Learn to love again - Investigating the theory of consumption values of owned electronics to promote product retention.

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Abstract

The production of electronic devices is rising, along with the amount of discarded devices. This trend is not sustainable in the long run as materials are scarce and the waste created from electrical and electronic devices (e-waste) is costly and harmful to the environment and human health. Although the motivations for disposing, replacement, repair, reuse or upcycling products have been studied, what motivates consumers to intend to keep using their electronics in the first place is underexplored. This study investigates whether marketing strategies can be deployed to motivate consumers to retain their electronics for as long as possible through increasing consumers' perceived value in terms of the consumption values: functional, social and emotional value. The three marketing strategies that were developed to increase the electronic retention intention of consumers, were each based on one of these consumption values, namely: Waste aversion (functional value), social norms (social value) and product attachment (emotional value). Results of an online experiment (n = 159) through Qualtrics XM were that the strategies failed the manipulation check and had no effect on consumer's intentions to retain electronics nor on their perceived value. The quality aspect of perceived functional value was found to have a positive effect on consumers' intention to retain electronics but was weakened by higher levels of trend sensitivity and if the electronic was older. Lastly, product retention is found to have different dynamics than product replacement and requires its own approach in order to achieve longer lifetimes for electronics. Longer lifetimes will eventually result in a society that needs less (raw) materials being needed and may limit the negative effects of e-waste from spiralling further.

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1 Introduction

Electronic and electrical waste (e-waste) generation is increasing rapidly worldwide as one of the fastest growing waste fractions. In 2022, the global generation of e-waste was approximated at a total of 62 million tonnes, which is 82% more compared to 2010 and is expected to keep increasing to 82 million tonnes by 2030 (Baldé et al., 2024). Although in 2020 the total municipal solid waste was 2.13 billion tonnes (UNEP, 2024) of which about 3% is e-waste, the generation of e-waste is rising five times faster than the documented recycling of such waste and is the fastest growing waste stream worldwide (Baldé et al., 2024). Furthermore, the amount that is documented as properly collected and recycled is only 22.3% (Alves, 2024). The result is a loss that is larger than the GDP of Uruguay ($78 billion) (Statista, n.d.) due to the externalised costs from lead and mercury emissions, plastic leakages and contribution to global warming having a direct and severe impact on the environment and people's health (Baldé et al., 2024; World Bank & OECD, n.d.). In addition to the costs of the generation of e-waste, the missed economic value of the recyclable resources contained in e-waste is as high as 91 billion USD in 2022, which is higher than the gross domestic product of most countries in the world (Baldé et al., 2024). In conclusion, the current situation of e-waste and its rapid growth are a problem and demand a solution.

One of the most effective ways to reduce waste generation and the extraction of raw materials is to extend the lifespan of electronic devices by postponing their replacement (Ohnmacht et al. 2018). By extending the lifespan, the generation of e-waste and the extraction of materials will be more spread out over time. Spreading out the generation of e-waste puts less pressure on waste collection services making proper management of e-waste easier. For example, if the average lifetime of a mobile phone was extended by 50 percent in the USA alone, this would avoid the generation of fifty million end-of-life mobile phones. As a result, e-waste generation would drop by roughly a third (OECD, 2012; Ohnmacht et al, 2018). These numbers raise the question why consumers replace their electronics prematurely instead of extending the lifespan of their electronic devices for as long as possible.

Consumers often replace electronics for reasons other than devices being broken beyond repair (Harmer et al., 2019; Hennies & Stamminger, 2016; Wieser & Tröger, 2018). Electronics are often pre-emptively replaced due to two reasons. Either other (newer) models on the market are more appealing and seem to offer more value than the electronics consumers already have or the initially offered value by the electronic is completely written off in the mind of the consumer and has, in their eyes, become obsolete (Cox et al., 2013; Magnier & Mugge, 2022). Both of these reasons are often the result of what a consumer perceives rather than whether the electronic is actually at the technical end of its life. If it is desired that consumers retain their electronic devices for longer to reduce e-waste, consumers need to see the value in their devices.

Social marketing can help stimulate consumers to see the value in their devices. Social marketing is: "the application of commercial marketing technologies to the analysis, planning, execution and evaluation of programs designed to influence the voluntary behaviour of target audiences in order to improve their personal welfare and that of society" (Andreasen, 1995, p. 7). Commercial marketing technologies focus on creating, communicating, delivering and exchanging value (American marketing association, 2024). Developing a social marketing

strategy that can stimulate consumers to value their electronics more and eventually keep their electronics for longer may end up increasing their welfare and that of society at large. Before developing such a strategy a comprehensive understanding of (perceived) value is required.

According to the theory of consumption values, five types of values influence the consumer's decision to (not) use or buy a product; functional, social, emotional, epistemic and conditional value (Sheth et al., 1991). Functional value can be understood as a product's instrumental benefits and its ability to satisfy consumer's task-related needs (Hou et al., 2020; Jung et al., 2016). This value derives from both the product's perceived quality and performance, and the costs related to the product and its use (Sheth et al., 1991). Emotional value is the extent a product arouses feelings and affective states (Sheth et al., 1991) Social value are the associations with a (desired) group. Epistemic value is the capacity for an offer to arouse curiosity, provide novelty or satisfies a desire for knowledge. Lastly, conditional value is the specific environment that make an offer less or more attractive (e.g. an ice cream on warmer days may offer more value than when it is freezing). Although maximising all five values may be desirable, it is often not practical, and consumers are usually willing to accept less of one value in order to obtain more of another (Sheth et al., 1991).

Currently there is no known empirical evidence what values are most relevant in stimulating longer product lifetimes, yet it is suspected that perceived functional, emotional and social value are most relevant. For instance, functional value was found to be most relevant for customer satisfaction (Sweeney & Soutar, 2001; Mason et al. 2023), however functional value did not affect purchase intentions (Mason et al. 2023). Hence, functional value may be more relevant after a product has been purchased rather than before purchasing. Alternatively, emotional and social value, as well as epistemic value, were shown to decrease brand switching behaviour for smartphones (Wong et al., 2019). If these values can reduce brand switching they may keep consumers to keep using electronics as well. Lastly, reasons for premature disposal were found to be emotional, social and functionally grounded (Schifferstein et al., 2004; Cox et al., 2013), possibly emphasising the importance of these aspects in premature product disposal. All in all, functional, social and emotional value may be critical to persuade consumers to keep their electronics for longer. Whether these values can be applied in marketing strategies to stimulate consumer's intention to retain electronic devices raises the following research question:

What are the effects of functional, social and emotional value-oriented marketing strategies on consumer's electronic retention intention?

Studying the dynamics of how perceived value from owned electronics is essential for reducing the rapid growing stream of e-waste. If consumers can be compelled to keep their electronics for longer through valuing their owned electronics more, it may not only lead to longer retention but can also be the first step for consumers to be more committed and maintain and repair their electronics more. If this is done successfully, a sustainable society will be one step closer.

2 Theoretical framework

2.1 Circular Economy

The linear approach of our economic system is not a sustainable use of the finite resources of our planet. In other words, changes are needed. A circular economy is often proposed as a solution for a more sustainable system in which the retention of materials by consumers is an essential element (EllenMacArthur Foundation, 2013). In the systematic review of Kirchherr et al. (2017) a definition was offered based on 114 definitions of a circular economy system. Their definition exists of three parts, namely: "an economic system that replaces the 'end-of-life' concept with reducing, alternatively reusing, recycling and recovering materials in production/distribution and consumption processes (1). It operates at the micro level (products, companies, consumers), meso level (eco-industrial parks) and macro level (city, region, nation and beyond), with the aim to accomplish sustainable development, thus simultaneously creating environmental quality, economic prosperity and social equity, to the benefit of current and future generations (2). It is enabled by novel business models and responsible consumers (3)".

This definition offers an alternative for the current economic system. First, the end-of-life concept needs to be replaced. The end-of-life concept is the linear process where products are produced, bought, consumed and then become waste. An alternative could be to increase efficiency of how materials are used to reduce required materials in production, distribution and consumption processes. Besides increasing efficiency, creating products that last longer and less frequent replacements of products may also reduce the demand for materials. The starting point of consumption is then to avoid consumption and only if a product is absolutely necessary (i.e. consumption can not be avoided) reuse, recycling and recovering materials become the next alternative. Second, the circular economy operates at the micro level (products, companies and consumers), meso level (eco-industrial parks) and macro level (city, region, national and beyond) to achieve sustainable development in an environmental, economic and socially equitable sense (Kircher et al., 2017). This means all actors on each level need to contribute to this shift, including consumers. Lastly, the shift is enabled by novel business models and responsible consumers (Kircher et al., 2017). This last part not only calls upon the responsibility of businesses to rethink their business models but, also for consumers to contribute to the shift for systemic change. If this shift is desired, consumers need to be encouraged to adjust their consumption accordingly, which includes retaining their electronics for longer.

Electronic retention fits within this idea of the circular economy and can be explained with the idea of the power of circling longer from the EllenMacArthur Foundation (2013). The power of circling longer is about products going through more use cycles or, in this study's case, spending more time in a cycle. Retaining electronics for as long as possible aligns with this principle. A product stays within a cycle for as long as possible which substitutes virgin materials flowing into the economy to counter the dissipation of materials out of the economy. Having consumers see the value in electronics circling longer can offer a solution of virgin materials needing to be pumped into the economy indefinitely. In order to do so, an understanding of electronic retention is first presented.

2.2 Electronics

Before examining how consumers can be encouraged to retain their electronics, a clear understanding of the context needs to be developed. When talking about electronics, this study focusses on consumer electronics, which are: “Electronic equipment for everyday home and personal use.” (Butterfield & Szymanski, 2018). However, how consumers conceptualise these electronics differs within this category.

The way consumers perceive the lifetimes of durable products, such as electronics, can be categorized in three types: up-to-date products, workhorse products and investment products (Cox et al., 2013). Up-to-date products are often replaced before the product is broken. They are not always treated with care, suffer many incidents of damage caused by pets, children or from their owners’ carelessness (especially mobile phones). They also perform an important role for individuals in terms of self- and social-identity and are often replaced for reasons of fashion or impulse purchase. Electronics that were found to be up-to-date products were mobile phones and small appliances. Workhorse products are valued principally for the service utility they provide, typically over a long lifespan. They are expected to be reliable while in use and are most often discarded when broken. Large, and sometimes small, appliances are electronics in this category, such as refrigerators. Investment products are those which are perceived as ‘special’ and therefore worth investing in. Investment is manifested in considered purchase and care during ownership. They are generally expensive products (where the notion of ‘expensive’ is subjective) but are also those which have an emotional dimension, including gifts or delayed purchases that people have had to wait or save for. Products include ‘quality’ electronics and major appliances (e.g. boilers). Up-to-date products are most often replaced due to consumer preferences, rather than technical reasons (Laitala et al., 2021), and will be the focus of this study. Before discussing these preferences, an understanding of what is meant with electronic retention is required.

2.3 Electronic Retention Intention

Product retention tendency has been described as: “a consumer lifestyle trait where consumers have a tendency to retain consumption-related possessions” (Haws et al., 2012, p.225). According to this definition, product retention tendency is seen as a consumer literally retaining products in their possession. However, sustainable use requires products to be used for as long as possible and not merely kept. Consumers often replace their electronics and keep their old devices in storage in a hibernating state (Arends-Tóth, 2022; Kurisu et al., 2020; Wilson et al., 2017). Here the definition of product retention tendency falls short. Namely, it does not address the unsustainable flow of virgin materials for new electronics. Therefore, the problem of premature replacement of electronics by consumers requires looking further than mere possession of products but also needs to adress how long an electronic is used for its intended purpose.

The concept of disadoption can help understand what motivates consumers to use their electronics for as long as they can. Disadoption is: “the volitional ceasing of a valued and adopted behaviour (including but not limited to product use) with the intent of not resuming that behaviour in the future” (Lehmann & Parker, 2016, p. 38). This definition is split into three sections: disadoption is volitional (1), the behaviour was valued and adopted (2) and

lastly there needs to be intended permanence of ceasing the behaviour (3). Volition means that the stopping of the behaviour is within consumers' will and control (voluntary). Whereas a valued and adopted behaviour means that the behaviour was not originally intended to be performed incidentally (e.g. sampling or trying out), rather, the disadoption needs to have consequences because it was valued and used. Lastly, intended permanence is the idea that the behaviour is meant to be stopped completely and will not be repeated in the future. An example of disadoption would be a consumer that wants to quit eating sugar due to health reasons. This behavioural change would be volitional, no external factors force the consumer to stop their sugar consumption. Eating sugar was a valued and adopted behaviour because eating food that contained sugar was something the consumer may have enjoyed and as a consequence he consumer needs to adjust their diet. Finally, the consumer intends to stop eating sugar forever (although they may not succeed).

Placing disadoption in an electronic product use context, disadoption could be seen as consumers choosing to cease use of an electronic. Electronic retention would then be the volitional continuing to make use of an electronic by consumers with intended permanence (i.e. not disadopting their owned electronics). For example, a consumer intends to use their valued and adopted device for the rest of their lives. However, this interpretation can be understood in two ways. It can both be understood as the general behaviour of using an electronic device as well as using a specific device. Firstly, understanding disadoption in a general sense still allows for consumers to continue using electronic devices but the actual device itself can still be replaced prematurely (e.g. you keep using smartphones in general but keep replacing devices). Second, the idea of disadoption as continued use of a specific product is less problematic. A consumer can intend to keep using a specific device for as long as possible. However, this intention can change based on consumer preferences. Electronic devices can then still be functional but can also become obsolete in the eyes of the consumer and are no longer desired to be kept. Electronic retention then becomes a dynamic concept where consumers' intention can change, which still enables the replacement of functioning electronics.

Where disadoption looks through the eye of the consumer and their reasons for using electronics, product lifespan takes the perspective of a product (i.e. durable goods such as electronics). The lifespan perspective differentiates and describes five stages through the lifetime of an electronic (Shi et al., 2022). It describes for the different stages how consumers use electronics and how the electronic is valued for each stage. The five identified stages are: pre-acquisition, early-use, middle-use, late-use, and pre-disposal. In the pre-acquisition stage, the consumer forms initial value perceptions and an expectation about the rate of value decline. During early-use and middle-use stages, perceived value changes: while certain values may decline, other values may emerge. Whereas, during late-use and pre-disposal stages, the consumer makes a trade-off between the remaining value of the product and the value/cost from efforts (i.e., repairing, upcycling) to extend product lifespan.

For this study, the definition of disadoption and the idea of the life stages of electronics are combined. Electronic retention intention is then defined as: "a consumer's will to adopt the use of an electronic device until the end of the product's lifespan". This definition stresses the intention of wanting to adopt the use of an electronic device for as long as possible. Using the device is an important aspect because if a device was not adopted and

used sporadically but did reach the end of its lifespan (e.g. due to rust or obsolescence), the resources spent to create that electronic were wasted and the purchase and consumption of the electronic may have better been avoided. Furthermore, it emphasises the intended permanence to use the product until it is past the final life stage and thus avoid premature disposal. If consumers would favour using the product until the end of the final stage, then the perceived value of the owned electronic device needs to be kept as high as possible (Magnier & Mugge, 2022). This means a closer look is necessary to how electronic retention intention relates to perceived value.

2.4 Theory of Consumption values

Electronic retention is influenced by the value that the consumer perceives from the product (Shi et al., 2021). To stimulate consumers to keep using their products for as long as possible, the perceived value needs to be kept as high as possible (Cox et al., 2013; Shi et al., 2022; Van den Berge et al., 2023). Perceived value was first defined as: "a consumer's overall assessment of the utility of a product based on perceptions what is received and what is given" (Zeithaml, 1988). A more contemporary way to understand perceived value in a less abstract manner is through the theory of consumption values which takes a multidimensional approach to perceived value and dissects perceived value in multiple different values which additively make up a consumer decision.

As briefly introduced prior, the theory of consumption values offers a basis to understanding what motivates consumers to use or not use products and services. According to the theory of consumption values, consumers use five types of values in their decision to (not) use or buy a product; functional, social, emotional, epistemic and conditional value (Sheth et al., 1991). However, functional value has been argued to exists of two dimensions: price/sacrifices (sacrifices) and quality/performance (quality) (Sweeney & Soutar, 2001; Wang et al, 2004). While sacrifices decreases the perceived value, quality increases perceived value of an offer. In this study, both perceived sacrifices and perceived quality are included as subcomponents of functional value. Where sacrifices are seen as "the loss derived from using an electronic device due to the increment of its perceived short-term and long-term costs, in terms of time, effort, energy and money" (adapted from Wang et al., 2004). Perceived quality as "the utility derived from the perceived quality and expected performance of the product or service" (Sweeney & Soutar, 2001).

The theory of consumption values has three propositions that form the foundation of the theory (Sheth et al., 1991). First, it states that a consumer choice is a function of multiple consumption values. This means that a consumer choice is based on a combination of these type of values. Second the values make differential contributions to any choice situation. Each value is different for each situation for each consumer. Where one consumer uses electronics to have the most fun and pleasure (emotional value), another might use it for only doing what is necessary (functional value). Lastly, the theory assumes that the forms of values are independent from one another. Each value contributes to their respective domain and cannot contribute to another or influence another. Now that the theory of consumption values and electronic retention tendency has been explained in full, the relationship between the consumption values and electronic retention can be hypothesised.

2.5 Consumption values and Electronic Retention Intention

Perceived functional value is the extent an electronic device is perceived to offer instrumental benefits (e.g. durability, performance, reliability, functionality) to serve a task-related need weighed against the perceived sacrifices it requires to perform that task (Hou et al., 2020; Jung et al., 2016; Wang et al., 2004). Although using some electronic devices may be perceived as more effortful than others, all are typically perceived to perform less over time (Shi et al., 2022). Lower perceived performance is often the result of an electronic device requiring more time, effort and energy to use to meet the same needs as before. Additionally, maintenance and repair become more common as time passes which require more monetary or non-monetary sacrifices. If these sacrifices are perceived to be too great and the electronic device is experienced to fall short, the device is likely to be replaced (Magnier & Mugge, 2022). If consumers would want to keep their electronics, they need to perceive the overall functional value of that electronic device as high as possible. This raises the following hypothesis:

H1: The higher the perceived functional value of an electronic device, the higher consumers' intention to retain their electronic device.

Increasing perceived social value may also stimulate electronic retention. Perceived social value is understood as: the utility offered by an electronic device from being associated with societal groups consumers aspire to belong to or identify with (Long & Schiffman, 2000). Social value of used electronic devices can be hindered by fleeting fashion trends (Shi et al., 2022) or by signs of inferior performance and wear and tear which could signal poverty or incompetence (Philp and Nepomuceno, 2020). Still, used electronic devices can foster social value. Long-term use can strengthen the identity associations with the consumer to prevent disposal (Trudel et al., 2016). Consumers may also alter the electronic device and invest effort into it which creates additional meaning for the product (Belk, 1988). The signs of use or modification may then be seen as something positive by preserving the owner's past and telling others what type of person the owner is, decreasing the likeliness of disposal (Kleine et al., 1993). Moreover, perceived social value has been shown to be positively related to a green purchasing attitude (Caniëls et al., 2021). If social value is able to have a positive effect on the attitude of green purchasing, the same effect may also hold true for other sustainable ideas such as electronic retention. Hence, perceived social value could be a determinant for electronic retention and is hypothesised as follows:

H2: The higher the perceived social value of an electronic device, the higher consumers' intention to retain their electronic device.

Higher emotional value may also stimulate electronic retention. Emotional value is understood as: "the enjoyment or pleasure derived from an electronic device" (Sheth et al., 1991). Initially, signs of use from wear and tear of used electronics can reduce emotional value (Shi et al., 2022). Consumers may also get frustrated from using subpar electronics or they may be displeased with their unaesthetic appearance, resulting in the arousal of negative

feelings towards the device (Shi et al., 2022). Such negative associations could decrease the likelihood of consumers retaining their electronics. Still, consumers can also feel an emotional bond with a device which creates emotional value (Schifferstein & Zwartkruis-Pelgrim., 2008). Positive memories of used electronic devices can also foster emotional value by giving it a special and symbolic meaning (Mugge et al., 2010). Also, persons who are highly involved (in a sentimental or emotional sense) with a product will be more likely to keep it (Jacoby et al., 1977). Lastly, the choice for green products is positively affected by emotional value (Lin & Huang, 2012). Choosing for green product may have similar mechanisms as retaining electronics. Electronic retention intention might also be stimulated by emotional value. It is therefore hypothesised that:

H3: The higher the perceived emotional value of an electronic device, the higher consumers' intention to retain their electronic device.

As mentioned before, consumers replace their electronics because other market alternatives are perceived to offer more value than their current electronic does (Cox et al., 2013; Magnier & Mugge, 2021). Not only do consumers value the same electronic differently, how consumers respond to changing market offers may depend on how sensitive they are to trends. Consumers who are more sensitive to trends may value their current electronic less as opposed to consumers who are less sensitive to trends and are therefore less likely to keep their current electronic device. For example, fashion sensitive consumers have been found to be highly likely to dispose of clothing for fashion or stylistic reasons (instead of fit problems or damage), often discard damaged clothing that can be repaired (McNeill et al., 2020) and dispose clothing more frequently (Lang et al., 2013). How well perceived value in forms of functional, social and emotional value may affect electronic retention could be dependent on their sensitivity to trends. The current study hypothesises the effect of trend sensitivity to be as follows:

H4: The strength of functional (a), social (b), and emotional value (c) on a consumer's intention to retain their electronic device is dependent on a consumer's sensitivity to trends.

Epistemic value is seen as not suitable for the context of this study. In the study of Sweeney and Soutar (2001) about the dimensions of perceived value, consumers did not generate responses that reflected epistemic value for purchasing durable goods. Epistemic value was therefore argued to play a small to no role in the purchase of durable goods. It is also suspected that in a post-purchase context where products are likely to be familiar to the consumer, appealing to epistemic value will likely be ineffective. A new electronic device will almost always offer more novelty, arouse more curiosity or better satisfy a desire for knowledge (i.e. offer more epistemic value) than an already familiar owned device could. Therefore marketing strategies that appeal to other consumption values may be more suited.

Conditional value is also excluded from this study. Sweeney & Soutar (2001) did not identify this value for purchasing durable goods. They argued that conditional value was expected to have a moderating effect and should not be seen as an independent value. Although identifying the conditions which enable electronic retention may be relevant, this

study aims to identify the relationships between the consumption values and electronic retention through marketing strategies that leverage these values. Identifying conditions that moderate these effects are therefore beyond the scope of this research.

Now that the dimensions of perceived value (sacrifices, performance, social and emotional) have been defined along with their respective effects on electronic retention tendency, marketing strategies can be developed that may increase the functional, social, or emotional perceived value of electronic devices. When such strategies successfully increase functional, social or emotional perceived values, this can promote electronic retention tendency.

2.6 Marketing Strategies to increase Perceived Value

To understand how perceived value can be increased, the value dimensions are approached separately to come up with three possible strategies that align best with the three respective consumption values. Although it is possible that a single strategy also affects the other value dimensions they are not included in the theoretical model to not overcomplicate the model. (figure 1). However, these other relationships were exploratorily tested to see if they had any effects.

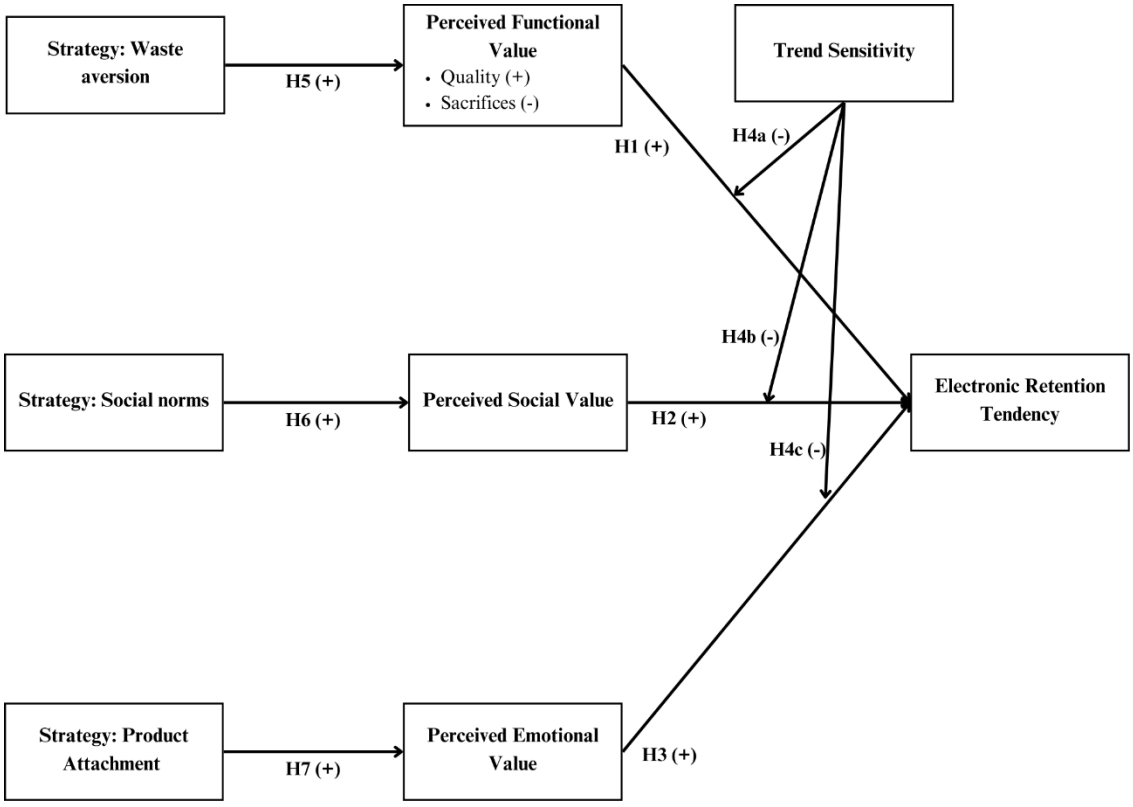

Figure 1: *Theoretical model.*

2.6.1 Waste Aversion and Functional Value

Playing into waste aversion may be an appropriate strategy to increase functional value. According to Haws et al. (2012, p. 225) consumers who are waste avoidant have a tendency to: *"(1) a desire to be careful with economic resources (i.e., frugality), (2) a tendency to think about new or different ways to use products (i.e., upcycling/creative reuse), and (3) a general concern for the environment."* All of these tendencies might lead to an increase in perceived functional value. Firstly, consumers who are waste averse (frugal) want to have the most value for their sacrifices, this may result in the prioritisation of optimising the lifetime to avoid (financial) waste. This process is expected to be mediated by functional value. Frugal consumers may mind the decrease in performance less and perceive the performance as higher than non-frugal consumers and are more likely to retain their electronics. In addition, frugality has already been shown to positively affect product retention for used laptops (Simpson et al., 2019). In this sense frugality is understood as a trait of the consumer to be economic with their electronic devices. If consumers can be convinced to behave more frugally they may want to extract more value for their 'investments' and keep using them for as long as possible. Secondly, if consumers can be creative in reusing electronic devices they may try to seek ways to extract as much value out of a device as possible. They may therefore perceive more functional qualities of the device than consumers who are not creative in reuse. Thirdly, consumers who are more environmentally aware are generally more concerned about their use of their product (Webb et al., 2008). These consumers may therefore perceive more value than those who are not environmentally concerned and may be less concerned with how they use their device. Similar to waste aversion, consumers also have an aversion to unused utility (Bolton & Alba, 2011). Prior to disposal consumers already anticipate waste and try to avoid it. On top of that, consumers were even found to engage in risk-seeking behaviour to avoid waste (Bolton & Alba, 2011). In other words, consumers are willing to find ways to avoid waste and may perceive more utility in the things that are at risk of being wasted. This aversion for waste and unused utility is therefore hypothesised as follows:

H5: A waste aversion strategy has a positive effect on perceived functional value compared to no strategy.

2.6.2 Social Norms and Social value

Social norms are a common type of social influence (Trudel, 2019) and have been shown to promote sustainable behaviours such as: changes in people's energy consumption (Allcott & Mullainathan, 2010), likelihood to compost (White & Simpson, 2013), likelihood to reuse towels in hotels (Goldstein, Cialdini, & Griskevicius, 2008), and likelihood to recycle (Meng & Trudel, 2017). Social norms are the unwritten rules developed through shared interactions of a social group that govern social behaviour (Trudel, 2019). When consumers transgress social norms they are attributed negative social value, are disapproved by peers and suffer social sanctions (Ehrich & Irwin, 2005). Social norms can either be descriptive or injunctive. Descriptive norms prescribe what consumers perceive to be common behaviour whereas injunctive norms prescribe what consumers ought to do and what is commonly (dis)approved by a social group (Schultz et al., 2007). Descriptive norms are effective if an

activity is seen as ambiguous or unfamiliar (White & Simpson, 2013). The idea of keeping your phone for until the end of its lifespan may be perceived as ambiguous since it is not known when or how this point will be reached. Descriptive norms were therefore chosen as a suitable formulation of a social norms strategy. If a descriptive norm would be successful in persuading consumers that retaining electronics is normative then they should perceive the behaviour as desired and owning older phones may be perceived to have higher acceptability (i.e. the social value of the electronic increases). Hence, the following hypothesis is formed:

H6: A social norms strategy that promotes electronic retention has a positive effect on perceived social value compared to no strategy.

2.6.3 Product attachment and Emotional Value

Using product attachment as a marketing strategy could be a very impactful way to foster emotional value. Product attachment, which is *"the strength of the emotional bond a consumer experiences with a durable product.*" (Schifferstein et al., 2008, p. 1), is associated with stronger feelings of connection, affection, love, and passion (Mugge et al., 2010). In other words, attachment facilitates emotional value. Factors that promote product attachment are irreplaceability, positive emotions, sentimental emotions, aesthetics, associations with others and self-identity and self-expression, while negative emotions hindered product attachment (Kowalski & Yoon, 2022). Product attachment can result in consumers feeling more protective of the product (Belk, 1991), to handle the product with care, to repair it when it breaks down, and to postpone its replacement (Mugge et al., 2005). These insights seem to suggest that if consumers can be successfully attached to their electronics they experience positive feelings (i.e. emotional value) toward the electronic which results in promoting behaviours that are similar to electronic retention. Therefore, the following is hypothesised:

H7: A product attachment strategy has a positive effect on perceived emotional value compared to no strategy.

Something to take into account is that product attachment does not happen overnight. Attachment happens slowly and is partially determined by factors that take time to develop like memories, trust and experience (Japutra et al., 2014; Mugge et al., 2005). A marketing strategy that focusses on product attachment should therefore target electronics that consumers actually own for a longer period of time to increase the likeliness of a consumers feeling attached to their electronic. However, product attachment can not only lead to active use but it can also lead to passive use which causes redundant consumption (Kowalski & Yoon, 2022). If a product is associated with memories, experiences or places it promotes redundant consumption where a product is kept around but still replaced by another. Furthermore, sentimental and negative emotions are negatively associated with active use, while pleasure, durability and stimulation are positively associated with active use. Hence, a product attachment strategy can be effective if it successfully evokes attachment by promoting irreplaceability, positive emotions and aesthetics. Nevertheless, such a strategy needs to avoid sentimentality, negative emotions and emphasise pleasure or durability to emphasise active use instead.

3 Methods

3.1 Participants & Design

An online experimental survey with a between-subjects design of four conditions (No condition, waste aversion strategy, product attachment strategy, social norms strategy) was deployed to test the hypotheses. The required sample size was computed a priori with a power analysis in G*Power 3.1.9.7. An analysis of covariance (ANCOVA) with a given α of 0.05, a medium effect size (f = 0.25) and at least 0.80 power was the test that required the most amount of participants: 179. Eventually, after a total of 182 responses were collected the survey was closed after a period of two weeks of recruiting participants. After removing any participants that did not complete the survey and people who gave implausible answers (e.g. straight-liners and extreme answers) a total of 159 participants remained (42.8% male, 53.5% female and 3.8% other or unknown) between the ages of 18 and 80 (M = 26.5, SD = 10.8) from the Netherlands were recruited by sharing the survey on LinkedIn, Instagram, Whatsapp and personal approaches with a QR-code.

3.2 Procedure and measures

Before starting the survey, participants were informed that their answer would remain anonymous and were asked to agree to their data being collected, confirm that they were over the age of 18 and that they owned a smartphone. In the experiment participants were randomly assigned in one of the four conditions by the survey software, Qualtrics XM. Additionally, the presented order of all statements on each page were randomised to avoid any bias caused by the order. Afterwards, the participant was shown one poster that reflected their assigned condition. The poster showed three smartphones which depicted discarded smartphones. Beneath the smartphones a slogan was present that was adjusted to each condition. The slogan was followed by a call to action to try to keep using smartphones for as long as possible (Figure 2).

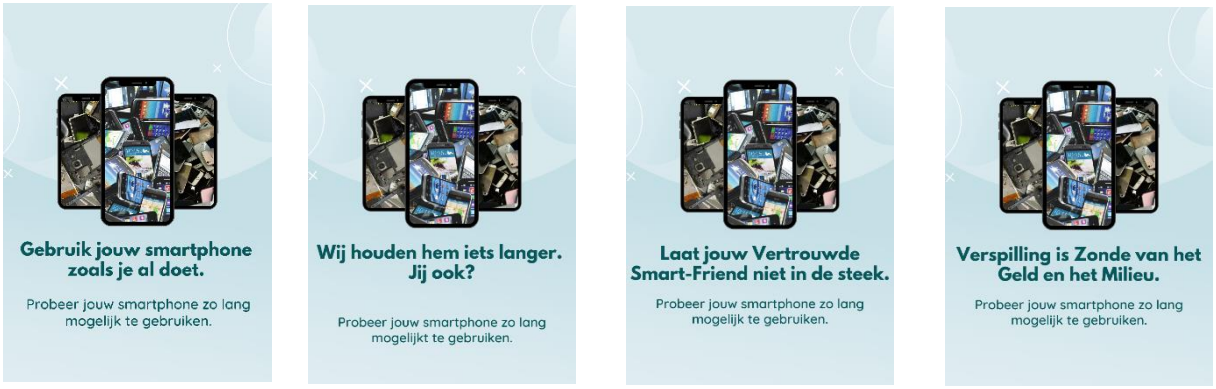

Figure 1. Manipulations for the four conditions (control, social norms, product attachment, waste aversion)

Above the poster was a text with the request to read the poster carefully because participants could not go back to the poster and to inform them that they could move on to the questions after five seconds. The five second timer was put into place to prevent participants quickly skipping over the poster. Smartphones were selected as an example because they can be considered as up-to-date products which are generally discarded prematurely due to

consumers perceiving them to be ‘out of date’ rather than that the electronic malfunctions (Cox et al., 2013). Additionally, 91% of the people in the Netherlands owned a smartphone in 2022 (Arends, 2023) which means most consumers in the Netherlands can likely relate to owning a smartphone.

Next, participants were asked to rate statements about their current smartphone. On the first page of questions there were five statements about their electronic retention tendency. Afterwards, the survey asked on a new page to rate five statements for participants’ perceived quality (functional value) of their smart phone and then moved on to the next page where they were presented with five statements related to sacrifices of use. The participants were then asked to rate five statements about their perceived emotional value on a new page. Furthermore, they were sent to the next page where they rated four questions on perceived social value. The items of perceived functional value (quality), perceived social value and perceived emotional value were based on the items of Sweeney & Soutar (2001) while the items related to perceived functional value (sacrifices) were based on the scale of Cronin et al. (2000). The participants were then shown the poster again as a reminder with an explanation stating that this was the same poster as previously shown and that it was a repetition. This reminder was followed by the indication that the next questions would be about the poster and about their personal demographics. On the third to last page a manipulation check was put in place The second to last page asked the participant to rate four statements related to their smartphone trend sensitivity. Finally, the participant was asked for control variables such as their demographic information (age, gender) and to indicate how old their phone was (phone age). The survey then ended and thanked the participants for their participation and allowed the participant to raise any questions or remarks.

All items were measured on a seven point Likert scale (ranging from Strongly Disagree (1) to Strongly Agree (7)). After the responses were collected, five initial principle component analyses with Oblimin rotation were conducted in SPSS 27 for the items of each construct, namely: ‘electronic retention intention’, ‘functional value’, ‘social value’, ‘emotional value’, and ‘trend sensitivity’. The principal component analyses identified six factors, namely: ‘Electronic retention intention’, ‘Quality’, ‘Value for money’ ‘Social value’, ‘Emotional value’, and ‘Trend sensitivity’. All items loaded well on their respective construct, except for functional value which was split into two separate scales; quality and value for money (Appendix 2)

Electronic retention intention ($\lambda = 2.29$, VAF = 45.8%) existed of five items. Although only 45.8% of the variance was accounted for, other factors had an eigen value smaller than one and the scree plot revealed a clear one factor solution which is why a one factor solution was deemed most appropriate. The items of electronic retention intention were: “I want to use my smartphone for as long as possible”, “I intend to use my smartphone until it is beyond repair”, “I will replace my smartphone when I want a new smartphone (reverse coded)”, “I intend to keep using my smartphone even when newer models get released” and “I plan to use my smartphone for a long time”.

The initial principal component analyses with the items of functional value suggested three factors, which was not in line with the scale suggested by Sweeney & Soutar (2001) and did not load well on possible theorised factors. After further investigation it was decided that the item “My smartphone uses a lot of electricity” caused some confusion as it had similar

loadings (.435 & .429) for two of the factors. After removing the item and conducting another principal component analysis, a two factor solution was found which explained 55% of the variance and aligned with the concepts of quality/performance and price/value for money as described by Sweeney & Soutar (2001). These two factors were deemed 'quality' ($\lambda = 3.76$, VAF = 41.7%). and 'value for money'($\lambda = 1.19$, VAF = 13.2%). The first factor existed of the five items: "My smartphone costs much effort to use (reversed)", "My smartphone is slow (reversed)", "My smartphone is reliable", "My smartphone is of acceptable quality" and "My smartphone performs consistently". These items seemed to indicate the performance which was associated with quality and was therefore labelled as 'quality'. The second factor contained the four items: "My smartphone is sturdy", "My smartphone is a good product for what I paid for it", "My smartphone is expensive to use (reversed)" and "My smartphone does not last for long a time (reversed)". These items seemed to describe the value a consumer received for the duration they were able to make use of their phone. The sturdier the phone was, the longer the participant got to use it, the more they got their money's worth, therefore the factor was labelled as "value for money". Interestingly, the two factors both seemed to both suggest different functional traits namely: performance and durability, however, durability was associated with value for money and performance with quality.

Social value ($\lambda = 3.07$, VAF = 76.8%) contained the four items: "My smartphone helps me to feel accepted", "My smartphone improves how I am viewed by others", "My smartphone leaves a good impression on others" and "My smartphone gives me the approval of others". Only one factor had an eigen value above one, explained a notable amount of the variance and showed a clear drop in the scree plot after the first factor which resulted in a clear one factor solution.

Emotional value ($\lambda = 2.64$, VAF = 52.8%) existed of the five items: "My smartphone give me a sense of guilt (reversed)" "My smartphone gives me pleasure", "My smartphone gives me a good feeling", "I use my smartphone with ease of mind" and "I like using my smartphone". Although one factor only explained 52.8% of the variance, there was only one factor with an eigen value above one and the scree plot also aligned with a one factor solution.

Finally, trend sensitivity ($\lambda = 2.08$, VAF = 51.9%) existed of the four items: "I find it important to stay on top of trends", "I replace my smartphone when I think it is no longer in fashion", "I buy a smartphone with the expectation that I replace it within two years" and "Every month I look at the newest smartphone models". Again, trend sensitivity had one factor that had an eigen value that was higher than one and a scree plot with a drop after one factor but only explained 51.9% of the variance. Still, it was decided to settle on a one factor solution.

All factors had at least an acceptable level of reliability (Cronbach's $\alpha > 0.6$), except for value for money (Cronbach's $\alpha = 0.579$). However, the scale was preserved as it was because the Cronbach's α could not be notably increased by deleting items and the scale aligned closely with the idea of price/value for money as described by Sweeney & Soutar (2001). All scales were averaged and comprised into new variables for further analyses. Exact items and statistics for the factor and reliability analyses can be found in Appendix 2.

4 Results

4.1 Descriptive statistics

Descriptive statistics for the scales were first examined to assess normality. All but one scale had an acceptable skewness between -0.8 and 0.5, and were almost mesokurtic with a kurtosis between -1 and 1.2. Trend sensitivity was right skewed (Skewness = 1.70) and Leptokurtic (Kurtosis = 4.08). Further inspection of trend sensitivity revealed that the mode answer was 1 (Strongly disagree) and a mean of 1.84 (*sd* = 0.88). Further normality testing with a Kolmogorov-Smirnov revealed that all scales were not normally distributed ($p < .05$). However, Q-Q plots indicated that only trend sensitivity was slightly right skewed. Due to this seeming violation of normality, the complete model was tested with the use of bootstrapping by the extension Process 4.2 for SPSS by Andrew Hayes to confirm or disprove initial tests.

4.2 Manipulation check

To test whether the manipulations were perceived to align with their respective condition, three one-way ANOVA tests between the four conditions and the manipulation check items were conducted with use of Tukey's HSD for post-hoc testing. If the manipulation was successful it would be expected that the social norm, waste aversion or product attachment condition would score significantly higher on their respective manipulation check item than the other conditions. It would also be expected that the conditions that do not reflect the manipulation check item would show no difference among each other.

The first ANOVA test between the four conditions and the manipulation check item "the poster emphasises the consequences of disposing a smartphone" (i.e. waste aversion) revealed a significant difference ($F(3, 155) = 5.79$, $p = .001$). Post-hoc tests with Tukey's HSD were conducted to see whether participants in the waste aversion condition perceived more consequences of discarding than the other groups. It was expected that the participants who saw the waste aversion poster would perceive the poster as describing the consequences of waste as higher than the participants who saw a different poster. The tests indicated that the participants in the waste aversion ($M = 4.30$, $SD = 1.57$) indeed scored significantly higher than the control condition ($M = 3.23$, $SD = 1.66$, $p = .017$) and the product attachment condition ($M = 2.86$, $SD = 1.42$, $p = .001$) but was not perceived differently compared to the social norms condition ($M = 3.61$, $SD = 1.79$, $p = .208$). This meant that participants in both the social norms and waste aversion condition did not perceive the poster differently in terms of describing disposal consequences

The second ANOVA test found no significant difference between the conditions and the manipulation check item "The poster describes what others do with their smartphone" (i.e. descriptive norm) did not show a significant difference between the conditions ($F(3, 155) = 1.82$, $p = .145$). The four posters were seen to describe a descriptive norm to about the same extent.

Lastly, the final ANOVA between the conditions and the manipulation check item "The poster calls upon attachment with my smartphone" (i.e. product attachment0 showed no

significant difference $F(3, 155) = 0.53$, $p = .660$). Again, the posters were not seen to be different in terms of describing product attachment.

Overall, the manipulation check for all conditions was unsuccessful, which meant that participants did not perceive the manipulations as intended. Nevertheless, the conditions were still further examined to see whether the manipulation may still have had an effect. However, these results should be interpreted with careful consideration due to the uncertainty of what the cause of any found effect could be.

4.3 Analysis

Whether the waste aversion, social norms and product attachment strategies had a positive effect on participant's electronic retention intention compared to no strategy (control) was tested with a one-way analysis of variance (ANOVA). Since the assumption of the homogeneity of variances was violated (Levene's = 3.00, $p = .032$), the ANOVA was tested with the Welsch test statistic which is robust to this violation. The ANOVA of the effects of the posters on the participant's electronic retention intention revealed that the conditions did not significantly differ (Welsch = 1.02, $p = .389$). Thus, participants in the waste aversion, social norms and product attachment condition did not have a higher electronic retention intentions compared to participants in the control condition.

A multivariate analysis of covariance (MANCOVA) was conducted to test the effects of the conditions on perceived functional (H5), social (H6) and emotional value (H7). Because the age of a participant's smartphone may influence how they value their current smartphone, smartphone age was included in the analysis as a covariate. Levene's test of equality of variances showed that the assumption of equal variances between the groups was violated ($F(3, 155) = 3.11$, $p = .028$) for emotional value. The MANCOVA was still continued but without emotional value. Before the MANCOVA, a Box's M test was performed to validate the homogeneity of covariance matrices. Box's M test revealed that the assumption of homogeneity of covariance matrices was violated (Box's $M = 38.66$, $F(30, 63943) = 2.07$, $p = .005$). As a result, Pillai's Trace was used as a more robust test statistic to test the results of the MANCOVA. The MANCOVA indicated no significant multivariate effect of the posters on the perceived values (Pillai's Trace = .014, $F(12, 459) = 0.244$, $p = .988$), suggesting that the posters did not have an effect on either functional or social value when accounting for the effect of the smartphone's age. There was no difference between the conditions for functional value (quality: $F(3, 154) = .552$, $p = .647$; value for money: $F(3, 154) = .150$, $p = .929$). The waste aversion strategy did not have a positive effect on functional value and H5 was not supported. Additionally, there was no significant difference between the conditions for social value ($F(3, 154) = .150$, $p = .930$), which showed that a social norms strategy did not have a positive effect on social value, thus, H6 was not supported. However, covariate phone age did have a significant multivariate effect on the perceived values (Pillai's Trace = .134, $F(4, 151) = 7.81$, $p < 0.001$). Phone age had a significant negative effect on quality ($\beta = -0.009$ $F(1, 154) = 7.92$, $p = .006$, $\eta^2 = .049$), a marginally significant positive effect on value for money ($\beta = 0.006$, $F(1, 154) = 3.18$, $p = .077$, $\eta^2 = .020$) and a marginally significant negative effect on social value ($\beta = -0.009$, $F(1, 154) = 3.50$, $p = .063$, $\eta^2 = .022$).

A Kruskal-Wallis test was used to determine the effects of the conditions on emotional value. The Kruskal-Wallis test revealed that the conditions did not differ significantly for emotional value ($H(3) = 3.79$, $p = .285$). A product attachment strategy did not have a positive effect on emotional value compared to no strategy and H5 was therefore not supported.

A multiple linear regression test was performed to test whether functional value (quality & value for money; H1), social value (H2), and emotional value (H3) had a positive effect on electronic retention intention. The multiple regression showed that quality had no significant effect on electronic retention intention ($\beta = 0.105$, $t = 1.20$, $p = .234$), neither had value for money ($\beta = 0.012$, $t = 0.134$, $p = .894$). Surprisingly, social value had a significant negative effect on electronic retention intention ($\beta = -0.134$, $t = -2.603$, $p = .010$). Specifically, the higher participants perceived the social value of their smartphone, the less likely they were to intend to keep their phone for as long as possible. Lastly, emotional value had no effect on electronic retention ($\beta = -0.094$, $t = -1.19$, $p = .236$). Overall, the results suggested that while quality, value for money, and emotional value did not significantly influence electronic retention intention, social value had an unexpected negative impact on electronic retention intention. Consequently, H1, H2 and H3 were not supported.

4.4 Model testing

The entire model, as depicted in Figure 1, was tested with Model 14 from Hayes's Process Macro with current phone age (in months) as a covariate and trend sensitivity as a moderator. This analysis was done to confirm the earlier findings by bootstrapping in case non-normality was an issue. First, the direct effect of the strategies on electronic retention intention were inspected. The control condition was used as a reference group. No significant effects were found of the waste aversion strategy ($\beta = 0.156$, $t = 0.92$, $p = .358$), social norms strategy ($\beta = 0.019$, $t = 0.11$, $p = .916$), and the product attachment strategy ($\beta = 0.060$, $t = 0.33$, $p = .741$) on electronic retention intention. Phone age also had no significant effect on electronic retention intention ($\beta = 0.020$, $t = 0.64$, $p = .522$). These findings align with the first ANOVAs, confirming that the posters did not have a direct effect on electronic retention intention.

Next, the effects of the strategies on the consumption values, the mediators, was investigated. The result was that a waste aversion strategy did not have an effect on social value ($\beta = -.115$, $t = -0.38$, $p = .706$), quality ($\beta = -0.156$, $t = -0.79$, $p = .429$), value for money ($\beta = -0.051$, $t = -0.27$, $p = .787$) nor on emotional value ($\beta = -0.192$, $t = -0.93$, $p = .353$). A social norms strategy had no significant influence on social value ($\beta = -0.159$, $t = -0.52$, $p = .606$), quality ($\beta = .091$, $t = 0.46$, $p = .648$), value for money ($\beta = .066$, $t = 0.35$, $p = .730$), nor emotional value ($\beta = 0.079$, $t = 0.38$, $p = .703$). Lastly, a product attachment strategy had no significant effect on social value ($\beta = 0.012$, $t = 0.04$, $p = .968$), quality ($\beta = -0.016$, $t = -0.08$, $p = .9380$), value for money ($\beta = 0.042$, $t = 0.21$, $p = .831$), and neither on emotional value ($\beta = 0.243$, $t = 1.31$, $p = .259$). In conclusion, one strategy was not more or less effective in influencing participant's consumption values. Phone age did have a significant effect on quality ($\beta = -.009$, $t = -2.81$, $p = .005$), a marginally significant effect on social value ($\beta = -0.009$, $t = -1.87$, $p = .063$) and value for money ($\beta = 0.006$, $t = 1.78$, $p =$

.077) but had no significant effect on emotional value (β = -0.005, t = -1.50, p = .135). These results aligned well with the results of the earlier MANCOVA.

Subsequently, the effects of the consumption values on electronic retention intention were explored. The consumption values, social value (β = -0.118, t = -1.13, p = .260), quality (β = 0.267, t = 1.34, p = .182), value for money (β = -0.157, t = -0.73, p = .467) and emotional value (β = 0.137, t = 0.73, p = .463) all had no significant effect on electronic retention intention. Notably, unlike the earlier multiple regression, which did not include the conditions, trend sensitivity as a moderator and phone age, social value no longer had a significant effect.

Next, the moderating effect of trend sensitivity on the relationship between the consumption values and electronic retention intention was examined. No moderating effect of trend sensitivity was found from social value (β = 0.046, t = 0.91, p = .362), quality (β = -0.087, t = -0.71, p = .478), value for money (β = 0.303, t = 0.26, p = .793) emotional value (β = -0.068, t = -0.64, p = .521) to electronic retention intention. In other words, the effects of the consumption values has not been shown to be dependent on trend sensitivity and H4 was not supported.

Lastly, the confidence intervals (CI) for the mediations between the strategies and electronic retention intention through the consumption values was reviewed. The confidence interval of the waste aversion strategy through quality (-0.104 < CI95% < 0.049) and value for money (-.049 < CI95% < 0.069) contained zero and showed therefore no indirect effect. The confidence interval between a social norms strategy through social value (-0.766 < 0 < 0.448) also contained zero and showed no indirect effect. Lastly, the confidence interval between the product attachment strategy and emotional value (-0.181 < CI95% < 0.667) did also contain zero and showed no indirect effect. In conclusion, there is no mediation between the product strategies and electronic retention intention through the consumption values.

4.5 Additional analyses

To see whether the participant's age and gender may have had an effect on electronic retention intention, trend sensitivity or one of the consumption values, two separate analyses of covariance (ANCOVA) and one MANCOVA was conducted. Three participants stated that they did not prefer to share their gender and three participants identified differently from either male or female, this small group were excluded from the analyses that involved gender. The first ANCOVA was between the conditions and electronic retention intention with phone age, gender and age as covariates. Phone age was added as a covariate because how old a phone is might determine a participant's intention to keep their smartphone for as long as possible due to this intention possibly eroding over time. The analysis revealed that phone age (F(1, 147) = 2.18, p = .142), gender (F(1, 147) < 0.01, p = .966) and age (F(1, 147) = 1.81, p = .181) did not influence participant's electronic retention intention. The test also confirmed that the conditions did indeed not differ for electronic retention intention (F(3, 147) = 1.34, p = .262).

The second ANCOVA was performed the same way but with trend sensitivity as the dependent variable and without phone age as a covariate as it is unlikely for the age of someone's current smartphone to influence their personal trend sensitivity. Gender was found to have no significant effect on trend sensitivity (F(1, 147) = 0.480, p = .489) but age (F(3,

147) = 11.44, p = .001) did have a significant negative effect. Older people were less likely to be sensitive to trends than younger people. In addition, the conditions had a significant effect on trend sensitivity (F(3, 147) = 3.25, p = .024). Further post-hoc tests with Tukey's HSD showed marginally significant differences between the product attachment (M = 2.16, SD = 1.10) and the control (M = 1.65, SD = 0.70, p = .061) and waste aversion conditions (M = 1.70, SD = 0.77 p = .091). A product attachment strategy was therefore more effective in increasing trend sensitivity as compared to no strategy or a waste aversion strategy.

Lastly, the MANCOVA between the conditions and the consumption values with age, gender and phone age as covariates were examined. The analyses revealed that age, gender and phone age did not have a significant effect on quality, value for money and emotional value (F(1, 146) < 2.24, p > .05). However, both gender (F(1, 146) = 7.80, p = .006, η^2 = .051) and age (F(3, 147) = 9.29, p = .003, η^2 = .071) did have a significant effect on social value. Where women (M = 3.20, SD = 1.40) scored higher on social value than men (M = 2.56, SD = 1.27) and older participants scored lower on social value (β = -0.030, t = -3.05, p = .003). Notably, by adding age and gender as covariates, phone age no longer had an effect on social value whereas in the earlier MANCOVA phone age did have an effect. The fading of the effect was most likely due to age and gender better explaining social value. Age and gender may better explain perceived social value of smartphones than phone age.

Although phone age was initially added as a covariate to control for, the interpretation of the posters and therefore the effectiveness may have been dependent on how long a participant has had their smartphone for. Owners of newer smartphones could regard the message as more or less important than owners of older smartphones. Also, the importance of each consumption value for its effect on a consumer's intention to retain their electronic for as long as possible may depend on how long an electronic has been in use for. Whereas some qualities may be more important for newer phones, others are more important for older phones (Shi et al., 2022). These possibilities combined with numerous (marginally) significant effects of phone age on quality, value for money and trend sensitivity sparked the investigation of phone age as a possible moderator.

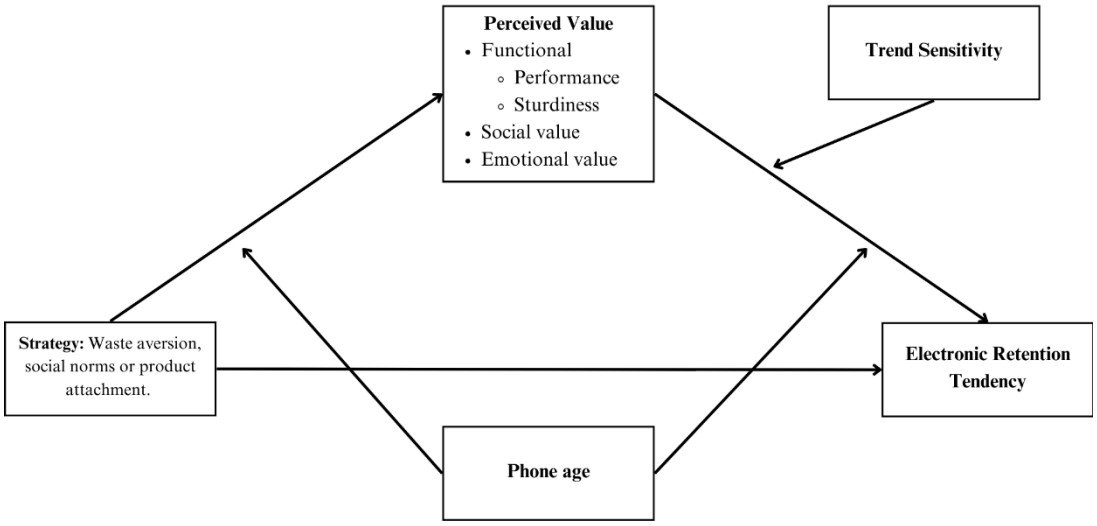

Figure 3. *Adjusted model with phone age added as a moderator.*

Exploring whether phone age had the speculated moderating effects, model 64 of Process Macro was used. The new model that was drawn up can be seen in Figure 3. The new model showed that quality had a significant positive effect (β = 0.882, t = 3.13, p = .002) on electronic retention intention. A smartphone that was perceived to perform better, made participants more likely to intend to keep using it. This effect was moderated by phone age (β = -0.145, t = -3.28, p = .001) and trend sensitivity had no moderating effect (p > .1). Yet, the tests of highest order unconditional interactions showed a significant change in variance explained for phone age as a moderator between quality and electronic retention intention (R^2 change = .050, F(1, 141) = 10.73, p = .001) but also showed a significant change for both quality and trend sensitivity as moderators between quality and electronic retention intention (R^2 change= .051, F(2, 141) = 5.49, p = .001). The conditional effects of the focal predictor showed that the effect of perceived quality on a participants intention to retain it, gets lessened or completely fades if the smartphone is older and if a participant was more sensitive to trends (Table 1).

Table 1.

Effect of Quality on Electronic Retention Intention by Phone Age and Trend Sensitivity.

		Smartphone Age (years)		
		1.00	2.75	5.07
Trend sensitivity (1-7)	1.00	0.563^{***}	0.312^{**}	$-0.019^{n.s.}$
	1.75	0.437^{**}	0.186^{*}	$-0.142^{n.s.}$
	2.50	$0.311^{m.s.}$	$0.070^{n.s.}$	$-0.266^{n.s.}$

Note. Effect of quality is assessed at the 16^{th}, 50^{th} and 84^{th} percentile points of phone ag and trend sensitivity.

n.s. indicates p > 0.1, m.s. indicates p < 0.1, * indicates p < 0.05, ** indicates p < 0.01 and *** indicates p < 0.001.

No moderating effects were found between the conditions and phone age. Phone age had a marginally significant negative effect on quality (β = -0.143, t = -1.88, p = .063) and a marginally significant positive effect electronic retention intention (β = 0.528, t = 1.88, p = .062). Meaning that the older a smartphone was, it was perceived to be of lesser quality but was more likely to be retained. The waste aversion condition, social norms condition, and product attachment condition showed no effects on the consumption values or on electronic retention intention. Lastly, social value, emotional value and value for money had no effect on electronic retention intention and trend sensitivity showed no moderating effect between the consumption values and electronic retention intention.

5. Discussion

5.1 Theoretical implications

E-waste remains a hazardous and rapidly increasing waste stream that needs to be addressed (Baldé et al., 2024). From a consumer's perspective, electronic devices are replaced when they are perceived to no longer offer enough value (Cox et al., 2013; Magnier & Mugge, 2022). However, the moment of replacement is relative and is often not the moment when an electronic is at the end of its lifespan (Harmer et al., 2019; Hennies & Stamminger, 2016; Wieser & Tröger, 2018). The current study tried to show whether consumers could be motivated to adopt the idea of retaining their smartphones by increasing their perceived value through posters that reflected a waste aversion, social norms or product attachment marketing strategy. The results were that these strategies did not make consumers value their smartphones more nor did they increase their intentions to retain their electronics. Although the marketing strategies that were tested are ineffective, they offer a foundation for exploring alternative approaches to combat e-waste by promoting product retention.

The consumption values that formed perceived value may offer direction for strategies that promote electronic retention. The results showed that if an owned smartphone is perceived to perform better and thus be of higher quality, a consumer is more likely to intent to keep using their smartphone. Yet, this effect depends on how old a smartphone is and how trend sensitive consumers are, where quality perceptions become less effective if smartphones get older and if consumers are more trend sensitive. Similarly, perceived quality was also found to increase the intention to adopt the use of green vehicles (Bhutto et al., 2022). Interestingly, Hou et al. (2010) did not find that functional value had an effect on mobile phone replacement intentions. This suggests that functional value may work different for retention than for replacement where perceived quality seems to offer direction for future efforts to promote product retention.

Time seems to be an important factor for replacement and retention intentions. Hou et al. (2010) found that ownership duration increases replacement intentions. On top of that, most consumers want to keep their electronics for as long as possible (Van den Berge et al., 2023) and are waste averse (Bolton & Alba, 2011), but consumers still start to value their electronics less over time (Van den Berge et al., 2023). The depreciation of perceived value is in line with the finding of this study which found that perceived quality gets less when smartphones get older. However, it would be expected that if replacement intention become higher over time, retention intentions would decrease over time. Yet, the findings show that electronic retention intentions increase over time rather than decrease. The cause of this contradiction might be that consumers' lifetime expectations influence actual lifetimes (Shi et al., 2022; Van den Berge et al., 2023). As a product gets older it approaches their 'expiration date' where the product has served its purpose. The perceived value is then slowly being written off in a consumer's mind and has been completely written off when the mental expiration date has been reached which increases the likelihood of replacement (Magnier & Mugge, 2022). The value consumers might still see in the electronic may then become irrelevant for retention and consumers have different motivations other than perceived value to keep using their electronic. How consumers form estimates of product lifetimes and what

motivates consumers to continue to keep using their electronic after it has been mentally written off may be relevant to know for designing strategies that promote product retention.

Trend sensitivity needs to be taken into account when attempting to persuade consumers through quality perceptions. Trend sensitivity, combined with smartphone age, moderated the relationship between quality and electronic retention. This finding is similar to how consumers dispose of clothing due to stylistic choices despite the quality of the clothing may still being in order (McNeil et al., 2020). Although clothing is different from electronics, both clothing and smartphones can be seen as an up-to-date product in terms of consumer's lifetime expectancies (Cox et al., 2013). Consumers could also be more likely to intend to dispose or at least stop using their electronics because they succumb to trends even though the smartphone might still be perceived to be of good quality.

The other functional value aspect was value for money which was about the perceived durability, expenses and the extent a consumer got their money's worth. The findings did not show that value for money affect electronic retention intentions. Although value for money aspect of an electronic is relevant for post-purchase satisfaction (Sweeney & Soutar, 2001), it seems to be irrelevant for promoting retention. Value for money or 'getting your money's worth' may therefore not be a suitable ground to base strategies that promote electronic retention on.

Although social influence has been argued to stimulate sustainable behaviours (Trudel, 2019), perceived social value showed no effect on electronic retention intentions. However, consumers who perceive higher social value are more likely to experience satiation from their mobile phone which leads to higher replacement intentions (Hou et al., 2010). Also, social value has been found to stimulate the adoption of green vehicles (Bhutto et al., 2022). Social value may therefore be a way to stimulate the purchasing of green products and be able to leverage replacement intentions, but is not suitable to influence retention intentions.

Perceived emotional value was not shown to promote retention but might be an effective strategy to extent product lifetimes in combination with perceived quality. Consumers who perceive higher emotional value from their mobile phones experience less satiation which resulted in lower replacement intentions (Hou et al., 2010). Redundant consumption may be explained by how emotional differs for retention and replacement. Redundant consumption is when a functioning product is replaced by similar product but the original product is still kept which is found to be caused by memories & associations but prevented by active use and the degree of obsolescence of the product (Kowalski & Yoon, 2022). Consumers may decide to not replace their electronic due to the emotional value (memories & associations) it holds and are not motivated by emotional value but by the perceived quality to use (retain) their electronic. Thus, if the product is perceived to not perform well enough to use but holds enough emotional value to not be replaced, consumers consume an additional (redundant) similar product. Increased emotional value which reduces replacement intentions along with the increased perceived quality aspect of functional value which increases intentions to use and retain products may therefore not extend product lifetimes but also prevent redundant consumption.

Combining the findings about the consumption values with the literature reveals four new main insights. First, the strategies that were coined in this study were not as successful in promoting retention intentions as theorised (Van den Berge et al., 2021) and their potential for

stimulating active use and retention needs to be reevaluated. Second, it seems that product retention is a different concept than merely the opposite of product replacement. Where some values are relevant for retention intentions (quality), others are relevant for replacement intentions (social and emotional). This novel insight not only reveals that product retention is a different concept than replacement but also requires a different approach than replacement. Third, the passing of time has a multitude of ways of how it influences the dynamics of perceived value and retention intentions which may be caused by the expected lifetimes which form actual lifetimes. Lastly, emotional value combined with functional value holds potential for a new marketing strategy to extend the lifetime and usage period of electronics while avoiding redundant consumption.

5.2 Practical implications

Although circular practices have been studied extensively, the practices are often already at the later stages of a product's lifespan anymore such as reuse, repair, refurbishing, remanufacturing, recycling and upcycling. However, little research has studied ways how consumption can be reduced by stimulating prolonged use (i.e. product retention). Programs that aim to motivate consumers to extend the lifetime of products may need to also consider motivating consumers in earlier use stages to adopt the idea of product retention. Doing so might motivate consumers to use up their electronics instead replacing it and letting it deteriorate in storage (Arends-Tóth, 2022; Kurisu et al., 2020; Wilson et al., 2017). This study indicates that the focus of product retention should be on increasing perceived quality. This may be because consumers do not want to waste the utility that the product has left (Bolton & Alba, 2011) and keep using it even though a consumer might desire to replace it due to, for example, satiation (Hou et al., 2010). A marketing strategy that focusses both on perceived quality and perceived emotional value might succeed in promoting product retention, while also reducing replacement intentions. If this proofs to be successful it could contribute to curbing the harmful effects of e-waste on the environment and human well-being (Baldé et al., 2024).

Manufacturers that want to contribute to a circular economy are presented with an opportunity to develop a long term relationship with consumers that could continue after the purchasing moment. Enhancing quality perceptions increases brand loyalty (Alkhawaldeh & Eneizan, 2018) but may also stimulate product retention. Promoting quality perceptions after a product has been sold may therefore kill two birds with one stone. Consumers also favour product longevity (Van den Berge 2023) and offering a product that offers such longevity may increase quality perceptions which may also increase product retention. Even so, consumers do need to be made aware of this higher longevity. A lifetime label could help consumers having a better grounded idea about the lifetime they can expect if the label provides relevant and reliable information (Van den Berge et al., 2023). However, a product lifetime can be a double edged sword that may justify disadoption when the indicated lifetime has been reached (Marcus, 2020) and should be carefully considered before implementation.

5.3 Limitations & Future research

The developed marketing strategies int heir current form did not find an effect but may still hold potential. Frugality and attachment have been shown to increase product retention

for frequently used computers (Simpson et al., 2019) and social norms can influence a multitude of sustainable behaviours (Trudel, 2019). But, this study was not able to reproduce similar results. The failure to reproduce the results was most likely due to the operationalisation of the strategies into posters. First, the posters failed the manipulation check which questions whether the strategies were perceived correctly. Second, the effectiveness of the posters as a standalone intervention is not effective at facilitating knowledge transfer be it through an increase in knowledge, change in attitude or behaviour (Ilic & Rowe, 2013). Posters need to be accompanied by another source of information to be effective, otherwise the only drawing point to the poster is the imagery (Ilic & Rowe, 2013). In conclusion, even though the operationalisation of the strategies was lacking, the strategies could still proof to be effective if executed differently.

Even though posters may not have been the proper medium for the strategies and the manipulation was unsuccessful, some effects were to be expected. A possible explanation for the lack of effects could be that the strategies focussed on a single consumption value instead of on multiple which has been shown to be effective for green purchasing behaviour (Gonçalves, 2016). Furthermore, owned electronics are more weighed against the perceived value of an alternative rather than being evaluated solely on the perceived value of the owned electronic (Guiltinan, 2009). Combining consumption values to develop marketing strategies or addressing the comparison between old and new products may show promise in increasing the intentions of consumers to retain their electronics and provides direction for future research.

Lastly, the findings should be interpreted with careful consideration as electronic retention intention, emotional value, functional value and trend sensitivity explained around fifty percent of the variance which still leaves a notable amount of the variance that was left unexplained. This begs the question to what extent these factors capture the full picture of the dynamics of and relations with the idea of retaining products. Although, some effects have been found there may be other antecedents or aspects of product retention that better explain the phenomenon and should be explored before generalising the results presented in this study. Still, to the knowledge of the researcher, this study is the first of its kind to attempt to empirically test how consumption values can be manipulated to stimulate product retention.

5.4 Conclusion

Although the antecedents and motivations of repair, reuse, upcycling and replacement behaviour have been studied before, the current study takes a step back and looks at what motivates consumers to intent to use and retain their electronics. Electronic retention can be seen as a first step for consumers of adopting a mindset that supports a circular economy where retention is not only about keeping an electronic in possession but also intend to keep using it until the end of its lifespan. Consumers who have the intention to retain electronic devices and keep using it, may be more likely to engage in other circular practises. However, what marketing strategies are effective to promote product retention remains unclear. The strategies explored were not successful in showing any effects. On the contrary, the quality aspect of functional value is relevant for retaining electronics. Functional value has been argued before to be an essential starting point to encourage behaviours aiming to extend the lifetime of products by means of repair and reuse (Arias et al., 2024) and increasing the

perceived quality may also be the best stepping stone for promoting product retention. A stepping stone that is necessary to limit the rapid increase in e-waste and its effects on the environment and human health.

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Appendix 1 – Survey questions (in Dutch)

Welkom!
Hartelijk dank voor uw deelname aan dit onderzoek. In dit onderzoek ben ik geïnteresseerd in uw mening over uw smartphone. Alle informatie die u verstrekt, wordt strikt vertrouwelijk en anoniem behandeld en wordt uitsluitend gebruikt voor mijn wetenschappelijk onderzoek. Het invullen van de vragenlijst neemt ongeveer 5 minuten van uw tijd in beslag. Wanneer u op "IK GA AKKOORD" klikt, bevestigt u dat u deze tekst hebt gelezen, dat u een smartphone heeft en dat u 18 jaar of ouder bent. Klik vervolgens onderaan de pagina op "volgende".

- ○ Ik ga akkoord EN ik heb een smartphone. (1)
- ○ Ik ga NIET akkoord of ik heb GEEN smartphone. (2)

Hieronder ziet u een reclameposter. Bekijk deze goed. Na 5 seconden kunt u verder naar de vragen. Let op: u kan niet meer terug nadat u verder hebt geklikt. Neem de poster dus goed in u op.

No condition

Waste aversion condition

Social norms condition

Product attachment

Start of Questions

Ik zou graag willen weten hoe u denkt over uw huidige smartphone na het zien van de reclameposter. Daarom staan hieronder een paar stellingen over uw huidige smartphone. De vragen gaan over uw huidige smartphone en niet over smartphones in het algemeen. Kunt u aangeven in hoeverre u het eens bent met de volgende stellingen? De mogelijk antwoorden lopen van: "Helemaal mee Oneens (1)" tot "Helemaal mee Eens (7)" Er zijn geen goede of foute antwoorden, ik ben vooral geïnteresseerd in uw mening.

Mijn smartphone:

	Helemaal mee Oneens (1)	2	3	Neutraal (4)	5	6	Helemaal Mee Eens (7)
wil ik zo lang mogelijk gebruiken. (1)	○	○	○	○	○	○	○
zal ik gebruiken tot hij niet meer te	○	○	○	○	○	○	○

repareren is. (2)							
ga ik vervangen als ik behoefte aan een nieuwe smartphone heb. (3)							
zal ik blijven gebruiken, ondanks dat er nieuwe modellen uitkomen. (4)							
ben ik van plan lange tijd te gebruiken. (5)							

De volgende stellingen gaan over wat u vindt van uw huidige smartphone. De mogelijk antwoorden lopen van: "Helemaal mee Oneens (1)" tot "Helemaal Mee Eens (7)" Geef aan in hoeverre u het eens bent met de volgende stellingen.
Mijn smartphone:

	Helemaal Mee Oneens (1)	2	3	Neutraal (4)	5	6	Helemaal Mee Eens (7)
is stevig. (1)							
is betrouwbaar. (2)							
is van acceptabele kwaliteit. (3)							

presteert consistent. (4)							
is een goed product voor wat ik betaald heb. (5)							

Deze stellingen gaan nog steeds over wat u vind van uw huidige smartphone. De mogelijk antwoorden lopen van: "Helemaal mee Oneens (1)" tot "Helemaal Mee Eens (7)" Geef aan in hoeverre u het eens bent met de volgende stellingen.

Mijn smartphone:

	Helemaal Mee Oneens (1)	2	3	Neutraal (4)	5	6	Helemaal Mee Eens (7)
is traag. (1)							
kost veel moeite om te gebruiken. (2)							
is duur in gebruik. (3)							
kost veel stroom in gebruik. (4)							
gaat niet lang mee. (5)							

Page Break

Geef aan in hoeverre u het eens bent met de volgende stellingen over uw huidige smartphone. De mogelijk antwoorden lopen van: "Helemaal mee Oneens (1)" tot "Helemaal Mee Eens (7)"
Mijn smartphone:

	Helemaal Mee Oneens (1)	2	3	Neutraal (4)	5	6	Helemaal Mee Eens (7) (7)
helpt me geaccepteerd te voelen. (1)	○	○	○	○	○	○	○
verbetert hoe ik gezien word door anderen. (2)	○	○	○	○	○	○	○
geeft een goede indruk op anderen. (3)	○	○	○	○	○	○	○
geeft mij goedkeuring van anderen. (4)	○	○	○	○	○	○	○

Page Break

PerEmoVal De volgende stellingen gaan over hoe u zich voelt bij het gebruik van uw smartphone. De mogelijk antwoorden lopen van: "Helemaal mee Oneens (1)" tot "Helemaal Mee Eens (7)" Geef aan in hoeverre u het eens bent met de volgende stellingen. Mijn smartphone:

	Helemaal Mee Oneens (1)	2	3	Neutraal (4)	5	6	Helemaal Mee Eens (7)
geeft mij een schuldgevoel. (1)	○	○	○	○	○	○	○
geeft mij een goed gevoel. (2)	○	○	○	○	○	○	○
gebruik ik met een gerust hart. (3)	○	○	○	○	○	○	○
geeft mij plezier. (4)	○	○	○	○	○	○	○
gebruik ik graag. (5)	○	○	○	○	○	○	○

HERHALING Hieronder ziet u dezelfde reclameposter. Deze poster wordt aan u getoond om u aan de poster te herinneren. De stellingen over uw smartphone zijn afgerond. Als u verder klikt dan komen er stellingen over deze poster gevolgd door algemene vragen over u. De volgende stellingen gaan over de reclameposter die u hebt gezien. De mogelijk antwoorden lopen van: "Helemaal mee Oneens (1)" tot "Helemaal Mee Eens (7)" Geef aan in hoeverre u het eens bent met de volgende stellingen. De poster:

	Helemaal Mee Oneens (1) (1)	2 (2)	3 (3)	Neutraal (4) (4)	5 (5)	6 (6)	Helemaal Mee Eens (7) (7)
omschreef wat anderen doen met hun smartphone. (1)	○	○	○	○	○	○	○

benadrukt de gevolgen van het weg doen van een smartphone. (2)	○	○	○	○	○	○	○
riep op tot verbondenheid met mijn smartphone. (4)	○	○	○	○	○	○	○

Fashion sensitivity De volgende stellingen gaan over uw verhouding tegenover trends.
Ik:

	Helemaal mee Oneens (1)	2	3	Neutraal (4)	5	6	Helmaal mee Eens (7)
vind het belangrijk om op de hoogte te blijven van trends. (1)	○	○	○	○	○	○	○
vervang mijn telefoon wanneer ik denk dat deze niet meer in de mode is. (2)	○	○	○	○	○	○	○
koop een telefoon met de verwachting dat ik deze binnen twee jaar vervang. (3)	○	○	○	○	○	○	○
kijk iedere maand naar	○	○	○	○	○	○	○

de nieuwste
smartphone
modellen.
(4)

Demographics

PhoneAge Tot slot, een aantal vragen die gaan over algemene informatie van u. Hoe oud is uw smartphone? Type hieronder het aantal jaren en maanden afgerond naar beneden. Mijn huidige smartphone is .....jaren en .....maanden oud.

- ○ Jaren: (1) _____
- ○ Maanden: (2) _____

Gender
Wat omschrijft uw gender het beste? Klik hieronder op het beste antwoord dat bij u past.

- ○ Man (1)
- ○ Vrouw (2)
- ○ Anders namelijk: (3) _____
- ○ Zeg ik liever niet. (4)

Age
Wat is uw leeftijd? Type hieronder uw antwoord afgerond naar beneden in hele jaren. Ik ben ..... jaren oud.
_____

Heel erg bedankt voor uw bijdrage aan mijn scriptie onderzoek! Zonder u was het een stuk moeilijker geweest om mijn onderzoek te doen. Mocht u nog onduidelijkheden, opmerkingen of vragen hebben over de vragenlijst laat het dan hieronder weten. Bent u geïnteresseerd in het eindresultaat? Dan kunt u mij een email sturen op melle.huijsman@wur.nl

Appendix 2 – Results Principal component analyses

	Factor Loadings					
	ERI	SV	EV	FVQ	FVV	TS
I want to use my smartphone for as long as possible.	.834					
I plan to use my smartphone for a long time.	.775					
I will keep using my smartphone even if newer models are released.	.686					
I would use my smartphone until it can no longer be repaired.	.591					
I will replace my smartphone when I am in need of a new one.(reversed)	.416					
My smartphone give me approval from others.		.904				
My smartphone improves how others see me.		.889				
My smartphone helps me feel accepted.		.881				
My smartphones leaves a good impression on others.		.828				
My smartphone gives me pleasure.			.813			
I like using my smartphone.			.794			
My smartphone gives me a good feeling.			.767			
I use my smartphone with ease of mind.			.753			
My smartphones gives me feeling of guilt (reversed).			.437			

My smartphone is slow (reversed).				.811		
My smartphone takes a lot of effort to use (reversed).				.761		
My smartphone performs consistently.				.751		
My smartphone is reliable.				.682		
My smartphone is of acceptable quality.				.651		
My smartphone is sturdy.					.731	
My smartphone is a good product for what I paid for it.					.648	
My smartphone does not last long (reversed).					.591	
My smartphone is expensive in use (reversed).					.569	
I replace my phone when I think it is no longer in fashion.						.832
I look at the newest smartphone models every month.						.696
I find it important to stay up to date with the latest trends.						.683
I buy a smartphone with the expectance that I will replace it within two years.						.658
Variance Accounted For	45.7%	76.7%	52.7%	41.7% (55.0%)*	13.2% (55.0%)*	51.9%
Eigen value	2.29	3.07	2.64	3.76	1.19	2.08
Cronbach's α	.636	.898	.740	.822	.579	.646

Loadings are from non-orthogonal Oblimin rotation. ERI = electronic retention intention, SV = social value, EV = emotional value, FVQ = functional value (quality), FVS = functional value (value for money), TS = Trend sensitivity. *Cumulative variance accounted for of the principal component analysis