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Bought today gone tomorrow? From linear to circular consumption[1]

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In 2010, 3.5 million tons of waste were produced all over the world every day, by 2025 this amount is expected to almost double, and to triple by 2100 (Hoornweg, Bhada-Tata, Kennedy, 2013). In the EU alone, 13.5 kg of waste was generated per capita per day in 2015 (Eurostat, 2014). An increasing proportion of these are electrical devices that create social-ecologocial damage not only as waste (Wang, Huisman, Stevels, Baldé, 2013), but also by the mining of resources, by high emissions and low occupational safety during production and transport (Hütz-Adams, 2012). The negative socio-ecological effects are exacerbated by the fact that many consumer items, in particular electrical appliances, are often used much less than the technical lifespan would allow and are often replaced, although they still work or can be easily repaired (Jaeger-Erben, Winzer, Marwede & Proske, 2016; Prakash, Dehoust, Gesell, Schleicher & Stamminger, 2016; Jaeger-Erben & Hipp, 2018). At the same time, extending the useful life is an important lever for more sustainability in the consumption of everyday objects.

"We live in a throwaway society." This - often fatalistically connoted - statement is constantly expressed in interviews, surveys or media discourses on the subject of modern consumer culture. Correspondingly, in a survey from 2017, 94% of the participants agreed with the statement (Jaeger-Erben& Hipp, 2017).

If one were to believe this perception, the question of the social drivers of product obsolescence, i.e. the too short useful life of consumer goods, would be answered very quickly: Disposable production and disposable consumption go hand in hand and are symptomatic of a modern, negligent use of finite resources. This perception has a counterpart in the material reality that presents itself in the form of "gigantic mountains of electronic thrash" and an "incalculable trail of hazardous waste" (Oetzel 2012, translation by author). Thus, is the diagnosis correct? The term "throw-away society" was framed in the second half of the 20th century (see for example Packard, 1960) and was constantly referred to in the context of growth- and consumption-critical debates that followed. There is talk of a cultural

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“throw-away mentality” and it is observed that the amount of consumer goods and particularly electronic devices in everyday life constantly increases (Oetzel, 2012).

However, terms such as “throw-away society” only scratch the surface of the modern consumer culture. In fact, the amount of waste per capita per year is increasing worldwide, but national trends vary greatly from one country to another(Trentmann, 2016). Nevertheless, a linear economy is based upon or inseparably entangled with different forms of linear consumption. Both base on a more or less explicit, but common definition or meaning of value: Value is created by taking natural resources and transforming them into products. As soon as a product enters the market, its value is usually the highest, be it monetary or symbolic, since new products are often favoured before used products. After a product is sold, its value is exploited until it is finally disposed of. Since refurbishment, reuse or recycling schemes are far away from being mainstream, the product is stored away, particularly if it is a small item, or it is landfilled or thermally processed.

In contrast, circular economy concepts do not only consist of new forms of designing and processing or alternative business models, they also promote an alternative way of thinking and valorisation. Not only the value of the product is supposed to be preserved, but the value of eco-systemic reproduction and recovery is acknowledged. While the technological and organisational transformation of current systems of consumption and production into a circular economy is already a tremendous challenge, a change of mind-sets, social meaning and societal narratives around value, or better: a profound cultural change, seems as unavoidably as it is demanding. It is argued here, that a main prerequisite is a thorough understanding of how obsolescence is produced in our current material culture.

This chapter presents some conceptual reflections as well as empirical results from interdisciplinary research on the causes and drivers of obsolescence of consumer goods, particularly electronic devices. A basic conceptual differentiation is that obsolescence should be approached with a:

1. Focus on material manifestations: The too short life of products manifests on the one hand materially, for example, in the disintegration of the material and the loss of originally planned functionality, but also in the acceleration of material flows or the height of electronic waste mountains.
2. Focus on manifestation in communication and discourses: On the other hand, the lifetime and useful life of products is the subject of social discourses and narratives dealing with social and technological change and the consequences of modern forms of production and consumption. Obsolescence is also a matter of negotiation and allocation of meanings, values and norms.

Both manifestations of obsolescence are closely related, but sometimes the discourse is disconnected from material reality and tends to become independent, which can be challenging for overcoming obsolescence or promoting sustainable production and consumption, as we will see in the following. In this chapter, we will describe discursive and material practices in (re)producing obsolescence based on conceptual and empirical insights.

Finally, the problem of one-sided or linear explanatory models and causal attributions is pointed out and a systemic perspective on obsolescence is sketched.

Obsolescence as a social construct

The confrontation with the value of consumer objects and a certain discomfort in view of growing mountains of waste is not a modern phenomenon. While in the mid-20th century it was rather a fear of decadence and waste, nowadays it is more of a concern over increasing pollution (Trentmann 2016: 836) that causes discomfort.

The history of obsolescence is a history of the relationship between society and its consumer goods that is reproduced in social practices of consumption and production. Throughout history, the value of a product and the corresponding diagnosis “useful” or “obsolete” has changed almost independently from how the design or material properties of a product changed. For example, even though durable consumer goods such as an electronic mixer got more complex in their function and more resource-intensive in their production, their value did not increase in general. On the contrary. globalised mass production and the pervasive availability of electronic consumer goods have led to a massive decline in the monetary and practical value of the single device.

Becoming obsolete is not a natural process but a process of actively devaluating and invalidating an object until being no longer useable or useful. What is considered as useless and no longer worth preserving - for example, through repair, upcycling, functional or aesthetic reuse - is therefore also the result of a social construct and not a predefined property of a consumer object that is determined by the product developer or manufacturer. Thus, in this social constructivist reading, there is no clear distinction between absolute or relative obsolescence - as Cooper (2004) suggests – because it is always relative in the sense of a comparison between obsolete / useless / dysfunctional and non-obsolete / used / desired / functional.

A more social constructivist perspective is also reflected in Science and Technology Studies (STS) that define consumer goods as something that is actively produced or transformed to an object of consumption and commodity in the course of its useful live. “Consumer goods are neither finished nor invisible forms at the points of production and acquisition, but [...] continuously evolving, positioned within and affected by an ongoing flow of consumer practice." (Gregson et al., 2009: 250). Although certain usage modes and the range of object performance are to a certain extent inscribed into an object Akrich 1992), it is the practice of usage that constitutes what an object becomes. Thus, the user or consumer might overwrite what was inscribed by design ("description", ibid.) as the object is used and here it is decided whether the intended uses and services are actually realised. Product designers and users are thus connected. Teir knowledge, their expectations and their practices indirectly interact with each other via the object.

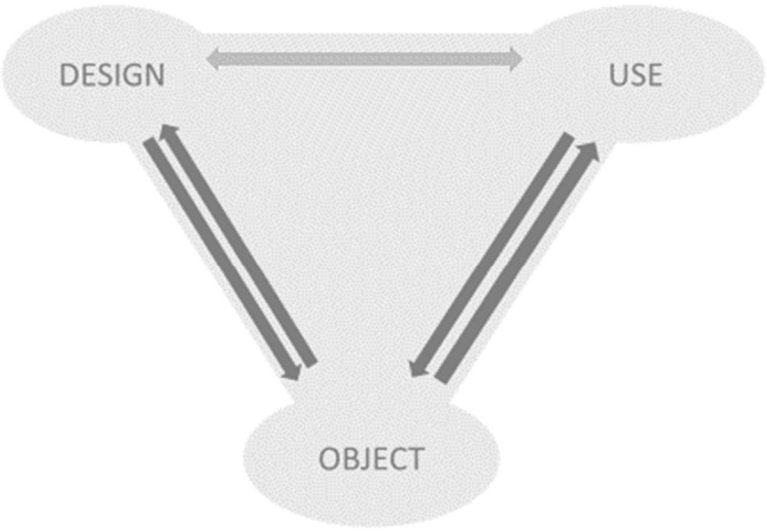

Figure 1: In order to understand social drivers of obsolescence, the "triangular relationship" of design, use and consumer object must be taken into account

An analysis of the social drivers of obsolescence thus has to decipher the dynamic "triangular relationship" (Figure 1) of design, use and object in a context-sensitive approach and needs to relate to both: the discursive and the material manifestation of obsolescence. However, as described in the following public discourse, and sometimes even scholarly debate, tends to be more of a linear and one-dimensional understanding of obsolescence.

The Communication of Obsolescence - Insights into Media Discourses

In public discourse, obsolescence is mostly perceived as "planned" or "enforced obsolescence", i.e. a premature passing of a consumer good. The term itself was first mentioned in the early 20th century, particularly during the economic crises. In addition, it was frequently "reactivated" in public discourses as a societal problem in the decades that followed, particularly in times of crisis (Weber 2014). However, a significant intensification of the debate and the emergence of civil society initiatives and campaigns[2] against obsolescence is particularly noticeable since 2011. This intensification coincides with the release of the documentary "The Lightbulb Conspiracy" by Cosima Dannoritzer[3] in 2011, which shows some historical and current cases of an active reduction of the lifetime of consumer goods or at least the active acceleration of a new purchase. The documentary film points in particular to the agency of the manufacturers and the trade and as the "planners" of obsolescence. A perspective that has prevailed in media discourses.

A content analysis of about 200 contributions from online archives of regional and national newspapers on themes such as a "useful life/ lifetimes of consumer goods" or "obsolescence"

[2] An example is the French NGO "HOP – Halte à l'obsolescence programme" or the German organisation Murks NeinDanke e.V.

[3] https://www.videoproject.com/Light-Bulb-Conspiracy-The.html

since 2000[4] , shows that the obsolescence of consumer objects is mainly seen as a deliberate consequence of the "malicious intentions" of manufacturers. Many media contributions start with a presentation of planned obsolescence as a common everyday experience of consumers by introducing the issue with a sentence like "Like all of us have already experienced, the electric toothbrush / printer / mixer stops working as soon as the warranty has expired…".

This perspective is underpinned in media presentations by repeatedly referring to the same examples. This includes cases like so-called "light bulbs cartel", which was formed in the 1930s by the world's largest light bulb manufacturers and which ended in agreements to standardise – and at the same time reduce – the burning time of light bulbs[5]. Another example, which also is a main case in the above-mentioned documentary, is the case of Inkjet printers with smart chips in their ink cartridges that prevents them from being used after a certain threshold (number of pages, time, etc.), even though the cartridge may still contain usable ink or could be refilled. Further examples are electric toothbrushes with glued-in rechargeable batteries or hand-held mixers with fast-wearing plastic wheels. Among these examples are cases like the light bulb cartel, that are vastly researched and relatively unequivocal, but in many cases the burden of proof is more on anecdotes rather than on scientific sources and long-term comprehensive studies. The anecdotal evidence provides no proof, but a presumed proximity to the lifestyle of readers. Furthermore, through the clear victim vs. perpetrator categories, the reader can feel as a potential victim of fraud. The "perpetrator-victim narrative" is also relatively resistant to the results of various investigations that have so far provided no clear or comprehensive evidence for a system of maliciously planned obsolescence[6] and even report rather increasing use- and lifecycles (Oguchi 2017, Trentmann 2017). Although in the course of the publication of results such as the studies of the German Environmental Agency in 2015 and 2016 (see Prakash et al., 2016), several contributions that call into question the generalised charges against manufacturers emerged. However, recent developments in the context of various lawsuits against manufacturers, in particular those based on law on "obsolescence programme" in France, have again led to a significant increase in contributions that view the guile of (many) manufacturers as certainty.

[4] The research based on terms such as obsolescence, lifespan, and product life. The body contains articles from 28 daily and weekly newspapers. The analysis of the articles was oriented towards the approach of discourse analysis (Keller 2011). A qualitative-reconstructive method is often used in the analysis of media to work out how social order and social meanings are constructed and constituted in discourses. The following are some initial results of the ongoing analyzes reported.

[5] While it is for the arrangements of the light bulb manufacturers to limit the burning time of incandescent lamps to about 1 . 000 hours documents are , it is debatable whether this is a conscious, sales increasing deception of consumers * inside or an agreement to standardize the quality of light concerned (Krajewksi 2014) . The central parameters for a light bulb life, light output and power consumption can each be optimized only to the detriment of the other parameters. For example, a more durable bulb will emit less light while consuming the same amount of power, so the desire for brighter bulbs will inevitably affect their burn time. For example, the light output of Centennial Bulb, which has been in operation for over 100 years (see footnote 9), is only 4 watts.

[6] See, for example, studies by the Öko-Institut on behalf of the Federal Environment Agency or the project LOiPE and Wieser et al 2015

It is not surprising that media reports often use simplified representations and categorisations to create a gripping narrative. However, these narratives can be effective and become problematic when they lead to a distorted perception that tends to exacerbate the denounced problem, as discussed below.

Perceptions and experiences of obsolescence - results of consumer research

The medial representation of the causes of short-lived products can affect the perception of the consumers' own role in the productions of obsolescence and their perceived options for action. Different surveys of consumer perceptions show that mainly manufacturers are held responsible for the longevity of products (European Economic and Social Committee 2016). Consumers even seem to expect that their products will have shorter lifespans due to deliberate misconstructions and cite this as justification for their short usage time (Wieser et al 2015).

In order to explore consumer perspectives and practices in the context of product lifetimes and obsolescence, we conducted an online survey in 2017. Participants were recruited by a panel institution and received coupons for their participation. The sample was determined by screen-out conditions so that representativeness for the German population for age, education, income and gender was given. The sample consisted of 2.000 participants between 14 and 66 years of age. The questionnaire contained 44 questions on consumption -related meanings and practices with a focus on washing machines and smartphones, practical knowledge concerning electronic products, the perception of responsibility for products and a number of attitudes around production and consumption.

Concerning the perception of responsibility for products lifetimes, our survey shows that 90% of respondents believe that some manufacturers purposefully built their devices in a way that they break shortly after the end of the warranty period of two years. Far more than half believe that it does not matter how much they spend on electrical appliances, since everything breaks down early anyway. However, when asked if they have ever experienced that an owned device has broken prematurely, more than 60% of the survey respondents denied. That is, the belief in planned obsolescence or the deliberate reduction in the lifetime by manufacturer affects the expectations towards products negatively, although the own experience provides no prove for that (see. Figure 2).

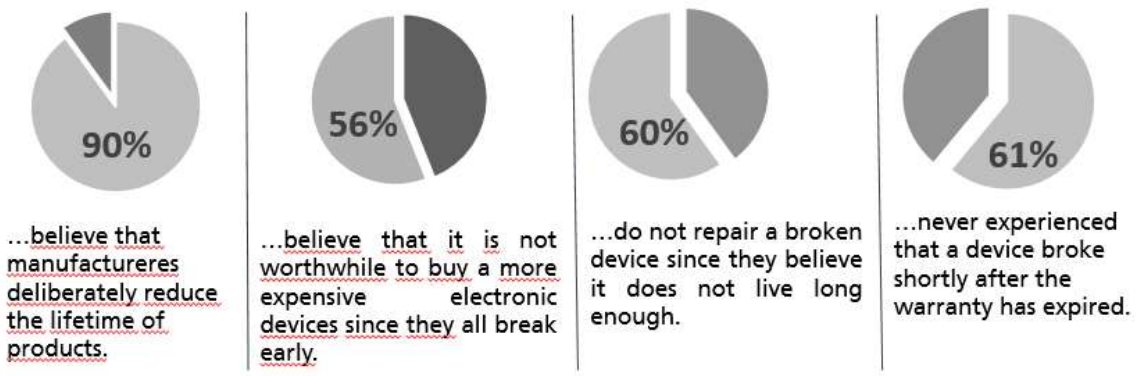

Figure 2: Communicative and material obsolescence in the perception and experience of consumers

The survey also asked about the respondents' experiences with broken devices and the presumed causes for their breakdown. When asked why the last device had reached the end of its lifecycle from the point of view of respondents, the main cause was that they failed due to expected signs of wear and tear (except for smartphones and notebooks) (see Figure 2) .

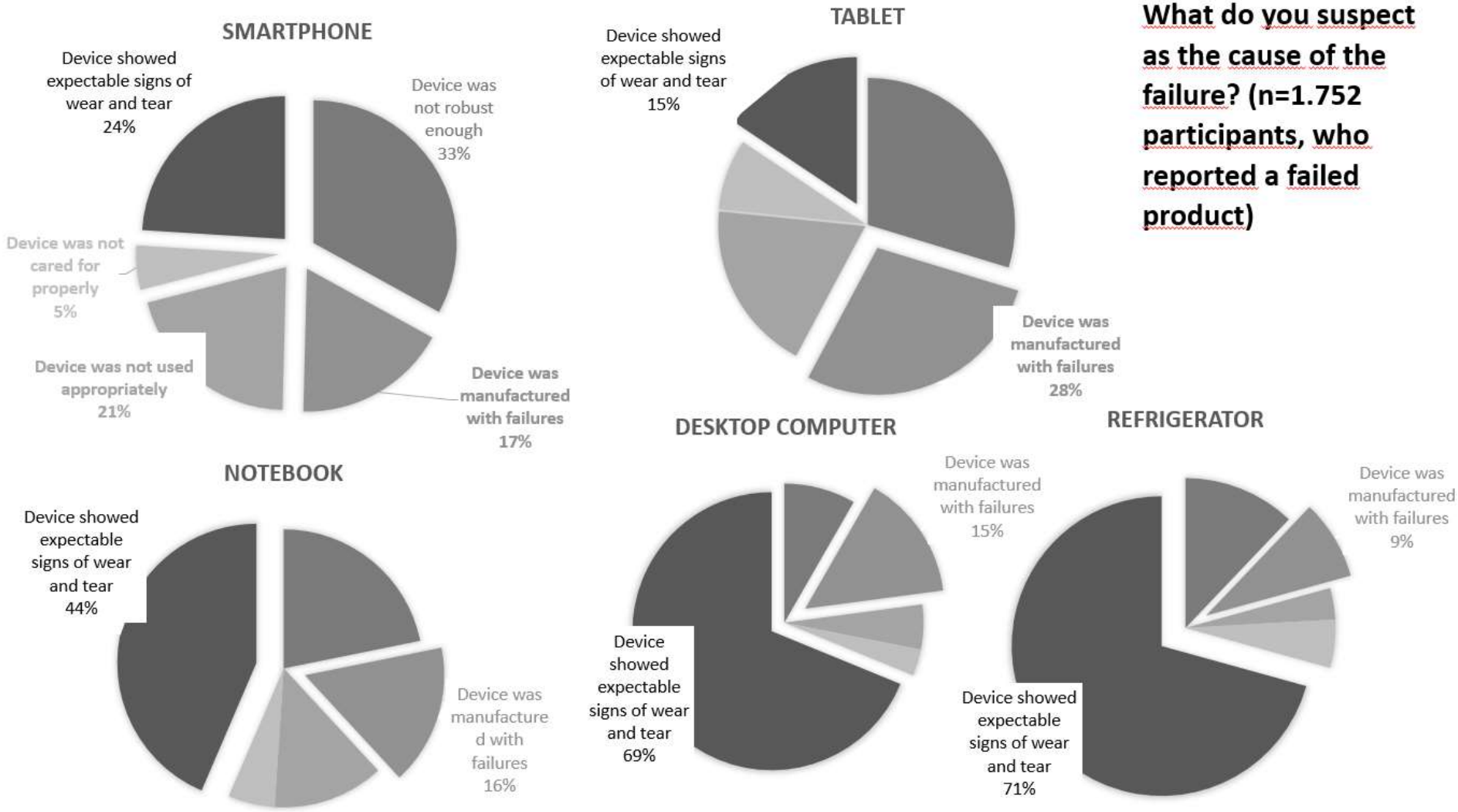

Figure 3: Suspected reasons for the last failure of a device

Thus, the representation in the media does not seem to be an all too common experience. - From the experiences of the survey participants, most devices reach the end of their life in a rather expected way because of anticipated wear and tear. Smartphones and notebooks are an exception, since in most cases respondents suspect a lack of robustness. Both devices are among the most frequently used. This might be the reason why the proportion of devices that have broken down due to improper use is comparatively high.

In line with the interactive relationship between design and usage described above, it is also important to investigate how the usage practices affect the functionality of products. The frequency of care practices or maintenance of washing machines, like decalcifying the machine or cleaning the drawer, can affect its durability. Moreover, the routines of mobile phone charging affect the long-term performance and functionality of the battery. These actions are embedded in everyday practices, which are automated and based on an implicit, practical knowledge. The decisive factor is whether the relevant knowledge for functionality and longevity exists. However, the knowhow often seems to be limited. Among the survey participants, only about 40 % knew how a lithium-ion battery should normally be recharged so that its performance is maintained for as long as possible (Jaeger-Erben and Hipp 2017).

Another important question is whether enough time and space for care and maintenance is available in everyday life. Our survey points out that the proportion of people who do not care for or maintain their devices properly for lack of time is about one third. Thirteen percent do not fix a broken device and immediately buy a new one since they cannot do without the device. Successful conduct of everyday life seems to be based on the fact that devices are functional and available. At the same time, everyday life does not leave enough room for manoeuver to ensure long-term functionality of the devices. This observation adds an alternative perspective to the common assumption that an early new purchase is primarily related to the "allure of the new" and a high sense of fashion or status (Ullrich 2014, Klose 2015, Harrell and McConocha 1992). Nevertheless, various studies show that there are a considerable number of people preferring new products to caring for the old ones because they want to "go with fashion" (e.g. Cox et al., 2013). In our survey we also found that about one fifth of the participants see a broken device as a welcomed opportunity to buy something new. They relate quality of life to new devices and are happy to show that in their social environment.

To explore further the role of newness, we analysed the relation between the attractiveness of newness and the usage time of the last device The self-reported use time (material practice) of the previous electronic device was assessed by asking how many months the previous smartphone had been used, and how many years the previous washing machine had been used. The attractiveness of newness was extracted from an exploratory factor analysis and based on seven items (α=.85), e.g. “having new devices means quality of life to me”. Other factors were: Responsibility for longevity attributed to the producer (10 items, α =.85, e.g. ‘Producers of electronic devices should pay more attention to longevity when designing products.’) and to the user (6 items, α =.74, e.g. ‘consumers should be more careful with their products so they last longer.’); satisfaction with the status quo of product longevity in society

(2 items; e.g. ‘I am satisfied with my rights as a consumer.’); indifference about product longevity (2 items; e.g. ‘I don’t have time to maintain devices.’); and the purchase criterion of longevity (2; e.g. ‘I buy devices that are more expensive but last longer. These attitudinal factors were entered in multiple regressions with the usage time of the last washing machine or smartphone. The analyses revealed that the length of the usage time of both devices negatively predicted by the attractiveness of being new, whereas the other factors were not important, except for the user’s preceived responsibility, which positively predicted the usage time of the smartphone. That means that the attractiveness of a device being new is the best predictor of how long it is used (compare also Frick et al. 2019).

However, fashion, status and novelty value are only drivers of obsolescence depending on the cultural context, and this context explains why there are differences between product categories. For example, it is often more important to own and demonstrate the latest fashion in case of mobile phones but not in the case of large household appliances (Wieser et al 2015; Evans and Cooper 2010; Cox et al 2013; Cooper and Mayers 2000). In our survey, the proportion of respondents who bought their current device, even though the old device was still working, is also significantly higher in the case of smartphones (around 60%) than in washing machines (44%). Moreover, in this regard, it is worth looking at how the device is embedded in everyday practice. The smartphone as a "digital life companion" (Eisentraut 2016) has an important role in the design of everyday life and social relationships and is constantly visible to the social environment. Devices that stand in the home all have mainly one function, such as "washing" or "cooling", play an entirely different role in everyday life . The novelty thus serves only partly as an explanation, therefore a more thorough analysis of social practice in dealing with different devices and the different forms of everyday integration is necessary. This consideration, in turn, needs to be embedded in the structural incentives and opportunities that favour a new purchase over function preservation and long-term use. Buying a new device seems much easier to many consumers than repair and is stimulated by appropriate offers. Not least the digitisation and the simplicity of online shopping contribute to the impression that everything is easy and simply available and that resources or material are worth nothing and therefore not worth preserving (Hilty 2017). In addition, care, maintenance and repair are structurally not only neglected, but sometimes even prevented. For example, the design - bonded parts, miniaturisation and modularisation - can make repairs and care practices much more difficult. When selling, information about the technical function (capabilities) and maintenance requirements are not in the foreground and consumers often feel a kind of learned helplessness in dealing with technically predictable devices (Echegaray 2016) .

The function and visibility of the device in everyday life, time and expertise to care, maintenance and repair, as well as the product-related and structural incentives and barriers to the preservation of the old and the acquisition of the new therefore affect the freedom of action of consumers. The high dependence on functioning devices and the busy timing of everyday life complicate life-prolonging actions and accelerate functional obsolescence.

In addition, the consumers' influence on product lifetimes were perceived as limited by the survey respondents, which corresponds to a low feeling of responsibility for functionality and durability. If the common media presentation is believed, the own possibilities - and thus the willingness to accept responsibility - are regarded as very limited, because "the market" controls the lifetime. The expected (short) lifetime can have a significant influence on the length of the useful life and the date of replacement (Cox et al. 2013; Wieser et al. 2015). In our survey, one-third of reported broken devices were not repaired because the assumption was that a repair would not be worthwhile because the device would not last long enough.

However, not all responsibility attributions point towards the manufacturer. As indicated above, the vast majority (94%) agree with the statement "we live in a throw-away society". About eighty percent find it "awful that fellow citizens buy new electrical appliances, even though their old ones still work" and just as many believe that the advertising significantly influences the needs and encourages new purchases. Thus, the survey reflects somehow the cultural pessimism that also characterises the media presentations of today's consumer society. Thus, a crucial question is, who can bear the responsibility for the product if the actors themselves do not have any room for decision and action?

Factors influencing life span from a holistic perspective

The preceding sections presented some empirical insight into the communicative and material reproduction of obsolescence. The insights into the discourse on obsolescence bear witness to a communication that works primarily with simplistic categories and linear attributions of cause and effect, often with the aim to tell an interesting story. This story draws some one-dimensional pictures of both, the manufacturer or product designer and the consumer. However, it also reveals a very limited view on the products.

Firstly, practical action by manufacturers and consumers are limited to decisions (for a particular design / business model for new purchase / discarding) and the decision itself is mainly presented as based on cost-benefit considerations. Manufacturers and consumers alike are said to make more or less calculated decisions for their own benefit maximisation - be it benefits through financial gain and competitive advantages or by status and novelty consumption. The practice itself and the relevant, often limited know-how or the structural, often unquestioned logic, which offer incentives for the one and hinders other actions, remain underexposed.

On the other hand, the products themselves attract little attention and appear rather as "passive puppets". They only become conspicuous when they can be presented as novelty, when they no longer function or when they become threatening as "electronic waste mountains". Otherwise, being defined as passive, the objects can be used by companies to project their profit dreams onto them or by consumers to satisfy the desire for the new. To put it bluntly, producers and consumers are somehow accomplices in the production of obsolescence and the consumer products are the actual victims - and with them the natural

resources used for that purpose, as well as the people and environments that are affected by manufacturing and disposal practices.

This escalation may initially be irritating. What should a consumer product be other than a human-made and manipulated object? Here we return to the triangular relationship of design, usage and object outlined above and add an extended understanding of consumer objects as "equal playing partners" (Miller 2006)) or "teammates in social practice" (Hörning 2016). As a co-player consumer objects can be resistant and inscrutable. They can refuse their "service" and interrupt the flow of practice. This is even more true for modern electronic products and digital, mobile technologies, which are becoming more and more important actors and role carriers in everyday life through an ever-expanding "life of their own" (Rammert 2009; Rammert and Schulz-Schaeffer 2002). Furthermore, modern production processes are complex chains and networks of globally widely distributed practices. It becomes an almost impossible challenge for product developers and manufacturers to keep an eye on all the components and functions - and thus possible malfunctions of the devices. Samsung's effort to understand why the Galaxy Note 7 batteries exploded shows that even market leaders have limited access and limited knowledge of the features of their device components. The emergence of a product and its quality involves a large number of actors who act according to their own logics. While designers primarily focus on the product itself, controlling and trading are above all interested in an increase in margins, which is the practice-relevant logic. In addition, not only does everyday life seem to accelerate, product developers also have less and less time to plan the quality and reliability of their products.

However, this independent role of consumer products usually only becomes the focus of attention when they do not work (van Hinte 1997). The controllability and functionality is taken for granted, without thinking about how elementary it is for the design and use in everyday life. The acceleration of everyday life by both product developers and users, the increasing complexity of manufacturing processes and devices, and the resulting decrease in know-how are the real challenges in the case of obsolescence.

As long as short lifetimes and usages times, and the selling or purchase of new items is structurally more supported than prolonging the life of the old, by repair, reuse or upcycling, premature obsolescence will be reproduced. In our survey robustness and long durability were nominally declared to be the most important criteria in the selection of a device. At the same time in many cases a new - as robust as possible - device is purchased, although the old device just proves its robustness and durability and still works. These kinds of paradoxes cannot be understood by applying a linear cause and effect or attitude-behaviour-scheme. Our final plea is therefore that the focus of consideration must be more on the generation of system knowledge. In order to develop options for action and transformation paths, it is important to decipher the "culture of obsolescence". In other words, when looking for the causes of short-lived electronic products and fast-moving consumption, we do not construct a detective story with clear perpetrator-victim categories, but - as in an archaeological excavation. This would expose the fabric and layers of our material culture and ask ourselves the open question why the short life of consumer products can be useful, practical or simply the easiest way for different social actors. Only a systemic understanding of the causes, drivers and stabilizers of

obsolescence allows to effectively answering the question of who is in which way responsible for the lifetime of consumer products.

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