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A poorly educated guess: consumers' lifetime estimations, attitudes towards repairability, and a product lifetime label

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Abstract: Consumers' expectations about product lifetimes have an influence on the actual lifetimes. Promoting repairability and a product lifetime label can potentially encourage consumers to extend product lifetimes. In this paper, we present in-depth insights in how consumers make estimations about product lifetimes, and their attitudes towards repairability and a product lifetime label. Our results reveal that consumers feel unable to make a well-informed estimation about the product lifetime, have negative associations with product repairability, and have concerns about how use intensity and use behavior can be taken into account on a label. Additionally, displaying a minimum number of years on a label may cause unintentional rebound effects.

Introduction

Prolonging product lifetimes of consumer electronics lowers their environmental impact. Longer product use decreases the need for new products, which in turn lowers the released CO2 emissions, the amount of critical raw materials needed for production processes, and the number of products ending up in landfills. Product lifetime extension is therefore desirable for the environment (Bakker et al., 2014). Consumers and their behavior have an important role in product waste reduction (Cooper, 2004), however, a lot of nowadays products are disposed of for other reasons than being broken 'beyond' repair (Harmer et al., 2019; Hennies & Stamminger, 2016; Wieser & Tröger, 2016). When aiming to prolong product lifetimes, it is thus important to consider the consumer perspective on product lifetimes.

Consumers generally have certain expectations regarding the lifetimes of their products. Research suggested that low lifetime expectations may lead to shorter use times and replacement cycles (Wieser et al., 2015). When aiming to increase product lifetimes, it is important to be aware that the replacement of a product is in most cases not only based on rational decision-making (Guiltinan, 2010). During its lifetime, a product is mentally written off by the consumer. This mental value depreciation is influenced by both economical (e.g., low price of new product compared to costs of possible repair) and psychological factors (e.g., the desire for a new feature) (Okada, 2001). If consumers expect a product to be relatively short-lived, this mental accounting goes faster, and the product is more likely to be prematurely replaced because it has made its money worth (van den Berge et al., 2021). To understand how consumers form lifetime expectations is therefore key. It can provide insights on how to lengthen lifetime estimations, and hereby potentially increase actual lifetimes.

Product repairability (i.e., the extent to which a product is able to be repaired) has been indicated as a potential way to increase product lifetimes (Bocken et al., 2016). It seems likely that providing repair possibilities could thus lengthen consumers' lifetime expectations as well. Previous research indicated that even though consumers may prefer repair over disposal, they currently do not look for repairability in products (Sabbaghi et al., 2016). Furthermore, consumers' face a lot of barriers towards repair (Tecchio et al., 2019). To lengthen product lifetimes, it is thus important to explore consumers' attitudes towards repairability.

Consumers currently lack information in making product lifetime estimations (Cox et al., 2013). To support consumers in making more well-informed estimations, a lifetime label can

potentially bring the longevity of the product more on top of mind during decision-making (Braithwaite et al., 2015; Gnanapragasam et al., 2018). However, it is unclear how consumers would respond toward such a label.

This paper contributes to the literature on product lifetimes. It provides in-depth insights on how consumers make estimations about product lifetimes, how consumers perceive product repairability, and how a product lifetime label could support consumers in making more informed estimations about the lifetime.

Method

The explorative nature of semi-structured interviews (n=22) left room for new insights to emerge and supported in obtaining in-depth insights (Patton, 2002). The recruited participants showed variety in age (29-72 years), gender (41% male, 59% female) and income. All participants replaced one or two of the selected products (washing machines: n=8, vacuum cleaners: n=8, TVs; n=8 and smartphones; n=8) within six months preceding the interview, to make sure the replacement decision was fresh in their memories. For the selection of the products that were discussed in the interview, a high market penetration, high environmental impact, high frequency of usage and a variety in technological advancement (high for smartphones and TVs, medium for vacuum cleaners and low for washing machines) were used as selection criteria.

During the interviews we asked how the participants estimated lifetimes, whether the lifetime and repairability were considered at purchase, and what their opinion was about a product lifetime label. To identify the context of the replacement, we asked the participants about the actual product lifetime and the physical state of the old product when replaced, as well as the reason(s) for replacement. The interviews lasted 30-60 minutes and took place at people's homes (November 2019). All interviews were audiotaped and fully transcribed. For this paper only the data on lifetimes, repairability and lifetime labelling were reported. The data was analyzed using Atlas.ti software, and coded in-vivo in the first round in order to stay close to the raw data (Saldaña, 2013). The in-vivo codes were clustered into sub-codes (50) and codes (22), which were iteratively formulated, discussed and refined within the research team.

Results and Discussion

The actual lifetimes of the replaced products greatly differed within all categories (washing machine: 5-18 years; vacuum cleaner: 5-30 years; TV: 4-25 years; smartphone: 2-9 years). This indicates a large variation in lifetimes of products analyzed in this study. Differences between product categories regarding the physical state of the products during replacement were observed as well. While most washing machines had a defect, most TVs were still working. The reasons for replacement were diverse as well, ranging from a defect or decrease in functionality (e.g., a broken drum of a washing machine, or a decrease in battery capacity of a smartphone) to a desire or a good deal for a new product (e.g., a TV with a bigger screen or a good deal for a vacuum cleaner). The insights related to the context of the replacement are presented in table 1. Below, we further elaborate on consumers' lifetime estimations, responses towards repairability, and attitudes towards a product lifetime label.

Consumers' lack the ability to make well-informed product lifetime estimations

Participants' estimations about the lifetime of their new product (i.e., the product bought as a replacement) were diverse, ranging from 5-12 years for a washing machine, 5-15 years for a vacuum cleaner, 5-15 years for a TV and 2-10 years for a smartphone (see table 1). Assuming that there is a large variety in lifetimes between products within each product category (i.e., depending on quality, range, price etc.), the diversity in lifetime expectations is not surprising. The observed spread in consumers' lifetime estimations suggests there is a possibility to influence currently fluctuating lifetime estimations, because they currently seem to be very unpredictable for consumers. This is promising when aiming to extend undesirable short product lifetimes estimations.

Initially, consumers either confirmed or denied that the product lifetime played a role in their purchase decision-making. More in-depth insights revealed that most of the participants did actually took the lifetime into account, but not always consciously.

P16 – Vacuum cleaner: 'No I do not think I took lifetime into account. Not consciously at least, but it might be something kind of self-evident. A thought of what you can expect from such a device.'

Participant number – Product category	Actual lifetime replaced product	Physical state replaced product	Replacement reason replaced product	Repair attempt replaced product	Lifetime expectation new product	Considered lifetime new product	Considered repairability new product	Interest Product lifetime label
P1 - WM	15	Defect	Unknown defect	No	10	Yes	No	Yes
P6 - WM	10	Defect	Electronical defect	No	5-10	Yes	No	No
P15 - WM	5	Defect	Unknown defect	No	10	Yes	No	Yes, but concerns
P17 - WM	13	Defect	Unknown defect	No	10	N.a.	No	N.a.
P18 - WM	10	Defect	Broken door	Yes, new door	10	No	No	No
P19 - WM	18	Defect	Broken drum	Yes, but failed	10	No	No	Yes, but concerns
P20 - WM	15	Working, but decrease in functionality	Wear of drum bearings	No	10-12	Yes	No	Yes
P22 - WM	15	Decrease in functionality	No clean wash	No	10	Not consciously	No	Yes
P1 - VC	17	Working, but decrease in functionality	Noise and smell	No	15	Not consciously	No	Yes
P2 - VC	30	Damaged	Power plug felt unsafe	No	10	Not consciously	No	Yes, but concerns
P4 - VC	25	Working	New product less noise, more energy efficient	No	10 - 15	No	No	Yes, but concerns
P6 - VC	10-15	Defect	Unknown defect	No	5	N.a.	No	N.a.
P8 - VC	10	Defect	Unknown defect	No	N.a.	No	No	No
P9 - VC	10	Working	New product was a good deal	No	10	Yes	No	Yes
P11 - VC	6-7	Defect	Unknown defect	No	7-12	Yes	No	Yes
P16 - VC	5-6	Defect	Electronical defect	No	5	Not consciously	No	Yes
P3 - TV	5	Working	New technological desires	No	15	No	No	N.a.
P5 - TV	7	Working	Screen too small	No	15	No	No	No
P7 - TV	10	Damaged and decrease in functionality	Damaged screen and decrease function	No	10-12	Yes	No	Yes, but concerns
P8 - TV	2-3	Damaged	Stroke through screen	No	5-6	No	No	Yes
P10 - TV	10	Working	Stain in screen and new technological desires	No	6	No	No	Unsure
P12 - TV	25	Working	Analog TV incompatible with service provider	No	10	No	No	Unsure
P13 - TV	10	Working	Analog TV incompatible with service provider	No	10	No	No	Yes
P21 - TV	4	Working	Screen too small	No	10	No	No	No
P2 - SP	4	Working, but decrease in functionality	Battery malfunctioning	No	4	Yes	No	Yes
P3 - SP	2	Working	Subscription ending and brand reputation	No	2	Yes	No	No
P4 - SP	3	Working	New desired, old product to family member		2 - 2,5	No	No	Yes, but concerns
P5 - SP	3	Damaged	Broken screen	No	5 - 6	No	No	No
P7 - SP	8-9	Working	No available software updates	no	7-8	Yes	No	Yes, but concerns
P9 - SP	4	Decrease in functionality	Decrease of function, low quality camera	Yes, replaced screen 2 times	4	Not consciously	Yes, ability to repair screen	Unsure
P11 - SP	3-4	Decrease in functionality	Low memory capacity, low quality camera	Yes, replaced screen 2 times	4	N.a.	No	Yes
P13 - SP	6	Working	No available software updates	Yes, replaced button	10	Yes	Yes, modular phone	Unsure

Table 1. Overview of the interview data presented per product category.

Participants' lifetime estimations were mainly based on intuition (i.e., instinctive knowing). When we asked what this intuitive estimation was based on, they mentioned personal experiences, recommendations from family or friends, consumer reviews, salesmen, the price and brand reputations.

P1 – Washing machine: '[When making a lifetime estimation] you consider the price and the brand. It is based on instinctive feelings, but also on experiences from the past. Seeing products in the store or on the internet, you don't see the difference at all, and really have to read into it. If you see them in the store, you really need someone to tell you about the product.'

Consumers seem to lack expertise and knowledge to make a well-informed estimation about the product lifetime. Many participants acknowledge this and even declared themselves unable to make an estimation. From the appearance, it is difficult to identify differences between products in terms of lifetime. Information about the quality and robustness of used materials and components is often not communicated by the manufacturer. Estimating the lifetime feels as a guess to many consumers. To make the product lifetime a more prominent aspect in consumers' purchase decision-making, it is thus important to better support them in making lifetime estimations.

Consumers have a negative attitude towards product repairability

Before replacing the product, three participants repaired their smartphone, and only one repaired her washing machine. None of the participants repaired a vacuum cleaner or TV (see table 1). Our results thus demonstrated that repair was often not considered for the replaced product, and thus was unable to lengthen the lifetimes of the investigated products. Confirming existing literature, the age of the product and cost of repair were mostly mentioned as barriers towards repair activities (Laitala et al., 2021; Tecchio et al., 2019). Interestingly, product defects that did result in repair all had a visible effect on the product appearance (e.g., broken door of a washing machine, a broken screen and button of smartphone, see table 1). This suggests that a know-how of what is wrong, either by visual or technical indication (supporting in the notion of what is wrong) may stimulate product repair.

We also investigated the repair considerations of participants' new products. Some additional barriers, such as the lack of a convenient repair infrastructure (Jaeger-Erben et al., 2021) and the availability of spare parts for a reasonable price (Sabbaghi et al., 2017), emerged that confirmed existing literature. Additionally, consumers also seem to face concerns about the repair outcome.

P3 -TV: 'How do you get an appliance like that safely and securely to a place you get offered a repair? And does it pay off to repair it? […] Are there any replacement parts available for a fair price? And after repair, do you really have a working device again that will have the life you hoped for?'

Our results revealed the uncertainty of the repair outcome as a hindrance towards executing repair activities. We believe that the prospect of a sound repair outcome may support in lengthening lifetimes expectations from consumers. It is interesting to investigate what design, service or business model elements (e.g., repair guarantee services) can take away this experienced hindrance, and consequently increase consumers' confidence in repair.

Finally, most participants responded that they did not take repairability into account when purchasing the new product. They were often surprised or confused by the question and indicated to 'not have thought of it at all'. The participants also indicated that manufacturers currently do not communicate about repairability, and therefore, they could not have taken it into account. Additionally, some participants mentioned that the product did not look like it could be repaired.

P 9 – Vacuum cleaner: No, not at all [considered the repairability]. I just did not think about it […] To me, this vacuum cleaner looks very closed as well... It doesn't look like I could open it up myself to replace something.

Participants associated a repairable product with a performance that does not live up to the latest standards, as well as the more expensive option compared to similar products. Some participants even perceived repairability as a negative feature for products, because consumers just want a well-functioning product and do not wish to be bothered with potential repairs.

P15 – Washing machine: 'No, I haven't thought about that… Well, it's not really promoted, that it's easy repairable [...]. You hope that it will last a very long time. It is a negative thing if someone would promote that it is easy repairable. Then you think; does it break down that often?'

The discouraging attitude towards repairability can be attributed to consumers' unfamiliarity with the topic and may change when more awareness is raised. Governmental parties should focus on promoting repairability and making policies for manufacturers that stimulate the promotion of repairs. For example, a policy obliging companies to share information about repairability may also change consumers' current negative attitudes because repairability then becomes a more commonly considered attribute for products (such as the European Union energy label).

Consumers' varying attitude towards a product lifetime label

Participants' attitude towards a product lifetime label varied. Often concerns about the trustworthiness of the label were observed when it would be provided by the manufacturer. According to the participants, manufacturers have no interest in selling long-lasting products as this would reduce their sales. Additionally, the continuous development of new models made the participants wonder whether the lifetime of products can be predicted in advance. The speed of new technological developments makes it difficult to include evidence from practice in lifetime estimations.

P16 – Vacuum cleaner: 'I don't know if a lifetime label is reliable when it is provided by the manufacturer. They obviously commit to the mandatory warranty duration but have no interest in making the device last a lot longer […]. It also has to do with the fact that they keep renewing the devices and changing things. How can you predict anything about that?'

Furthermore, it was questioned how a label can take the influence of (careless) consumer behavior into account. Current warranty legislations from the European Union require proof that a failure is not due to the consumer. Often this was experienced as a burden, because for some cases it is difficult to provide proper evidence. On the one hand, participants mentioned that a lifetime expectation expressed in years could affect them, because this would enable them to compare the purchase price to the expected lifetime. On the other hand, there were concerns about a lifetime expectation expressed in years, because the use intensity (i.e., the frequency of usage) and consumer behavior (i.e., the way the product is handled by the consumer) strongly influence the product lifetime. Especially consumer behavior is difficult to take into account on a label.

P4 – Smartphone: 'I think that's very difficult for smartphones because it depends so much on individual usage. I think it is more important whether you have a good case around it protecting the phone, than the brand.'

Reflecting on these results, displaying a minimum number of years on the label may have undesirable rebound effects. Firstly, because consumers indicated that the lifetime of a product strongly depends on the products' use intensity and consumers' behavior, and therefore cannot be guaranteed. Additionally, research suggested that consumers' lifetime expectations potentially affects the replacement decision (van den Berge et al., 2021). Displaying a minimum number of years may unintentionally encourage consumers to replace a still functioning product when these indicated years are exceeded. They may feel the product has made its money worth.

Conclusions

Our findings suggest that consumers do not feel confident in making accurate lifetime estimations. They need support in making more well-informed decisions with regards to product lifetimes. A product lifetime label potentially not only supports consumers in making better estimation, but it may also incentivize manufacturers to design products with a longer lifetime. When aiming to extend product lifetimes by a product lifetime label, it is important to alleviate consumers' concerns. Special attention should be focused on the current negative attitude towards repair and repairability. Only then consumers will have confidence in the label and use it in their decision-making at purchase.

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