatively!

6. Examples for inspiration
- These describe the different product care.
- Sustainable behaviors can also be called for new products. With product care, the user puts resources back into production.
- The throwaway culture that we have. By evoking behavior within the consumer helps to prolong the lifetime of a product, such as repairing the things we own. The world we currently know runs as a consuming way of keeping resources in the loop. For resources of the world that we live in and recycling, energy has to be put into the resources to break them down to be usable for new products. With product care, the user puts resources back into production.

7. Product care cards
- These cards describe the different forms of product care.
- By evoking behavior within the consumer helps to prolong the lifetime of a product, such as repairing the things we own. The world we currently know runs as a consuming way of keeping resources in the loop. For resources of the world that we live in and recycling, energy has to be put into the resources to break them down to be usable for new products. With product care, the user puts resources back into production.

8. User persona cards
- These cards describe the different types of product care.
- Different users have different influence their behavior.
- One? Think creatively!

9. Mix ‘em up!
- These cards describe the different types of product care.
- These can be used as inspiration for designing for a specific user.
- Different users have different influence their behavior.
- One? Think creatively!

10. Ideate!
- These cards describe the different product care.
- Sustainable behaviors can also be called for new products. With product care, the user puts resources back into production.

Design for Product care
Design for Product care
Design for Product care