Slow Design

Creating long lasting consumer product relationships

Dr. Ilona E. de Hooge, Cristobal Milosavljevic Virrueta, Sem Reimink

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March 2024

WAGENINGEN
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Wageningen Science Shop

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Creative Connectors

Creative Connectors is a community made up of young professionals active within design and various fields of research, including sustainability. Within their professions and in different contexts, they each work with the theme of emotional sustainability. By combining knowledge and ideas through the community, they strive for a deeper understanding of this topic and a better applicability of this within different design processes.

Marketing and Consumer Behavior, Wageningen University & Research

The Department of Marketing and Consumer Behaviour at Wageningen University focuses on all issues concerning the relationships between products, companies, and consumers. One of the essential directions of research and education is to understand the relationships between consumers and products. The department also focuses on encouraging companies and consumers toward sustainable and healthy products.

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Civil society organizations which lack sufficient financial resources, can contact Wageningen Science Shop with research questions. This offers support in the realization of research projects. Applications must be in line with Wageningen University & Research's fields of activity: sustainable agriculture, nutrition and health, a liveable green space and processes of social change.

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Foreword

In a throw-away society where trends are rapidly changing and the lifespan of products seems to be getting shorter and shorter, it is crucial to understand how to design products that are not only sustainable, but that people will cherish. What does it take to design in a way that people feel connected to a product and that they will cherish it for a lifetime, that they will repair it rather than throw it away?

These are questions that many designers ask themselves. That's why we, Creative Connectors, were very excited that the Wageningen Science Shop was able to research this topic. The report on Slow Design that you are about to read explores how product design can contribute to the emotional bond between people and products in order to prolong their lifespan. In doing so, the design process slows down consumerism and promotes sustainability.

By creating emotional bonds between users and their possessions, we hope to outline a new direction for the future of design and consumption.

This study is the result of meticulous work and in-depth analysis, made possible by the efforts of dedicated researchers and designers. We hope that this work will inspire not only to professionals in the design world, but also to consumers striving for a more conscious and sustainable lifestyle.

We wish you an enjoyable read and new insights as you explore the findings of this study.

Summary

In their move towards a more sustainable society, many designers, manufacturers, and producers have thus far focused on reduced use of natural resources, or on the reuse of previously used materials. One other way to move towards a more sustainable future, however, is to motivate consumers to use their products for longer, and to motivate consumers to repair their products when necessary. In the current project, we delved into the question how consumers can be motivated to use their products for longer and to repair their products if necessary. Moreover, as extending the lifespan of products may have negative effects on the sales of designers, manufacturers, and producers, we also examined whether it would be possible to motivate consumers to extend the lifetime of their products in ways that can be considered economically viable for designers, manufacturers, or producers.

To answer these research questions, we first conducted an extensive literature review. We searched for articles that had studied effects on consumer product lifetime extension, consumer product usage, or on consumer product repair. After screening through 477 scientific articles, we ended up with 36 relevant articles that examined factors influencing consumers' product usage and product repair.

To focus more on the question how designers, manufacturers and producers can motivate lifetime extension in economically viable ways, we also conducted two experiments. In both experiments, we studied the influence of lifetime extension-, repairability- and sustainability marketing strategies on consumer responses to a (fashion) product. In Experiment 1, the product concerned a trousers (jeans), and in Experiment 2 the product concerned a backpack. We measured consumers' attitudes towards the product and the brand, consumers' usage and repair intentions for the product, and consumers' willingness to pay for the product. The findings reveal that…..

Together, these findings provide multiple valuable suggestions on how to increase the lifespan of products, and whether this is possible in ways that can be considered promising for designers, manufacturers, and producers. Although future research is necessary, there certainly seems to be a future for the extension of product lifetimes.

1 Introduction

1.1 Background Science shop project

The commissioner is an informal group of eight young professionals in the fields of design, arts, and sustainability. Within these fields, there has been growing attention towards more sustainable design and manufacturing of products. Thus far, the sustainable focus has been mostly on the use of circular/reusable materials, or the reduced use of natural resources. There is, however, in general a lack of attention for one other crucial factor in sustainability: consumers' use of products. That is, when consumers use their products for longer, and tend to repair rather than waste their products, they automatically move towards a more sustainable society. The ambition of the commissioner is to discover whether consumers can be motivated in such a way that products will have a longer lifespan (through maintenance, repair, etc.). A special focus thereby includes the emotional relationship between consumers and products – it is assumed that a positive emotional relationship between consumers and products can motivate consumers to extend their products' lifespans. This sphere within a product's sustainability will be addressed as emotional sustainability.

There is currently limited information or know-how on how consumers can be motivated to extend the lifespan of their products, and how they can be motivated to repair their products in case this is needed. Moreover, to ensure the existence of designers, manufacturers and producers, the commissioners would also like to know whether consumers can be motivated to expand the product lifespans in ways that are economically viable for designers, manufacturers and producers. The final objective is to generate awareness at both designers and consumers (product owners) of this sustainability strategy: the commissioners ultimately want to create a broader community of professionals with an affinity for product design that takes into account product lifetime.

1.2 Research questions

The project focused on multiple research questions, especially related to the emotional relationship between consumers and products. Over time, however, it appeared that more general research questions fitted better our interests. Hence, the final report focuses on the following research questions:

- What factors motivate consumers to use their products for longer, and what factors withhold consumers from doing so? This research question is answered with a literature review.
- What are the different ways in which designers can stimulate consumers to use their products for a longer period of time in an economically viable way? This research question is answered (as far as possible) with a literature review, and two experiments.
- What factors motivate consumers to repair their products once these are damaged (imperfect), and what factors withhold consumers from doing so? This research question is answered with a literature review.

It should thereby be noted that all research questions are answered as much as possible based on the literature and materials available. However, all research questions are more extensive than could possibly be fully answered within a 2-year project. Hence, many gaps and questions remain after having conducted the literature review and the two experiments that are focused on answering these research questions.

1.3 Theoretical background

The relationships between the concepts of consumers, product lifetimes, emotions, relationships, sustainability, and design are currently underdeveloped in the literature. Whereas many studies have focused on how consumers decide to purchase a product, fewer studies have examined the process following the purchase phase. The diverse concepts of emotions and sustainability, which can both be understood in different ways, seem to make matters more complex. For example, whereas most studies agree that emotional relationships between consumers and their brands or products motivate consumers to use and keep their products for longer (Al Mamun, Prybutok, Peak, Torres, & Pavur, 2022; Lastovicka & Sirianni, 2011; Nieuwenhuis, 2008; Simpson, Power, Riach, & Tsarenko, 2019; van den Berge, Magnier, & Mugge, 2021), other studies suggest that emotions in the buying phase may lead to impulsive buying behavior, which in turn leads to faster disposal or returns of products (Cook & Yurchisin, 2017; Thornquist, 2017). Some even go as far as arguing that emotional detachment, rather than emotional attachment, is necessary to achieve more sustainable relations between consumers and products (Thornquist, 2017). Another discussion raised in the literature is whether the relationships between consumers, products, emotions, and sustainability concern products themselves, or brands. Ample research has focused on how consumers develop emotional relationships with brands, even sometimes talking about brand love (Aboulnasr & Tran, 2020; Batra, Ahuvia, & Bagozzi, 2012; Huber, Meyer, & Schmid, 2015; Joshi & Garg, 2021; Palusuk, Koles, & Hasan, 2019). Fewer studies have focused on how consumers develop emotional relationships with specific products, which is one of the interesting elements of the current research project.

Even though all of these concepts, and especially the relationships between the concepts emotions, sustainability, consumer-product relationships, product lifetimes, product repair, and design elements are underdeveloped, the literature does provide some indications as answers to our research questions. The literature on consumer-brand relationships provides some suggestions on how consumers develop relationships, and reveals that one of the consequences of such a relationship is longer use of the product(s). The literature on product lifetimes (product retention), although quite dispersed, presents some design aspects or elements that designers can include to extend the product life. Finally, there is also some literature on the reasons why consumers would repair their products once they are damaged, and some literature on product care (which includes product repair) that presents multiple design elements that can be focused upon.

Therefore, this science shop project started with a focus on consumer-product relationships, and developing a short literature review on consumer-product relationships. this information is presented in the remainder of Chapter 1. Later on, we extended our focus to all possible factors that can influence product lifetimes and product repair. We conducted a structured literature overview (Chapter 2), which provides an overview of the existing knowledge on factors that influence product lifetimes and product repair. These factors include not only design principles that alter the product itself, but also actions surrounding the product (e.g. marketing actions, pricing strategies), and other aspects (e.g. consumer characteristics). It should thereby be noted that most of the factors mentioned in existing literature have been discovered based on interview studies or case studies – hardly any factor has been experimentally examined or tested on their effectiveness. The literature overview also takes into account whether the mentioned factors include any hint at the economic viability of these factors for designers, manufacturers, and producers. After all, most designers, manufacturers and producers need at least some economic viability to include such product lifetime-extending strategies.

The literature review of Chapter 2 resulted in many factors that play a role in product lifetimes and repair. Yet, there are few indications for the economic viability of these factors. Therefore, the project continued with two experiments that test the effectiveness of three factors – communications concerning the lifetime of products, the repairability of products, and the sustainability of products (chapter 3). We thereby examined their influences on product usage intention and product repair intentions (as proxi's for product lifetime and product repair), and their influences on consumer attitudes towards products, consumer attitudes towards producers and consumers' willingness to pay for such products. These findings provide some first indications on factors that may play a role in consumers' decisions concerning product lifetimes, and that are interesting for designers, manufacturers, and producers to explore further.

1.3.1 Consumers' emotional relationships with products (brand level)

As the project started with a focus on consumer-product relationships, we started with a short literature review on consumer-product relationships. The idea that consumers form an emotional bond or relationship with their products, has been captured in multiple different concepts. On a brand level, concepts such as emotional brand attachment, consumer-brand relationships, and brand love have been extensively examined. This stream of literature reveals that consumers may develop intense emotional relationships with brands, both positively (e.g., brand love) (Huber et al., 2015; Joshi & Garg, 2021; Kaufmann, Loureiro, & Manarioti, 2016; Lastovicka & Sirianni, 2011; Le, 2022) and negatively (e.g., brand hate) (Hegner, Fetscherin, & van Delzen, 2017; Zarantonello, Romani, Grappi, & Bagozzi, 2016; Zhang & Laroche, 2021). The concept of brand love is thought to consist of multiple elements, such as self-brand integration, positive emotional connections with the brand, long-term relationship with the brand, and positive attitude towards the brand (Batra et al., 2012). It can be defined as "the passionate emotional attachment of a consumer with a brand" (Batra et al., 2012; Joshi & Garg, 2021; Palusuk et al., 2019). Independent of the terminology used, the literature shows that consumers can develop emotional relationships with their brands that last for a longer period of time. There are multiple factors that can cause emotional consumer-brand relationships to develop, and once established, emotional consumer-brand relationships can have multiple consequences.

Causes of emotional consumer-brand relationships. Factors leading to positive emotional relationships between consumers and brands can be distinguished on the basis of whether the factor is more consumer-related or brand-related. The consumer's concept of oneself and how it matches with the product (Huber et al., 2015; Malar, Krohmer, Hoyer, & Nyffenegger, 2011), and hedonic and utilitarian values perceived in the brand (Huber et al., 2015) may affect whether consumers develop an emotional relationship with a brand. The more value consumers perceive in a brand, the more likely they are to develop an emotional relationship with the brand (Bairrada, Coelho, & Coelho, 2018). Also, the more positive experiences consumers have with a brand, the more likely they are to develop positive emotional relationships (Joshi & Garg, 2021).

Indeed, Palasuk et al. (2019) present three ways in which consumers may develop emotional relationships with brands: a love marriage, an experience-based relationship, and an arranged marriage. First, consumers may fall in love immediately and experience quite some overlap between their selves and the brands ('love marriage' or 'love all the way') (Langner, Bruns, Fischer, & Rossiter, 2016; Palusuk et al., 2019). In these cases, there is a two-way communication between consumers and brands, and consumers mostly focus on honesty, reliability, intimacy, pleasure, memories, affection, and passion. This type of brand love is related to brand passion, brand trust, and brand attachment, and consumers experiencing this type of relationship show more tolerance and forgiveness towards brands when they encounter negative behaviors from the brand.

Second, consumers may start with liking a brand and fall in love over time based on experiences with the brand ('experience-based relationship' or 'liking becomes love') (Langner et al., 2016; Palusuk et al., 2019). In these cases, consumers first explore different alternatives, and then fully consciously choose the brand. They tend to become brand lovers due to aspects such as intrinsic rewards, willingness to invest, frequent thought and use of the product/brand, and length of use. They pay attention to quality and service, and experience more intimacy and commitment, but lower levels of passion with the brand compared to love marriages. This type of relationship is mostly related to brand satisfaction and brand liking. When consumers encounter negative information about the brand, they may be forgiving, but repeatedly encountering negative information may lead to distancing.

Third, consumers may start with a neutral position and slowly develop love over time ('arranged marriage' or 'slow development') (Langner et al., 2016; Palusuk et al., 2019). In these cases, consumers do not have initial experiences with the product, but may start to like and love the brand over time. There is initially no overlap between the consumers' selves and the brands at the start of the relationship, and consumers focus on engaging in shared encounters that will lead to a build-up of history over time. The relationship reflects low passion, low intimacy, and high commitment. This type of relationship is related mostly to brand commitment. Usually, this type of relationship occurs when consumers are initially 'forced' to work together with a certain brand without having any affiliation or association with the brand (e.g. a work laptop or mobile phone).

In sum, this typology suggests that early experiences with a brand and potential overlap between consumers' self-images and aspects of the brand are important for the development of emotional consumer-brand relationships, and that aspects such as brand image and brand personality play a role in the relationship development process (Palusuk et al., 2019). The authors also suggest that seduction, creativity, and conviviality (agreeableness, warmth) are especially aspects that brand should focus upon.

From the perspective of a brand, multiple activities have been found to lead to consumer-brand relationships. Brand communication, especially when it concerns the communication of luxury in terms of quality, heritage, conspicuousness, or uniqueness, can generate positive consumer emotions towards brands and lead to strong consumer-brand relationships (Mandler, Johnen, & Grave, 2020). Similarly, story-telling may strengthen consumer-brand relationships (Dias & Cavalheiro, 2022). The more brands are perceived as being unique, exciting, and sincere, the more likely consumers are to develop emotional relationships with brands (Bairrada et al., 2018; Roy, Khandeparkar, & Motiani, 2016). Perceived brand quality is not necessarily related to the development of such emotional relationships (Bairrada et al., 2018).

Consequences of emotional consumer-brand relationships. When consumers form an emotional relationship with certain brands, they show varying kinds of positive behaviors towards the brand. Consumers with a strong(er) emotional attachment with a brand show a lower perceived risk in new products, and a higher willingness to try new innovations from that brand (Aboulnasr & Tran, 2020). They can show increased willingness to continue use of the brand products (Al Mamun et al., 2022), appear more willing to engage in active co-creation behaviors together with a brand, and ultimately experience more brand loyalty (Batra et al., 2012; Kaufmann et al., 2016). In more extreme situations, brand love may lead to an obsessive passion for the brand and an addiction to the brand (Le, 2022). In general, emotional consumer-brand relationships are positively related to brand loyalty and brand performance (Zarantonello, Formisano, & Grappi, 2016), and to positive word-of-mouth (Batra et al., 2012). Consumers experiencing brand love also seem resistant to negative information about the brand (Batra et al., 2012).

In summary, the literature on consumer-brand emotional relationships provides multiple indications of how consumer-brand emotional relationships can be developed, and what the consequences of such emotional relationships would be. Yet, it is unclear to what degree the findings on brands can be translated to specific products – it might for example be the case that consumers replace one product of a certain brand with other products of the same brand, while maintaining a consumer-brand relationship. Therefore, it is essential to examine the existing literature on the relationships between consumers and specific products.

1.3.2 Consumers' emotional relationships with products (product level)

On a product level, consumers' relationships with products have been described with multiple concepts, such as romantic consumer-product relationships, product attachment, or possession love (Dong, Li, Liu, Cai & Fan, 2018; Haines-Gadd, Chapman, Lloyd, Mason, & Aliakseyeu, 2018; Ji & Lin, 2022; Lastovicka & Sirianni, 2011; Whang, Allen, Sahoury, & Zhang, 2004). The few articles on this topic suggest that consumers may develop relationships with specific products that reflect a love relationship, including aspects such as passion, being possessive, and being selfless (Whang et al., 2004). On a more extreme case, the concept of material possession love suggests that consumers can fall deeply in love with their owned products, motivating consumers to nurture their possessions and to buy complementary products and services (Lastovicka & Sirianni, 2011). This material possession love especially occurs when consumers experience loneliness and social affiliation problems.

Causes of consumer-product relationships. Consumers have been found to like their products more and to develop emotional relationships with their products when stories are associated with these owned products (Dias & Cavalheiro, 2022), or when consumers are involved in the physical production of their products (Atakan, Bagozzi, & Yoon, 2014). Especially when consumers can add to the design of the product, they are more likely to develop a relationship with their product (Atakan et al., 2014). For newly acquired products, consumers tend to become attached when they enjoy the product (Schifferstein & Zwartkruis-Pelgrim, 2008). For old products, consumers tend to become attached when the product is related to memories (Schifferstein & Zwartkruis-Pelgrim, 2008).

Consequences of consumer-product relationships. Especially when consumers experience a passion for their product, they tend to be more loyal towards their product (Whang et al., 2004). Consumers developing a love relationship with their products may act more sustainably (Dong et al., 2018), and consumers being attached to their products have a tendency to use their products for longer (Schifferstein & Zwartkruis-Pelgrim, 2008).

1.3.3 Design principles motivating consumer-product emotional relationships

The causes of consumer-brand emotional relationships and of consumer-product emotional relationships can also provide suggestions on how designers can try to evoke relationships between consumers and their products. A first possibility seems to focus on the match or similarity between the consumers' self-image or identity and aspects of the product (Huber et al., 2015; Malar et al., 2011). Indeed, one way to create emotional attachment is to match the brand's personality with the identity of the consumer (Kumar & Kaushik, 2020; Malar et al., 2011). Especially when brands are matched with the actual identities of consumers, and when the consumers experience product involvement, a high self-esteem, and public self-consciousness, the brand's actions will lead to emotional brand attachment (Malar et al., 2011). This may, for example, be developed by involving consumers in the design and production process of the product (Atakan et al., 2014).

A second possibility focuses on the (perceived) hedonic and utilitarian values of the product. In general, the more value consumers perceive in a product or a brand, the more likely they are to develop an emotional relationship with the product/brand (Huber et al., 2015) (Bairrada et al., 2018). This may, for example, relate to the product being luxurious, authentic, unique, or expensive (Armstrong, Kang, & Lang, 2018; Mandler et al., 2020; Sun, Bellezza, & Paharia, 2021).

A third possibility focuses on the development of positive experiences with the product or the brand. The more positive experiences with a brand, the more likely consumers are to develop an emotional relationship with a brand (Joshi & Garg, 2021; Langner et al., 2016; Palusuk et al., 2019). On a product level, positive consumer experiences with the aesthetics of a product have been found to increase consumers' emotional attachment with a product and to increase the motivation to purchase the product (Agost & Vergara, 2020; Vilches-Montero, Hashim, Pandit, & Bravo-Olavarria, 2018).

Fourth, there are some indications that visual communication design strategies may positively influence already existing relationships between consumers and their products. For example, Ji and Lin (2022) examined how to make use of visual communication design to improve the relationship between consumers and products, thereby prolonging the use of products. These authors suggested six design strategies to increase the emotional relationship between consumers and products, including enjoyment, interactions, and innovation (Ji & Lin, 2022). Similarly, Schifferstein and Zwartkruis-Pelgrim (2008) revealed seven design aspects, including enjoyment, memories, utility, reliability, and market value, that may positively relate to product attachment.

1.3.4 Product lifetime (extension), product repair, and product reuse

Currently, the idea that sustainability also entails durability and an extension of the life span of products is gaining more and more attention (Sun et al., 2021). Whereas most sustainability research thus far has focused on sustainable sourcing of materials, on sustainable production and manufacturing processes, or on circular economies, some lines of research suggest that sustainability may also be reached by extending the lifetime of products as much as possible. This research is currently scattered, however, and uses different concepts to focus upon. Product durability (Haug, 2018; Sun et al., 2021), product longevity (Armstrong et al., 2018; Haines-Gadd et al., 2018; Jensen, Laursen, Haase, & Klemes, 2021), emotional durability (Haines-Gadd et al., 2018; Ji & Lin, 2022; Kam, 2022), resilient product design (Haug, 2018), affective design (Agost & Vergara, 2020), psychologically durable design (Haug, 2019), life extension practices (Corsini, Gusmerotti, & Frey, 2020; McNeill et al., 2020), product lifetimes (Bakker, Mugge, Boks, & Oguchi, 2021), product care (Ackermann, Mugge, & Schoormans, 2018; Ackermann, Mugge, & Schoormans, 2022;

Ackermann, Schoormans, & Mugge, 2021; Ackermann, Tuimaka, Pohlmeyer, & Mugge, 2021), and long-lasting products (Frahm, Laursen, & Tollestrup, 2022) are some examples of the terminology used to examine whether a consumption society can become more sustainable by motivating consumers to make use of their owned products for a longer period of time before discarding the product. It should thereby be noted that this does not include alternative consumption behaviors such as sharing (Belk, 2010; Belk, Eckhardt, & Bardhi, 2019), donating (Sarigollu, Hou, & Ertz, 2021), collaborative consumption (Belk, 2014), servitization (Kanatli & Karaer, 2022), redistributing behaviours (Sarigollu et al., 2021), reselling (Sarigollu et al., 2021), or renting products (Amasawa, Shibata, Sugiyama, & Hirao, 2020; Graul & Brough, 2021). It also does not include actions that involve a change in the product, such as recycling (Brouillat, 2009), or repurposing (Scott & Weaver, 2018). Importantly, when studying the factors that can motivate consumers to use their products for longer, it should also be taken into account that other factors unrelated to the product, such as product obsolescence or products becoming outdated, may motivate consumers to discard their owned products sooner (Brouillat, 2015; Cordero, 1991; Levinthal & Purohit, 1989; Maitre-Ekern & Dalhammar, 2016; Yamamoto & Murakami, 2021).

Causes of increased product durability behaviors. Product attachment, or the emotional relationship between consumers and their products, can expand product lifetimes (Nieuwenhuis, 2008; Simpson et al., 2019) and is thought to decrease consumers' tendencies to replace products (van den Berge et al., 2021). In addition to creating an emotional relationship between consumers and products, especially the recent work of Ackermann and Mugge on product care (Ackermann et al., 2018; Ackermann et al., 2022; Ackermann, Schoormans, et al., 2021; Ackermann, Tuimaka, et al., 2021) can shed some light on the reasons why consumers would use their products for longer, and the potential design aspects that might play a role in this process. In their research, they have identified eight strategies that may increase consumers' tendency to use products longer. These include social connections to care for products, informing consumers about how to care for products, enabling product care, appropriation or adjusting the product to the consumer, control consumers or forcing consumers to take care of their products, awareness about the need for product care, antecedents and consequences of taking care of products, and reflecting on the product (Ackermann, Tuimaka, et al., 2021).

In addition to the work of Ackermann and Mugge on product care, there are some other lines of research on product retention that can provide suggestions on how to motivate consumers to use their products for longer. These studies usually focus on a specific type of product. For example, a study on cars has suggested that products with a rarity value can make consumers feel special, and that appeals to nostalgia may motivate consumers to keep their products for longer (Nieuwenhuis, 2008). This study also suggests that creating a level of control for the consumer, which allows the consumer to carry out maintenance and repair of the product, and to personalize the product when wanted, can contribute to product retention (Nieuwenhuis, 2008). These suggestions are in line with the findings of Ackermann and Mugge. In a similar vein, a study on the design of refurbished products has shown that using a timeless design style, especially the neo-retro design style which generates nostalgia and positive associations with the past, or the simplistic design style, which is independent of cultural or time-related cues, can improve consumers' evaluations of refurbished products (Wallner, Magnier, & Mugge, 2020).

Research on electronical products has presented multiple design elements that may, in the eyes of designers, stimulate consumers to use products for longer (Haines-Gadd et al., 2018). These design elements include creating relationships, narratives, a shared identity, imagination, conversations, consciousness, integrity, materiality, and evolvability.

Recent research examining the characteristics of long-lasting inherited products has found that emotional properties of products (memories attached to the product, the brand), the aesthetic properties of products (colors and materials), and functional properties of products (whether they fulfil a function that does not rely on other products) can positively influence whether inherited products are kept (Frahm et al., 2022). Interestingly, this line of research also suggests that products are kept for longer when they 'display honest and/or gracefully aging material'. Along these lines, a study on fashion product design in Korea suggested that products that reflect nature itself or resilience to nature can motivate consumers to use their products for longer (Kam, 2022).

Research on high-end or luxurious products versus ordinary products, as well as research on new and second-hand products show that high-end, luxurious products have a longer life cycle (Sun et al., 2021). Consumers are likely to own such products for longer, and to dispose of these type of products in more environmentally friendly ways. At the same time, this research reveals that consumers are often more likely to purchase ordinary products instead of high-end products because consumers tend to forget to consider how long products will last at the point of purchase. Indeed, there are some suggestions that higher prices may motivate consumers to use their products for longer (Nishijima, Nansai, Kagawa, & Oguchi, 2020). One study showed that price increases for air conditioners motivated consumers to use their air conditioners for a longer period of time (Nishijima et al., 2020). Consumers did match the value of the product's enhanced durability with the value of the price increase.

One important issue is whether consumers see the durability potential in their products, and whether they are able to fully grasp the enjoyment of durable products. Products deliver their utility over time, but some studies have shown that consumers are unable to correctly predict their enjoyment with products over time (Wang, Novemsky, & Dhar, 2009). Moreover, consumers have appeared to become adapted to a constant and rapid up-dating of products (i.e., having the latest versions of products), and the rapid up-dating of products have become associated with feelings of being successful in life (Cox, Griffith, Giorgi, & King, 2013). This tendency to up-date consumer products seems to hold especially for fashion products, and to be related to the low prices for new products. There are some preliminary indications that consumers may become more interested in slow fashion alternatives (Castro-Lopez, Iglesias, & Puente, 2021).

Economical consequences of repair of products for designers, manufacturers, and producers. The possibility to offer products with extended durability or longevity can have economical consequences for companies. There are some indications that increased prices for products that last longer will decrease product sales (Nishijima et al., 2020). Business models examining the effects of recycling and extending product lives on companies' economic incentives showed that combining improvements in recycling with product-life extensions can lead to higher economic performance (in terms of profits and market share) and higher environmental performance (in terms of product recyclability and product lifetime) (Brouillat, 2009). Yet, more research is needed to examine the financial aspects of extending product lifetimes.

The short literature overview presented here reveals that there are certainly some indications for design strategies to improve consumer-product relationships, and thereby to increase the sustainability of product use. To delve more deeply into this matter, we conducted a structured, extensive literature review on all factors that can influence product lifetime (extension) and product repair. Thus far, the effectiveness of these design strategies have been challenging to test, and the economic consequences for designers, manufacturers and producers have hardly been taken into account. Therefore, Chapter 2 and Chapter 3 also include the economic aspects of the factors influencing product lifetime and product repair.

2 Literature review

2.1 Introduction

In this chapter, we present the structured literature review conducted on the research questions: which factors influence the product lifetime (extension) and product repair (when necessary)? The literature review was conducted by Cristobal Milosavljevic Virrueta and Ilona de Hooge over the period March 2023 – February 2024.

2.2 Method literature review

2.2.1 Data collection

To answer the research question(s), a systematic review was conducted in the online database Scopus. This database includes high-quality and peer-reviewed journal articles and contributions to scientific conferences, but the current review focused solely on English, peer-reviewed articles in scientific journals. In Appendix A (Chapter 1.3), an overview of the search terms and their hits can be found. The search was restricted to the search term being included in the title, abstract, or keywords, and to articles published between 2003 and 2023 (with the last search being conducted on June 10, 2023).

The search resulted in 477 articles, 287 of them coming from two search queries associated with product usage, plus 190 articles from a third search query related to product repair (see chapter 2.3). After reading each of the articles' title and abstract it was decided whether the article concerned an English-written, peer-reviewed journal article focusing on product lifetime extension or product repairability/care. A first screening resulted in a selection of 65 articles. Then a further screening on eligibility excluded 21 articles. This exclusion was done for articles not relating to product lifetime extension or product repairability/care, not presenting new findings (literature reviews), or not fitting the pre-selection filters (English-written, peer-reviewed scientific articles). A further removal of 8 duplicate articles resulted in a final selection of 36 articles for this review.

2.2.2 Data analysis

A review and content analysis of the 36 selected articles was performed. This stage focused on systematically extracting and organizing data from the research papers in terms of variables (factors) that influenced three variables of interest of the study: product lifetime extension, product care and repair, or the economic viability for businesses. This stage resulted in the identification of a total of 340 variables that influenced these variables of interest. These variables were sometimes presented as design principles or interventions, and other times they were general factors, and they were consequently classified under these labels (see Table 2.1). Design principles thereby refer to findings in the form of rules or propositions that can be applied to the products, such as timeless design, or design for repairability. Interventions refer to contextual actions or interferences to influence the lifetime or repairability of products, and are, therefore, not directly applied to (the design of) products. Finally, general factors refer to multiple existing elements that influence the variables of interest, but that, as studied in the literature, did not take the shape of design principles or interventions, such as consumer characteristics.

Table 2.1 The classification into three types of variables (factors) influencing product lifetime extension and product repair used in the literature review.

Design principle	*Rules of propositions that can be applied to products to influence the products' lifetime (extension) or products (not) being repaired when necessary. Variables under this principle relate to at least one element of the product itself (e.g., timeless product design, product efficiency)*
Intervention	*Contextual actions or inferences that influence the lifetime (extension), repair behaviour towards, or repairability of products. Variables under this principle do not change (elements of) the product itself (e.g., repair services, payment schemes, marketing actions)*
General factor	*Elements that influence the lifetime (extension), repair behaviour towards, or repairability of products but that do not take the shape of design principles or interventions (e.g., consumer characteristics, ownership arrangements)*

After this initial classification, a clustering phase was started, where the findings were grouped based on a non-computer-aided evaluation of their semantic relationships. Given the extensive number of findings, this process was highly iterative. As the findings were coded, higher-order similarities among codes as well as within code nuances were identified. Consequently, two additional levels were created to represent higher and lower abstraction levels. This allowed to better represent and fit the patterns in the data by aggregating and splitting the original codes. In total, these three levels of aggregation were found appropriate to properly represent the patterns in the data. After categorizing all the findings under the three different aggregation levels, a further iterative review process was performed to ensure that the categorizations were mutually exclusive and that the codes and levels of aggregation adequately represented the patterns in the data.

2.3 Literature review search Query

Search query 1: 93 hits
Query string: (product OR object OR goods) AND (lifetime OR lifespan OR "life span" OR "life time" OR durability OR longevity OR "long lasting" OR "us* time" OR "us* period" OR "us* cycle" OR "service life") AND (consumer OR user OR owner) AND (extension OR lengthening OR augmentation OR shortening).

Concept 1	**AND Concept 2**	**AND Concept 3**	**AND Concept 4**
product	lifetime	consumer	extension
OR object	OR lifespan	OR user	OR lengthening
OR goods	OR "life span"	OR owner	OR augmentation
	OR "life time"		OR shortening
	OR durability		
	OR longevity		
	OR "long lasting"		
	OR "us* time"		
	OR "us* period"		
	OR "us* cycle"		
	OR "service life"		

Search query 2: 194 hits
Query string: (product OR object OR goods) AND (lifetime OR lifespan OR "life span" OR "life time" OR durability OR longevity OR "long lasting" OR "us* time" OR "us* period" OR "us* cycle" OR "service life") AND (usage OR reuse) AND (consumer OR user OR owner).

Concept 1	AND Concept 2	AND Concept 3	AND Concept 4
product	lifetime	consumer	usage
OR object	OR lifespan	OR user	OR reuse
OR goods	OR "life span"	OR owner	
	OR "life time"		
	OR durability		
	OR longevity		
	OR "long lasting"		
	OR "us* time"		
	OR "us* period"		
	OR "us* cycle"		
	OR "service life"		

Search query 3: 190 hits
Query string: (product OR object OR goods) AND (lifetime OR lifespan OR "life span" OR "life time" OR durability OR longevity OR "long lasting" OR "us* time" OR "us* period" OR "us* cycle" OR "service life") AND (consumer OR user OR owner) AND (extension OR lengthening OR augmentation OR shortening).

Concept 1	AND Concept 2	AND Concept 3	AND Concept 4	AND Concept 5
product	lifetime	consumer	repair*	marketing
OR object	OR lifespan	OR user	OR maint*	OR design
OR goods	OR "life span"	OR owner	OR care	OR "business model"
	OR "life time"		OR caring	OR Strategy
	OR durability		OR upgrade	
	OR longevity			
	OR "us* time"			
	OR "us* period"			
	OR "us* cycle"			
	OR "service life"			

2.4 Results literature review

Of the 340 factors reviewed, the majority concerned general factors (about half of the 340 factors). Slightly more than 100 factors concerned designed principles (31%), and 19% of the factors concerned interventions. These factors could all be separated into factors concerning the product itself, factors concerning the interaction between the product and the user, factors concerning the user, and factors surrounding the product or in the product environment (the marketing, sales and distribution of the products). Table 2.2 displays the definitions of these categories, and how often they occurred.

Table 2.2 General overview of the factors found in the literature review.

Type of factor	Definition	Occurrence
Product	Factors that relate directly to the product characteristics and product design	37%
Product-user interaction	Factors that relate to interactions between products and consumers (the users), or to the intersection between products and users	24%
User	Factors that relate to the users (consumers) of the product	18%
Product surrounding	Factors related to the surroundings of the product, that do not change the product itself. This involves, among others, marketing strategies, sales, and distributions of products. It also includes interventions focused on lifetime extension or product repair surrounding the product.	21%

Tables 2.3 to 2.6 show the factors that are included for products (table 2.2), for product-user interactions (table 2.3), for users (table 2.4) and for marketing/sales (table 2.5). In every table, the groups factors are presented, descriptions are provided, and examples are provided. It may be noted that some factors occur for multiple categorizations. For example, care and repair experiences occur both in product-user factors, and in user factors. In these instances, the categories include different factors that relate to same overarching categorization. For example, care and repair experiences within the product-user category relate to experiences with that specific product, while care and repair experiences within the user relate to experiences of the user to e.g. have other products repaired previously.

Table 2.3 The factors playing a role in product lifetime and product repair related to the product.

Product factors		
Name	**Definition**	**Example(s)**
Care and repair convenience	Convenience of the care and repair activities	Amount of time and effort required to fulfil the care /repair Easiness of repair (including disassembly) Complexity of the repair
Design for care and repair	Care and repair design elements for products	Durable repair parts Product self-care Design for easy care and repair Product communicates care relevance Simple design
Product condition	Current product conditions	Wear and tear, defects, failures Product age Product out of fashion
Product functionality	Factors focused on the functions of products	Comfort of using the product Functional value of the product Products that fulfil consumers' practical needs
Product modularity	The product is flexible or compatible with other product (parts)	Product can be adapted Product is multifunctional Product is (easily) upgradeable Product is compatible
Product obsolescence	Technical obsolescence (in comparison to developments within the product category)	New technological developments and software updates Design for restricted software Product being technically outdated
Product performance	Performance of the product on various performance aspects	Efficiency of the product (e.g. electronic consumption) Economy of use Product cleanliness (of e.g. product usage interface) Product being (perceived) as performing suboptimal
Product quality	(perceived) quality of the product, including durability and reliability aspects	(perceived) quality of products Product value Durability of products (e.g. design for long product life) Reliability of products Timeless design
Product repairability	The degree to which the product is open to being repaired	The fact or assumption that a product can(not) be repaired Products include elements that can be replaced/repaired Product cannot be opened to be repaired

Table 2.4 The factors playing a role in product lifetime and product repair related to the product-user interaction.

Product-user factors		
Name	**Definition**	**Example(s)**
Care and repair experiences	Experiences with caring for and repairing the product at hand	Experiences of caring for the product (effort, time) Care experimentation with the product Enjoying repairing the product
Care and repair relevance	Relevance of the care and repair activities	Periodic triggers reminding users of the need for care or repair Product forcing users to engage in care/repair
Product and brand perceptions	Users (consumers)' perceptions of the product and or the brand	Emotions experienced when interacting with the product Fit of product and the consumer (user)
Product obsolescence	Psychological obsolescence	Psychological obsolescence (being perceived as outdated)
Product usage	Factors related to the use of products by users (consumers)	Products being used intensively Products being used frequently
Product-user interactions	The product engages in interactions with the user, or the user engages in interactions (other than regular use) with the product	User expectations about the lifetime of the product Communications of the product with the user Product being repurposed for different use by the user
User-Product attachment	Attachment of the user to the product	Consumer involvement in product design Product being irreplaceable User being emotionally attached to the product Personalized products

Table 2.5 The factors playing a role in product lifetime and product repair related to the user.

User factors		
Name	**Definition**	**Example(s)**
Care and repair experiences	User experiences with other care and repair activities	Previous experiences with repairing products Positive experiences with taking care of products
Social influences	Influences exerted by other social actors	Neighbours, family Shared ownership Social repair community
User characteristics	Characteristics of users that are unrelated to the product	Demographics (age) Care attitudes and behavior Emotions Environmental concerns
User knowledge	General knowledge of users concerning the product and related aspects	Care knowledge and ability Repair knowledge and ability Product knowledge Lifetime extension knowledge

Table 2.6 The factors playing a role in product lifetime and product repair related to the marketing or sales (the product environment).

Product surrounding factors		
Name	**Definition**	**Example(s)**
Care and repair convenience	All factors surrounding the product that relate to care and repair practices	Lifetime extension services Repair services Repair costs Duration of the repair Repair infrastructure
Care and repair materials	Care and repair materials provided by others than the user (consumers)	Repair information (video's) Repair tools included with the sales of the product Delivery of spare parts with the sales of the product (e.g. additional buttons)
Payment model and sales channels	Revenu, sales, or payment models for products and brands (e.g. payment schemes), and sales channels through which products are sold	Payment schemes Online sales channels Sales in store
Product communication	Communications surrounding the product that affect the lifetime and or repair of products	Communicating the story of the product Providing information on the expected lifetime of the product Providing information on the possibility to repair the product
Product price	Pricing strategies surrounding the product	Price discounts Premium prices Price increases
Product warranty	Warranty provided by the manufacturer or retailer	Extended warranty information Length of warranty period

2.5 Discussion and conclusion literature review

The literature review has provided quite an extensive list of factors that can play a role in the lifetime of products, and their likelihood of being repaired. Many of the studied factors in the literature relate to the general factors playing a role in the lifetime of products, such as consumer characteristics, sales activities for current products and for new products, and environmental aspects such as trends. There are also product design aspects that influence product lifetimes and repair, and interventions aimed at influencing product lifetimes and repair (positively or negatively) that do not affect the nature of the product.

Another interesting finding is that, of the studied factors, the interaction between users (consumers) and products, and aspects of users (consumers) also seem to play a role. Moreover, the context of products, such as marketing strategies, can affect product lifetimes and repair. Therefore, it is valuable for designers, manufacturers, and retailers to explore not only product design, but also marketing strategies and consumer interactions.

One note of care is that most findings relate to interview and focus group studies. That is, the factors are based on studies in which consumers, designers, or other supply chain actors indicate that they think the factor would influence product lifetimes or product repair. Few studies have examined whether these factors indeed influence product lifetimes and product repair.

3 Experiments

3.1 Introduction

In this chapter, we present two experiments that examine both the influence of factors on the consumers' product lifetime/repair intentions and on aspects related to the economic viability of factors for designers, manufacturers and producers. We thereby focus on three marketing strategies: lifetime communication, repair communication, and sustainability communication. The experiments were designed, run, and analysed by Sem Reimink and Ilona de Hooge over the period September 2023 – March 2024.

3.2 Method Experiment 1: Jeans

Two main experiments were conducted to assess the influence of lifetime extension, repairability and sustainability communications on consumers' responses to a (fashion) product. In both experiments the same manipulations were used. The product on which the communications were applied differed, however, to examine whether the same communications would lead to similar effects for different products. In Experiment 1 we examined the communications being applied to a pair of jeans, and in Experiment 2 being applied to a backpack.

3.2.1 Participants and design

Aiming for 100 respondents per condition, we ended up with 774 participants for Experiment 1 (M_{age} = 29.69, SD_{age} = 9.24; 52.1% males, 46.3% females, 1.6% not identified). The participants were recruited using the online platform *Prolific* and received a small monetary compensation for participation in the study. They were all Dutch inhabitants with their main language being Dutch. The participants were randomly assigned to one of the research conditions of a between subjects design. The study had a 2 (lifetime communication: yes vs no) x 2 (repairability communication: yes vs no) x 2 (sustainability communication: yes vs no) design, meaning that each participant saw a different combination of the communications. All the participants were asked to indicate their attitude towards the jeans, their attitude towards the manufacturer of the jeans (in general and in terms of Corporate Social Responsibility) and their Willingness To Pay (WTP) for the jeans. They also indicated how long they intended to use the jeans, and whether they were motivated to repair the jeans in the case of a damage.

3.2.2 Procedures and Variables

When the participants entered the survey they were greeted with an introduction explaining that the survey was conducted for a Wageningen University study, that participation was voluntary, that data was being treated confidentially and that the researchers were interested in their opinions regarding clothing items. They then provided their informed consent, and indicated their gender.

After indicating their gender, the participants were shown an image that they could encounter during online-shopping for jeans. In the experiment, the participants were put in the hypothetical situation *"Imagine that you are (online) shopping for new jeans. You are looking in several stores for jeans and encounter multiple jeans. At a certain point, you encounter these jeans"*. For males and females, a different pair of jeans was displayed. For non-binary participants, the female version of the jeans was displayed. The image resembled an online clothing store page for a particular jeans, and depending on the condition that the participants were assigned to, the jeans had different (or no) communications regarding the topics of clothing lifetime, repairability or sustainability. Table 3.1 shows the communications used for the manipulation of the lifetime extension, repairability, and sustainability. Figures 3.1 and 3.2 show two examples of the image: one for males and one for females.

Table 3.1 The marketing strategies used in Experiment 1.

Lifetime communication	*The average usage-lifetime of clothing is 3.3 years. These jeans last for a minimum of 5 years.*
Repairability communication	*This product is easy to repair, by you or by our experts.*
Sustainability communication	*These jeans are produced with eco-friendly materials and under ethical working-conditions.*

Figure 3.1 The communications used in Experiment 1 on a male pair of jeans. The image displays the application of the lifetime, repairability, and sustainability communication.

Figure 3.2 The communications used in Experiment 1 on a female/non-binary pair of jeans. The image displays the application of the repairability communication.

Then, the participants received questions about their

i) Attitude towards the jeans.
ii) Attitude towards the manufacturer of the jeans (in general and in terms of Corporate Social Responsibility (CSR)).
iii) Willingness to pay for the jeans.
iv) Intended lifetime usage (intended time to use the jeans).
v) Repair intentions of the jeans in the case that a malfunctioning would occur.

All dependent variables were measured with multiple items. These categories of questions were asked in a randomized order, to avoid any biases that could arise from a particular order in which the question would be asked. For measuring the different aforementioned attitudes and willingness to pay, existing scales were used. Attitude towards the jeans was measured with a scale composed of a combination of two scales (brand attitudes & perceived durability) by Munten and Vanhamme (2023). The scale used in this study consisted of the items (*'to what extent do you think the jeans are:'*) nice, attractive, high quality, reliable and sustainable (answered on 7 point Likert scales, with 1 = not at all and 7 = very much). A factor and reliability analysis of the scale showed that the items could be combined into one dependent measure *Attitude towards the jeans* (with an Eigenvalue of 3.01, explaining 60.51% of variance, and Cronbach's α = .829).

Attitude towards the manufacturer was measured with the scale used by Martin (2012) and CSR was measured with the Corporate Social Responsibility scale by Folse, Burton and Netemeyer (2013). In the scale used to measure CSR, the first item of the five was removed as it was deemed redundant and a proper translation to Dutch was not available. Factor analysis and reliability analyses showed that also for these measures the items could be formed into one scale for *Attitude towards the manufacturer* and *CSR manufacturer.*

To measure the participants Willingness to pay, Jedidi and Zhang's (2009) definitions of 'floor price' and 'ceiling price' were used. These were transformed into two items: 'I would at most pay … euros for these jeans' and 'The lowest price that I would buy these jeans for is … euros'. Lifetime usage was measured by asking participants *'Imagine that you actually buy these jeans. How long are you planning to use these jeans?'*, to which the participants needed to give an answer in years of expected usage.

Repair intention was measured by asking participants how probable it would be that they would i) repair the jeans themselves, ii) let someone else repair the jeans, or iii) throw the jeans away, in the case that the jeans were damaged. A factor analysis on these three items showed that they could be merged into one dependent measure with a somewhat reliable outcome (Cronbach's α = .613).

Next, the participants needed to answer the questions that were focused on checking the success of the manipulations (the communications). These manipulation checks were focused on i) the perceived expected lifetime of the jeans, ii) the perceived repairability of the jeans and iii) the perceived sustainability of the jeans. The manipulation checks were done by asking the participants i) how long they thought the jeans would last (based on the given information), ii) to what extent the jeans were repairable and how easy it was to repair them, and iii) how sustainable the jeans were produced. All the questions were answered using 7-points Likert scales (ranging from 1 = not at all to 7 = very much).

Lastly, participants were asked 'general' control questions, where they were informed that the questions did not have any relation to the provided situation and the jeans. The general control questions asked i) how often the respondents bought clothing, jeans, clothing online and jeans in general online (7-point Likert, 1 = never, 7 = always), ii) how long their jeans usually last (answered in number of years), iii) how often they repaired their jeans themselves or let a professional repair them (7-point Likert, 1 = never, 7 = always) and lastly iv) twelve statements for measuring their sustainability orientation, which were taken from the Value Orientation Scale by De Groot and Steg (2008). The participants were then thanked and debriefed on their participation.

3.3 Results Experiment 1: Jeans

To examine whether the lifetime, repair, and sustainability communications had any influences on consumers' responses, we ran multiple three-way ANOVA analyses. As the results differed depending on the type of consumer response, we present the results separately for the different consumer responses. Also, for the sake of simplicity, we do not present any information on the role of the control questions in the effects of the communications on consumers' responses.

3.3.1 Attitude towards the jeans

The analyses on attitudes towards the jeans showed that communication about the lifetime of the jeans, about the repairability of the jeans, and about the sustainability of the jeans all had an influence on consumers' attitudes towards the jeans. In general, all three types of communication made attitudes towards the jeans more positively. Also, lifetime and repairability communication together had stronger positive effects, as well as the combination of lifetime and sustainability communication, and repairability and sustainability communication. All the effects can be seen in Figure 3.3.

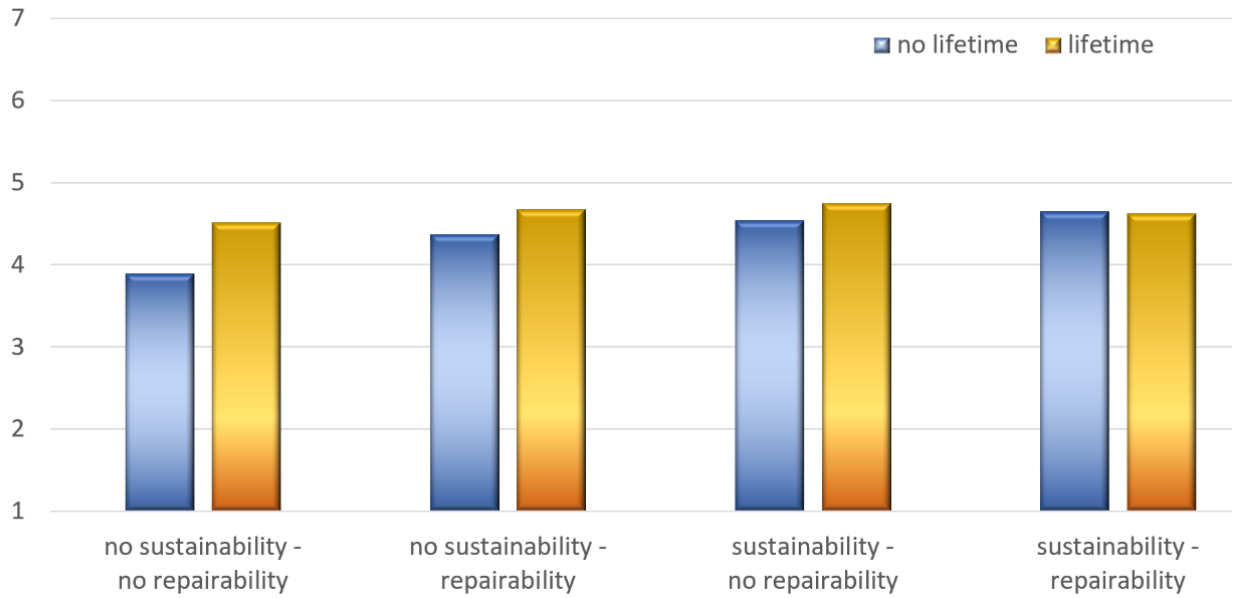

Figure 3.3 Attitude towards the jeans in Experiment 1.

3.3.2 Attitude towards the manufacturer and CSR

The analyses on attitudes towards the manufacturer showed that communication about the lifetime of the jeans, about the repairability of the jeans, and about the sustainability of the jeans all had an influence on consumers' attitudes towards the manufacturer. In general, all three types of communication made attitudes towards the manufacturer more positively (see Figure 3.4).

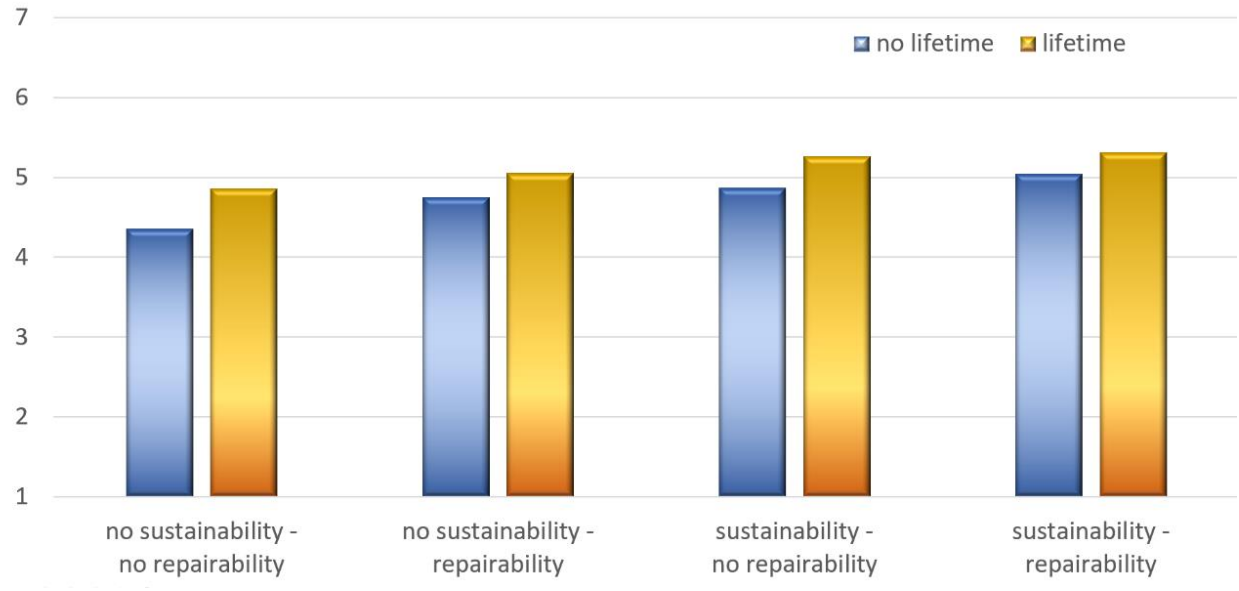

Figure 3.4 Attitude towards the manufacturer in Experiment 1.

The analyses on consumers' CSR perceptions of the manufacturer revealed that communication about the lifetime of the jeans, about the repairability of the jeans, and about the sustainability of the jeans all had an influence on consumers' CSR perceptions of the manufacturer. That is, all three types of communication increased consumers' CSR perceptions of the manufacturer. Also, lifetime and repairability communication together had even stronger, positive effects on CSR perceptions, and the combination of lifetime and sustainability communication, and the combination of repairability and sustainability communication also together led to stronger CSR perceptions. All the effects can be seen in Figure 3.5.

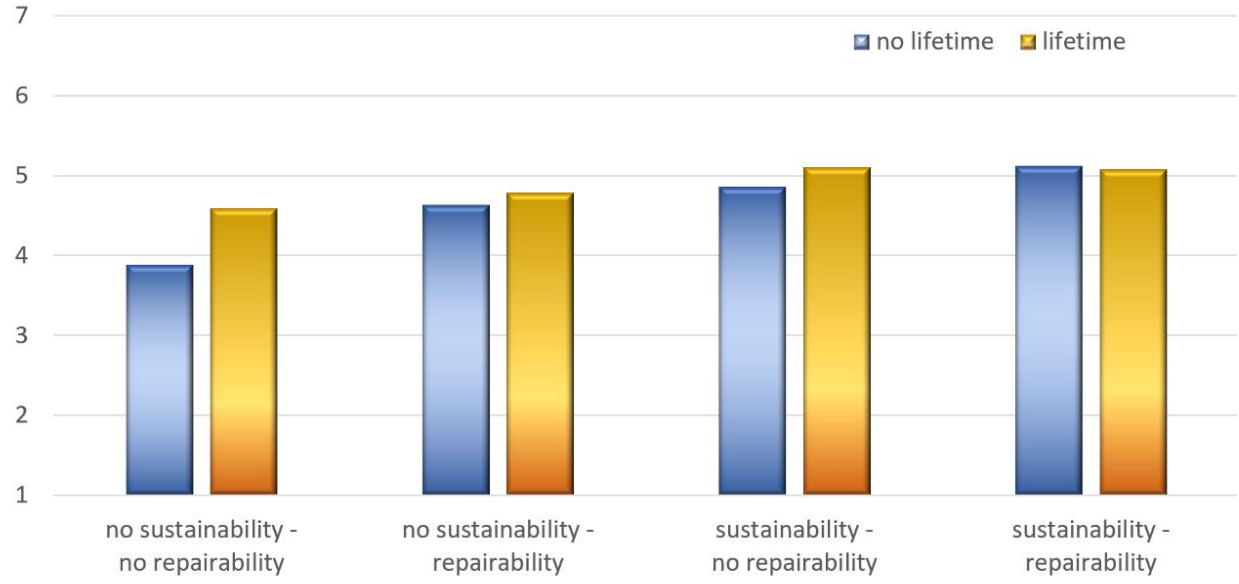

Figure 3.5 Corporate Social Responsibility (CSR) perceptions of the manufacturer in Experiment 1.

3.3.3 Willingness to pay for the jeans

We measured willingness to pay in two ways: the minimum price consumers were willing to pay for the jeans, and the maximum price consumers were willing to pay for the jeans. Open ended questions at the end of the survey showed that participants did not understand the question concerning the minimum price: they thought the question was "strange", and many answered the question with 0 euros (willing to receive the jeans for free). Hence, we did not analyze the effects of the communication manipulations on the minimum willingness to pay.

We also asked participants to indicate the maximum price they were willing to pay for the jeans. The analyses showed that communication about the lifetime of the jeans, a combination of lifetime and repairability communication, and a combination of lifetime, repairability, and sustainability communication influenced consumers' willingness to pay for the jeans. The findings can be seen in Figure 3.6 below. It reveals that especially a communication about the lifetime of the jeans, without communication about the repairability or sustainability of the jeans, increased willingness to pay for the jeans.

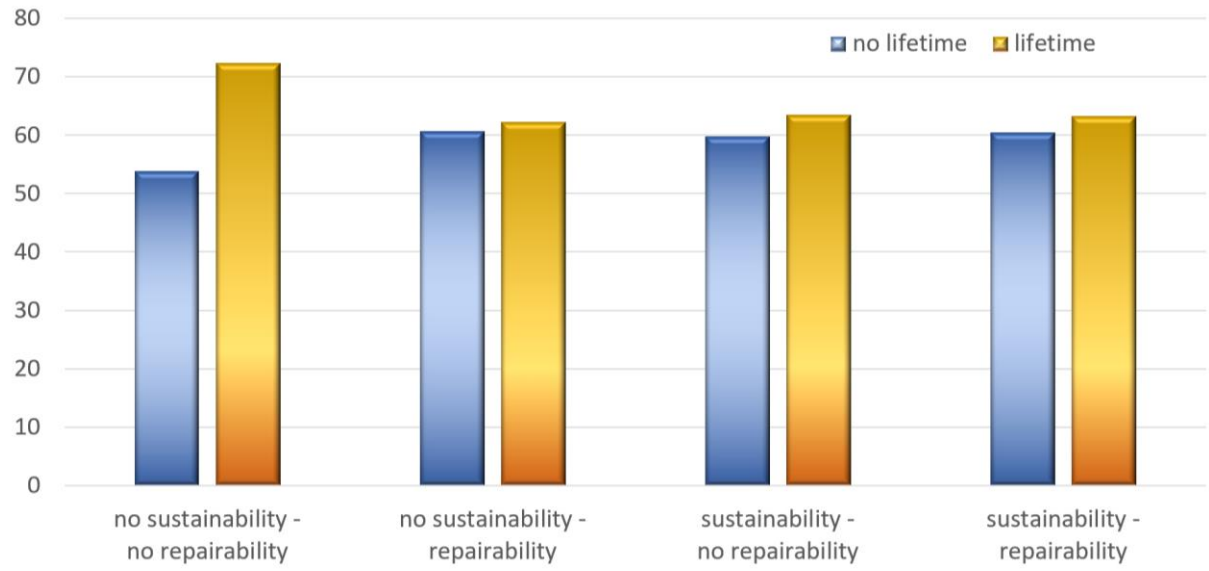

Figure 3.6 Willingness to pay for the jeans in Experiment 1.

3.3.4 Lifetime usage intention for the jeans

Analyses on the intention to use the jeans in years showed that only lifetime extension communication had a significant effect on how many years consumers intended to use the jeans: communication about the expected lifetime of the jeans increased the number of years consumers intended to use the jeans.

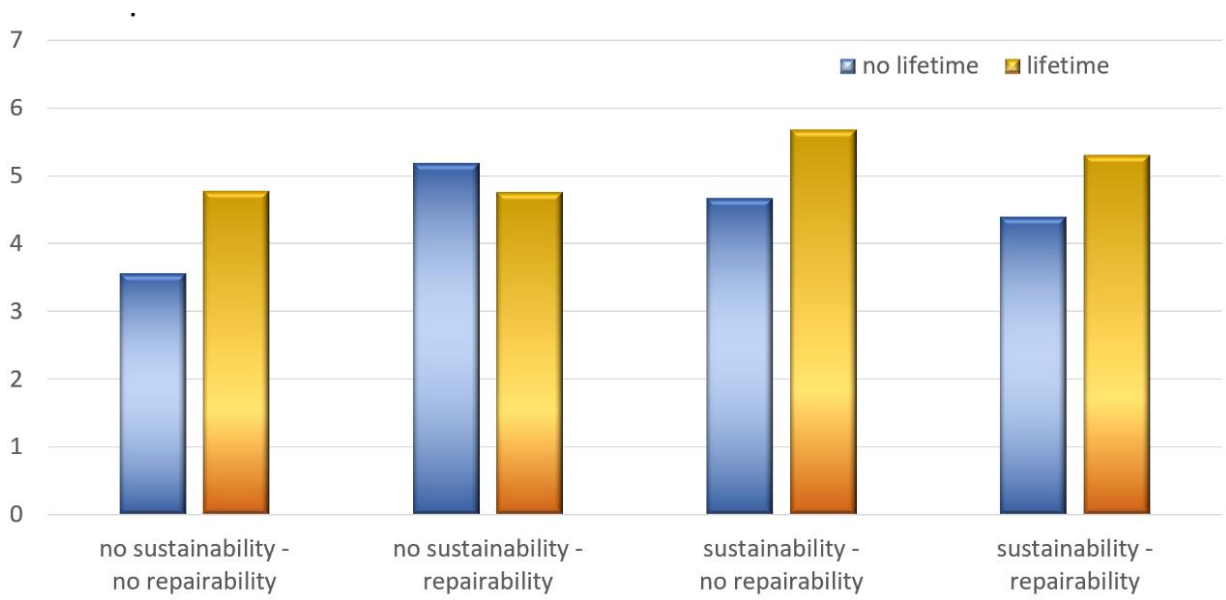

Figure 3.7 Intentions to use the jeans (in years) in Experiment 1.

3.3.5 Intentions to repair the jeans

Finally, analyses on the intentions to repair the jeans when necessary showed that mostly communication about the repairability of the jeans, and the combination of repairability and sustainability communication influenced consumers' intention to repair the jeans (see Figure 3.8). The figure also shows that, in general, consumers' intention to repair the jeans was relatively low (all averages below the midpoint of the scale).

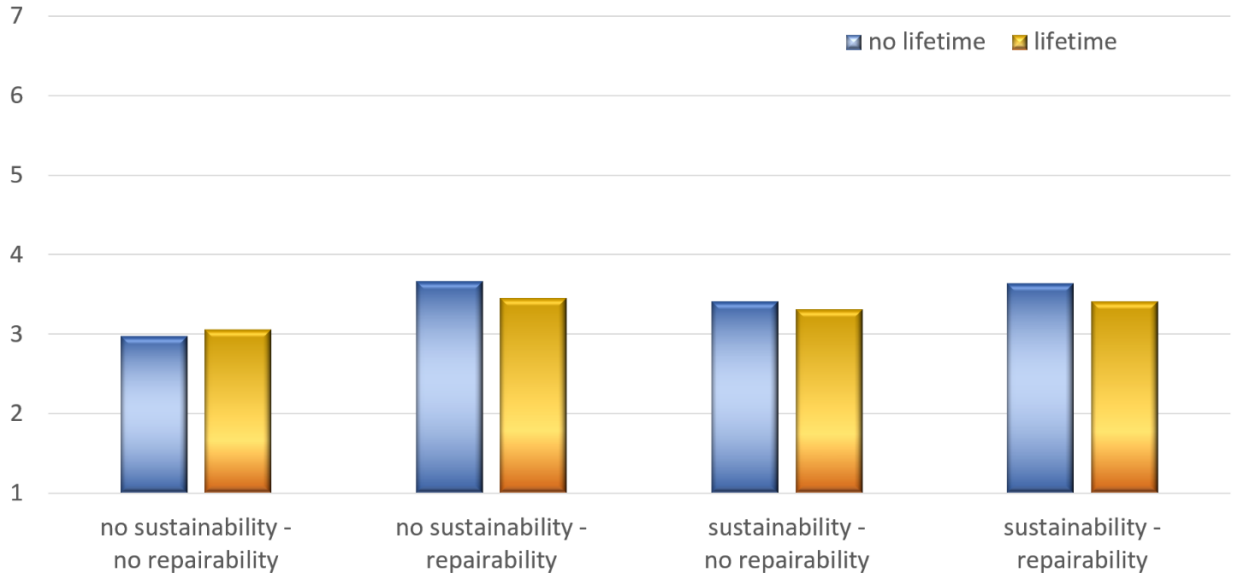

Figure 3.8 Intentions to repair the jeans in Experiment 1.

3.4 Discussion Experiment 1: Jeans

The findings of Experiment 1 reveal that communication about the expected lifetime of a fashion product, communication about the repairability of a fashion product, and communication about the sustainability of a fashion product can influence consumer responses to the product. Not only do these communications influence consumers' attitudes towards the product itself, they also influence consumers' attitudes towards the manufacturer, perceptions of the manufacturer's CSR, and willingness to pay for the product. These findings indicate that marketing strategies surrounding the lifetime and repair of products may have interesting effects on aspects that are relevant for designers, manufacturers, and producers: consumer attitudes and consumers' willingness to pay for products.

Moreover, lifetime communication influenced consumers' intention to use the product, and repairability communication (together with sustainability communication) influence consumers' intention to have the product repaired when necessary. It should thereby be noted that these intentions are only proximate indications of consumers' actual behaviours towards the products: there are many factors playing a role in consumers' behaviors towards products and in their decision to retain and repair or discard a product. Moreover, consumers have a difficult time predicting their actual behaviors. Nevertheless, these findings give hope for potential ways to motivate consumers towards more sustainable behaviors towards their products in ways that are (economically) interesting for designers, manufacturers, and producers.

To examine whether these findings can be replicated for a different type of product, we ran Experiment 2. In Experiment 2, we studied the effects of the same communications for a backpack.

3.5 Method Experiment 2: Backpacks

3.5.1 Participants and design

To increase the reliability of the findings, we aimed for 200 respondents per condition in Experiment 2. We ended up with in total 1279 respondents, of which 79 respondents did not finish the experiment. The participants were recruited using the online platform *Prolific* and received a small monetary compensation for participation in the study. They were all Dutch inhabitants with their main language being Dutch. The remaining 1200 respondents (M_{age} = 30.50, SD_{age} = 9.93; 6 did not identify their age; 51% males, 46.7% females, 2.3% not identified). were randomly assigned to one of the research conditions of a between subjects design. Similar to Experiment 1, the study had a 2 (lifetime communication: yes vs no) x 2 (repairability communication: yes vs no) x 2 (sustainability communication: yes vs no) design, meaning that each participant saw a different combination of the communications. All the participants were asked to indicate their attitude towards a backpack, their attitude towards the manufacturer of the backpack (in general and in terms of Corporate Social Responsibility) and their Willingness To Pay (WTP) for the backpack. They also indicated how long they intended to use the backpack, and whether they were motivated to repair the backpack in the case of a damage.

3.5.2 Procedures and Variables

The procedure was very similar to the procedure of Experiment 1. This time, however, the respondents saw a backpack with one, multiple, or none of the communications from Experiment 1 (depending on the condition). The lifetime communication for the backpack included the average years for backpacks: it was mentioned that a backpack usually goes along 5 years, while this backpack would last for at least 8 years. The participants answered the measures from Experiment 1, all related to the displayed backpack (see Figure 3.9 for an example of the backpack with the communications).

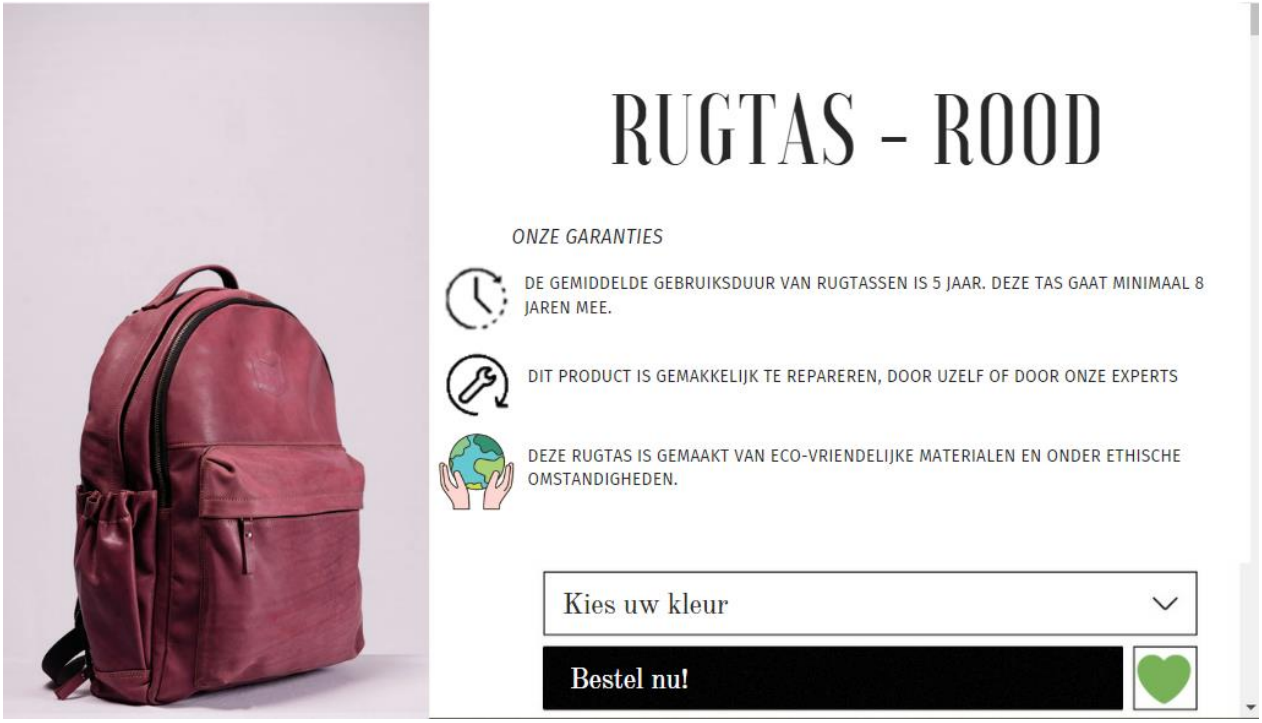

Figure 3.9 The communications used in Experiment 2 on a backpack. The image displays the application of the lifetime, repairability, and sustainability communication.

3.6 Results Experiment 2: Backpacks

To examine whether the lifetime, repair, and sustainability communications had any influences on consumers' responses towards the backpack, we ran multiple three-way ANOVA analyses. As the results differed depending on the type of consumer response, we present the results separately for the different consumer responses. Also, for the sake of simplicity, we do not present any information on the role of the control questions in the effects of the communications on consumers' responses.

3.6.1 Attitude towards the backpack

The analyses on attitudes towards the backpack showed that communication about the lifetime of the backpack, about the repairability of the backpack, and about the sustainability of the backpack all had an influence on consumers' attitudes towards the backpack. In general, all three types of communication made consumers more positive towards the backpack. Also, the combination of the three communications had an additional positive influence on attitudes. All the effects can be seen in Figure 3.10.

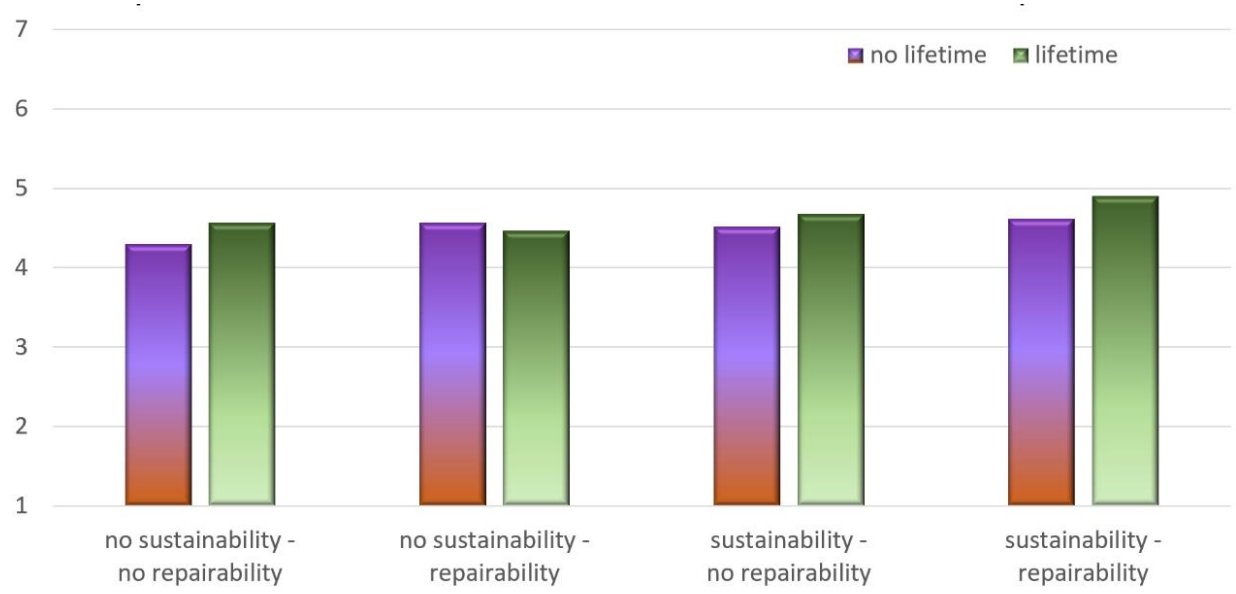

Figure 3.10 Attitude towards the backpack in Experiment 2.

3.6.2 Attitude towards the manufacturer and CSR

The analyses on attitudes towards the manufacturer showed that communication about the lifetime of the backpack, about the repairability of the backpack, and about the sustainability of the backpack all had an influence on consumers' attitudes towards the manufacturer. In general, all three types of communication made attitudes towards the manufacturer more positively (see Figure 3.11). Moreover, the combination of lifetime and repairability communication positively influenced attitudes towards the manufacturer.

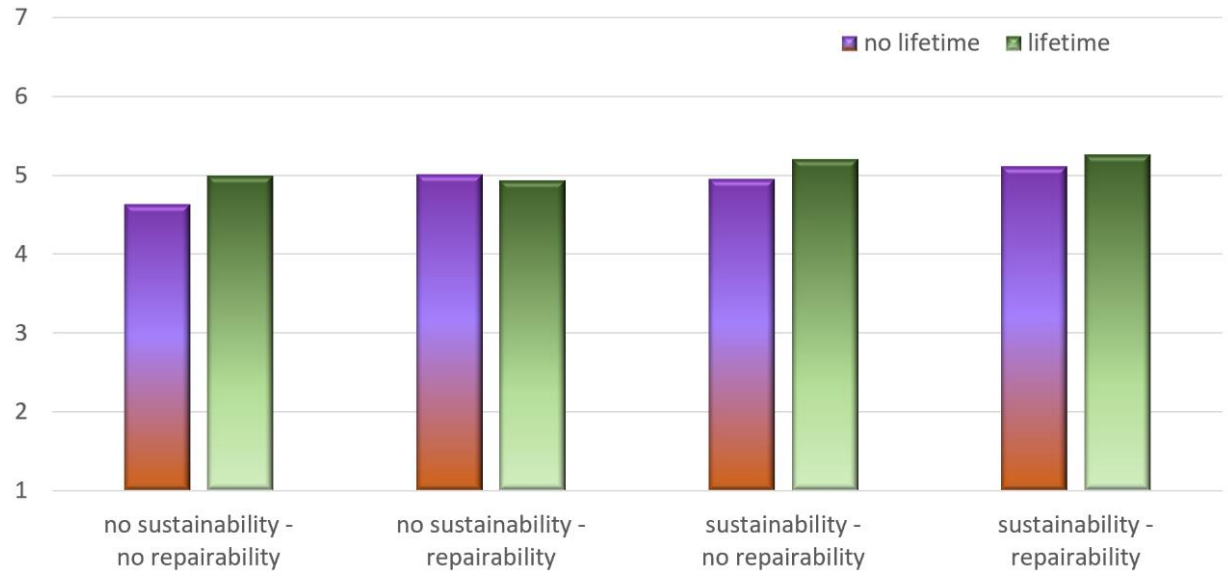

Figure 3.11 Attitude towards the manufacturer in Experiment 2.

The analyses on consumers' CSR perceptions of the manufacturer revealed that communication about the lifetime, about the repairability, and about the sustainability of the backpack all had an influence on consumers' CSR perceptions of the manufacturer. That is, all three types of communication increased consumers' CSR perceptions of the manufacturer. Also, all types of combinations of the communications had additional positive effects on CSR perceptions. All the effects can be seen in Figure 3.12.

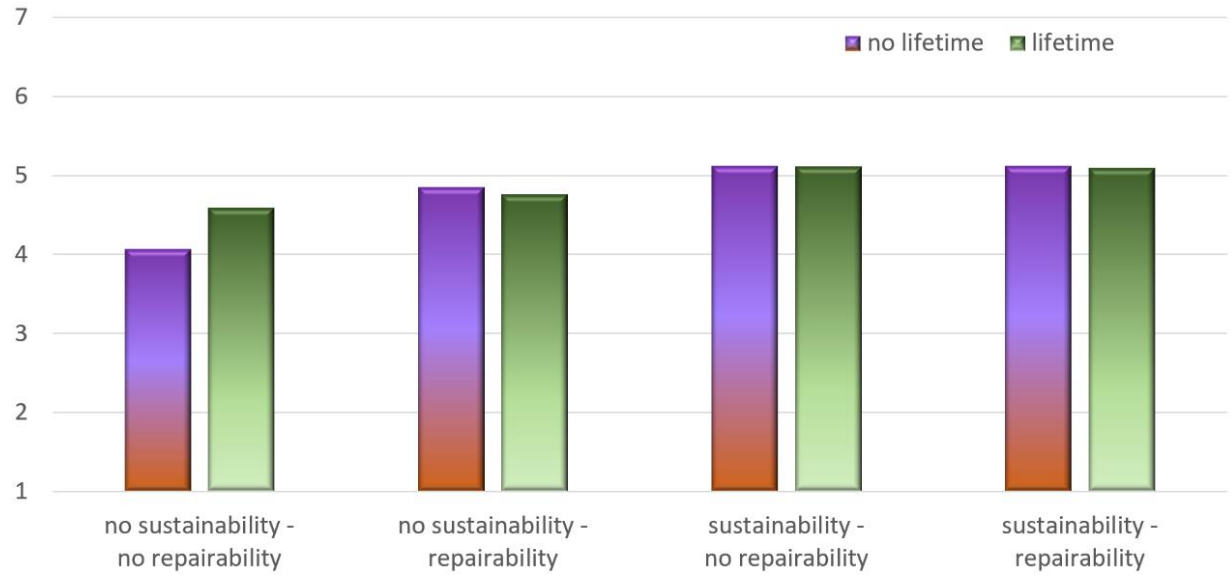

Figure 3.12 Corporate Social Responsibility (CSR) perceptions of the manufacturer in Experiment 2.

3.6.3 Willingness to pay for the backpack

We asked participants to indicate the maximum price they were willing to pay for the backpack. The analyses showed that communication about the lifetime of the backpack and a combination of communication about the lifetime and repairability of the backpack influenced consumers' willingness to pay for the backpack. The findings can be seen in Figure 3.13 below. It reveals that a communication about the lifetime of the backpack increases willingness to pay for the backpack, as well as a combination of lifetime and repairability communication. To make the effects more clear, we also included a figure without the sustainability information (see Figure 3.14).

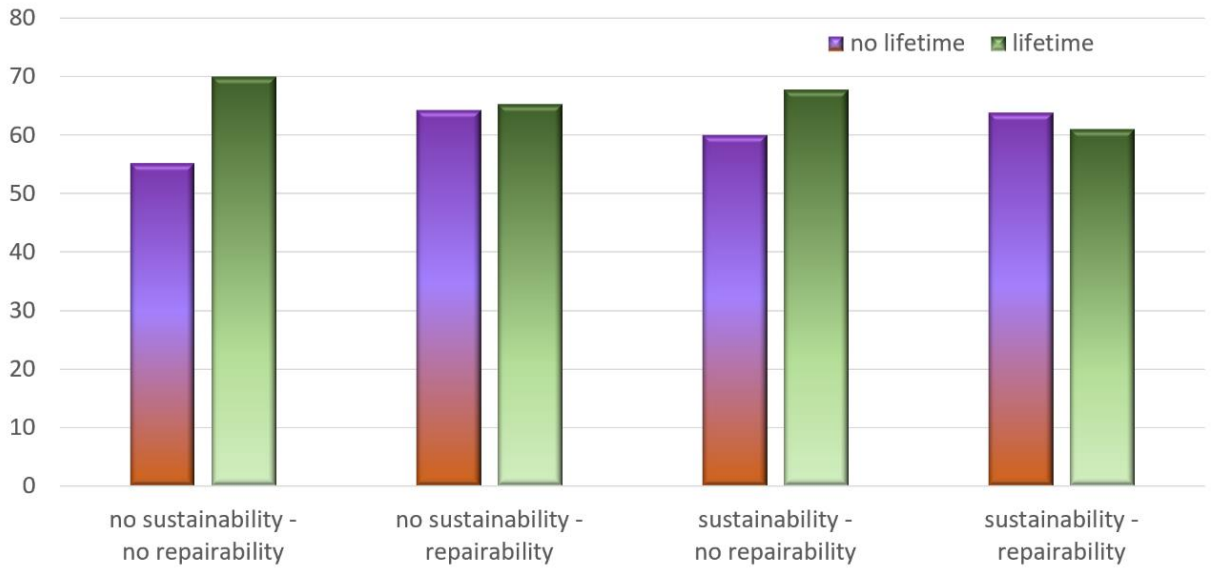

Figure 3.13 Willingness to pay for the backpack in Experiment 2.

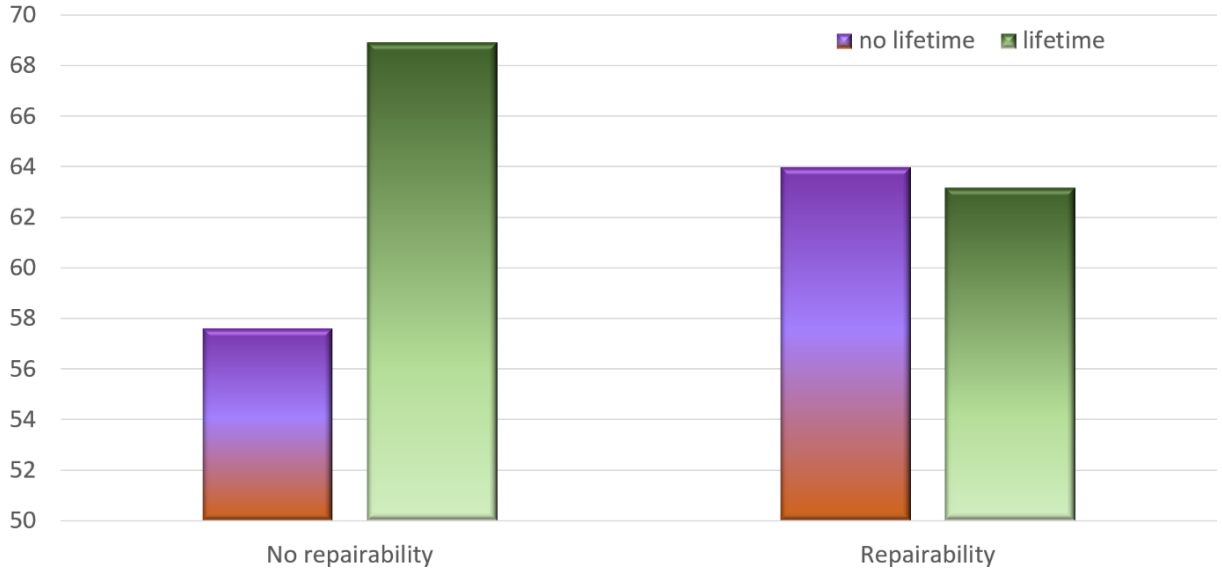

Figure 3.14 Willingness to pay for the backpack in Experiment 2, without the sustainability information.

3.6.4 Lifetime usage intention for the backpack

Analyses on the intention to use the backpack in years showed that only lifetime extension communication had a significant effect on how many years consumers intended to use the jeans: communication about the expected lifetime of the jeans increased the number of years consumers intended to use the jeans. There was also a small effect of the combination of a repair communication with a sustainability communication: consumers intended to use the backpack for more years when these two communication were combined.

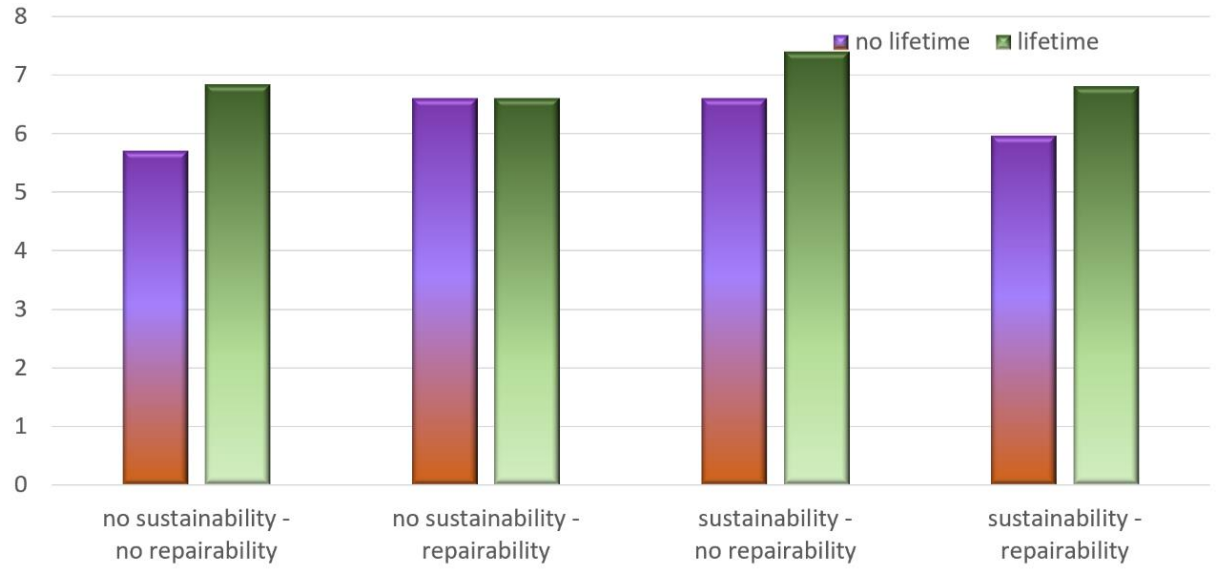

Figure 3.15 Intentions to use the backpack (in years) in Experiment 2.

3.6.5 Intentions to repair the backpack

Finally, analyses on the intentions to repair the backpack when necessary showed that only communication about the repairability of the backpack influenced consumers' intention to repair the backpack (see Figure 3.16). The figure also shows that, in general, consumers' intention to repair the jeans was relatively low (all averages below or around the midpoint of the scale).

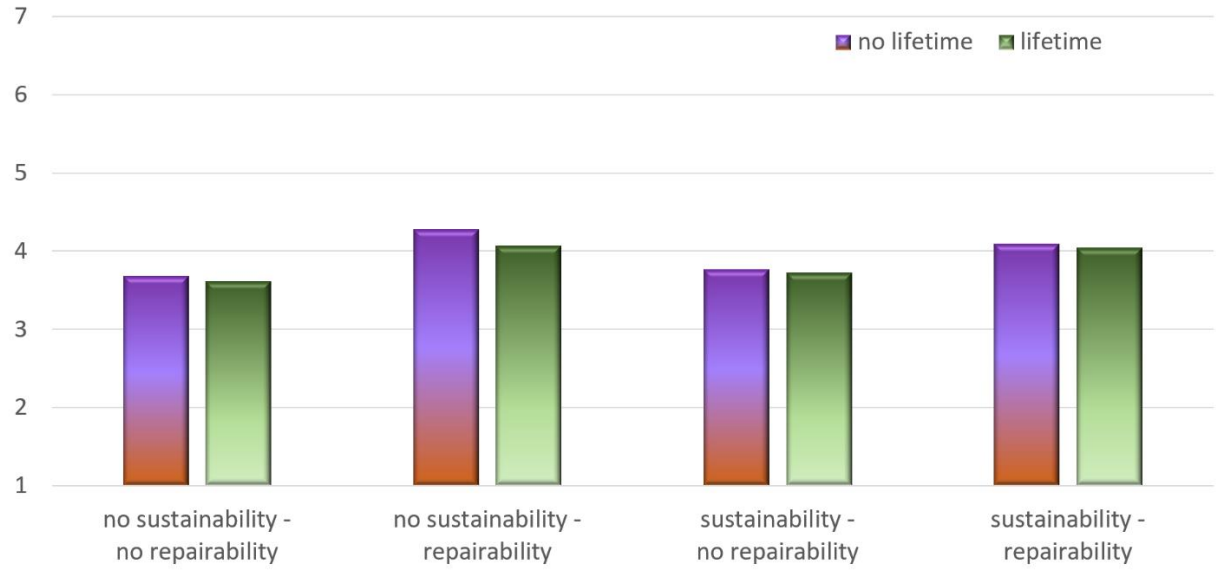

Figure 3.16 Intentions to repair the backpack in Experiment 2.

3.7 Discussion and conclusion experiments

The findings of Experiments 1 and 2 reveal that communications surrounding a product can influence consumer responses to the product. When mentioning the potential of extending the lifetime of a fashion product, it appears that consumers are more positive towards the product and towards the manufacturer. Consumers are also willing to pay more for the product and intend to use the product for longer.

When consumers are focused upon the repairability of the products, consumers also appear more positive towards the product and the manufacturer. It may, however, have a negative effect on willingness to pay for the product when combined with a lifetime communication, and it does not affect consumers' intention to use the product. A repairability communication does positively affect consumers' intentions to repair the product.

Finally, a sustainability communication has a positive effect on consumers' attitudes towards the product and towards the manufacturer. Consumers are, however, not willing to pay more for a product that includes a sustainability communication, and they do not intend to use the product for longer. Moreover, sustainability communication does not influence consumers' intention to repair the product.

In sum, it appears that especially communications about the lifetime of products may have positive effects on product lifetime extensions, and may be an economically interesting way for designers, manufacturers, and producers to increase the lifetime of their products. Further research in which other methods than self report measures are used is necessary to further confirm these findings, but they provide an interesting starting point for companies to explore the economic viability of slow design fashion.

4 Conclusion

The project and this final report focused on examining what factors influence consumers to use their products for longer (and to repair when necessary), and what ways designers can stimulate consumers to use their products for a longer period of time in an economically viable way. Although the current research project does not provide a full answer to these research questions, the literature review and the experiments do provide valuable insights for these research questions.

It appears that there are already quite some factors in the literature that designers can apply to increase the longevity of their products, and to increase the likelihood of the products being repaired. The literature review also shows that interactions between products and users (consumers) can best be taken into account, as these are likely to also influence the product lifetimes and repair likelihoods. Special attention can there be paid to the emotional relationship between consumers and products: both in the theory part and in the literature overview this element played an important role in how consumers deal with products. Hence, there is value in further examining emotional sustainability in our research and societal actions.

Moreover, next to the design of products, activities in the surroundings of products can also influence product lifetimes and repair. Indeed, the experiments in Chapter 3 show that relatively simple communications about the expected lifetime or repairability of products may influence consumers' intention to use and repair the product. Whereas marketing research and activities thus far have typically focused on selling as many products as possible, there thus also seems to be a future in designing and using marketing strategies to promote the lifetimes and repair of products.

Another relevant aspect concerns the economic viability of the lifetime extension and repair strategies. After all, product lifetime extension strategies can only be fully included in society when all supply chain actors can thrive on these strategies. The literature review does not provide information on this aspect, simply because hardly any article took this aspect into account. The experiments shed some first lights on the importance of including these aspects in future research: consumers' attitudes towards products and companies, as well as their willingness to pay for products, may be influenced by strategies that aim for extending product lifetimes and repair. Together, these findings hopefully pave the way for many new, relevant insights to come that can all support our aim to improve the sustainability of our products' lives.

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