Radboud Universiteit

IN A SUSTAINABLE MINDSET:

The impact of construal level on the relationship between lateral placement and sustainable choice

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Abstract

In recent years sustainable consumption has become increasingly important. Unfortunately, while awareness and evaluations of sustainable consumption are high, consumer behavior is not necessarily consistent. This study aims to replicate recent findings of Romero & Biswas (2016), which demonstrated that laterally displaying food items congruent with a natural mental representation can nudge consumers towards healthier choices, and apply it to sustainable consumption. On top of this, it was suggested that a congruent lateral placement of more sustainable options is not fixed but depends on the construal level consumers adopt. Specifically, it was argued that when consumers adopt a high construal level a right placement would be congruent and enhance choice. Whereas the opposite would be true when a low-level construal was adopted. A mass customization configurator for mobile phones was selected as context due to the heightened influence of the customer on creating their product and the potential environmental impact of consumer electronics.

225 students participated in a 2x2 between-subjects online experimental design where construal level (high vs. low) and lateral placement of sustainable customization options (left vs. right) were manipulated. Sustainable choice, operationalized as the sum of sustainable customization options chosen, acted as the dependent variable. The results revealed no support for a significant influence of construal level on the relationship between lateral placement and sustainable choice. A possible explanation for this finding is that construal level does not influence where sustainable options are naturally represented and, in turn, does not influence mental congruence and choice. Another very plausible reason is that the manipulation of construal level did not last throughout the experiment, as a manipulation check showed no significant differences in construal level. Hence the influence of construal level on lateral placement and (sustainable) choice requires further research. The results do seem to suggest that consumers can be nudged towards more sustainable choices by placing the more sustainable options to the left of less sustainable options, controlling for the personal importance of environmentally sustainable consumption and product involvement. These findings appear to be in line with empirical findings demonstrating that mass customization configurators can be effective in translating environmental consciousness into more sustainable product choices, as well as corroborating Romero & Biswas (2016) by suggesting lateral placement can influence consumer behavior.

Table of Contents

1. Introduction

The world is in dire need of sustained action if future generations are to prosper. For this reason member states of the United Nations (UN) agreed to a number of sustainable development goals to meet by 2030 to "sustain the needs of the present without compromising the needs of future generations"(United Nations Department of Economic and Social Affairs, 2016 (UN DESA)). An essential part of meeting this objective is achieving sustainable consumption and production.

Throughout the years, attention has increased on improving the sustainable performance of companies and moving towards more responsible consumption patterns. How consumers purchase, use and dispose of products can have lasting implications for demand and sustainable development on a larger scale. These choices have consequences ranging from natural resource depletion to pollution and even child labor practices (Golisano Institute for Sustainability, 2016).

Various studies have indicated that increased awareness of sustainability issues has led to consumers developing favorable attitudes and intentions towards acting sustainably (e.g. Terlau & Hirsch, 2015; The Gallup Organization, 2009; Young et al., 2010). However, these studies also demonstrate that this positive disposition has not necessarily led to consumers putting this into practice. This so-called attitude-behavior gap has stimulated several research fields to investigate how to influence consumers to make consumption decisions sustainably.

One such body of research had discussed and demonstrated that consumers' decisions could be influenced by changing the choice architecture (i.e. the context in which choices are presented). Specifically, alterations that predictably influence behavior but do not prohibit any options, commonly referred to as nudges, can be a powerful means to promote specific choices (Thaler & Sunstein, 2008).

These nudges are typically interesting for buying situations where the customer co-creates the final product with the business. In such a situation, consumers have to make multiple sequential choices that can affect the environmental impact of the final product and are part of an informational exchange with the company that is much higher compared to regular products (Franke & Piller, 2003). Thus, there is ample room for the business to promote more sustainable choices throughout the process. One such context, which is growing in importance, is Mass Customization.

Mass Customization (MC) refers to offerings that are designed to meet customers individual needs and producing these with the efficiency of mass production (Jiao & Tseng,

2001). It gives consumers the ability to co-design products and build unique solutions through choosing between a predefined amount of options for various attributes. For example, imagine designing your own television. Instead of choosing a particular model, along with the process the company provides you with choices on how big your screen size should be, its resolution, whether it has smart options or not, and on how it should be packaged and delivered. All of these choices can affect the performance of the final product. Respectively, the environmental impact of the product depends on the preferences and chosen customization options made by the customer throughout (Medini et al., 2014).

Typically, the process of MC is facilitated by companies providing customers with an (often web-based) user-interface where they can choose and modify their product by choosing between a set amount of options for a number of features. These interfaces are commonly referred to as "configurators" (Franke & Piller, 2003). Configurators play a vital role in the MC process. For the consumer it is the main design -and communication tool in the customization process. Their design essentially determines the choice architecture for these products.

Despite their essential role, the literature on the design of MC configurators is sparse (Franke & Piller, 2003). Similarly, the combination of sustainable consumption in an MC context is a relatively new and slow building research field. Various authors have indicated the potential for improving the sustainability of the MC co-creation phase, but these papers have remained mainly conceptual (e.g. Hankammer et al., 2016). To the best of our knowledge, there is, to date, only one empirical study that demonstrates people can be nudged towards configurations with a lower carbon footprint (Hankammer et al., 2018b). Specifically, this study found that including the most sustainable options as defaults for the initial configuration led customers to produce more sustainable end-configurations. What this study neglects, however, is whether there may be a differential effect of how these customization options are displayed and how often they are chosen. Such findings may provide practitioners with more fine-tuned ways to promote sustainable choices in the MC co-design phase.

How to optimize choice architecture in these configurators may depend on the coherency between how information is presented externally and internally. Recent research in the food context has found that it is possible to nudge consumers towards healthier choices by presenting the options in a way that is coherent with how these choices are represented in the consumer's mind (Romero & Biswas, 2016). This research seeks to replicate this study to

nudge consumers towards more sustainable consumption choices. However, how would sustainable choices be displayed to be congruent with their natural mental representation?

Various studies have shown that people have a natural representation of concepts like time, numbers and space on a left-to-right continuum (e.g. Bueti & Walsh, 2009). Typically, this representation puts lower magnitudes on the left side of the spectrum and places higher magnitudes on the right. For a dimension like time, this proposes that events more proximal in time would be associated with the left and more distal events with the right.

Research has further demonstrated that as magnitude increases from left to right something perceived as "bad" would be placed on the left while something perceived as "good" would be on the right of the continuum (Casasanto, 2009). When consumers are then presented with choices that are coherent with this image, this can positively influence their (subconscious) preference for that option. Specifically, a "good" option shown to the right of an option perceived as less good would increase the likelihood of that option being chosen. An issue this study fails to address is that whether we perceive something as good or bad may depend on what aspects of the concept are salient at the moment and the mindset we adopt.

This study builds on insights from Construal Level Theory (CLT) and researches whether consumers consider sustainable consumption abstractly or concretely has a differentiating effect on how it is naturally presented in the mind. Should this be the case, how to laterally display customization options in a mentally congruent way may vary as well.

From a more abstract mindset, consumers may view sustainable consumption as a more general, desirable and distant goal that consumers want to work towards (Van Dam, 2016). In this case, the long term benefits and consequences of the choice are more salient (Trope & Liberman, 2010). In such a situation presenting it to the right rather than to the left of a less sustainable option may nudge people to choose the option more frequently. Alternatively, when consumers construe sustainable consumption more concretely, short term consequences of the choice become more salient (Trope & Liberman, 2010). In this scenario, the deviance from consumption goals and more immediate trade-offs like price premiums for more sustainable options (Van Dam, 2016) may lead to a sustainable option being perceived as "bad". In this scenario, positioning the option to the left of a less sustainable option would increase the likelihood of consumers choosing it.

1.2 Objective and Research Question

The purpose of this research is to replicate the recent findings of Romero and Biswas (2016) in the food industry by applying to a sustainable consumption context. Specifically, this study researches how consumers can be nudged to make more sustainable choices in an MC co-design phase through configurator design. In doing so, it draws on two streams of literature on mental representation, namely: Lateral Placement and Construal Level Theory (CLT). We propose that following a natural representation of sustainable consumption choices and applying them to how customization options are presented enhances how often that choice is selected. With this, we argue that the lateral display position that nudges consumers towards choosing the sustainable option more frequently is not fixed but is dependent on how concrete or abstract consumers view the purchasing decision.

In sum, the following research question will be answered:
"What is the impact of adopted construal level on the relationship between laterally displaying product customization options varying in sustainability and choice?"

1.3 Academic and Managerial Contribution

An answer to the above research question will build on the virtually unexplored area of how sustainable consumption can be stimulated through MC configurator design. Specifically, it can provide empirical evidence of how choice architecture considerations can nudge consumers towards more sustainable choices. In doing so, it provides useful insights for research into configurator design, MC customization patterns and Sustainable Mass Customization (SMC).

Moreover, this study will contribute to research on lateral placement and construal level theory by potentially providing empirical support that optimal lateral placement may not be fixed but vary based on context and the mindset adopted by the consumer. This may have implications that suggest mindset may have to be influenced before being exposed to a particular choice representation to nudge customers towards a more sustainable choice.

For practitioners, the results of this study will offer more fine-tuned ways towards nudging consumers towards more sustainable options without making any choices unavailable. Configurator design and changes can be costly and difficult to implement (Franke & Piller, 2003). Tailoring MC configurators to promote sustainable options from its initiation can save

costly mistakes and build demand towards more sustainable products and steer companies towards producing sustainably.

2. Literature Review

This chapter provides a theoretical basis for relationships examined in the study. First, it discusses what Sustainable Consumption is and how changes in choice architecture can stimulate it. Next, there is a discussion of the context of this research, Mass Customization and the design of configurators. Additionally, it provides a review of the current state of research on the combined field of sustainable consumption and mass customization. Afterward, background information is provided on how congruence between mental representation and how information is displayed may enhance choice. Here we discuss two mechanisms of mental representation – lateral placement and Construal Level Theory. Insights from these research areas are then used to hypothesize how sustainable customization options can best be presented in MC configurators to enhance choice. These relationships are summarized in the conceptual model provided at the end of this section.

2.1 Sustainable Consumption and Choice Architecture

Sustainable consumption (SC) has been identified as one of the critical determinants of combatting climate change (United Nations Framework Convention on Climate Change (UNFCCC), 2015) and has been set as a Sustainable Development Goal by the UN since 2015 (UN DESA). It refers to consumer behavior that meets the current needs of customers without harming the needs and consumption of future generations (Terlau & Hirsch, 2015). In practice, this means using and producing services and products that minimize waste, pollution, use of toxic materials and natural resources across their whole lifecycle (United Nations, 2018).

While SC is highly dependent on manufacturers, consumer behavior plays an integral part as well. The products we decide to buy, or not buy, on an everyday basis can have long-reaching consequences ranging from natural resource depletion and pollution to child labor practices (Golisano Institute for Sustainability, 2016). Further, if our current consumption and production patterns do not change with the population growing as it does, this would require the equivalent of three times the planet to meet the demand in natural resources (United Nations, n.d).

Despite increased awareness of sustainability concerns amongst consumers, there is a notable inconsistency between the intention to act sustainably and actual sustainable consumption behavior (Terlau & Hirsch, 2015; Young et al., 2010). This is a critical barrier to sustainable consumption. Customers may be willing to purchase sustainable products, but the number of people that do is much lower. This phenomenon is commonly referred to as the attitude-behavior gap (Terlau & Hirsch, 2015; Young et al., 2010). Research suggests that this gap can be influenced not only by the availability and supply of sustainable options as well as the choice architecture in which they are presented (Middlemiss, 2018).

Choice architecture refers to the context in which consumers make decisions (Balz et al., 2014) and can have a substantial impact on how decisions are made. Various researchers have confirmed that it may be possible to nudge consumers towards more responsible options by changing the way choices are framed or presented (e.g. Benartzi et al., 2017; White et al., 2011). Thaler and Sunstein (2008) define nudges as "any aspect of the choice architecture that alters people's behavior in a predictable way without forbidding any options or significantly changing their economic incentives" (p.6.). How nudges can be used to promote SC in a buying situation in which consumers customize products according to their own needs is particularly interesting to study because consumer choices are split up into several sub-steps. Therefore, SC is dependent on the decisions made throughout the co-creation process. Further, it has been established that MC is linked to more information exchange and involvement of the customer in the design process (Franke & Piller, 2004). In turn, this could lead to more environmentally friendly products than if they were produced through mass production (Hankammer et al., 2016).

With this in mind, this study aims to research how choice architecture can be designed to promote sustainable choices in a co-creation buying situation — specifically, Mass Customization. The next section will discuss what Mass Customization is, and how it is facilitated, its potential for stimulating sustainable consumption and what the existing knowledge on the topic is.

2.2 Mass Customization and Configuration Toolkits

Mass Customization (MC) refers to meeting the needs of individual customers while maintaining the efficiency of mass production (Jiao & Tseng, 2001). One of the earliest and perhaps most famous examples is that of NikeID. Launched in 1999, and initially offered

through their website, NikeID allows customers to customize their shoe by making decisions about colors, materials, logos, and texts of various components ("NIKEid," 2012).

Over the last years, MC has received much attention from researchers and is becoming increasingly important for manufacturing firms (Sandrin et al., 2018). For them, it presents a valuable means of differentiation and efficient production (Salvador et al., 2009). It reduces the need for increasing lines of standard products to meet heterogeneous customer needs and alleviates the risk of producing unwanted products and carrying too much or too little inventory. For customers, MC allows for products that better fit their personal needs. Additionally, research has shown that their involvement in the design of product typically leads to a higher willingness to pay and valuation of the product (Franke & Piller, 2004; Schreier, 2006).

Typically the process of MC is facilitated by companies providing customers with an (often web-based) user-interface (Franke & Piller, 2003). They then proceed to choose and modify their product by choosing between a set amount of options for a number of features. These interfaces are commonly referred to as "configurators". Configurators play a vital role in the MC process. For the consumer, it is the main design and communication tool used during the process as well as being an antecedent of customer loyalty. However, in their paper, Franke and Piller (2003) noted that how configurators needed to be designed and how customers interacted with them was still a research field relatively unexplored and poorly understood. Over the years, several authors have investigated the design of configurators. However, this has mainly been limited to decreasing complexity, alleviating the burden of choice and the capabilities companies require designing them.

Few researchers have addressed how MC configurators can be designed to promote more sustainable consumption. In practice, Hankammer et al. (2016) found that only 5%, of the over 900 configurators researched in their study, incorporated sustainability issues. In tackling this in the future, they propose that more intensive feedback on the environmental impact of choices in the configurators may enhance sustainable consumption.

However, Hankammer et al. (2018b) which is to the best of our knowledge the only empirical study researching how SC choices can be stimulated in the MC co-creation phase, no substantial evidence was found for this. What the study did demonstrate is that consumers could be nudged towards more sustainable configurations by changing the default configurations. Specifically, they show that selecting the most sustainable product options as default in the starting configuration led people to design TVs with a lower environmental impact.

While this research offers valuable insights into increasing SC in MC co-design, it neglects to take context dependent mindset and how the product customization options are positioned into account. This study aims to provide more insight into how product customization options need to be presented while taking into account the mindset of the consumer. Specifically, we argue that whether the relative position of customization options is congruent with how they are naturally presented mentally determines whether the option is more likely to get chosen.

2.3 Mental congruence

Various studies have indicated that when consumers are presented with information, messages and tasks that are coherent with their natural representation in the mind can enhance behaviors and attitudes (Casasanto, 2009; Deng & Kahn, 2009; Deng et al., 2016; Kadosh et al., 2008; Ramirez et al., 2015; Romero & Biswas, 2016; Ryoo et al., 2017; Schill & Shaw, 2016; White et al., 2011; Zhang & Schwarz, 2011). Among these effects are; increased processing fluency, reaction time, favorable attitudes, intentions, enhanced willingness to pay, as well as actual choice and behavior.

This study considers two mechanisms that may influence how sustainable customization options can be presented in a manner that is congruent with their natural mental representation, namely; Lateral Placement and Construal Level Theory (CLT).

2.3.1 Lateral Placement

In the literature, "lateral placement" commonly refers to how options are displayed in relation to each other on a horizontal spectrum (as opposed to an up-down, vertical spectrum).

It has been widely accepted that a similar mapping exists for concepts like time, numbers and weight that can be processed in terms of magnitude (Bueti & Walsh, 2009; Kadosh et al., 2008). Specifically, it has been demonstrated that natural mental representation puts lower magnitude objects and events on the left side of the continuum and higher magnitude on the right. For a concept like time, for instance, this would place more proximate events on the left while placing future events on the right.

Several studies have been conducted to investigate whether laterally displaying products, choices and messages, congruent with their natural mental representation has an effect on how we process information, form attitudes towards choices and how we make purchase decisions (Casasanto, 2009; Deng et al., 2016; Kadosh et al., 2008; Romero & Biswas, 2016;

Zhang & Schwarz, 2011). These studies propose and demonstrate that when options are displayed congruent with how they are naturally presented in our mind, it can influence how fast stimuli are processed, positive attitude formation, preference, choice, and consumption volume.

For instance, Zhang & Schwarz (2011) show that the spatial representation of time typically places the past on the left and the future on the right. In applying this to advertising for products where temporal aspects are relevant, they found that placing antiques on the left rather than the right led respondents to form more positive attitudes towards the product and the ad.

Deng and Kahn (2009) use similar rhetoric and find that putting weight labels on the left of packaging lead to respondents perceiving the product as lighter while doing so on the right resulted in perceptions of a heavier product. This further demonstrates that lateral placement can subconsciously convey information about the product and potentially affect what consumers decide to buy.

More recent research in the food context has found that by following a natural mental representation when laterally displaying food options, it is possible to nudge consumers to choose healthier foods (Romero & Biswas, 2016). In their paper, they demonstrated that positioning healthier options on the left (vs. the right) of food choices that were less healthy resulted in higher preference and consumption volume for those options. The reasoning behind this is that healthier options are perceived as being lighter, lower in calories and less tasty, and thus would be best presented on the left, congruent with a natural representation of lower magnitude objects.

This study aims to replicate these findings by applying lateral placement to SC within an MC context. However, their approach may not be directly applicable to SC as it does not have an unambiguous relation to either low or high magnitude.

Alternatively, Casasanto (2009) demonstrates that there is a relation between the mental representation of abstract constructs and their valence. Here things perceived as "bad" are typically mapped on the left side of the continuum, and things perceived as "good" on the right. Following this reasoning, placing an option perceived as "good" to the right of an option perceived as less good would enhance the likelihood of it being chosen. Unfortunately, this study neglects that whether a person perceives an object, event or choice as "good" or "bad" may depend on what aspects are salient. Potentially this distinction is influenced by how concrete or abstract the choice is construed (Chang et al., 2018). For instance, one could argue that if a consumer were to consider why they would eat healthy food (a more abstract

mindset), the healthy food option could be perceived as good. In this case, placing it on the right of an unhealthy option would enhance the likelihood of it being chosen. Alternatively, should more immediate contextual information like taste be more pressing, healthy food may be best presented on the left of an unhealthy option to induce choice.

Few researchers have considered the question of how these differences in perception may influence how lateral placement positions affect choice. This research aims to take insights from Construal Level Theory and apply them to how the effectiveness of laterally displaying product customization options differing in sustainability may depend on the mindset of the customer in the MC co-creation phase.

2.3.2 Construal Level Theory

Construal level theory (CLT) proposes that objects and events can be perceived in different ways depending on how the context is construed (Trope & Liberman, 2010). Trope et al. (2007) propose that how abstract or concrete something is construed is determined by psychological distance. This refers to the cognitive separation between our direct experience and what is being constructed in the mind.

CLT categorizes two types of construal levels. A low construal level refers to a more concrete representation and typically focuses on more detailed, contextual information and the more immediate benefits and consequences (Trope & Liberman, 2010). In contrast, a high-level construal is associated with more abstract, higher order information, as well as long-term benefits and consequences. Besides, lower construal levels often consider how action needs to be performed, whereas higher construal levels focus on why an action is performed.

There is a considerable amount of research that suggests a congruence between construal level and how a message is framed can positively affect sustainable (consumption) behavior (Ramirez et al., 2015; Schill & Shaw, 2016; White et al., 2011). Further, various studies confirm that the construal level people adopt is situational and context-dependent and can even be manipulated (Freitas et al., 2004; Ryoo et al., 2017). Accordingly, it can be assumed that as mental representation is context-dependent, lateral placement positions that lead to higher mental congruence and choice are not fixed either.

Several studies have found that the valence with which sustainable consumption is perceived can differ depending on the adopted construal. It has been argued that higher construals increase the saliency of moral principles and more abstract values (Trope & Liberman, 2010) and enhances how positive virtuous actions are perceived (Eyal et al.,

2008). On that note, when a higher construal is adopted sustainable consumption is typically seen as a distal, desirable goal that should be supported and more idealistic in considering why actions should be performed to promote it (Van Dam, 2016). Generally, people can see how meeting the needs of future generations and saving the environment is beneficial and perceive it as "good". Following Casasanto (2009) and Romero and Biswas (2016) this would implicate that positioning the sustainable choice to the right of a less sustainable option would result in a higher chance of the option being chosen, as this is congruent with the mental representation of sustainable consumption.

Alternatively, when a low construal is adopted, which is often the case in a concrete purchasing decision (Van Dam, 2016) consumers may evaluate choices on more salient product attributes and short term consequences. Typically, sustainable consumption conflicts with regular consumption goals and consumers may not find the option more rewarding in terms of valence. Subsequently, this suggests that the option may be perceived as relatively "bad". While this may lead to the option not being preferred at all, laterally displaying the more sustainable option on the left of a less sustainable option still increases congruence with mental representation. It can thus be argued that this positioning would still increase the likelihood of the option being chosen compared to an alternative lateral placement.

2.4. Conceptual model

As previously discussed this research aims to replicate the findings of Romero and Biswas (2016) to a sustainable consumption context in MC configurators. We argue that whether laterally displaying sustainable options enhances the likelihood of that option being chosen is moderated by the construal level a person adopts. This relationship is summarized in Figure 1.

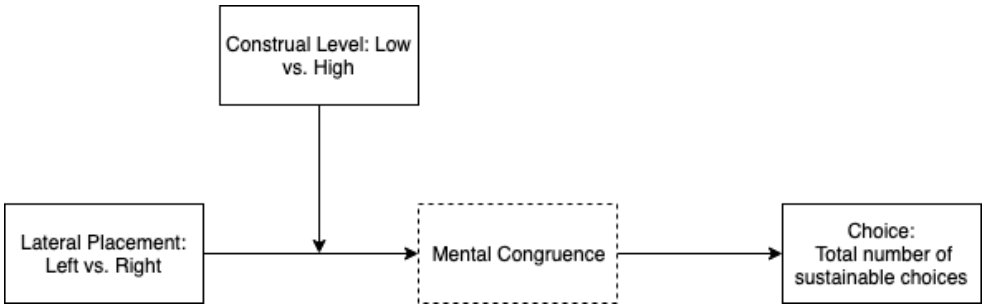

Figure 1: Conceptual Model

This study proposes that when a high-level construal is adopted displaying the sustainable option to the right of a less sustainable option would enhance the likelihood of the option being selected in comparison to a left placement. This placement would enhance mental congruence as SC will be seen as a generally "good" option from an abstract mindset, which is naturally represented on the right. In turn, this mental congruence enhances the likelihood of the sustainable customization option being chosen. Mental congruence cannot be formally measured. Therefore, sustainable choice will be treated as indicative of mental congruence.

Hypothesis 1: When a high-level construal is adopted laterally displaying a more sustainable product customization default option to the right (congruent) rather than the left (incongruent) increases how often it is chosen.

Further, we propose that when a person adopts a low construal, the sustainable choice may be considered as a more negative tradeoff that does not immediately meet the person's consumption goals. Presenting the option to the left of an unsustainable option (rather than to the right) would, therefore, be more congruent with how the choice is naturally presented mentally.

Hypothesis 2: When a low-level construal is adopted laterally displaying a more sustainable product customization default option to the left (congruent) rather than the right (incongruent) increases how often it is chosen.

2.5 Control Variables

Besides the relationships discussed in the conceptual model, some control variables are included in the analysis that may influence the number of sustainable choices made in the configuration. These include product involvement (PINV), Environmental Consciousness for Sustainable Consumption (ECfSC) handedness, native language and a number of demographics.

2.5.1 Product Involvement

Product involvement has been named as a key influence in consumer behavior and response to purchase decisions (Zaichkowsky, 1985). As a result, it may have an undue influence on

the choices being made throughout the configuration process and was thus included in the analysis as a control variable.

2.5.2 Environmental Consciousness for Sustainable Consumption

Hankammer et al. (2018b) demonstrate that consciousness for sustainable consumption as developed by Balderjahn et al. (2013), specifically the environmental dimension, influenced the environmental footprint of the products made in an MC co-creation phase for TVs. Although this is not treated as the independent variable in this study, it was included as a control variable to account for the influence it may have on the total amount of sustainable choices made in this research.

2.5.3 Handedness

Casasanto (2009) shows that the valence associated with either left or right on a horizontal spectrum may be dependent on the dominant hand of the person. To account for the influence, this may have on the selection of laterally displayed customization options it was included in the analysis.

2.5.4 Native Language

Chae and Hoegg (2013) found evidence that suggests the effect of horizontally displaying images varying in temporal distance in advertising had opposite effects for participants that read and write from left to right versus right to left. This may influence whether the left or right is associated with more temporally distant or proximal contexts, which in turn influences psychological distance and construal level (Trope et al., 2007). As a result, the effect of lateral placement on mental congruence may be reversed as well. Consequently, it was included as a control variable.

2.5.5 Demographics

Lastly, demographic dimensions were taken into consideration to test for extraneous influence on the dependent variable. These include age, gender, nationality, and education level.

3. Methodology

The following section describes the setting of the research, the research design, participant selection, as well as the materials and procedure that were used during the research.

3.1 Research Setting

As previously discussed, the context of this research was that of MC configurators. To facilitate the configurator process, a suitable product to customize had to be selected.

Consumer electronics present one of the largest growing waste streams in the world, with mobile phones presenting a significant contribution (Xu et al., 2016). Hankammer and Steiner (2015) have argued that using mass customization business patterns combined with complementary Product Service Systems (PSS) provide a promising lever in enhancing sustainability in the sector. Similarly, (Hankammer et al., 2018a) discuss the potential of prolonging mobile phone life cycles (or at least that of their parts) through co-design and modularity could have an environmental impact of consumer electronics.

Due to this potential for sustainable consumption, a configurator for mobile phones was created as the unit of analysis in this study.

Phone customization is, as of yet, not commonplace and mainly consider aesthetics choices in the available business models (Hankammer et al., 2018ab). The scenario presented in the study is therefore hypothetical and based on a number of choices that could be made for phones to enhance sustainability in manufacturing, use, and post-use through a number of material, service and PSS choices. The exact choices are discussed in section 3.4.3.

3.2 Research Design

To research whether there was indeed a differentiating effect of adopted construal level on the choice for laterally presented sustainable customization options, an online experiment was designed. This research method was selected due to its appropriateness in investigating causal relationships (Field & Hole, 2003, p. 26). Further, the decision for an online experiment was made due to the often web-based nature of configurators (Franke & Piller, 2003). To test the proposed hypotheses, level of construal and lateral placement were manipulated in the experiment.

This study used a between-subjects design with two treatments. The independent variables both had two levels, namely; Construal Level (high vs low) and Lateral Placement (left vs right). Consequently, the online experiment follows a 2x2 factorial design in which

participants were randomly assigned to any of four combinations of treatments. The dependent variable to be researched was ‘Sustainable choice' and was operationalized as the total amount of sustainable options chosen throughout the configuration process. In other words, the score for each participant was the number of sustainable options chosen for the number of choices provided, measured at a ratio level.

The experiment did not have a control group in the traditional sense. This decision was made because theory suggests that participants would adopt a construal level regardless of manipulation. A control situation without treatment would therefore only lead to ambiguity in regards to what construal level was adopted by the participants. Rather than a control treatment where manipulation of construal levels was absent, the treatment conditions were compared against treatment groups where the lateral placement customization options and construal levels were assigned in an incongruent manner. This made it possible to isolate the differential effect of mental congruence.

3.3 Sample

Research suggests that college students are among the chief user-groups of mobile phones (Smith, 2010). Consequently, they play an essential role in determining consumption patterns for this product. Therefore, students were deemed suitable participants for this study. Participants were gathered through convenience sampling. Primarily, students were reached through the author’s own network, social media and online platforms for sharing academic surveys. Participants were further incentivized to take part in the experiment by a chance to win a €50,- gift certificate. The online experiment included the option to provide their email address at the end of the survey. A statement was provided that their email would be deleted once a recipient had been chosen to address privacy concerns.

This study was designed with analysis through parametric tests and particularly two-way independent Anova in mind. The study, in terms of participants, aimed to have a minimum of 30 per cell of treatment. To increase the power of the study, however, the aim for the number of participants was set higher at 200.

3.4 Materials and Procedure

In the main experiment, participants were subjected to a configurator embedded in an online survey. The survey was made available in both English and Dutch. To achieve this, the survey was first translated to Dutch by the author and then translated back to English by a

peer. This version was then compared to the original English survey, and differences were discussed to ensure no meaning was lost. Comparison and discussion only let to minor changes to the text. The full survey can be found in Appendix B.

The following section outlines the procedure of the main experiment as outlined in Table 1, and discusses the materials and rationale behind materials used.

Overview of the content online experiment
1. Introduction
2. Construal level manipulation
3. Configuration phase (and lateral placement manipulation)
3.1 Introduction
3.2. Configurator (11 choices)
4. Post configurator survey
4.1. Manipulation Check BIF
4.2. PINV, EcfSC, handedness, native language
4.3. Demographics
5. End of survey

Table 1: Overview of content online experiment

3.4.1 Construal Level Manipulation

Participants were first treated to an introduction to the research. After the introduction to the online experiment, participants were presented with a thought experiment aimed to manipulate their construal level to be either high or low using an established method by Freitas et al. (2004). Participants were randomly assigned to this treatment through randomization options present in Qualtrics.

Freitas et al. (2004) successfully demonstrated that participants may be primed to have an abstract mindset by engaging them in a thought exercise. Continuously asking participants why they would perform a certain, mundane task would result in a high-level construal. Whereas, asking people to elaborate on how they would perform the same task would lead to a lower level construal. Both the action discussed in the passage nor the subsequent thought exercise has to be related to the (sustainable consumption) choices the participants have to make in the main experiment. This was expected to potentially influence the participants' responses.

Participants were first subjugated to an introductory passage, adapted from Freitas et al. (2004) discussing either linking broad goals to how these can be achieved through specific actions or on reasons behind our behavior, linking actions as to why we perform them and the broad goals they are linked to.

After reading the passage, participants assigned to the low construal condition answered four questions on how they would maintain good physical health with each answer elaborating on the previous answer. For instance, a participant may first answer they can maintain good physical health by sticking to a healthy diet. The next question would then be ‘how' to do that, e.g. by eating more fruit and vegetables or to consume fewer calories.

After reading the introductory passage, participants assigned to the high construal condition had to fill in a similar diagram instead of answering ‘why' they would maintain good physical health.

3.4.2 Manipulation Check Construal Level

To test whether construal level had been manipulated successfully, a manipulation check of construal level was adapted from (Fujita et al., 2006) Two independent judges coded the responses given in the diagram by the respondents, after data collection. If the response was subordinate to the original statement or prior response (i.e. a means of achieving the previous statement), it was coded as -1 whereas responses that were considered to be superordinate to the initial statement or previous response (i.e. the response was an end achieved by the previous response) were coded as +1. Responses that were neither considered to be subordinate or superordinate were coded as 0. This led to a possible range of scores between --4 and +4 for the thought exercise. Here lower scores are indicative of a low construal level, whereas higher scores are indicative of a high construal level.

For the main experiment, an additional manipulation check was added as it became apparent during pre-test analysis that the first test was more indicative of whether the exercise was performed successfully rather than indicative of what mindset the participants were in during the experiment. As a result, a second manipulation check, commonly used in prior research on construal levels (e.g. Fujita et al., 2006; Liberman & Trope, 1998; Slepian et al., 2015) was used as an additional check.

Participants were asked to indicate whether they preferred a high or low order description for 8 behaviors adopted from the Behavior Identification Form (BIF) developed by Vallacher and Wegner (1989). For instance, participants were asked whether the behavior “reading”

was best described as “following lines of text” or “gaining knowledge” according to their personal preference.

The reasoning behind this is that when participants adopt a high (low) construal they show a higher preference for higher order (lower order) descriptions of behavior. For the analysis, lower order descriptions were coded as 1 and higher order descriptions were coded as 2. A mean score was then calculated for each participant.

3.4.3 Configuration Phase and Lateral Placement

After participants had completed either the high or low construal level treatment, they were presented with the configuration phase of the experiment.

At the beginning of this phase, participants were presented a small introductory text explaining its purpose and a mockup image of a configurator. This text briefly explained that participants were intended to customize their own phone by making a number of choices between customization options. Participants were then randomly assigned to a condition where more sustainable choices were consistently placed on either the right or left side of the range of choices provided. In total, the configurator phase included eleven choices of which 3 were filler choices that did not include a particular sustainable choice but were added for realism.

The product customization choices related to the configuration of a smartphone as well as associated services and featured small explanatory text. Imagery for all options were sourced from stock photo databases. The following section discusses the rationale behind the choices and identifies sustainable options for each decision in the process.

Body: Aluminum- plastic- **bioplastic**

Aluminum alloys and plastic are both common materials used in the body/case of phones (Singh et al., 2018). While both aluminum and plastic are recyclable, plastic is more durable and resistant to damage. Bioplastic, however, as a recovered material presents less environmental waste than the production of virgin materials (Liao et al., 2013). Hence it is the sustainable option for this choice.

Lens: Glass – **recycled plastic**

Mobile phones are typically made out of glass or plastic. Recycled plastic offers ecological benefits but can scratch more easily than glass lenses (Liao et al., 2013).

Fingerprint identification: no-**yes**

Fingerprint identification can improve energy consumption and reduces the need to enter codes, potentially leading to a longer screen lifetime (Liao et al., 2013).

Take-back service: no-**yes**

After replacement, many still functional phones are often left in households while they could be used for reuse or remanufacturing or allow for material recovery (Singh et al., 2018). A take-back scheme could allow for recovery of these devices.

Offsetting: no-**yes**

Considering the low recycling rates of e-waste for mobile phones (Singh et al., 2018). Potentially companies can contribute collecting and reintegrating used phones and materials (Nußholz, 2018) There are various companies, for instance Closing the Loop, that offset the CO2 impact of mobile phone usage by collecting e-waste in less developed countries, for an additional amount spent on phones (DHL, 2011).

Warranty: standard-extended-**premium**

Warranties can extend life cycles and narrow material loops by steering customers towards repairing their products rather than replacing them (Bocken et al., 2016). Hence a longer warranty is associated with a longer lifetime and enhanced sustainability.

Packaging: standard-**eco-friendly**

Typically, mobile phone packaging includes inner plastic trays. A way sustainability of phones can be enhanced is by opting for eco-friendly packaging, made from renewable sources and ideally sources that have a lower environmental footprint in production like fairphone currently does using starch and fiber solutions from Paperfoam (Zero Packaging, 2016).

Delivery: express-standard-**eco-friendly**

Express shipping can have a higher environmental impact than standard shipping as it can lead to inefficiencies like using delivery trucks that are not full (Climate Action, 2018). A form of eco-friendly shipping can be found in delivery companies that offset the CO2 impact of delivery for an additional charge like GoGreen by DHL (DHL, 2011).

Coding and Sustainable Choice

For each choice, the sustainable customization option was coded as 1 while other options were coded as zero for each participant. These scores were then summed to create a Sustainable Choice score with a range from 0 to 8, indicating the number of sustainable choices made.

3.4.4 Control variables and demographics

After the completion of the configuration phase, participants were presented with a post configurator survey. Participants were first asked to indicate to what extent they agreed with statements related to ECfSC and PINV. Participants first responded (7 point Likert scale) to 3 items adapted from the PII index of (Zaichkowsky, 1985) to test product involvement in mobile phones. ECfSC was tested with a 7-point Likert scale with the eight items associated with the environmental dimension of CfSC suggested Balderjahn et al. (2013).

Because the likert scales for these items were presented in a manner where lower scores indicated lower EcfSC and PINV, scores were first reverse coded, for ease of interpretation.

Next participants were asked to indicate their dominant hand as either left or right and provide their native language.

Lastly, participants were asked their age, gender, nationality, and current education level.

Questions related to control variables and demographics were asked last in the experiment. This decision was made because in the event participants did not finish the entire survey, the main experiment, the manipulation and configuration phase, had higher importance than the specific demographics, ECfSC and PINV.

3.4.5 End of survey

Lastly, participants were asked to enter their email address if they wished to participate in the raffle for the Bol.com gift certificate. Afterward, participants were thanked for their contribution to their research and informed that any inquiries and comments regarding the study and the use of data could be directed to the researcher's academic email address.

3.5 Research Ethics

In terms of ethics, participants took part in the experiment in a voluntary nature, hence with consent. Further, participants were informed that they were free to withdraw from the study at any time. Although, the tasks included in the experiment were outlined in the introduction

the full nature of the experiment was not made clear to the participants to avoid influencing the results. However, participants were informed that their data would be treated with confidentiality and anonymity in the introduction and contact details were provided at the end of the survey if they had any comments or inquiries or would like to receive the results of the study. As stated in section 3.3, participants were asked to leave their email address as a means of contact if they wished to be eligible to receive the giftcard used as incentive. They were informed that email addresses would be deleted as soon as a recipient had been selected.

4. Pre-test

A pre-test among a group of participants (N=64), gathered from the researcher's personal network, was performed to confirm whether the customization options were perceived as intended and to confirm whether the construal level manipulation was acceptable for the main experiment.

4.1 Perceived Sustainability of Customization Options

Respondents were shown all customization options per choice and asked to indicate on a 5-point likert scale how sustainable they found each option (1= very sustainable, 5 = not sustainable). Mean scores for each customization option can be found in Table 2.

Choice	**Intended (from least to most sustainable)**	**Results**	**Decision**
Body	Aluminum – Plastic- Bioplastic	Aluminum: (M=2.48, SD -1.084) Plastic: (M= 4.11 SD= 1.041) Bioplastic: (M= 1.83, SD =.918)	Remove Aluminum as an option for the main experiment
Lens	Glass – Recycled Plastic	Glass: (M= 2.30, SD= 1.064) Recycled Plastic, (M=2.05 , SD =.898)	Make sustainability signifier more prominent in the main experiment
Fingerprint	Absent - Present	Absent: (M=2.67, SD= 1.024) Present: (M=2.33, SD= .874)	Make sustainability signifier more prominent in the main experiment
Takeback	No- Yes	No: (M=4.05, SD= 1.099) Yes: (M=1.77, SD= .874)	
Offsetting	No- Yes	No: (M=4.02, SD = .934) Yes: (M=1.92, SD =.878)	
Warranty	Standard- Extended – Premium	Standard: (M=3.41, SD=.971) Extended: (M=2.81, SD=.774) Premium: (M= 2.27, SD= 1.238)	
Packaging	Standard – Eco-Friendly	Standard: (M= 3.81, SD=1.022) Eco-friendly: (M= 1.75; SD = .713)	
Delivery	Express- Standard- Eco-friendly	Express: (M= 3.98, SD= 1.134) Standard: (M= 3.47, SD= .872) Eco-friendly: (M= 1.72 SD =.701)	

Table 2: Intended perceived sustainability, mean scores and decisions for the main experiment

One-way ANOVA analyses were performed for all customization choices that included more than two options, namely: body type, warranty type, and delivery type.

First, a one-way ANOVA was performed with body type as a factor. Levene's test of homogeneity of variances was not significant (F (2,189) = 1.765, p= .174) therefore equal variances were assumed. A significant mean difference on perceived sustainability for each body option was found [F(2,189)= 85.411, p= .000]. Post hoc comparison with Tukey HSD test revealed that all options significantly differed from each other ($p < .05$ for all tests). However, unfortunately, Aluminium was not perceived as intended. Therefore the decision was made to not include it in the main experiment instead having participants opt between plastic and bioplastic.

Similarly, a one-way ANOVA with warranty type as a factor was performed. Levene's test indicated that the assumption of homogeneity of variance had been violated [F(2,189)=7.944, p= .000]. As a result, the Games-Howell post hoc analysis was used. The results showed that warranty types significantly differed in perceived sustainability [F(2,189)= 20.326, p= .000]. Post hoc analysis with Games-Howell revealed significant differences between all groups ($p < .05$ for all tests)

A one-way ANOVA analysis was also performed with delivery type as a factor. Levene's test indicated that the assumption of homogeneity of variances had been met [F(2,189)=2.890, p= .058]. The results further indicate significant differences between mean perceived sustainability amongst delivery types [F(2,189)=106.708, p= .000]. Post hoc comparison with Tukey HSD test revealed significant differences between all groups (p<.05 for all tests).

For the remaining customization choices that included two options, paired t-tests were performed.

A paired sample t-test showed that there was no significant mean difference in the perceived sustainability of glass and plastic lens options (MD=.250, SD=1.501, t(63) =1.332, p= .188.

Similarly, no significant difference was found between the perceived sustainability of a fingerprint identification being absent or present (MD= .344, SD= 1.383), t(63)= 1.989, p= .051.

The decision was made to still include these options in the main experiment but make it more apparent that the option intended as more sustainable is more likely to perceived as such by the participants. Therefore the eco-friendly text in the imagery was made bold and green for the main experiment.

Paired t-tests for the remaining choices, namely: take back, offsetting and packaging, showed significant mean differences between the two options respectively (MD=2.270, SD= 1.628), [t(63)= 11.064, p= .000]; (MD=2.094, SD= 1.433), [t(63)= 11.686, p= .000]; (MD= 2.063, SD= 1.379), [t(63)= 11.968, p= .000.].

4.2 Construal manipulation

Of the 64 participants that started the pre-test, 13 participants abandoned the pre-test after completing the first phase. This meant 51 participants were presented with the construal level manipulation resulting in N=24 for the high construal treatment and N=27 for the low construal treatment.

Further, 3 participants were excluded from the analysis, specifically the high level manipulation, leaving N=24 participants per condition. One participant filled in the exercise with joke answers, another did not follow the example diagram and answered in single, unrelated words, and finally, one participant answered "How do I maintain good physical health?" with answers related to the physical health of a mobile phone.

Responses were coded by two coders, as discussed in subparagraph 3.4.2, providing each participant with a score ranging between -4 and 4. The CL scores assigned by the two coders were highly correlated (r=.97) and were averaged together.

A one-way ANOVA using construal (high vs. low) as a factor was conducted to compare mean CL scores between the low construal and high construal treatments.

Levene's test indicated the assumption of equal variances was violated (F (1,46) = 6.812, p= .012). Because the assumption was not met, Welch's adjusted F ratio was used (Field, 2013). The results showed a significant difference between CL score for the low construal treatment (M=-3.58, SD=.8165) and the high construal treatment (M= 3.83, SD= .3807) [*Welch's F*(1, 32.55)= 1626.63, p= .000]. This suggests that the manipulation was performed as intended.

After the thought experiment, participants were asked to what extent they agreed that the exercise was understandable and doable on a 7-point likert scale (1= strongly agree, 7= strongly disagree). For the high construal level manipulation, the results indicate that the exercise was understandable (M=2.42, SD = 1.248) and doable (M=2.42, SD= .974) to some degree. For the low construal level manipulation, similar results were found for understandability (M=2.67, SD=1.007) and doability (M=2.29, SD= 1.083).

Despite this being acceptable, a filled-in diagram, based on the introductory text for each treatment, was made to be included as an example in the manipulation for the main experiment, to make the manipulation easier to perform.
A decision was also made to include an additional manipulation check, as discussed in subparagraph 3.4.2.

5. Results

5.1 Sample

In total, 269 responses were collected of which 225 were used for the analysis. From the 44 responses that were not used for the analysis, 29 were deleted for not following the diagram for the thought exercise (i.e. by providing 4 unrelated responses, answering the questions in reverse order or providing answers unrelated to the focal behavior), 6 were deleted for providing non-serious responses and 4 were deleted for not filling in the entire diagram. These reasons were enough to suggest that the manipulation check had not been performed correctly and warranted deletion.

Further 5 participants were excluded from the analysis because they indicated, in the question concerning what educational program they were currently enrolled in, that they were not students.

After this cleaning process, a minimum of 50 participants remained per treatment group as intended (See Table 3).

	Lateral Placement	
	Left	Right
Construal		
High	HL (N=*55)*	HR (N=61)
Low	LL (N=50)	LR (N=59)

Table 3: Participants per treatment

The majority of the participants were Dutch (79.6%) with 20.4% having a different nationality. This coincides with the majority of participants having Dutch as a native language (80%) followed by other languages (13.3%) and English (6.7%). Moreover, the majority of participants were female (71.6%) and right-handed (87.6%).
Further, participants had a median education level of a WO bachelor and a mean age of 22.9.
A full table of demographics across treatments can be found in Appendix C.

5.2 Manipulation Checks

To test whether the construal level was successfully manipulated in the main experiment, two manipulation checks were performed as outlined in section 3.4.2.

5.2.1 Manipulation Check 1

For the first manipulation check based on the responses for the thought experiment, participants were given an individual score between -4 and 4 by two coders, as outlined in section 3.4.2. The two scores correlated highly (r= .96) and were averaged together.

Next, an independent t-test was conducted to compare mean differences in construal scores between high and low construal treatments. Levene's test of homogeneity was not significant ($F(1,223)= 3.687$, $p= .056$) so equal variances were assumed. Further, the independent t-test showed there was a significant difference between construal level score for low construal treatment (M= -3.93, SD= .186) and the high construal treatment (M=3.86, SD= .736), $t(223)= 107.365$, $p= .000$, suggesting that the manipulation was performed as intended.

5.2.2 Manipulation Check 2

For the second manipulation check, as outlined in section 3.4.2, higher order descriptions of behavior were coded as 2, and lower order descriptions were coded as 1 for all 8 behaviors presented to the participants. A mean score with a range between 1 and 2 was then calculated for each participant, where lower (higher) scores were indicative of a lower (higher) construal level.

An independent t-test was performed to test whether the mean construal level score differed between the high-level treatment and low-level treatment. Levene's test was not significant ($F(1,223)= .192$, $p= .661$) therefore equal variances were assumed. Unfortunately, there was no significant difference found between the low construal treatment (M=1.68, SD= .229) and the high construal treatment (M=1.70, SD= .219) on construal level, [$t(233)=.537$, $p= .592$.].

This seems to suggest that the manipulation failed, or at the very least did not last throughout the entire experiment. Participants from both treatments seemed to be in a relatively high construal mindset. Despite this, the construal treatment was still included in subsequent analyses as it did represent a difference in treatment across treatment groups and it is not clear from this check whether mindset was not affected during the configurator phase.

Fayant et al. (2017) suggest that when a manipulation check fails this does not make any result expected from theory invalid. In other words, if a significant effect of construal level on sustainable choice is found, the failed manipulation check does not negate this. Considering that the manipulation presents a difference in treatment the difference in effectiveness between interventions may still be shown. In addition, the manipulation check only shows one instance, in the event of a successful manipulation check this would not have been less ambiguous. Hauser et al. (2018) even suggest that manipulation checks may undo the effects of manipulation. The construal treatment was still included in subsequent analyses as it did represent a difference in treatment across treatment groups and may still have affected sustainable decision making throughout the configurator phase.

5.3 Scales

A principal axis factor analysis was conducted on all items related to PINV and ECfSC, using orthogonal rotation (varimax) to see if the proposed underlying structure existed. The Kaiser-Meyer Olkin measure was sufficiently high, KMO= .816 and Barlett's test of sphericity was significant (.000) indicating factor analysis could be performed (Field, 2013).

An initial analysis was performed to compute eigenvalues for each factor. Based on Kaiser's criterion this revealed 3 factors should be extracted which together accounted for 71.38% of the variance. The rotated factor matrix (See Table 4) revealed that items representing PINV loaded highly only on factor 3, suggesting it represents PINV.

Items	Factor*		
	ECfSCI	**ECfSCB**	**PINV**
EcfSC_1		**.760**	
EcfSC_2		**.881**	
EcfSC_3	.257	**.796**	
EcfSC_4	.248	**.843**	
EcfSC_5	**.775**	.279	
EcfSC_6	**.861**		
EcfSC_7	**.877**		
EcfSC_8	**.876**	.222	
PINV_1			**.780**
PINV_2			**.855**
PINV_3			**.734**

*Table 4: rotated factor matrix. *factor loadings under .20 were suppressed*

The items of ECfSC, however, loaded highly on 2 separate factors. This last revelation is understandable as Balderjahn et al. (2013) created the items for the environmental dimension of consciousness for sustainable consumption as a combination of importance and beliefs. Following this rhetoric, factor 1 seems to represent importance, while factor 2 represents beliefs.

However, while Balderjahn et al. (2013) refer to the two subscales of ECfSC as such, another interpretation seemed more plausible. The 'beliefs' scale asks the respondent to consider the question "I only **buy** a product when I believe…" in relation to statements about the environmental impact of the product. This suggests that the emphasis lies more on purchasing behavior, or translating awareness into action, rather than beliefs. This also underlines why the scales are inherently different, as discussed in section 2.1, positive attitudes towards sustainable consumption do not necessarily convert to action.

As this scale proposes two distinct dimensions, they were used separately in subsequent analyses as two subscales: ECfSCB and ECfSCI.

The sub scales for ECfSCB, ECfSCI, and PINV all had high reliabilities as can be seen in Table 5. Cronbach's alpha could not be improved for any scale by item deletion. All multi-item scales were averaged for used in later analyses.

Scale	Items	Cronbach's alpha
Environmental Consciousness for Sustainable Consumption Behavior	**I only buy a product if I believe it…** • is made from recycled materials • can be disposed of in an environmentally friendly manner • is packed in an environmentally friendly manner • is produced in an environmentally friendly manner	.909
Environmental Consciousness for Sustainable Consumption Importance	**How important is it for you personally that a product…** • is made from recycled materials • can be disposed of in an environmentally friendly manner • is packed in an environmentally friendly manner • is produced in an environmentally friendly manner	.927
Product Involvement	• I am interested in new mobile phones • I would like to learn more about new mobile phones • I have broad knowledge of mobile phones	.831

Table 5: Reliability of scales used in the experiment

5.4 Hypothesis testing

5.4.1 Hypotheses

In this section, two hypotheses, as formulated in section 2.4, will be tested. **Hypothesis 1** argued that when participants adopt a high construal mindset, presenting the sustainable options to the right (congruent) versus to the left (incongruent) would result in those options being chosen more often.

Similarly, **Hypothesis 2** states that when participants adopt a low construal mindset, presenting the sustainable options to the left (congruent) versus to the right (incongruent) would result in those options being chosen more often.

To find support for these hypotheses, mean sustainable choice must be higher for condition HR compared to condition HL, as well as higher for condition LL compared to condition LR.

To test this presumption a two-way ANCOVA was performed using lateral placement and construal level as factors and controlling for PINV, ECfSCB, ECfSCI, handedness, & native language as well as some demographics. Specifically, PINV, ECfSCB, ECfSCI, and age were included in the analysis as covariates. For handedness, an interaction term was added to the analysis as its proposed influence is related to lateral placement. No such interaction terms were added for native language, considering the dataset exclusively consisted of participants with left-to-right reading directionality.

Two separate tests were performed using sustainable choice (range 0-8) as the dependent variable as well as a measure of sustainable choice variable that excludes the lens and fingerprint options (range 0-6). This decision was made because, while it is assumed that more prominent signifiers of sustainability should have influenced perceived sustainability for the correct options, it cannot be guaranteed that participants perceived the choices correctly.

5.4.2 Assumptions

Before performing the ANCOVA analyses, assumptions for performing the analysis were checked.

First, the sustainable choice measures were inspected to confirm normal distribution across all four combinations of treatment. Visually inspecting the Q-Q plots of both sustainable choice measures across all treatments revealed that it followed a relatively normal distribution. As a further check, *z*-scores were calculated for the skewness and kurtosis of the dependent variable for each level of treatment and compared to the critical value of ± 1.96

(Hair et al., 2014). The z-scores for skewness for both sustainable choice measured exceeded, or closely approximated, the proposed critical value of ± 1.96 (See Tables 6 & 7).

To correct for the negative skew of the data, a power transformation was performed where the scores of the original variables were squared. This resulted in z-scores of kurtosis and skewness within acceptable limits for both measures of sustainable choices.

Treatment	Initial z-scores kurtosis and skewness	Post power (squared) transformation
HL	Kurtosis: 0.86 Skewness: -2.76	Kurtosis: -0.93 Skewness: -0.49
HR	Kurtosis: -.022 Skewness: -1.95	Kurtosis: -1.27 Skewness: -0.30
LL	Kurtosis: -1.43 Skewness: -2.67	Kurtosis: -0.36 Skewness: -0.62
LR	Kurtosis: 1.58 Skewness:-3.44	Kurtosis: -0.73 Skewness: -1.12

Table 6: z- scores kurtosis and skewness sustainable choice (8) pre and post transformation

Treatment	Initial z-scores kurtosis and skewness	Post power (squared) transformation
HL	Kurtosis: -0.11 Skewness: -2.18	Kurtosis: -1.31 Skewness:-0.29
HR	Kurtosis: 0.32 Skewness:-2.21	Kurtosis: -1.10 Skewness: -0.21
LL	Kurtosis: 2.69 Skewness: -3.79	Kurtosis: 0.07 Skewness: -1.44
LR	Kurtosis: 0.76 Skewness: -2.98	Kurtosis: -1.01 Skewness: -0.67

Table 7: z-scores kurtosis and skewness sustainable choice (6) pre and post transformation

Independence of participants was ensured, despite non-probability sampling being used, by randomly assigning participants to a treatment through the Qualtrics program.

Additionally, tests were performed to check assumptions specifically associated with ANCOVA (See Appendix D). First, the assumption of homogeneity of regression slopes was checked by running ANCOVA analyses with interaction terms between treatment and each covariate (Field, 2013) for both measures of sustainable choice. The results showed no significant interaction effects between the covariates and treatment, suggesting the assumption was met. To test the independence of the covariates and treatment, separate

ANOVA analyses were conducted using treatment as a factor and the covariates as the dependent variable. No significant effects were found suggesting the assumption was met. Lastly, the assumption of homogeneity of variance was checked prior to each test.

5.4.3 ANCOVA Results Sustainable Choice 8

First, a two-way ANOVA analysis was performed to illustrate the effects of lateral placement and construal level on sustainable choice (8) without controlling for the effect of control variables and covariates. Sustainable choice (8) refers here to the full measure of sustainable choice which includes all 8 configuration choices that included a sustainable choice.

Levene's test indicated that the assumption of homogeneity of variance had been met, $F(3,221)= .151$, $p= .929$. The results showed that their was no significant effect on sustainable choice of construal level, $F(1,221)= 1.410$, $p= .236$, lateral placement, $F(1,221)= <1$, nor of their interaction, $F(1,221)= 1.008$, $p= .317$. This means that no support was found for hypotheses 1 and 2.

Following this, an ANCOVA analysis was conducted including all control variables and covariates. Levene's test was not significant, $F(87,137)= 1.147$, $p= .235$, indicating that the homogeneity of variance assumption had been met. As with the ANOVA, the results (See Table 8) show no main effects of lateral placement, $F(1, 205)= 2.123$, $p= .147$, construal level, $F(1, 205)= 1.872$, $p= .173$, on sustainable choice. There was also no significant effect of their interaction, $F(1,205)= <1$, $p= .541$.

The results do show a significant effect on sustainable choice from covariates PINV, $F(1,205)= 5.652$, $p= .018$, ECfSCI, $F(1,205)= 31.807$, $p= .000$, and age, $F(1, 205)= 4.505$, $p= .035$. The b-values for these effects suggest that PINV and age have a negative effect on sustainable choice, while ECfSCI has a positive influence on sustainable choice.

None of the other covariates or control variables had any significant effect on sustainable choice ($p >.05$ for all tests).

		df	F	Sig.	Partial Eta Squared
Factors	Lateral Placement	1	2.123	.147	.010
	Construal Level	1	1.872	.173	.009
	Lateral Placement * Construal Level	1	.376	.541	.002
Covariates	PINV	1	5.652	.018	.021
	ECfSCB	1	.118	.732	.096
	ECfSCI	1	31.807	.000	.134
	Age	1	4.505	.035	.022
Control variables	Sex	1	.003	.955	.000
	Handedness	1	2.557	.111	.007
	Handedness * Lateral Placement	1	2.433	.120	.012
	Native language	2	.128	.880	.001
	Nationality	1	.001	.972	.000
	Education	6	1.036	.403	.029
	Intercept	1	13.339	.000	.061
	Corrected Model	19	3.058	.000	.221
	Error	205			
	Total	225			
	Corrected Total	224			

Table 8: Test of Between-Subjects Effects Sustainable Choice 8, R squared= .211, Adjusted R squared= .149

To see whether the means of the treatment groups were at least in the hypothesized directions, the estimated marginal means of the interaction effect between construal level and lateral placement were inspected. These figures seem to suggest that this was only partially the case (See Table 9). For the right placement treatment, means of sustainable choice were higher for the incongruent construal level (LR) compared to the congruent construal level (HR). For the left lateral placement, however, mean sustainable choice was higher for the congruent construal level (LL) compared to the incongruent construal level (LR).

Lateral Placement	Construal Level	Mean	Std. Error
Right	High	35.897	3.235
	Low	37.403	3.178
Left	High	38.992	3.135
	Low	43.025	3.380

*Table 9: Estimated Marginal Means Sustainable Choice 8, Lateral Placement * Construal Level*

5.4.4 ANCOVA Results Sustainable Choice 6

A second ANCOVA analysis was performed using a measure of sustainable choice that excluded the fingerprint and lens options. Similar to the first analysis a two-way ANOVA analysis was conducted to illustrate the effect of construal level and lateral placement on sustainable choice.

Levene's test was not significant, $F(3, 221)= 1.027$, $p= .381$, suggesting the homogeneity of variance assumption had been met. The results showed no significant effect of construal level, $F(1, 221)= 1.410$, $p= .236$, lateral placement, $F(1, 221)= <1$, nor the interaction between the two factors, $F(1, 221)= 1.502$, $p= .222$, on sustainable choice.

Following this, an ANCOVA analysis was conducted including all control variables and covariates. Levene's test was not significant, $F(87, 137)= 1.267$, $p= .107$, indicating that the homogeneity of variance assumption had been met.

In contrast to the analysis on the full sustainable choice measure, results show a significant main effect of lateral placement on sustainable choice, $F(1,205)= 4.307$, $p= .039$, as can be seen in Table 10. Inspecting estimated marginal means revealed that sustainable choice was higher when sustainable options were laterally placed to the left (M= 25.141) rather than to the right (M= 21.342).

Further, no significant effect on sustainable choice was found for construal level, $F(1, 205)= 2.012$, $p= .000$, nor for the interaction of lateral placement and construal level, $F(1, 205)= .523$, $p= .471$. Therefore no support is found for hypothesis 1 and 2.

The results also show significant effects for the covariates PINV, $F(1,207)= 4.634$, $p= .033$, and ECfSCI, $F(1,207)= 28.405$, $p=.000$. No significant influence on sustainable was found for the other covariate and control variables ($p > .05$ for all tests).

		df	F	Sig.	Partial Eta Squared
Factors	Lateral Placement	1	4.307	.039	.021
	Construal Level	1	2.012	.158	.010
	Lateral Placement * Construal Level	1	.523	.471	.003
Covariates	PINV	1	4.634	.033	.022
	ECfSCB	1	.389	.534	.002
	ECfSCI	1	28.045	.000	.120
	Age	1	2.177	.142	.011
Control variables	Sex	1	.439	.955	.000
	Handedness	1	1.299	.111	.007
	Handedness * Lateral Placement	1	3.045	.083	.015
	Native language	2	.446	.641	.004
	Nationality	1	.029	.864	.000
	Education	6	1.084	.373	.031
	Intercept	1	9.948	.002	.046
	Corrected Model	19	2.929	.000	.214
	Error	205			
	Total	225			
	Corrected Total	224			

Table 10: Test of Between-Subjects Effects Sustainable Choice 6, R squared= .214, Adjusted R squared= .141

As with the previous measure of sustainable choice, estimated marginal means for the interaction effect of construal level and lateral placement on sustainable choice (6) were inspected to see whether the means were in the hypothesized direction. Again, this was only partially the case (See Table 11). For the right placement treatment, means of sustainable choice were higher for the incongruent construal level (LR) compared to the congruent construal level (HR). For the left lateral placement, however, mean sustainable choice was higher for the congruent construal level (LL) compared to the incongruent construal level (LR).

Lateral Placement	Construal Level	Mean	Std. Error
Right	High	20.920	1.980
	Low	21.764	1.945
Left	High	23.806	1.918
	Low	26.475	2.068

*Table 11: Estimated Marginal Means Sustainable Choice 6, Lateral Placement * Construal Level*

6. Conclusion & Discussion

6.1 Conclusion & Discussion

In a recent study, Romero and Biswas (2016) demonstrated that it was possible to nudge consumers towards healthier food choices by laterally displaying healthy food options to the right of unhealthy options. This study aimed to replicate these recent findings by applying it to a sustainable consumption context. In particular, this study was designed to provide insight into whether consumers could be nudged towards making more sustainable choices within an MC configurator. It was argued that the main mechanism that leads to preference and choice of an option was mental congruence. Specifically, presenting the options in a manner congruent with mental representation should enhance the choice for those options. Drawing on prior research, it was argued that the lateral placement which is congruent with sustainable options, is not fixed but depends on whether the decision maker adopts an abstract or a concrete mindset. Consequently, the following research question was formulated:

"What is the impact of adopted construal level on the relationship between laterally displaying product customization options varying in sustainability and choice?"

Based on research in lateral placement, construal level theory and sustainable consumption, it was hypothesized that when consumers adopt a high level (abstract) construal, sustainable choices would be selected more often when displayed to the right of less sustainable options. Whereas when consumers adopt a low level (concrete) construal level, it would best be presented to the left of less sustainable options to induce choice. The argumentation behind this is that, on the one hand, high construal levels enhance the importance and value in moral actions and goals (Eyal et al., 2008; Trope & Liberman, 2010) From this mindset sustainable consumption can be seen as a desirable overall goal (Van Dam, 2016). Based on the study by Casasanto (2009), this would place the sustainable option on the right in a natural mental representation due to its positive valence. On the other hand, lower construal levels enhance the importance of situational factors and more immediate tradeoffs (Trope & Liberman, 2010). In this case it was assumed that because sustainable alternatives in a purchasing context can be associated as negative in terms of price and utility (Van Dam, 2016), the negative valence would lead to a natural mental placement on the left.

The results of the main experiment, as discussed in section 5.4, do not suggest support for these hypotheses. No significant interaction effect of construal level and lateral placement was found on either measure of sustainable choice. On top of that, the estimated marginal means for both sustainable choice measures suggest that only for the left lateral placement the mean of the congruent group was higher, and thus in the direction of the hypothesis, while the opposite was through for right placement groups, (See Table 9 & 11). As no substantial differences were found between the treatment groups, this also does not seem to lend immediate support to alternative combinations of lateral placement and construal level in terms of mental congruence. Therefore, to answer the research question, the findings seem to indicate that there is no substantial impact of construal level on the relationship between laterally displaying customization options varying in sustainability and choice.

This is not particularly in line with prior research suggesting that construal levels (and elements of psychological distance) can affect perceptions, choice, and preference through congruent mental placements. An explanation may be that the difference in construal level and evaluation of sustainable options did not lead to a change in valence, and thus where the option would be placed to be mentally congruent, following Casasanto (2009). Likewise, it may be that priming construal level may have resulted in different aspects of the choice becoming salient, but that the magnitude associated with those aspects is similar, thus not affecting the optimal placement to enhance choice through mental congruence either.

It is crucial to note, however, that this answer to the research question cannot be stated with complete confidence, primarily due to the manipulation check for construal level indicating that mindset had not been manipulated successfully throughout the experiment. A plausible explanation is that the mindset manipulation was either not strong or durable enough to last throughout the interaction with the configurator phase. Accordingly, this tentative conclusion has to be interpreted with caution. The possibility of a failed manipulation is explored in more detail in section 6.4.

In sum, the present study was unsuccessful in providing support for an influence of construal level on lateral placement and choice. Despite a lack of support for the proposed hypotheses, however, the results do seem to suggest other predictors of sustainable choice that may be of value.

First, a significant main effect of lateral placement controlling for Product Involvement and Environmental Consciousness for Sustainable Consumption Importance was found for sustainable choice 6, the measure of sustainable choice that only included options which showed significant mean differences in perceived sustainability in the pre-test. Specifically,

the results seem to suggest that placing sustainable customization options to the left increases the number of sustainable choices made.

To some extent, these findings are in line with Romero and Biswas (2016), which found that presenting healthy options to the left of unhealthy led to higher preference and consumption of those options. Similar to their rhetoric, a possible explanation may be that sustainable options are associated with less magnitude. While healthier options may be associated with fewer calories and less taste, more sustainable options could potentially be associated with, for instance, less environmental impact compared to their less sustainable alternatives. Following Bueti and Walsh (2009) a natural representation would, therefore, place more sustainable choices on the left of less sustainable options. As a result, left placement would be congruent with mental representation and enhance choice.

An alternative explanation is that sustainable options could be perceived negatively in terms of utility and price (Van Dam, 2016). Based on Casasanto (2009) which demonstrated that more affective constructs are typically placed on the right, this would suggest that the left lateral placement would be congruent with the mental representation of the option.

Second, a significant effect of Environmental Consciousness for Sustainable Consumption Importance (ECfSCI) on both measures of sustainable choice was found. Through common factor analysis, this study found and subsequently used two dimensions of Environmental Consciousness for Sustainable Consumption (ECfSC) This was not surprising as Balderjahn et al. (2013) created the scale as a combination of 'importance' and 'beliefs' dimensions. However, contrary to Balderjahn et al. (2013) this study argues that the beliefs scale is more indicative of environmentally sustainable consumption behavior, rather than beliefs as it revolves around the statement “I only buy a product when I believe…”. This behavior, however, had no significant effect on sustainable choice. Environmental Consciousness for Sustainable Consumption Importance, however, seemed the most important predictor of sustainable choice in this study. Equally, the effect of lateral placement on sustainable choice 6 is only present when controlled for of Environmental Consciousness for Sustainable Consumption Importance and other covariates. This suggests that when consumers value environmentally sustainable consumption as more important, they make more sustainable choices. This finding is in line with Hankammer et al. (2018b), which found that participants with a higher Evironmental Consciousness for Sustainable Consumption produced configurations with lower environmental footprints.

The present study seems to lend further support that Mass Customization configurators are a suitable environment to translate a higher (environmental) consciousness of sustainable consumption into more sustainable end products.

Third, an interesting finding is the significant negative effect of Product Involvement (Zaichkowsky, 1985) on both measures of sustainable choice. The results seem to suggest that when consumers are more involved in the category, they make fewer sustainable choices. This finding is contrary to Hankammer et al. (2018b) the study which inspired inclusion of product involvement as a control variable, which found no significant influence of product involvement on the environmental footprint of configurators. The reason for this significant result is not entirely understood. A possible explanation for this relationship is that when consumers are more involved in the category, utility may become more important in a purchase decision. As sustainable alternatives in purchase decisions may be perceived as having lower (Van Dam, 2016), this could contribute to consumers choosing sustainable alternatives less often.

Contrary to Casasanto (2009), no significant interaction was found between handedness and lateral placement on sustainable choice. However, this may have been due to the relatively low number of left-handed participants.

6.2 Theoretical Implications

The present study enhances the understanding of the design and interaction with MC configurators, a field that is still relatively unexplored (Franke & Piller, 2003). Specifically, it bridges the gap between the central importance of configurators in the success of mass customization and empirical findings. It builds on the study by (Hankammer et al., 2016) by highlighting a potential way sustainability can be incorporated in configurators successfully. Further, the findings of this study seem to corroborate with findings of (Hankammer et al., 2018b) by providing empirical support for the notions that configurators may be used to translate attitudes towards sustainability into more sustainable products and that consumers could be nudged towards more sustainable choices through configurator design.

It also builds on previous literature on nudging, lateral placement, sensory marketing and specifically the study by Romero and Biswas (2016), as the results seem to suggest that consumers may be nudged towards more sustainable choices by laterally placing sustainable options to the left of less sustainable options. If these effects can be replicated, they present a promising area in which sustainable consumption can be influenced.

6.3 Practical Implications

Although the results of the present study do not provide practitioners with as finely-tuned methods of influencing sustainable choices as intended, they do seem to suggest applications that may be used for companies that use configurators to facilitate the co-creation process of their mass customization business model. The results seem to imply that laterally placing options perceived as more sustainable to the left of options perceived as less sustainable can enhance the choice for those options. Consequently, this may not only help reduce the environmental footprint of the mass-customized products manufactured by the company, but also the environmental impact of the company itself. However, this also suggests that the perception of sustainability of customization options, especially in contrast to their counterparts, must be clear. Hankammer et al. (2018b) has demonstrated that providing in-depth knowledge on environmental footprint may not be suitable as consumers have no frame of reference for it. Equally, the results of this study seem to indicate that simple signifiers of sustainability may not always successfully influence the perception of sustainability either. Hence, market research may need to be performed to account for the perceived sustainability of individual parts and may potentially require campaigns to change their current perception. It is advisable that practitioners test and evaluate these notions themselves, for instance, by employing A/B tests of configurators where sustainable choices are presented to either the left or the right of less sustainable choices. Such studies would directly apply to the customer base for the company issuing the configurator and would provide empirical support in an actual purchase context, instead of a simulated one.

Further, the significant effect of product involvement seems to suggest that perceptions may have to be changed on the inferiority of sustainable products, possibly by providing more information about the individual options, which was not done in this study, as minimal descriptions were used to not influence mindset by providing too much contextual information.

6.4 Limitations and Further Research

The findings of this study have to be seen in light of a number of limitations. On top of these limitations, this section provides recommendations for future research.

First and foremost, a major limitation of this study is that while the first manipulation check indicated that the participants had correctly performed the manipulation exercise, a

second manipulation check using 8 items of the BIF scale (Vallacher & Wegner, 1989) indicated that mindset did not significantly differ across treatments. One possible explanation for this is that the manipulation of construal level did not last throughout the entire configuration phase. Previous studies have typically used the BIF as developed by Vallacher and Wegner (1989) as a manipulation check directly after manipulating construal level or included it only in a pilot study but not within the actual experiment (e.g. Fujita et al., 2006; Slepian et al., 2015). As a result, not much is known about the duration and strength of the manipulation. Additionally, these studies have commonly manipulated construal level in a lab setting. It may be possible that the effects of construal manipulation last for a shorter amount of time outside of a controlled environment. Further research could investigate how long the effects of commonly used construal level manipulations (e.g. Freitas et al., 2004; Fujita et al., 2006) last, to find a suitable method for longer and more information heavy tasks like interacting with a configurator (Franke & Piller, 2003), as well as replicate manipulations outside of a lab setting.

An alternative possibility is that the results of the manipulation check arose from the fact that a shortened version of the BIF was used in contrast to the full 25 items. This is not unprecedented in construal level research (see Fujita et al., 2006; Slepian et al., 2015) but it is plausible that this influences the results. Since the BIF is commonly used as a manipulation check in this field of research, it may be worth researching whether the number of items participants are presented with influences the results of the manipulation check.

Nevertheless, it is important to take into account that manipulation checks do not guarantee construct validity nor (in)validate the results of a study (Fayant et al., 2017). To illustrate, Freitas et al. (2004), the study from which the construal level manipulation in this study is adopted, does not include a manipulation check. However, a failed manipulation check does reduce the confidence that mindset was appropriately affected throughout the use of the configurator. Indeed, this is a very plausible reason as to why the construal treatment had no substantial effect. As a result, the tentative conclusion that construal level does not have an impact on the relationship between lateral placement and choice requires further research. Future studies could usefully investigate whether non-significance between construal level and lateral placement persists when the manipulation check does succeed.

Second, a significant effect of lateral placement was only found on the sustainable choice measure that excludes the fingerprint and lens choices. It seems that these options may not have been correctly perceived, or at least that the differences in perceived between the options were not substantial enough to affect mental congruence through lateral placement.

This is despite the use of signifiers that indicated which option was meant to be more sustainable. Further research would do well to carefully categorize options and take note of how big the differences are in perceived sustainability to see whether the effect is stronger for certain choices. Potentially, this can be done by analyzing the likelihood of an individual choice using logistic regression. Equally, it would be beneficial to include measures of perceived utility and environmental impact for each option and the perceived importance of each choice for the final product. This could provide more insight into the associations that lead a left lateral placement to be mentally congruent, whether the negative effect of product involvement is related to utility and whether the importance of the customization choice influences whether the effect persists. Equally, future studies should research what the optimal way of influencing perceived sustainability of customization options within MC configurators.

Moreover, this study has some limitations in terms of research design present study did not use a representative sample of students and was gathered through convenience sampling. Future studies would do well by using larger and representative samples to see whether the effects persist, to add to the validity of the proposed model. Further, this study focused on one particular industry and product, consumer electronics, and mobile phones. Hence, additional research using different products and industries is necessary to provide support for the observed effects outside of this particular area.

There are also some limitations concerning the configurator and the included customization options. Contrary to Hankammer et al. (2018b), this study did not have the benefit of including realistic prices. Although this would have added to the realism of the configurator and an actual purchase situation, this was beyond the scope of this study. Future studies would do well to provide realistic prices for the sake of realism but also to see whether the effects persist when more situational trade-offs are presented to the user. Additionally, the choice to embed a configurator within the survey presents some issues with realism. A more elegant approach would have been to create different versions of the configurator using software to create such co-design spaces. This would have allowed the user to receive more immediate feedback, a core function of MC configurators (Franke & Piller, 2003) on their choices and presents the configurator phase more as an interconnected whole. Unfortunately, this was outside of the scope of this study, mainly due to budget and time constraints. Future studies would do well to use a similar approach to Hankammer et al. (2018b) to make the configurator as real as possible by using configurator software, realistic

prices for customization options, and life cycle analysis as a strong basis for comparing sustainability amongst options.

Nevertheless, even when the configurator is as realistic as possible, findings may still be limited in representativeness due to forced exposure. Participants do not actively seek out the configurator due to a need for a product, nor are they faced with the consequences of actually purchasing their customized product. It is, therefore, conceivable that consumers would make less sustainable choices when they actually have to purchase and use the product. This is evident from the attitude-behavior gap and can be seen in this study from the differences between the importance of environmental sustainable consumption scale and the environmentally sustainable consumption behavior scale. Ideally, future studies should collaborate closely with MC businesses using a configurator that is put to market to whether similar effects can be replicated when users are faced with actual consequences of the decisions made in the configurator.

Last, a possible direction for further research is to investigate whether the results of the present study and Hankammer et al. (2018b) could be combined to lower the environmental footprint of final configurations further. This could involve two versions of the configurator where sustainable default options selected for the initial configuration are consistently placed on either the left or the right. The results would potentially provide promising ways to enhance the nudges' influence on the environmental impact of mass-customized products.

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Appendices

Appendix A: Pre-test Survey

Introduction
Welcome!

Thank you for agreeing to take part in this research.
This research is part of my master thesis to receive my MSc degree in Marketing at Radboud University. Its main purpose is to test the materials to be used in the main experiment.
This study consists of two tasks. In the first task, you are asked to evaluate a number of customization options (that participants can choose between in order to customize a phone) in terms of sustainability.
As part of the second task, you are asked to engage in a thought experiment.
Lastly, you will be asked some general questions. In total the experiment will take approximately 10 minutes.
During the experiment, it is important that you read the instructions carefully and concentrate on the task at hand.
Please be noted that your data will be treated in a confidential and anonymous manner.

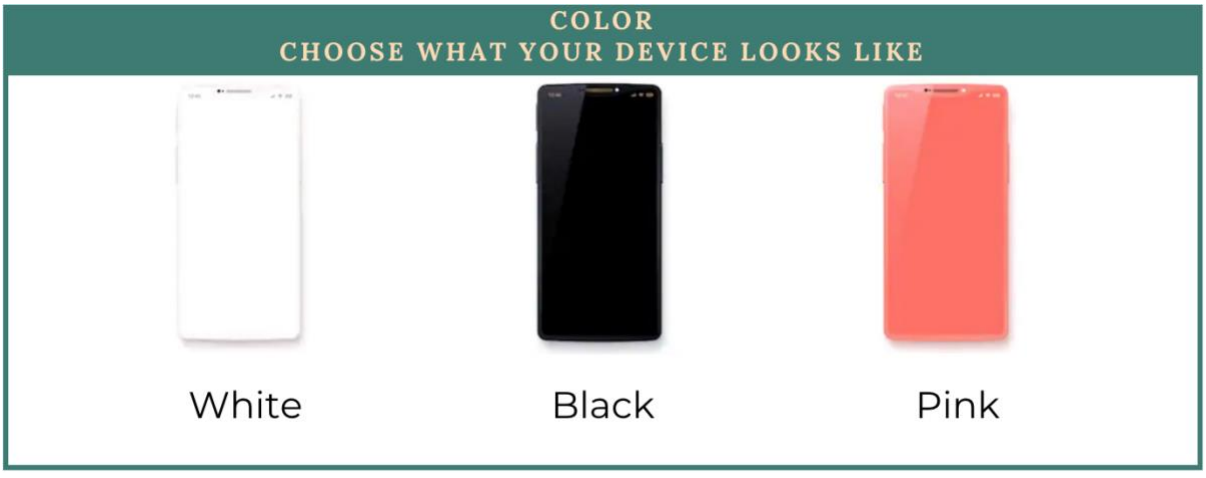
Thank you for contribution,
Stefan Verheul

Sustainability of Customization Options

In the next section, you are presented with a number of different options that participants in the main experiment can choose between in order to customize a mobile phone. Please

indicate for each option how sustainable you believe it to be.

	Very sustainable	Somewhat sustainable	Neutral	Not very sustainable	Unsustainable
Aluminium	○	○	○	○	○
Plastic	○	○	○	○	○
Bioplastic	○	○	○	○	○



	Very sustainable	Somewhat sustainable	Neutral	Not very sustainable	Unsustainable
White	○	○	○	○	○
Black	○	○	○	○	○
Pink	○	○	○	○	○

CONFIGURATION
CHOOSE YOUR SIM TYPE

Single SIM


Dual SIM

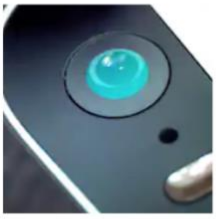
	Very sustainable	Somewhat sustainable	Neutral	Not very sustainable	Unsustainable
Single SIM	○	○	○	○	○
Dual SIM	○	○	○	○	○

INTERNAL STORAGE
CHOOSE YOUR STORAGE SIZE

16GB 32GB 64GB

	Very sustainable	Somewhat sustainable	Neutral	Not very sustainable	Unsustainable
16GB	○	○	○	○	○
32GB	○	○	○	○	○
64GB	○	○	○	○	○

LENS
CHOOSE YOUR MATERIAL



Glass

Recycled Plastic

	Very sustainable	Somewhat sustainable	Neutral	Not very sustainable	Unsustainable
Glass	○	○	○	○	○
Recycled Plastic	○	○	○	○	○

FINGERPRINT IDENTIFICATION
CHOOSE HOW YOU UNLOCK YOUR PHONE

Absent

Present
(eco-friendly)

	Very sustainable	Somewhat sustainable	Neutral	Not very sustainable	Unsustainable
Absent	○	○	○	○	○
Present	○	○	○	○	○

TAKE-BACK SERVICE
CHOOSE WHAT HAPPENS TO YOUR END-OF-LIFE DEVICE

No

Yes

Choosing take-back service for free recovery and delivery of a new phone if yours stops

functioning or if you want to replace it. Recovered devices will be recycled using the best available technology.

	Very sustainable	Somewhat sustainable	Neutral	Not very sustainable	Unsustainable
No	○	○	○	○	○
Yes	○	○	○	○	○

OFFSETTING
CHOOSE WHAT HAPPENS TO YOUR ENVIRONMENTAL FOOTPRINT

No

Yes

By choosing to offset your device, the CO2 impact of your device will be offset by collecting and recycling e-waste in developing countries.

	Very sustainable	Somewhat sustainable	Neutral	Not very sustainable	Unsustainable
No	○	○	○	○	○
Yes	○	○	○	○	○

WARRANTY

CHOOSE YOUR WARRANTY TYPE

Standard

Extended

Premium

	Very sustainable	Somewhat sustainable	Neutral	Not very sustainable	Unsustainable
Standard	○	○	○	○	○
Extended	○	○	○	○	○
Premium	○	○	○	○	○

PACKAGING

CHOOSE HOW YOUR DEVICE IS PACKAGED

Standard

Eco-Friendly

	Very sustainable	Somewhat sustainable	Neutral	Not very sustainable	Unsustainable
Standard	○	○	○	○	○
Eco-Friendly	○	○	○	○	○

	Very sustainable	Somewhat sustainable	Neutral	Not very sustainable	Unsustainable
Express	○	○	○	○	○
Standard	○	○	○	○	○
Eco-Friendly	○	○	○	○	○

Construal Manipulation High

Behind all our actions are reasons why we perform them. Further, the actions we take can regularly be attributed to the broad goals we want to achieve in life.

Take studying, for instance. Why are you doing this? Maybe so you can pass a test? Why do you want to pass the test? Probably so you can successfully pass the course it belongs to. Why would you want to pass the course? Probably so you can get your University degree.

Why do you want to earn this degree? Perhaps to find a good job. And maybe you want to find a good job so you can lead a happy life.

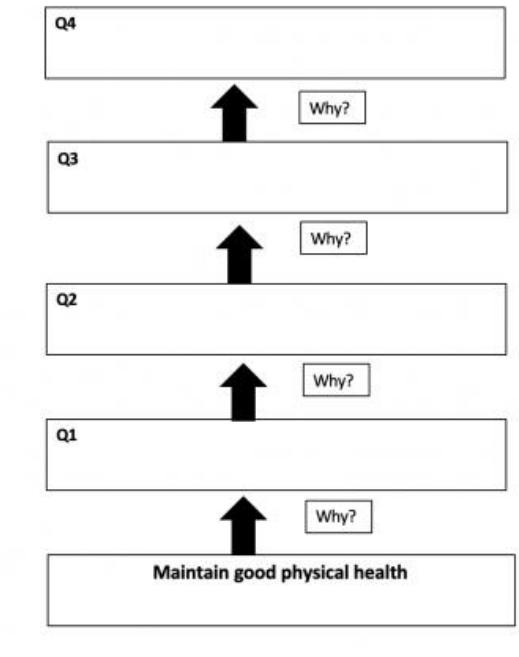
Studies indicate that thought exercises that link one's behaviour to the broad life goals one wishes to achieve, like above, can improve life satisfaction.

The following questions are meant to engage your thinking into **why** you perform certain actions.

Please try and answer the following question for yourself:

“Why do I maintain good physical health?”

Please use the following format in answering why you maintain good physical health. After your initial response in Q1, please elaborate on why you would perform that action in Q2 and continue elaborating this way until Q4.



Construal Manipulation Low

○ Q1: Why do I maintain good physical health?
_____

○ Q2: Why? _____

○ Q3: Why? _____

○ Q4: Why? _____

To achieve goals there are steps that we have to follow. Further, our life goals can generally be attributed to very specific actions we take.

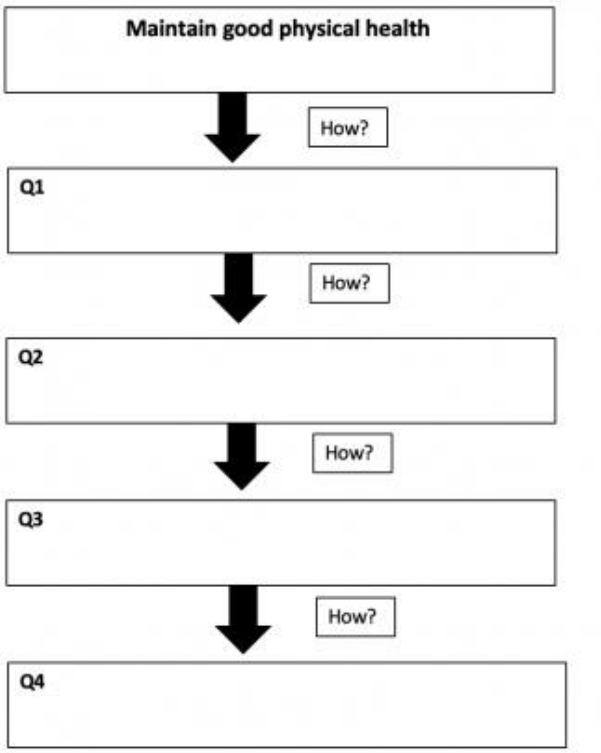
For instance, a broad life goal you may have is to lead a happy life. How can you achieve this? Maybe by finding a good job. How can you get a good job? Perhaps by getting your University degree. How can you get this? By passing your courses. You can pass your courses by passing the associated tests. How can you pass these? Probably by studying for them.

Studies indicate that thinking about how life goals can be achieved through specific behaviour can improve satisfaction with life.

The following questions are meant to engage you in **how** you perform certain actions. Please try and answer the following question for yourself:

“How do I maintain good physical health?”

Please use the following format in answering how you can maintain good physical health. After your initial response in Q1, please elaborate on how you would perform that action in Q2 and continue elaborating this way until Q4.



○ Q1: How do I maintain good physical health?
_____

○ Q2: How? _____

○ Q3: How? _____

○ Q4: How? _____

Evaluation of Construal Manipulation

Please indicate to what extent you agree to the following statements:

	Strongly agree	Agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Disagree	Strongly disagree
The thought exercise was understandable	○	○	○	○	○	○	○
Performing the thought exercise was doable for me	○	○	○	○	○	○	○

If you have any comments, questions or ideas for improvement of the exercise, please write them down below.

_____

Demographic questions

What is your gender?

○ Male

○ Female

What is your age?

_____

What is your nationality?

_____

What is the education level of the programme you are currently following?

- ○ Bachelor
- ○ Master
- ○ PhD
- ○ Other, namely _____

End of Survey Message

You have reached the end of the survey. Thank you for taking the time to contribute to this research!

Any questions, comments or inquiries regarding the research and its results can be directed by email to s.r.verheul@student.ru.nl.

Best regards,

Stefan Verheul

Appendix B: Survey Main Experiment

Construal Manipulation High

For everything we do, there is a reason *why* we do it. Further, our specific behavior can often be traced back to broad goals we want to achieve in life.

Take studying for something, for example. ***Why*** *are you doing this? Maybe to pass a test.* ***Why*** *do you want to pass that test? Perhaps to you want to pass a course.* ***Why*** *do you want to pass the course? Maybe to get your degree.* ***Why*** *do you want to get this degree? Perhaps to find a good job after you graduate. And maybe you want to do this because you feel it helps you to lead a happy life.*

Studies indicate that thought exercises that link one's behavior to the broad life goals one wishes to achieve, like above, can improve satisfaction with life.

The following questions are meant to engage your thinking into **why** you do the things you do.

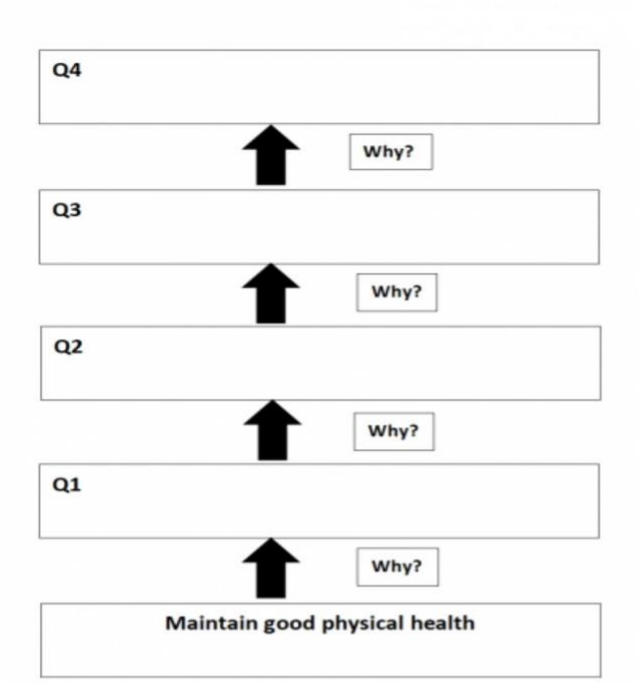
For the thought experiment, please consider the following question:

"Why do I maintain good physical health?"

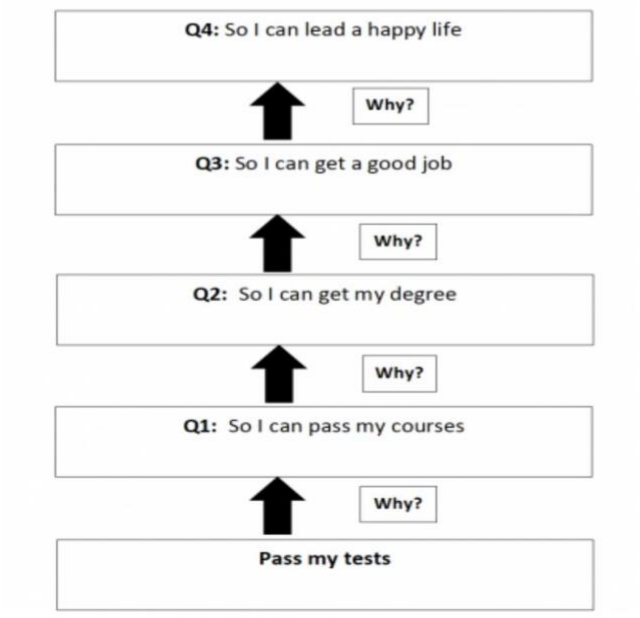
Please use the following format to answer the question "Why do I maintain good physical health?".

First, give your answer to the above question in Q1. Then in the second box you follow up on your first response by asking why you want to do or achieve the response you gave in Q2. You then continue answering this way until Q4. Please take the time to answer each question one by one.

Please review the second image for an example.



EXAMPLE



○ Q1: Why do I maintain good physical health?
_____

○ Q2: Why? _____

○ Q3: Why? _____

○ Q4: Why? _____

Construal Manipulation Low

For everything we do there is a process of *how* we do it. Further, our life goals can often be attributed to specific actions or behaviour.

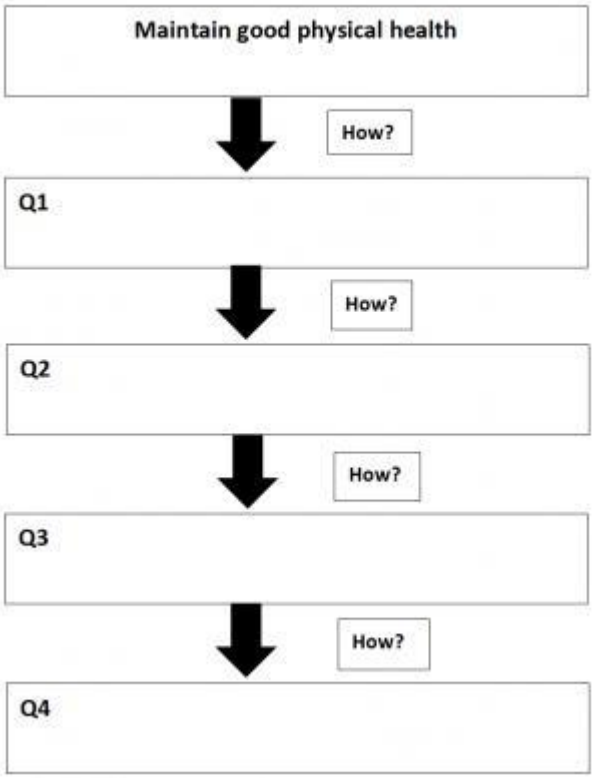
For example, one of your goals in life may be to find happiness in life. ***How*** *can you achieve this? Maybe by finding a good job.* ***How*** *can you get a good job? Perhaps by getting your University degree.* ***How*** *can you get this? Most likely by passing your courses.* ***How*** *do you pass these courses? Maybe by passing the tests for each course.* ***How*** *can you do this? Probably by studying.*

Studies indicate that thinking about how life goals can be achieved through specific behaviour can improve satisfaction with life.

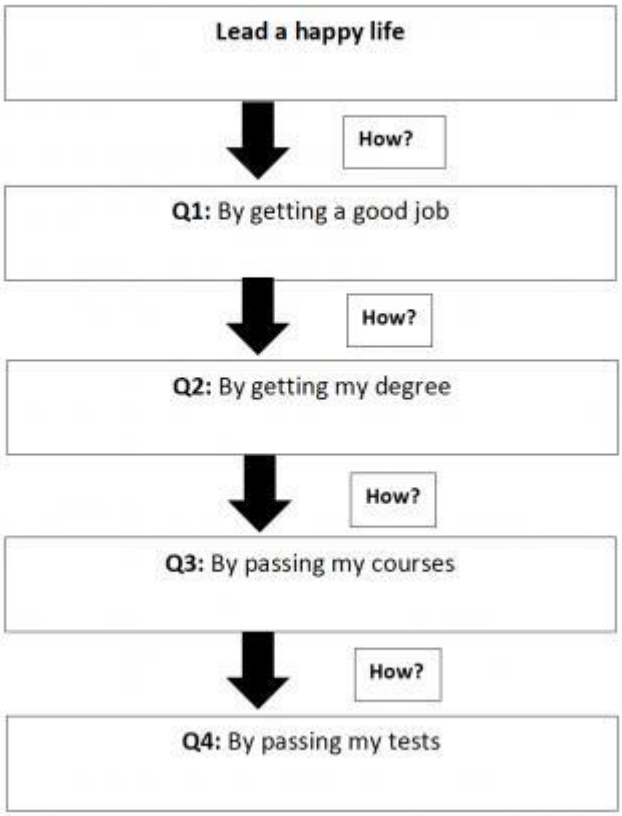
The following questions are meant to engage you in **how** you do the things you do.

For the thought experiment, please consider the following question:

"How do I maintain good physical health?"



EXAMPLE



○ Q1: How do I maintain good physical health?

_____

○ Q2: How? _____

○ Q3: How? _____

○ Q4: How? _____

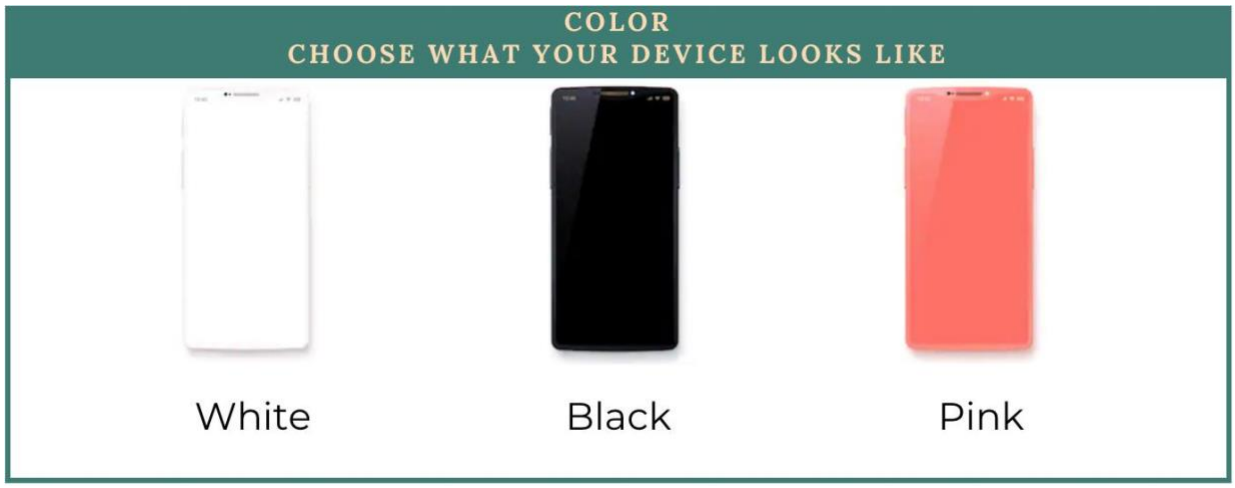
Configurator Left

In the next section, you are going to create your very own mobile phone. If you are taking this survey on your phone, please turn your phone sideways.

Specifications including the screen type, size, OS, processor and battery type are already fixed. You will further customize your phone by making a total of 11 choices.

Please make your choices by ticking the box below the option you would like.
(Selection boxes in actual survey were presented horizontally, directly under each option)

- ○ Bio-plastic
- ○ Plastic



- ○ White
- ○ Black
- ○ Pink

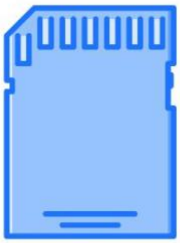
CONFIGURATION
CHOOSE YOUR SIM TYPE

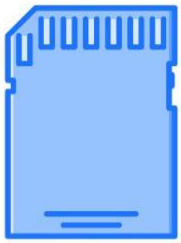
Single SIM

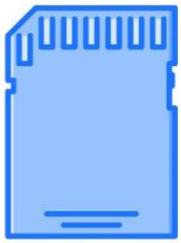

Dual SIM

- ○ Single SIM
- ○ Dual SIM

INTERNAL STORAGE
CHOOSE YOUR STORAGE SIZE

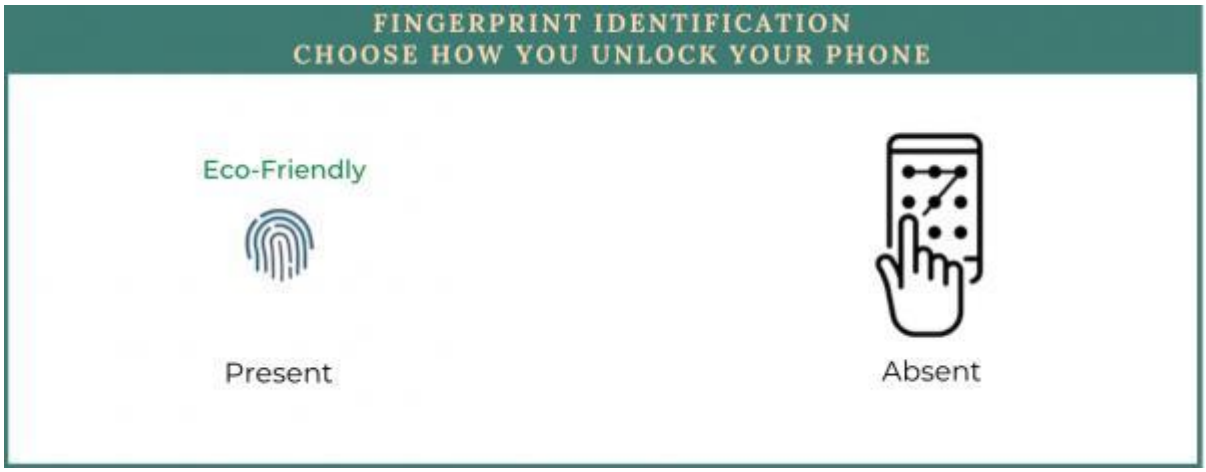

16GB


32GB

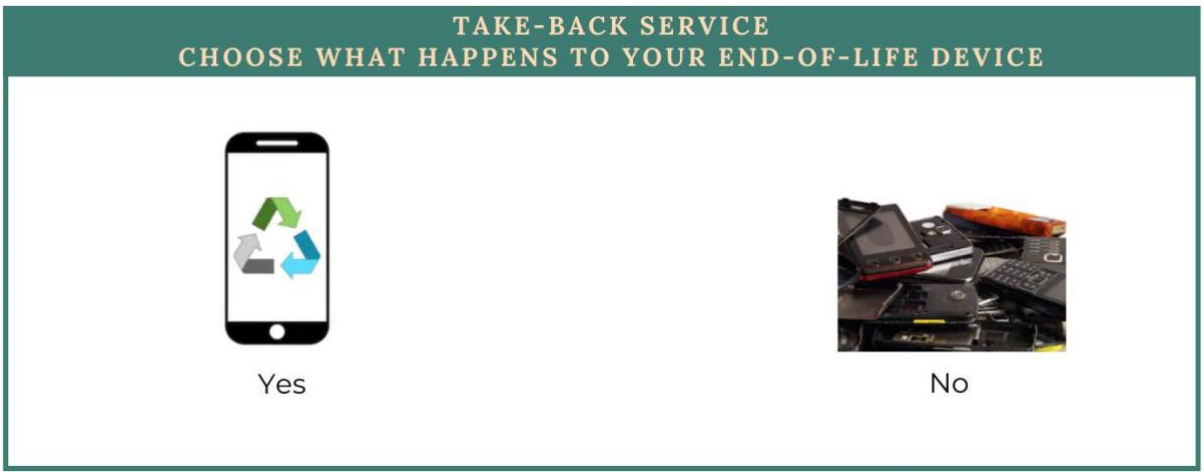

64GB

- ○ 16GB
- ○ 32GB
- ○ 64GB

- ○ Recycled Plastic
- ○ Glass



- ○ Present
- ○ Absent



Choosing take-back service for free recovery and delivery of a new phone if yours stops functioning or if you want to replace it. Recovered devices will be recycled using the best available technology.

- ○ Yes
- ○ No

By choosing to offset your device, the CO2 impact of your device will be offset by collecting and recycling e-waste in developing countries.

- ○ Yes
- ○ No

WARRANTY
CHOOSE YOUR WARRANTY TYPE

Premium

Extended

Standard

- ○ Premium
- ○ Extended
- ○ Standard

PACKAGING
CHOOSE HOW YOUR DEVICE IS PACKAGED

Eco-Friendly

Standard

- ○ Eco-Friendly
- ○ Standard

- ○ Eco-Friendly
- ○ Standard
- ○ Express

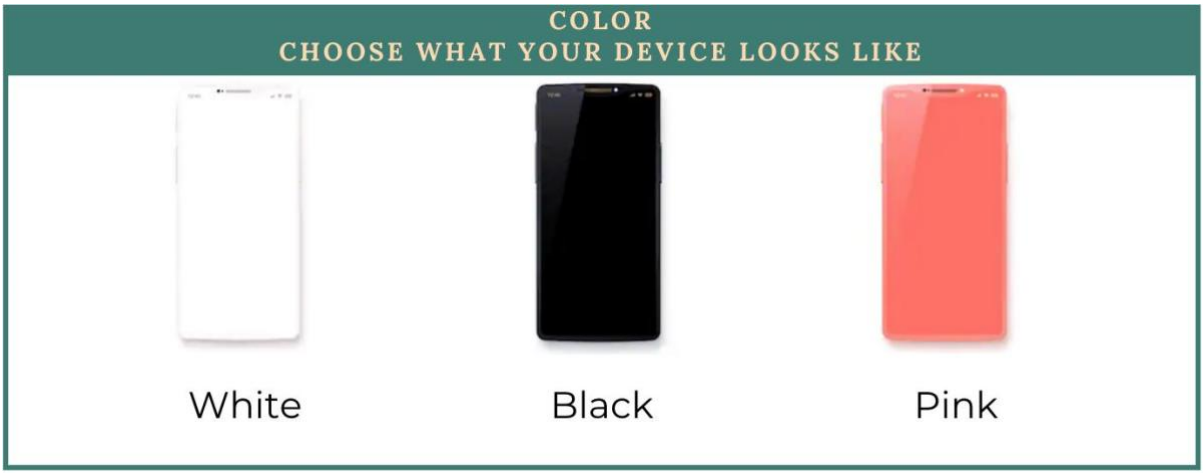
Configurator Right

In the next section, you are going to create your very own mobile phone. If you are taking this survey on your phone, please turn your phone sideways.

Specifications including the screen type, size, OS, processor and battery type are already fixed. You will further customize your phone by making a total of 11 choices.

Please make your choices by ticking the box below the option you would like.
(Selection boxes in actual survey were presented horizontally, directly under each option)

- ○ Plastic
- ○ Bio-Plastic



- White
- Black
- Pink

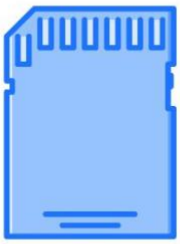
CONFIGURATION
CHOOSE YOUR SIM TYPE

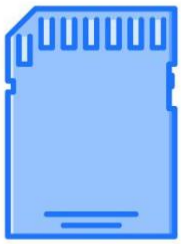
Single SIM

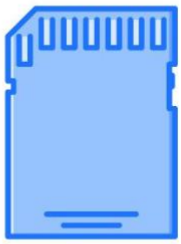

Dual SIM

- Single SIM
- Dual SIM

INTERNAL STORAGE
CHOOSE YOUR STORAGE SIZE

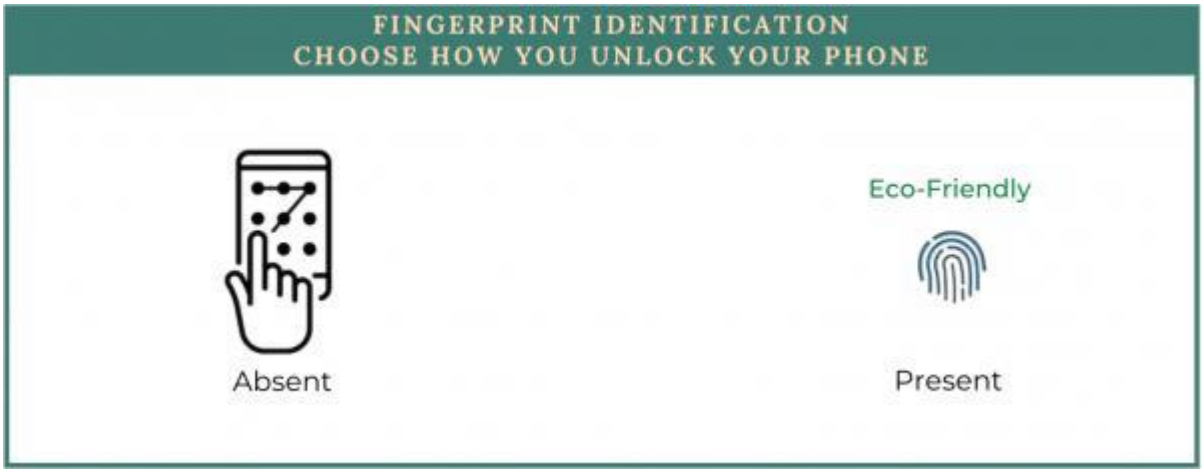

16GB


32GB


64GB

- 16GB
- 32GB
- 64GB

- ○ Glass
- ○ Recycled Plastic



- ○ Absent
- ○ Present

TAKE-BACK SERVICE
CHOOSE WHAT HAPPENS TO YOUR END-OF-LIFE DEVICE

No

Yes

Choosing take-back service for free recovery and delivery of a new phone if yours stops functioning or if you want to replace it. Recovered devices will be recycled using the best available technology.

- ○ No
- ○ Yes

OFFSETTING
CHOOSE WHAT HAPPENS TO YOUR ENVIRONMENTAL FOOTPRINT

No

Yes

By choosing to offset your device, the CO2 impact of your device will be offset by collecting and recycling e-waste in developing countries.

- ○ No
- ○ Yes

WARRANTY
CHOOSE YOUR WARRANTY TYPE

Standard

Extended

Premium

- ○ Standard
- ○ Extended
- ○ Premium

PACKAGING
CHOOSE HOW YOUR DEVICE IS PACKAGED


Standard


Eco-Friendly

- ○ Standard
- ○ Eco-Friendly

- ○ Express
- ○ Standard
- ○ Eco-Friendly

Manipulation Check BIF
In this task, you are presented with a list consisting of examples of behavior. For each example of behavior, you are meant to choose the description that you believe fits the behavior best.

Please take your time and complete all pairs. There are no right or wrong answers.

Making a list

- ○ Getting organized
- ○ Writing things down

Reading

- ○ Following lines of text
- ○ Gaining knowledge

Filling out a personality test

- ○ Answering questions
- ○ Revealing what you're like

Having a cavity filled

- ○ Protecting your teeth
- ○ Going to the dentist

Picking an apple

- ○ Getting something to eat
- ○ Pulling an apple off a branch

Voting

- ○ Influencing the election
- ○ Marking a ballot paper

Taking a test

- ○ Answering questions
- ○ Showing your knowledge

Eating

- ○ Getting nutrition
- ○ Chewing and swallowing

Post-Configurator Survey

In this last section, you are expected to answer some questions about your involvement with mobile phones and environmental consciousness. Lastly, you are asked some general questions.

Please answer the questions as truthfully as possible.

Product Involvement

Please indicate to what extent you agree with the following statements:

I am interested in new mobile phones

- ○ Strongly agree
- ○ Agree
- ○ Somewhat agree
- ○ Neither agree nor disagree
- ○ Somewhat disagree
- ○ Disagree
- ○ Strongly disagree

I would like to learn more about new mobile phones

- ○ Strongly agree
- ○ Agree
- ○ Somewhat agree
- ○ Neither agree nor disagree
- ○ Somewhat disagree
- ○ Disagree
- ○ Strongly disagree

I have broad knowledge of mobile phones

- ○ Strongly agree
- ○ Agree
- ○ Somewhat agree
- ○ Neither agree nor disagree
- ○ Somewhat disagree
- ○ Disagree
- ○ Strongly disagree

Environmental Consciousness for Environmentally Sustainable Consumption

Please indicate to what degree you agree with the following statements:

I only buy a product when I believe it...

Is made from recycled materials

- ○ Strongly agree
- ○ Agree
- ○ Somewhat agree
- ○ Neither agree nor disagree
- ○ Somewhat disagree
- ○ Disagree
- ○ Strongly disagree

Can be disposed of in an environmentally friendly way

- ○ Strongly agree
- ○ Agree
- ○ Somewhat agree
- ○ Neither agree nor disagree
- ○ Somewhat disagree
- ○ Disagree
- ○ Strongly disagree

Is packed in an environmentally friendly manner

- ○ Strongly agree
- ○ Agree
- ○ Somewhat agree
- ○ Neither agree nor disagree
- ○ Somewhat disagree
- ○ Disagree
- ○ Strongly disagree

Is produced in an environmentally friendly manner

- ○ Strongly agree
- ○ Agree
- ○ Somewhat agree
- ○ Neither agree nor disagree
- ○ Somewhat disagree
- ○ Disagree
- ○ Strongly disagree

Please indicate to what extent you agree with the following statements:

How important is it for you personally that a product..

Is made from recycled materials

- ○ Strongly agree
- ○ Agree
- ○ Somewhat agree
- ○ Neither agree nor disagree
- ○ Somewhat disagree
- ○ Disagree
- ○ Strongly disagree

Can be disposed of in an environmentally friendly way

- ○ Strongly agree
- ○ Agree
- ○ Somewhat agree
- ○ Neither agree nor disagree
- ○ Somewhat disagree
- ○ Disagree
- ○ Strongly disagree

Is packed in an environmentally friendly manner

- ○ Strongly agree
- ○ Agree
- ○ Somewhat agree
- ○ Neither agree nor disagree
- ○ Somewhat disagree
- ○ Disagree
- ○ Strongly disagree

Is produced in an environmentally friendly manner

- ○ Strongly agree
- ○ Agree
- ○ Somewhat agree
- ○ Neither agree nor disagree
- ○ Somewhat disagree
- ○ Disagree
- ○ Strongly disagree

Handedness, Native Language, Demographics

What is your dominant hand?

- ○ Left
- ○ Right

What is your native language?

- ○ Dutch
- ○ English
- ○ Other, namely: _____

What is your sex?

- ○ Male
- ○ Female

What is your age?

_____

What is your nationality?

- ○ Dutch
- ○ Other, namely: _____

What is the education level of the programme you are currently enrolled in?

- ○ Secondary education
- ○ MBO
- ○ HBO (Bachelor)
- ○ HBO (Master)
- ○ WO (Bachelor)
- ○ WO (Master)
- ○ Other, namely: _____

Gift Certificate

Please enter your email address for a chance to receive a Bol.com gift certificate worth €50,-. For privacy reasons, your email address will be deleted immediately after a recipient has been selected.

_____

End of Survey Message

You have reached the end of the survey. Thank you for taking the time to contribute to this research!

Any questions, comments or inquiries regarding the research and its results can be directed by email to s.r.verheul@student.ru.nl.

Best regards,

Stefan Verheul

Appendix C: Demographics

		Treatment				
		HL	**HR**	**LL**	**LR**	**Total**
Native language	Dutch	42	48	40	50	180
	English	6	5	2	2	15
	Other*	7	8	8	7	30
Handedness	Right-handed	48	55	43	51	197
	Left-handed	7	6	7	8	28
Sex	Male	14	18	16	16	64
	Female	41	43	34	43	161
Education Level	Secondary education	1	1	0	2	4
	MBO	3	0	3	2	8
	HBO Bachelor	14	24	21	16	75
	HBO Master	5	0	0	4	9
	WO Bachelor	5	7	14	9	35
	WO Master	27	24	11	24	86
	Other*	0	5	1	2	8
Nationality	Dutch	44	48	40	47	179
	Other*	11	13	10	12	46
Age		M=22.96, SD=2.624 Range: 17-34	M=22.85, SD=2.529 Range: 17-35	M=22.62, SD=2.212 Range 19-28	M=23.02, SD=2.529 Range: 17-32	

Responses 'other' category nationality

Nationality	**N**	**%**
American	1	.4
Australian	1	.4
Belgian	6	2.7
British	7	3.1
Chinese	1	.4

English	2	.9
French	4	1.8
German	8	3.6
Greek	2	.9
Hungarian	2	.9
Italian	1	.4
Latvian	1	.4
Lithuanian	1	.4
Polish	2	.9
Russian	1	.4
Spanish	3	1.3
Swiss	1	.4
Total:	44	19.6

Responses 'other' category native language

Language	**N**	**%**
Cantonese	1	.4
French	5	2.2
German	7	3.1
Greek	2	.9
Hungarian	2	.9
Italian	1	.4
Lithuanian	1	.4
Papiamentu	1	.4
Polish	2	.9
Russian	4	1.8
Spanish	2	.9
Swiss German	1	.4
Total:	29	12.7

Responses 'other' category Education:

Education	**N**	**%**
PhD	1	.4
Pre-master WO	4	1.8
Specialization post WO Master	1	.4
Tertiary Honours	1	.4
Undergraduate degree (not HBO or WO)	1	.4
Total:	8	3.4

Appendix D: Assumptions Covariates

Independence of Covariate and Treatment

PINV

F statistic	df1	df2	Sig.
2.814	3	221	.040

Levene's Test

Welch's F	**df1**	**df2**	**Sig.**
.886	3	122.633	.451

Welch's F test

ECfSCB

Levene's statistic	Df 1	df2	Sig
.225	3	221	.879

Levene's test

	Sum of Squares	**df**	**Mean Square**	**F**	**Sig.**
Between Groups	4.437	3	1.479	.896	.444
Within Groups	364.698	221	1.650		
Total	369.135	224			

Between-Subjects Effects ECfSCB

ECfSCI

Levene's statistic	**Df 1**	**df2**	**Sig**
.087	3	221	.967

Levene's test

	Sum of Squares	**df**	**Mean Square**	**F**	**Sig.**
Between Groups	2.601	3	.867	.578	.630
Within Groups	331.774	221	1.501		
Total	334.375	224			

Between-Subjects Effects ECfSCI

Age

Levene's statistic	Df 1	df2	Sig
.098	3	221	.961

Levene's test

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	4.900	3	1.633	.264	.851
Within Groups	1366.362	221	6.183		
Total	1371.262	224			

Between-Subjects Effects Age

Homogeneity of Regression Slopes

Sustainable choice 8

F	Df 1	df2	Sig
1.268	3	221	.286

Levene's test

	df	F	Sig.	Partial Eta Squared
Treatment	3	.444	.721	.006
ECfSCI	1	28.778	.000	.123
ECfSCB	1	.003	.957	.000
Age	1	1.441	.231	.007
PINV	1	2.148	.144	.010
Treatment* ECfSCB	3	.538	.657	.008
Treatment* ECfSCI	3	.294	.830	.004
Treatment* Age	3	.352	.788	.005
Treatment* PINV	3	1.337	.264	.019
Intercept	1	7.280	.008	.034
Corrected Model	19	2.959	.000	.215
Error	205			
Total	225			

Corrected Total	224			

Between-Subjects Effects Sustainable Choice 8 (R squared .215 Adjusted R Squared -.143)

Sustainable choice 6

Levene's statistic	**Df 1**	**df2**	**Sig**
2.668	3	221	.049

Levene's test

	df	**F**	**Sig.**	**Partial Eta Squared**
Treatment	3	.077	.972	.001
ECfSCI	1	24.730	.000	.108
ECfSCB	1	.026	.873	.000
Age	1	.375	.541	.002
PINV	1	2.140	.145	.010
Treatment* ECfSCB	3	.130	.942	.002
Treatment* ECfSCI	3	.294	.613	.009
Treatment* Age	3	.047	.987	.001
Treatment* PINV	3	.578	.630	.008
Intercept	1	4.313	.039	.021
Corrected Model	19	2.452	.001	.185
Error	205			
Total	225			
Corrected Total	224			

Between-Subjects Effects Sustainable Choice 6 (R Squared .185 Adjusted R squared =.110)