

Why do users (not) repair their devices? A study of the predictors of repair practices

Abstract:

Academic literature on circular economy describes repair as an important strategy to prolong the lifetime of products. However, repair is often analyzed in terms of business models or product designs and tend to underestimate the role of consumer practices and routines. The paper adds to the growing body of consumer research on repair with a particular focus on the relation between past repair behavior, product usetimes and different product types. Based on previous research and a conceptual perspective on repair as a social practice, the paper describes a survey-based, quantitative analysis of the role of social and material settings, meanings and competences for the likelihood of repairing an object (either DIY or by repair services). We further explore the pertinence of repair for prolonging product usetimes compared to other product related practices like replacements. A model is proposed that predicts patterns of 1) how agency- and setting-related aspects are predicting repair and 2) how product related practices predict product usetimes for two different consumer goods (washing machines and smartphones). Both models were implemented and tested by structural equation modelling (SEM) with latent variables, using R lavaan. The tests revealed among others that the behavioural and financial costs for repair are perceived as high and social and material settings are more likely to impede than to enable repair. We also found that novelty seeking is an important predictor for non-repair and short product usetimes, but that there are significant differences between smartphones and washing machines. Based on our results we discuss further research and policy strategies to understand and change the current culture of non-repair.

1. Introduction: The importance of repair for sustainable consumption and production

The production and consumption of electronics has far-reaching sustainability impacts throughout the whole lifecycle, starting from mining damage by extraction of rare earths to the increasing amount of electronic waste (Forti et al. 2020, Evens and Vermeulen, 2020, Klinger 2018, Jameson et al. 2016, Smith et al. 2006). The negative socio-ecological effects are exacerbated by the fact that many consumer items, in particular electronic devices, are often used much shorter than the technical lifespan would allow and are often replaced even though they still work or can easily be repaired (Prakash et al. 2018; Wilhelm 2012; Cooper 2009).

Prolonging the lifetimes and usetimes of products is seen as an important lever for increasing resource efficiency (UNEP 2011, Cooper 2010, Reuter and van Schaik, 2008) and is one of the core strategies of the concept of the circular economy (Cooper 2020). In the last decade, the circular economy (CE) has become an important new paradigm for advancing sustainable development in systems of consumption and production (Ellen McArthur Foundation 2012). CE strategies should overcome the current self-destructive “take-make-waste” value creation paradigm and replace it with restorative and regenerative practices. There is a huge body of literature that describe CE related strategies, business models and design approaches (see e.g. Centobelli et al. 2020, Kirchherr et al. 2017, Bocken et al. 2016) as well as barriers to a transformation towards CE (Guldmann et al. 2020, Kirchherr et al 2018). Although there are several different circular strategies (for example reuse and redistribution, refurbishment and recycling, Luedeke-Freund et al 2019) it is often highlighted, that CE transitions should foster strategies that prolong the lifetime of a product like repair and maintenance. Particularly, the repair of products receives increasing attention as an important

element of waste and resource management policies. For example, the EU policy on waste and circular economy prioritizes repair and reuse of products over strategies like recycling (European Commission, 2019). Similarly, the academic literature on CE sees repair as an important strategy to strengthen the inner loops of the CE (e.g. Webster, 2017; Kirchherr, 2017).

However, so far repair is often tackled from a technocratic point of view (Valenzuela and Böhm 2017) and analyzed in terms of the appropriate business models (Luedeke-Freund et al., 2019) or the required product designs (Vanegas et al., 2019). Nevertheless, many authors highlight that current consumer roles in the economy, consumer's self-perception and consumption patterns are huge barriers for a transition to CE business models (Hansen and Schmitt 2020; De Jesus and Mendonça Mont et al. 2017). CE strategies (e.g. as described by Potting et al. 2017) comprise that consumers should use less or as few products as possible ("refuse" and "reduce") and should "rethink" their use patterns in order to use products more efficiently or for multiple purposes.

Despite these efforts to understand and promote the role of consumers in a CE, research shows that consumer trends are mostly heading into another direction. While repairing, maintaining, restoring or even making everyday items in pre-industrial households was still an inherent part of everyday life, modern societies are characterized by a marginal role or even decline of repair (Sabbaghi et al. 2017, McCollough 2009). Thus, a growing body of research takes over a consumer perspective and addresses consumer's willingness or readiness to repair and to use the appropriate product-service systems (Ackermann 2018, Cherry and Pidgeon, 2018; Mugge 2018, Wieser and Tröger 2018, Stål and Jansson 2017, Gregson et al 2009). Studies on repair sometimes assume a macro-perspective and quantify the economic conditions for using repair services in a society (se.g. McCollough 2010, Brusselaers et al. 2019). Other studies take a lifeworld centred approach (e.g. Gregson et al. 2009, Wieser and Tröger 2018) and investigate repair as a part of everyday life.

In the study at hand, we take a closer look at repair by focusing on both: the role of structural settings for repair as well as of product users as agents of repair in these settings. Our main questions are: What defines whether users repair their devices or have them repaired by professionals? How relevant are repair practices compared to other practices, that may shorten product lifetime?

In the following, we will first present our conceptual background that informed the design of a quantitative study of consumer experiences, perceptions and practices.

2. Theoretical background: Conceptualizing and understanding repair

2.1 State of the art

How long everyday objects last and why they are replaced early has received considerable attention in obsolescence research. Obsolescence is often generally defined as a process where products "fall into disuse" (Cooper, 2010: 4) and is related to a number of factors that can be related to technical and material deterioration (material obsolescence) or lost or outdated functions (functional obsolescence). The term "psychological obsolescence" is often used to cover all cases where human thinking and acting is seen as the cause of a shortened usage and lifespan. The early work on obsolescence by Packard (1960) refers to this as an "obsolescence of desirability": "In this situation a product that is still sound in terms of quality or performance becomes "worn out" in our minds because a styling or other change makes it seem less desirable." (Packard 1960: 58). Other authors referred accordingly to changing fashions (Cooper, 1994), dissatisfaction (Heiskanen, 1996), low symbolic meaning (Kostecki, 1998), deteriorating user comfort (van Nes, Cramer, 2006), the persuasive influence of marketing or loss of status (Cooper, 2004), aesthetic devaluation (Burns, 2010), satiation (Hou 2020) or the desire for something new (Makov and Fitzpatrick, 2019) as varieties of psychological obsolescence.

However, the heuristic value of psychological obsolescence is limited if repair, i.e. DIY repair or using repair services is concerned. Here, functional and material obsolescence factors and user related factors like valuation and devaluation of objects interact. The debate on psychological obsolescence also leaves out the role of social practices in the human-object-relation during the use phase, like maintenance and care, as well as the socio-material settings that might facilitate or inhibit repair. It further tends to overemphasise the individual responsibility of consumers (Spinney et al, 2007) and individual decision making. Some authors for example refer to rational choice theory (Cooper, 2010: 15) to explain why people decide against repair and maintenance due to the high costs (e.g. Pérez-Belis 2017). However, research indicates that consumers often act non-rational if it comes to repair. Brusselaers et al (2019) for example show, that during most parts of a lifetime of a product, repair is the economically more viable strategy than replacement, but still the vast majority of consumers do not repair their broken objects. A variety of factors have been studied as possible influences on repair. As table 1 shows many studies focus on economic considerations and user characteristics. Some of these studies depict an image of the consumer as a homo economicus who rationally compares prices and take decisions on the basis of a mental book value (Okada 2001) or the societal discount rate (McCollough 2010). Other studies place repair in everyday life settings (e.g. Gregson et al. 2009, Scott and Weaver 2012) and consider the dynamic relationship between user and object (e.g. Ackermann et al. 2018, Desmet 2012) and the difficulty of repair, which is among others defined by the availability of competences and resources (e.g. Bakker et al. 2014, Wieser and Tröger 2018).

Dimension	Categories	Source
Economic Consideration	High cost of repair and spare parts Initial item cost Replacement cost Cost of spare parts Declining prices for new purchase Mental Book Value Trade value and utility value Linkage between Financial Incentive and Attitude	Cooper et al. 2000 Okada 2001 Tasaki et al. 2004 King et al. 2006 Guiltinan 2009 McCollough 2010 Brook Lyndhurst 2011 Tecchio et al. 2016 Pérez-Belis 2017 Kianpour et al. 2017 Ackermann et al. 2018 Wieser & Tröger 2018 Brusselaers et al. 2019
User Characteristics	Sociodemographic aspect (age, gender, household size, education, income) (In)competence or abilities Attitudes and motivation Environmental concern Frugality Innovativeness Perceived behavioural Control Trust in repair efficiency	Gregson et al 2009 Guiltinan 2009 Brook Lyndhurst 2011 Scott et al 2014 Raihanian Mashhadi et al. 2016 Kianpour et al. 2017 Pérez-Belis 2017 Ackermann et al. 2018 Wieser & Tröger . 2018 van den Berge 2020
Product characteristics and performance	Likelihood of repair of different product types Deterioration	Pourakbar et al. 2012 Tecchio et al. 2016 Wieser & Tröger 2018

Design for (non) reparability	Design issues such as clinched, bonded or fused parts Lack of access to software for diagnosis Lack of spare parts or repair tools	Raihanian Mashhadi et al. 2016 Bakker et al. 2014 Tecchio et al. 2016 Sabbaghi et al. 2016
Relationship user and product	Higher attachment stimulate repair Repair increase attachment Repair activities can evoke positive emotions	Desmet 2012 Page 2014 Scott et al. 2014 Wieser & Tröger 2018 Ackermann et al. 2018
Everyday life settings of repair	Integration into everyday life Convenience of repair Complexity of practicing repair Missing repair services leads to perception broken products have no value	Gregson et al. 2009 Scott et al. 2014 Kianpour et al. 2017 Harmer et al. 2019
Warranties	Extended product warranties can lead to more repair activities	Michaud et al. 2017 Brusselaers et al. 2019

Table 1: Dimensions and categories relevant to repair in the literature

These studies depict another image of the consumer as entangled in various material and social settings and interacting with the object and its design. They highlight that not the more or less rational decision to repair or not to repair is the important aspect but the conditions that surround the decision: What possibilities and resources to repair are available? What ability is necessary to assess reparability? How does the consumer relate to the product?

Taken the different approaches together it can be concluded that repair does not seem to be a one-time decision but relates to a process of valuation and devaluation of an object, its utility value (how well is the product performing) and its trade value (what is the product still worth on the market) in comparison with other, particularly newer products. Particularly the latter points to the relevance of the object itself: It can be assumed that it depends on the type of product whether it is repaired or not. Most of the cited studies do not systematically compare different product types. Inspired by the product typology identified by Cox et al (2013) we assume that the perceived trade value of up-to-date-products like smartphones is more sensitive to the dynamic market and the faster pace of product innovation. Thus we compare two different product categories and we consider how different types of purchase practices are related to repair. Furthermore there seems to be no or few cases where the relation between different predictors of repair practices, past repair behavior, product type and the lifetime of a product were analysed in one model. The literature contains examples of several models that correlate the intention to carry out a certain environmentally friendly behavior and examine constructs such as attitudes, norms and perceived behavioral control (mainly based on the theory of planned behavior by Fishbein and Ajzen 1975). These studies include Barr (2007) who modeled the reduction of waste, Hou and colleagues (2020) who examined the relationships between values, satiation, and product replacement intention and Kianpour and colleagues (2017) who investigate the factors influencing the intent to return end-of-life electronic

products for recycling. The theory of planned behavior assumes an intentional and reflexive decision maker and mainly considers the behavior intention. In contrast to these approaches we consider actual behavior (past repairs) which we see as embedded into various social settings and material arrangements. We investigate repair and its role for product lifetimes as constructed by the dynamic relation between individual agency and structures.

The dynamic reciprocity of agency and structure is a vital question to consumer research, particularly those studies that are inspired by theories of social practice (Welch and Warde 2015, Shove et al. 2012, Spaargaren 2011). Social practices per se are 'super-individual' and an important prerequisite for social order. Although social practice theories (SPT) want to set themselves apart from mentalist approaches (Reckwitz 2002) by understanding action less individually and intentionally, (individual) meanings, goals and emotions do play a role. For example, Schatzki (2002: 75) highlights the role of practical intelligibility for the 'control' of social practices: "practical intelligibility is an individualist phenomenon: It is always to an individual that a specific action makes sense. Features of individuals, moreover, are what principally determines what makes sense to them to do. Examples of such features are a person's ends, the projects and tasks he or she is pursuing and affectivity. " Similarly, Warde (2004) points out that the individual appropriation of practices, as well as the agent's specific meaning and commitment to practices are important to investigate.

Against this background, this paper focuses on the agency of consumers as well as the social and material settings as perceived by the agent to explain repair and its role to shortened useful lives of consumer goods. The term agency highlights that we mainly consider such conditions or influences on the useful life of an object that are related to the effectiveness of human actors, i.e. the meanings, competences and perceived behavioral options. With this perspective we seek to reveal how agent specific meanings, individual sense-making and perceived social and material settings are related to the individual appropriation of practices like repair.

The study is part of an interdisciplinary and mixed-method research project on the role of the consumer and consumption practices for production lifetimes¹. The overall project is based on a social practice theory approach (see e.g. Welch and Warde 2015, Shove et al. 2012, Spaargaren 2011; see also section 2.2) and focuses on the everyday life usage and handling of electronic devices and how this relates to product lifetimes and usetimes. The project is following an inductive approach based on the Grounded Theory methodology (Strauss and Corbin 1996), which means that qualitative inquiries were used to formulate theoretical assumption grounded in empirical observations. In this contribution, we are presenting the results of a quantitative investigation that elaborated further on several hypotheses developed during prior steps. In our previous research based on in-depth qualitative as well as quantitative studies we found among others, that

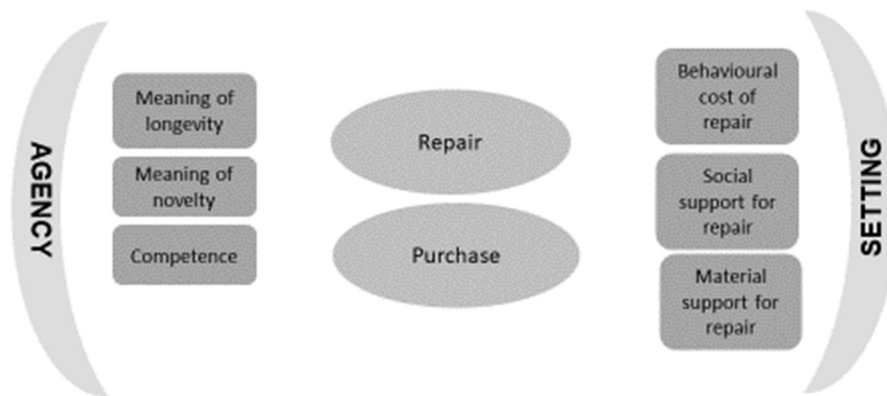
- socially constructed and personally appropriated meanings concerning novelty and longevity of products are important to understand the valuation and devaluation of products (Hipp 2019, Jaeger-Erben 2019, Jaeger-Erben & Proske 2017).
- an interest in or desire for novelty is an important predictor for product use times (Frick et al. 2019).
- care and purchase practices can prolong or shorten product lifetimes and are influenced by social and material settings, that e.g. provide support for caring or opportunity for replacements (Jaeger-Erben and Hipp 2018a/b).

Based on these findings the study presented here is supposed to generate statistically generalized findings on patterns between aspects of meaning, competence and setting and repair practices as

¹ The interdisciplinary researcher group "Obsolescence as a challenge for sustainability" is funded from 2016 to 2021 by the Federal Ministry of Education and Research within the framework of the Research for Sustainability programme. See further details on: challengeobsolescence.info

well as the lifetime of a product (see Figure 1). With this perspective we would like to contribute to the growing body of consumer-focused research on repair. Our particular contribution is to systematically study the differences between two product types (“up-to-date”-product vs. “workhorse”) and to compare the relative significance of different object related consumer practices for prolonging the usetime of a product. Furthermore and inspired by social practice theory, we systematically integrate structural and agency related aspect to better understand repair as a social practice.

Figure 1: Conceptual framing for the study of product-related practices



In the next section we will describe our general approach and research questions.

2.2 General approach and research questions

A quantitative approach towards everyday social practices is unusual. Even though some proponents of SPT argue that the theory as such does not imply a specific methodology (Shove, 2017), the usual approaches are qualitative inquiries (Halkier et al., 2011) like case studies, participant observation and interviews. Nevertheless, there are few examples where quantitative methods were applied to investigate social practices (e.g. Browne et al. 2013, Spotswood et al. 2015, Manderscheid 2019). The authors of these studies unanimously agree that social practice oriented quantitative research cannot replace qualitative case studies, but can complement qualitative research by, for example, analysing patterns of practices and their frequencies. .

In line with some of the aforementioned studies, the quantitative approach presented here is not pretending to reconstruct social practices as such. Nevertheless, we share the assumption that quantitative data can reveal patterns of relations between individual doings and material and social settings. We further assume that quantitative interviews are able to provide information about people’s past doings and everyday routines as well as on orientations, meanings and settings relevant to their behaviour (Hitchings, 2012). We assume that the reported behaviours and orientations in our survey are not social practices but the reverberations of social practices as far as they are available to individual post-hoc reflections. Our study is a way of zooming-in into individual agency and at the same time zooming out to a representative sample of individual agents. Like Browne (2016), we see the value of statistical generalization to complement the analytical generalisation enabled by qualitative research. Without attempting to isolate what practically is inseparable, we would like to compare the relative significance of agency and setting related aspects in social practices and in human-object relations. The objective is to use statistical methods to reveal general patterns that are relevant for product usetimes among others to be able to contribute to

research and action for longer lasting product consumption and for the support of repair as a social practice.

Our first objective is to compare the relative significance of different object-related practices, i.e. repair and replacement for the length of product usetimes. Herewith we would like to assess the importance of repair in prolonging product usetimes compared to replacement practices. Thus, the first research question is: Which usetime prolonging or shortening practices (repair, replacement) are predicting product usetime and how are they influenced by the social meaning of novelty vs. longevity? Based on previous research and literature on repair, we assume that repair is prolonging the usetime of a product and is fostered by a high social meaning of longevity. In contrast, the desire for the new (high meaning of novelty) shortens the usetime of a product and encourages replacements.

- RQ1: Which usetime prolonging or shortening practices (repair, replacement behaviour) or meanings (novelty vs. longevity) predict product usetime?
 - o H1.1: Repair behaviour prolongs the usetime of products.
 - o H1.2: While replacement behaviour due to functionality predicts a longer usetime, replacement behaviour due to novelty or opportunity predict a shorter usetime.
 - o H1.3: Longevity as a social meaning is positively related to repair and usetimes., whereas novelty as a social meaning is negatively related to repair and usetimes.

Our second objective is to analyse patterns between past incidents of repair (or non-repair) as object-related doings and possible predictors like the social meaning of repair and social and material settings of repair. Our second research question is: How (much) do aspects of agency (like competence and social meaning) compared to material and social settings like social support for repair predict past repair? We predict that competent users are more likely to repair which is fostered by a high importance of longevity but impeded by a high importance of novelty. In line with the research summarized above we assume that perceived financial and behavioural costs and missing infrastructures hinder repair but social support is fostering repair.

- RQ2: How (much) do aspects of meaning and agency compared to material and social settings like behavioural costs predict repair behaviour?
 - o H2.1: Competence (object and repair-related know-how), available social and material settings for repair predict lower financial and behavioural costs for repair and positively predict repair behaviour.
 - o H2.2: Perceived financial and behavioral costs negatively predict repair behaviour.
 - o H2.3: Meaning of longevity predicts repair positively, and meaning of novelty predicts repair behaviour negatively.

Our third objective is to analyse differences between objects in the aforementioned patterns of predictors and practices and product lifetimes. Following the categorisation by Cox et al (2013) we are contrasting smartphones as an “up-to-date-product” and washing machines as a product representing the category “workhorse”. Therefore, the third research question is: Are there any differences between product types concerning the predictive power of agency and setting-related aspects? Our research should test the hypothesis that smartphone related practices and smartphone usetimes are more influenced by the social meaning of novelty and replacements than washing machines but that in both cases behavioral costs are negatively related to repair as a usetime prolonging practice.

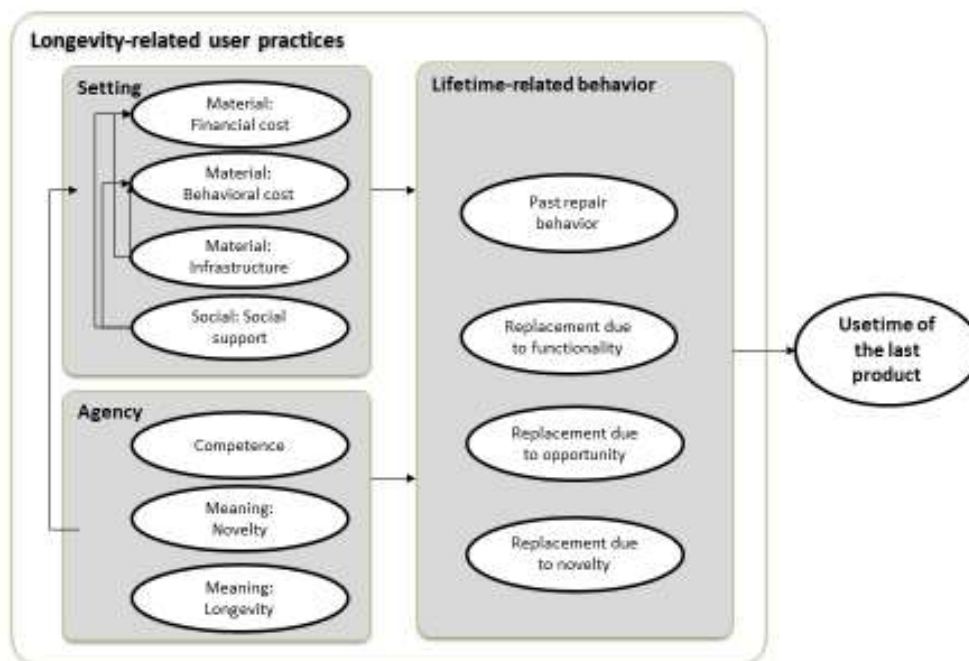
- RQ3: Are there any differences between product types concerning the predictive power of agency and setting-related aspects?

- H3.1: The meaning of novelty is a stronger predictor of usetimes and usetime related practices in the case of smartphones as compared to washing machines.
- H3.2: Replacement due to novelty are more often reported for smartphones than for washing machines.

Our model (see Figure 2) is supposed to test how different object-related doings like repair and care (usetime prolonging) predict the usetime of the last product in comparison to replacement (usetime shortening) and how this effect is mediated by meanings of longevity and novelty. Replacements were further differentiated into different occasions or affordances for the purchase: Replacement due to functional deficits of the past object, due to the opportunity or offer to get a new item or due to the desire to have the newest product. As factors related to agency, we investigated the social meanings of novelty and longevity and the perceived repair competences. As factors related to setting, we investigated the perceived behavioural costs of repair (effort, financial costs) and the material setting that enables or impedes repair. We also investigated the social setting in terms of the perceived social support for repair and the social meaning or norm of longevity and repair in the social groups that are relevant to the person.

The proposed model is shown in Figure 2, the composition of the relevant categories are described in Section 3.2.2. The model was tested for washing machines and smartphones separately.

Figure 2. Proposed model of longevity-related practices as predictors of product usetime



3.2 Material and Methods

3.2.1 Sample

N=1.000 Participants were visited at their homes and were questioned in a face-to-face (f2f) interview by professional interviewers in 2019. We decided for this more expensive and time-consuming method

since it provides better information than online questionnaires. Interviewees were given more time to reflect on the questions and had the chance to ask for more explanations. The participants were at least 14 years old, with no upper age boundary. The sample was collected by a panel organization using the ADM Mastersample method (ADM 2020), a three-stage random process to draw a representative face-to-face sample for all households in Germany. To ensure the integrity of the data collection process, they adhere to strict guidelines of the ADM - Arbeitskreis Deutscher Markt- und Sozialforschungsinstitute e.V. (business association for German market and social research; ADM 1999). As indicated in table 2, the full sample is comparable to the German population. The subsample that had complete data for the washing machine model was slightly less educated, older and there were more women in the sample, whereas the smartphone subsample is slightly younger and has slightly higher education than German population.

Table 1. Sample

	Full sample (N=1000)	Subsample washing machine (N=675)	Subsample smartphone (N=552)	Population in Germany (see www.destatis.de)
Age (M, SD)	49.9 (17.0)	53.3 (15.7)	43.5 (14.5)	44.5
Gender	53.8 % female	57.2 % female	54.2 % female	51 % female
Income (Median)	2000 – 3000 €	2000 – 3000 €	2000 – 3000 €	1960 €
Education level	32.4 % primary 41.3 % secondary 25.4 % tertiary education level 0.9 % still at school, no education or no answer	32.6 % primary 42.2 % secondary 24.9 % tertiary education level 0.3 % still at school, no education or no answer	18.7 % primary 47.5 % secondary 31.5 % tertiary education level 2.3 % still at school, no education or no answer	30.4 % primary 29.7 % secondary 31.9 % tertiary education level 7.7 % still at school, no education or no answer

3.2.2 Questionnaire

The questionnaire was developed in an interdisciplinary research group based on previous research, a literature review and assumptions from social practice theory. Items were either adapted from established existing scales or constructed based on the premises and assumptions described above. Whereas predictors related to agency and setting were assessed by self-report items on a 5-point Likert scale, mostly with the option of ‘I don’t know / does not apply to me’, outcome variables such as repair practice or product lifetime were measured in a different format and in a different phase of the survey, to minimize common method bias (Podsakoff et al., 2003). As an additional step to improve the validity and reliability of the survey, it was pre-tested for comprehensibility by several test persons. All measures included in the analyses are listed in the following chapter, and the list of items can be found in Appendix A. It should be noted that the items included in this study were part of a larger survey, including measures for other study purposes. Furthermore, the constructs examined in this confirmatory approach are not exhaustive. We also highlight that the survey provides a self-assessment of aspects like competence and settings and no objective measure.

Usetime of the last product. The participants estimated for how many months they had used their last smartphone on a scale from 0 to 120 months, and for how many years they had used the last washing machine on a scale from 0 to 60 years.

Past repair behavior. Repair behavior was operationalized as a sum score ranging from 0 indicating no repair practice to 8 indicating very frequent repair practice. The sum score included (a) the sum of

times participants reported to have repaired their current or their last device or any one of the devices they owned before (sum could range from 0 none to 6), (b) if they indicated that they had ever tried to repair the product type themselves (coded 0 for no and 1 for yes) and (c) their habit to repair the devices (0 to 1). To assess their habit to repair, we asked “Imagine the following product in your household breaks. What would be your spontaneous reaction?”. The options for response were: repairing the product right away, repairing it later, buying a new product, doing without, acquiring a used product or asking for help. If participants chose one of the repair options, this counted as 1, otherwise as 0.

Replacement. Buying a new product can be triggered by different occasions: Functionality (e.g. object is broken), opportunity (e.g. attractive offer) or novelty (desire to have the latest product). This was assessed with 4 items for each occasion for the purchase of the last washing machine (reliability $CR = .88$, $AVE = .65$) and the last smartphone (reliability $CR = .87$, $AVE = .63$).

Meaning of longevity. The meaning of longevity was assessed as a feeling of obligation to use devices as long as possible (after Schwartz, 1977). It was measured in general for devices (not separately for smartphones and washing machines) and included 3 items, e.g. ‘I feel morally obliged to use my smartphone as long as possible.’ Reliability was $CR = .76$, $AVE = .54$ for the washing machine, and $CR = .80$, $AVE = .54$ for the smartphone.

Meaning of novelty. The meaning of novelty was assessed by the meaning of using devices that are on the level of the newest technology, e.g. ‘It is a great feeling to own a completely new smartphone.’. The questions were measured separately for smartphones (reliability $CR = .85$, $AVE = .67$) and washing machines (reliability $CR = .82$, $AVE = .61$), since research indicates that novelty is more important for some products than for others (Cox et al., 2013).

Repair competence. Repair competence measured the self-reported competence to repair one’s own devices or to initiate a service repair, e.g. ‘I know what to do if my washing machine does not work.’. It was also measured separately for smartphones (reliability $CR = .66$, $AVE = .50$) and washing machines (reliability $CR = .69$, $AVE = .53$).

Perceived cost of repair. As described under 4.1, the perceived cost of repair was split into behavioural costs of time and effort (reliability smartphone $CR = .80$, $AVE = .52$; washing machine $CR = .82$, $AVE = .55$), and financial costs as the expected expenditure for repair, with a reliability of $CR = .79$, $AVE = .69$ for the smartphone cost and $CR = .84$, $AVE = .74$ for the washing machine cost.

Material setting for repair. This 1-item measure assessed the availability of service institutions where smartphones, or washing machines respectively, can be repaired.

Social setting: Social support for repair. Receiving support from social contacts was measured by two items, with the reliability of smartphone $CR = .73$, $AVE = .59$ and washing machine $CR = .79$, $AVE = .66$.

3.2.3 Statistical analysis

The research questions are addressed by two separate models predicting the lifetime of smartphones and washing machines as described in section 3.1, figure 2. The models test the link of certain lifetime-prolonging or shortening practices with the usetime of the last device. The model further includes predictors of repair practice, which tests agency and setting-related predictors of self-reported repair behaviour in the past.. The model was applied each for the case of washing machines as a white good, “workhorse” product type, and smartphones as an example of “up-to-date” product type. Both models were implemented by structural equation modelling (SEM) with latent variables, using R lavaan. While other practice theory inspired quantitative studies used cluster analysis to identify patterns (Manderscheid 2019, Browne et al. 2013), we choose the SEM approach for its capability to estimate the multiple and interrelated dependencies of a complex set of variables. To address the research questions, we took a 2-step approach in our analysis. We first conducted a confirmatory factor analysis to establish latent construct validity and reliability, and then tested the relationship between predictors and the outcome variable in structural equation models (Bagozzi and Yi 2012; McDonald

and Ho 2002). Not all variables are normally distributed and some missing variables occur due to the option of answering 'does not apply to me / I don't know'. Therefore, assumptions for normally distributed data and full data sets were not given, and robust maximum likelihood (MLR) with Yuan-Bentler Correction and Huber-White estimation of standard errors was indicated and applied (Steinmetz 2015). Further, error variance of single-item predictor constructs were fixed to 10 % of the indicator variance (ibid.).

4. Results

4.1 Differences in meanings and practices between washing machines and smartphone

The participants reported that they used their last washing machine for about 10 years and their last smartphone for 2.7 years (see table 3). An overall comparison of the predictors and outcomes for washing machines smartphones revealed that in both cases, repair rates were quite low: About 26% of washing machine users and 12% of smartphones users repaired their last device. The construct "repair practice" was a sum score made up of 8 items asking about current or past repair experiences. About 46% never repaired a washing machine, and 75% never repaired a smartphone. 30% of the washing machine users and 16% of smartphone users had only one repair experiences.

The personal meaning of novelty is higher for smartphones than for washing machines. Accordingly, purchase practices for smartphones were more driven by the wish for novelty and by opportunities like attractive deals and offers. In the case of washing machine, decreasing functionality initiated replacement more often. The meaning of longevity was not assessed for smartphones and washing machines separately but for products in general. Behavioural and financial costs of repair are generally perceived as rather high, and repair competence are low. The means for infrastructure and social support are medium for both product types.

Table 3. Descriptive results and differences between product types

	Washing machine (N=675)			Smartphone (N=552)		
		<i>M</i>	<i>SD</i>	<i>N</i>	<i>M</i>	<i>SD</i>
<i>Product lifetime</i>		10.12	5.81		2.71	1.46
<i>Meaning</i>						
Meaning of longevity		3.94	0.87		3.62	0.95
Meaning of novelty	N = 674	2.76	1.1	N = 546	3.22	1.13
<i>Repair practice</i>						
Repair practice*		0.86	0.97		0.34	0.68
Past self-repair**		8.15%		N = 546	4.03%	
Past repair by service**		26.37%		N = 546	11.90%	
Repair habit **					4.17%	
Experience of self-repair **		6.37%				
Behavioural cost of repair		4.34	0.74	N = 546	4.35	0.7
Financial cost of repair		3.2	1.18	N = 546	3.21	1.13
Repair competence		2.5	1.08	N = 546	2.57	1.04
Social support for repair	N = 673	2.92	1.12	N = 544	2.96	1.08
Infrastructure for repair	N = 656	3.16	1.24	N = 523	3.11	1.3
<i>Other practices</i>						
Replacement due to functionality	N = 643	4.1	1.36	N = 506	2.63	1.25

Replacement due to novelty	N = 643	2.13	1.16	N = 507	2.96	1.25
Replacement due to opportunity	N = 641	2.36	1.44	N = 508	2.91	1.79

Note. N = full sample if not stated otherwise. Values range on a Likert Scale of 1=low to 1 = high.

* range = 1-8; ** percentage of participants who report any type of repair behaviour or habit.

4.1 Predicting product usetimes and repair practices

As a first step, a confirmatory factor analysis tested the factor structure. It revealed good model fit for the models as presented in the description of table 4. The table further lists correlations between all included constructs for the model predicting washing machine usetime in the lower left corner and for the model predicting smartphone usetime in the upper right corner. The table reveals that the meaning of novelty and the practice of purchasing a new product due to the high meaning of novelty are highly correlated. Also financial and behavioural costs correlate highly. In the case of washing machines, replacement due to novelty is also closely linked to purchase due to opportunity. Further, behavioural and financial cost of repair are highly correlated and competence, social support and infrastructure are also closely linked.

In the second step, structural equation models were calculated for washing machines and smartphones (Table 5).

The models revealed that the lifetime of washing machines could not be predicted by any practice or meaning that was assessed in the survey. Therefore, we found no answer to RQ1 in the case of washing machines and all related hypothesis were not verified. Notably, both for smartphones and washing machines, repair behaviour was not linked to longer usetime, which contradicts our hypothesis H1.1. Yet, the smartphone lifetime is shortened by the meaning of novelty: participants kept their phone for a shorter period of time if it was important to them to own a device of the newest technology. Smartphones are also discarded of more quickly if there is an attractive offer. Both results support H1.3 for the case of smartphones.

Table 4. Correlations of constructs (washing machine N = 675, smartphone N = 552)

	1	2	3	4	5	6	7	8	9	10	11	12
1 Usetime		n.s.	.21	-.21	-.21	.16	-.28	n.s.	n.s.	-.17	n.s.	n.s.
2 Repair practice Replacement	n.s.		.13	n.s.	n.s.	.13	-.15	-.37	-.33	.32	.28	.20
3 functionality	.11	n.s.		-.21	-.35	.36	-.35	n.s.	n.s.	n.s.	.15	n.s.
4 Replacement novelty Replacement	-.10	-.18	-.38		.36	-.42	.74	n.s.	.20	.24	-.16	n.s.
5 opportunity	-.10	n.s.	-.15	.55		-.19	.37	n.s.	.12	n.s.	n.s.	n.s.
6 Meaning of longevity	.11	.11	.17	-.11	n.s.		-.47	n.s.	-.22	n.s.	.35	.12
7 Meaning of novelty <i>Repair:</i>	-.10	-.20	-.14	.69	.38	n.s.		n.s.	.20	.27	-.17	n.s.
8 Behavioral cost	n.s.	-.39	.12	n.s.	n.s.	.10	.15		.52	-.40	-.36	-.24
9 Financial cost	n.s.	-.52	n.s.	.17	.09	n.s.	.28	.55		-.21	-.38	-.36
10 Competence	n.s.	.34	n.s.	.12	.10	.18	n.s.	-.47	-.36		.45	.44
11 Social support	n.s.	.26	n.s.	n.s.	n.s.	.26	n.s.	-.27	-.32	.47		.53
12 Infrastructure	.07	.24	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	-.28	.38	.42	

Note. Level of significance: $p < .05$.

Lower left corner: washing machine, model fit: $\chi^2 (214) = 459.12$ $p < .001$, RMSEA = .043 [.037 – 0.48], SMSR = .038, CFI = .959, TLI = .943

Upper right corner: smartphone, model fit: $\chi^2 (247) = 481.97$, $p < .001$, RMSEA = .032 [.028 - .036], SMSR = .032, CFI = .966, TLI = .956

Table 5. Structural equation models predicting usetime of washing machines (N = 684) and smartphones (N = 552)

	Washing machine (N = 675)					Smartphone (N = 552)				
	<i>b</i>	<i>se</i>	β	<i>z</i>	<i>p</i>	<i>b</i>	<i>se</i>	β	<i>z</i>	<i>p</i>
Predictors of lifetime										
Meaning longevity	0.08	0.05	.08	1.57	.116	-0.01	0.06	-.01	-0.11	.915
Meaning novelty	-0.05	0.10	-.05	-0.50	.617	-0.34	0.11	-.32*	-3.20	.001
Repair practice	0.04	0.04	.05	1.13	.259	-0.04	0.05	-.04	-0.85	.395
Replacement functionality	0.08	0.04	.08	1.94	.052	0.09	0.06	.09	1.53	.126
Replacement novelty	0.00	0.06	-.01	-0.07	.940	0.09	0.07	.13	1.33	.185
Replacement opportunity	-0.06	0.05	-.06	-1.25	.210	-0.11	0.05	-.12*	-2.17	.030
				$R_2 = .03$					$R_2 = .11$	
Predictors of repair practice										
Meaning longevity	0.12	0.05	.10*	2.33	.020	0.06	0.07	.05	0.77	.439
Meaning novelty	-0.14	0.05	-.12*	-2.96	.003	-0.20	0.06	-.17*	-3.29	.001
Behavioural cost	-0.16	0.07	-.14*	-2.27	.023	-0.22	0.08	-.21*	-2.91	.004
Financial cost	-0.43	0.07	-.38*	-6.37	<.001	-0.19	0.06	-.19*	-3.14	.002
Competence	0.13	0.08	.11	1.76	.079	0.29	0.10	.25*	2.87	.004
Social support	0.01	0.07	.01	0.15	.882	-0.05	0.09	-.05	-0.63	.531
Infrastructure	0.11	0.06	.09	1.89	.059	-0.02	0.07	-.02	-0.35	.729
				$R_2 = .03$					$R_2 = .22$	
Predictors of replacement due to functionality										
Meaning longevity	0.18	0.05	.17*	3.34	.001	0.25	0.06	.23*	3.83	<.001
Meaning novelty	-0.16	0.05	-.16*	-3.43	.001	-0.29	0.06	-.26*	-4.53	<.001
				$R_2 = .03$					$R_2 = .17$	
Predictors of replacement due to novelty										
Meaning longevity	-0.14	0.05	-.10*	-2.64	.008	-0.17	0.08	-.11	-2.22	.027
Meaning novelty	0.96	0.08	.69*	11.37	<.001	1.11	0.11	.71*	10.14	<.001
				$R_2 = .03$					$R_2 = .59$	

Predictors of replacement due to opportunity

Meaning longevity	-0.09	0.05	-.08	-1.89	.058	-0.06	0.07	-.06	-0.95	.340
Meaning novelty	0.41	0.05	.38*	7.70	<.001	0.37	0.07	.34*	5.61	<.001
					$R_2 = .03$					$R_2 = .14$

Predictors of behavioural cost of repair

Competence	-0.55	0.10	-.48*	-5.53	<.001	-0.31	0.08	-.28	-3.75	<.001
Social support	-0.14	0.07	-.12*	-1.98	.048	-0.18	0.07	-.17	-2.49	.013
Infrastructure	0.22	0.06	.19*	3.58	<.001	-0.04	0.06	-.04	-0.69	.493
					$R_2 = .03$					$R_2 = .17$

Predictors of financial cost of repair

Competence	-0.26	0.08	-.23*	-3.15	.002	0.09	0.08	.08	1.06	.288
Social support	-0.17	0.08	-.15*	-2.14	.032	-0.35	0.09	-.32	-4.00	<.001
Infrastructure	-0.14	0.06	-.13*	-2.41	.016	-0.26	0.08	-.23	-3.36	.001
					$R_2 = .03$					$R_2 = .20$

Covariates

Competence - social support	0.48	0.05	.48	9.38	<.001	0.44	0.07	.44	6.46	<.001
Competence - infrastructure	0.38	0.05	.38	7.59	<.001	0.42	0.05	.42	8.06	<.001
Social support - infrastructure	0.43	0.05	.43	8.92	<.001	0.52	0.05	.52	10.47	<.001

Notes. * significant at the <.05 level.

Model fit washing machine: χ^2 (243) = 592.36, RMSEA = .047 [CI .043 - .052], SMSR = .061, CFI = .942, TLI = .929.

Model fit smartphone: χ^2 (243) = 478.09, RMSEA = .043 [CI .037 - .049], SMSR = .043, CFI = .949, TLI = .937.

Perceived financial costs were the prime barrier for repair practice both in the case of smartphones and washing machines, and also expected behavioural costs discourage participants to repair their devices, which supports H2.2 and H2.3. Also, the meaning of novelty was weakly related to less repair practice. The meaning of longevity only predicted repair practice of washing machines. Repair competence only predicted repair practice for smartphones. The other setting variables, social support and infrastructure, did not directly predict repair practice. Rather, these setting variables and competence are linked to lower perceived behavioural and financial cost, which in turn is linked to more repair. Thus, H2.1 could not be supported as it is, but needs to be completed by the mediating effect of the perceived difficulty to repair. Again, the constitutive elements of practices (social and material setting, competences) correlated highly which shows that a social practice inspired perspective is worthwhile.

A very obvious difference between the two products tested was that the usetime of washing machines could not be predicted by any of our constructs, thus H3.1 could not be tested or only be supported for smartphone. We discuss the possible reasons and implications in the last section. As already mentioned we found a higher significance of social meanings of novelty in case of smartphones and a higher frequency of purchases due to novelty in the case of smartphones compared to washing machines. This supports H3.2 to some extent, but we found a negative influence on repair by the meaning of novelty in both cases. Zooming in into practices of replacement, we found in both cases that they were predicted by meanings: Replacement due to a loss in functionality was linked positively to the meaning of longevity and negatively to the meaning of novelty. Replacement due to the wish for novelty was negatively linked to the meaning of longevity and positively to the meaning of novelty, and the replacement due to opportunity is also positively linked to the meaning of novelty. This means that people for whom novelty is an important social meaning are more likely to buy a new washing machine or smartphone if there is something new on the market or they receive a good offer. They are less likely to wait for the occasion where the current device does not work anymore.

In contrast, if people value longevity they are more likely to wait until a smartphones or a washing machine is not functional anymore before they buy a new device. They are also less likely to seek novelty by buying something new, but only in the case of washing machines.

Figure 3: Main predictors of smartphone usetime and smartphone repair

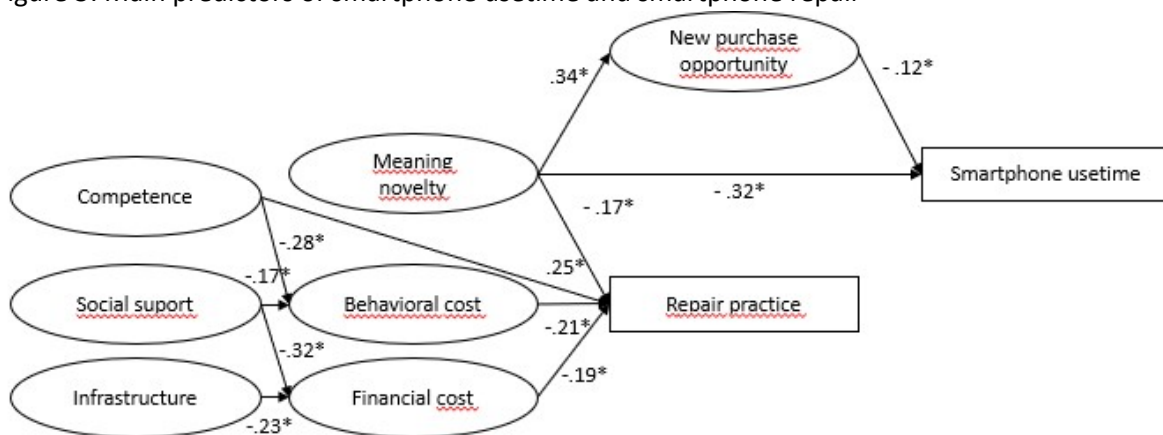
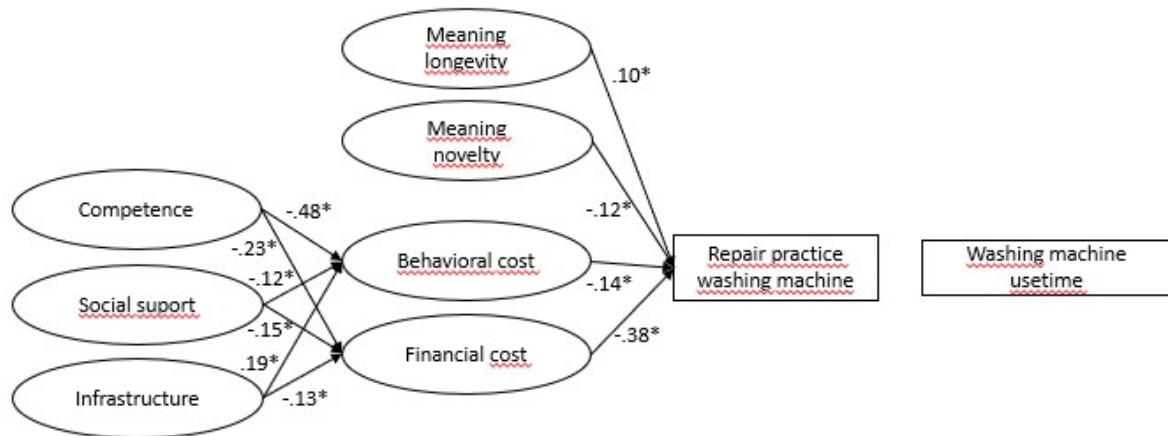


Figure 4: Main predictors of washing machine repair (none of the tested factors predicted washing machine usetime)



5. Discussion

The purpose of this study was to shed light on forms of individual appropriation of objects and object-related social practices that are relevant to their usetimes. We focused on predictors of repair and compared the relative significance of agency and setting related aspects. Moreover, we compared different object-related practices in their influence on the length of product usetime. Questionnaire based face-to-face interviews with a representative sample of people living in Germany provided a database that was analysed based on two predictive models.

A first overall comparison between meanings and practices related to smartphones versus washing machines revealed that novelty as a social meaning is more significant for the consumption of smartphones. This corresponds to other studies that found that up-to-date-products are generally more likely to be recognized for their novelty, or their correspondence to the latest technological standard, as Cox et al (2013) already described it in their typology of products. Novelty is also an important social meaning for replacements of smartphones, which supports Cooper's (2004) observation that products with short innovation cycles are more likely to be replaced early even though they still work. Replacements of washing machines seem to be mainly triggered by the object (functionality). It is important to note that for both products, setting and agency related factors are more likely to impede than to enable repair: Behavioural and financial costs for repair are perceived as high and competences as low. Both results can be related to other findings that highlight the role of behavioural costs and personal know-how for repair (McCollough 2009, Gregson et al. 2009). What our study could add here are more thorough analyses of the relative significance and interaction of settings and agency, meanings and costs, competence and support for repair and – at least in the case of smartphones – for product usetime. Given the fact that many studies on product lifetimes highlight the importance of repair, it is quite surprising that in our survey repair did not prolong the usetime of products. This could mean that repair is simply not important enough to increase product usetimes. Or it might be an effect of the low prevalence of repair in our sample (see 4.1). In the case of smartphones the non-significant role of repair for product usetimes can be due to the strong influence of novelty as a social meaning and the temptation of purchase offers. But we failed to find the predictors of usetimes of washing machine among the tested constructs. Thus, the usetime of washing machines might be predicted better by object-related aspects, like the brand or the price of the machine (as an indicator of its quality). It is also possible that other meanings or

social/ infrastructural factors are more relevant whom we did not cover by our survey. Nevertheless we could shed some light on object related practices and what influences them. Our findings can be summarized in two main conclusions: 1. Repair is impracticable in a culture of non-repair, and 2. Novelty seeking is a socially supported thread to longevity. We will describe each conclusion in the following sections. We will conclude with a discussion of our conceptual and methodological approach and its shortcomings and benefits.

5.1 Repair is impracticable in a culture of non-repair

We found that repair as an object related doing can best be predicted perceived behavioural and financial costs of repair. The material and social setting, in our case available repair services and social support, influence repair indirectly through perceived behavioural and financial costs. Smartphone repair is also predicted by self-ascribed competence. Since competence is mostly perceived as low and the costs of repair (time, energy, money) are perceived as high, it is not surprising that the overall repair rate is low. We can assume that in their everyday life people have little extra time for repair, especially when there are children to care for and fulltime-employment. On the other hand a new product is easily available via online-shopping. While repair is perceived expensive, special offers are just around the corner. Repair is quite simply impracticable. Although longevity as a social meaning received high ratings ($M=3.94$ and 3.62 , see table 2), it does not predict that a device is used longer. Thus, our study of repair as a social practice is more likely a study of structures of non-repair, where human agents are locked in incompetence and repair-impeding settings. An obvious strategy would be to foster the availability and affordability of repair services and look for means to boost the competences of consumers. But doing longevity also competes against the desire for novelty and the omnipresence of new products and replacement opportunity. Novelty seems to be a meaning that is much more relevant to product lifetimes in particular and current material culture in general than longevity, although on the upside, longevity is valued higher than novelty. Providing a setting that reduces barriers to repair may help users living up to their values of longevity.

5.2 Novelty seeking is a socially supported thread to longevity

Our study investigated the role of novelty in two ways: Firstly, novelty was explored as a social meaning of product related practices. Secondly, we explored replacements due to novelty as compared to functionality or opportunity. The SEM we conducted for the prediction of usetimes was quite complex and so are the patterns it revealed. At first glance novelty is more important to the usetime of smartphones: Replacements due to novelty seem to frequently shorten the serviceable life of a smartphone in use. But for both devices a high meaning of novelty decreases repair and increases the likelihood of replacements due to opportunities and due to the desire for something new. It could be assumed that novelty seeking influences how much attention is paid to replacement opportunities. Novelty as an important social meaning decreases the likelihood that a person buys a new device only after the current one was dysfunctional. This also means that the functionality of a product is more important for replacements when novelty is not a relevant meaning. These assumptions need to be tested further, but it could be an interesting shift of focus to investigate more thoroughly what turns people to new products instead of what drives them away from the old. Thus not the “obsolescence of desirability” (Packard 1960) but the “affordance of the desired” should attract more attention. The social meaning of novelty should not be treated as an individual characteristic. It is part of a social practice that is embedded in systems of consumption and production that favour the new instead of the old. Novelty seeking is only put into effect, if there is novelty to be found. Thus, the material and social settings that are promoting and nourishing novelty seeking should be focused more thoroughly. These are for example, offensive marketing strategies,

the pervasive innovation euphoria or business models that build on phone subscriptions offering new devices every year

Building on these assumptions we would like to encourage a more differentiated discussion on psychological obsolescence that could lead to better heuristics for the study of human agency in the social production of obsolescence. Based on our investigation we would propose to consider at least two dimensions: Firstly, symbolic obsolescence where shorter useful lives are associated with social meanings of novelty and assignment of value to new instead of the old (e.g. newism). Secondly, afforded obsolescence where short useful lives are facilitated by material settings, e.g. the relative behavioural costs of keeping or replacing an object. Both dimensions are not distinct but interrelated in multiple ways. Nevertheless, they could help to overcome an inappropriate individualisation of agency related obsolescence.

Novelty seeking is of course not everything. We also found that longevity as a meaning predicts repair practices (for washing machines), discouraged purchases due to novelty (for washing machines) and encouraged purchases due to functionality (for both devices). We can assume that if longevity means something to a person, the function of a product in use is more important than replacement opportunities or the temptation of the new. It is also important here, that the human-object relation to washing machines as a workhorse is different to smartphones as an up-to-date product (Cox et al. 2013). Workhorses mainly need to fulfil a functional purpose (as opposed to a social, aesthetic or conspicuous one) and are mostly kept as long as they do so. Compared to this, smartphones are more often not kept long enough to show serious functional failures since their value is mainly assessed by their up-to-datedness. Thus, it depends on the material setting (of which objects are part) whether meanings of novelty or longevity 'translate' into product lifetime.

5.3 Conceptual and methodological shortcomings and benefits

A main shortcoming of our study is that even though we applied a complex model with many factors, we could not shed light on predictors of the usetime of washing machines. We could only show what seems to be not important. But we believe that also non-significant results can help to understand social reality.

A further possible shortcoming is that we relied on self-reported behaviour and self-assessed personal, social and infrastructural aspects. While this is a general problem of all survey or interview based approaches, our intention was to zoom in into the lifeworld of consumers and see how the aspects we were interested in, unfolds for them. As indicated above, we assume that quantitative interviews are able to provide information about everyday routines and product-related doings and sayings. We think that a personal interview where people have more time to reflect on the questions are more capable of catching these routines than an online survey.

We undertook the somewhat risky approach to adopt an SPT inspired approach in a quantitative study. As already discussed in section 3, this is unusual and can be criticized as inappropriate for the holistic and social constructivist perspective that SPT promote. Furthermore, we did not only quantify observable behaviours or other more or less objective measures, like other studies on social practices. Instead, we tried to reconstruct practices and practice relevant settings and competences as they are perceived or observed by the human agent. Our approach has advantages and disadvantages. An advantage is that we were able to find generalizable patterns of how agency and setting related aspects create a culture of non-repair. With quantitative methods it is possible to process a high number of individual perceptions and self-descriptions. Even if face-to-face interview as a reflexive method triggers socially desirable reports of the self, our analytical approach enabled to differentiate between those meanings that are more relevant for sayings (longevity) and those

relevant for doings (novelty). Moreover, although we focused on agency, we could reveal the powerful influence of social and material settings on individual doings.

Nevertheless, quantitative methodologies reach their full potential when a standardized, linear and deductive procedure is followed. But since the assumptions of SPT cannot be operationalised in the usual sense, for example by defining causal relationships between distinct factors, a standardized procedure from uni-directional hypotheses to appropriate statistical tests is not possible. Thus, our own approach was more circular than standardized and linear which can clearly be criticized. Since quantitative methods do not allow thick and holistic descriptions of social practices but mainly highlight some elements of them, we also got some results that are surprising and cannot be fully explained yet. To fully explain, for example, why repair in our study did not prolong the usetime of a product, we would need further or other qualitative and quantitative inquiries. Our study could replicate some findings of other repair-related research, like the low prevalence of repair. But the low number of cases was also a challenge to our analysis. Our pragmatic decision to not differentiate between DIY repair and using repair services was necessary for conducting the SEM, but is clearly a shortcoming of our study.

To sum it up, our study supports the assumption, that quantitative methods can complement qualitative investigations of social practices, if their strengths are exploited and their explanatory power not over-interpreted.

6. Conclusions

Even though our findings represent accumulated individual perceptions of market structures and systems of provision and not describe the nature of these structures as such, they allow some assumptions for the promotion of repair as a social practice. We assume that promoting repair and valuing longevity are not naturally leading to product longevity. Longevity needs to be cared for in product-related practices on an everyday basis. We find some evidence for the important role of know-how and competence for product-related practices. Further research should investigate more thoroughly under which conditions a person is more likely to care for an object and how product-related know-how is appropriated. Policy measures should not only try to foster a general “Right to Repair” but also the capability to repair. Secondly, longevity needs to be cared for in the re-configuration of material settings as part of current material culture. Material settings facilitate novelty seeking instead of doing longevity and offer more opportunities to acquire something new than to keep the old.

We argue that material and social settings for repair are important but would hardly suffice, as long as novelty and innovation remain the more important and dominant meanings in current practices of consumption and production. For the debate on circular economy this means that related strategies of slowing the loop and sufficiency oriented economic practices are much more important for sustainable consumption of products than closing-loop strategies (see also Hofmann, 2019).

Since repair is not only difficult for consumers but also full of barriers for those who could or would provide the services (see Peach et al. 2020, Deloitte 2016) we would argue that concerted strategies are needed to decrease transactions costs for all participants of the value chain. These concerted political strategies can include combinations of regulations, tax reductions and subventions that favour repair and facilitate adoption of repair business models. A further strategy could be to form a repair alliance among different sectors and stakeholders (businesses, start-ups, NGOs, policy makers, consumer association, research institutes, etc.) that collaborate in the provision of services and in facilitating access to repair tools and repair knowledge. A strategy that might reveal its impact in the long run is to foster training and education for repair. These could be formal trainings to re-establish the repair profession but also the integration of repair as a basic skill in school education.

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Annexe A: Questionnaire

Personal meaning of novelty

It is important for me to use a smartphone / washing machine that is on the level of the newest technology.

To have the newest model signifies quality of life to me.

It is a great feeling to own a completely new smartphone / washing machine.

Personal meaning of longevity

I feel obliged to use devices as long as possible.

I would have a bad conscience if I bought a new device although the old one is still working.

It is also my personal responsibility to protect the environment.

Social meaning of longevity: 'People in my surroundings...'

... would always first try to repair or let repair electronic devices before replacing them with a new one.

... try to use their devices as long as possible.

... take care of and maintain their devices

Perceived behavioural cost of repair

Please indicate on a 5-point Likert scale between these semantic differentials:

Takes no effort – takes a lot of effort

Takes no time – takes a lot of time

Takes no knowledge – takes a lot of knowledge

Perceived financial cost of repair

Please indicate on a 5-point Likert scale between these semantic differentials:

Cheap – expensive

Does not pay off financially – pays off financially

Repair competence

I understand how my smartphone / washing machine is built and how it works.

I know what to do if my smartphone / washing machine is not working.

Social support for repair

People I know can help me if necessary in repairing devices or having them repaired.

I can ask people in my surroundings whether repairing a device is worthwhile.

Material setting / infrastructure

There are enough service providers in my vicinity where I can have my smartphone / washing machine repaired.

Repair behaviour: coded yes if any of the following items were answered with yes:

I repaired my current smartphone / washing machine myself.

I had my current smartphone / washing machine repaired by a provider.

I repaired my last smartphone / washing machine myself.

I had my last smartphone / washing machine repaired by a provider.

I repaired another smartphone / washing machine myself.

I had another smartphone / washing machine repaired by a provider.

Care behaviour

Washing machine:

I regularly use water softener.

I regularly decalcify my washing machine.

I regularly clean the pipes of my washing machine.

I regularly conduct a cleansing wash cycle, i.e. an empty wash cycle to clean the machine.

Smartphone: recoded –

The device falls down or hits things.

The device gets wet

The device is exposed to heat.

The device is exposed to the cold.

Replacement: ‘Reason for replacement of current device: I bought a new device, because...’

Due to novelty:

... a newer model came on the market, or because I wanted to have a new model.

... I discovered a model with a more attractive design.

... a new device gives me pleasure.

... I had the impression that I had used my last device long enough.

Due to functionality:

... because the device did not work anymore.

Due to opportunity:

... because I found a special offer (washing machine) / ... because I was offered a new smartphone as part of my contract.

Product lifetime:

For how many months (smartphone) / years (washing machine) did you use your last smartphone / washing machine?