

## Buying new or refurbished?

### The influence of the product's durability and attractiveness, contamination risk and consumers' environmental concern on purchase intentions of refurbished and new products

Wallner, T.S.; Magnier, L.B.M.; Mugge, R.

#### DOI

[10.31880/10344/10172](https://doi.org/10.31880/10344/10172)

#### Publication date

2022

#### Document Version

Final published version

#### Published in

4th Conference on Product Lifetimes and the Environment (PLATE)

#### Citation (APA)

Wallner, T. S., Magnier, L. B. M., & Mugge, R. (2022). Buying new or refurbished? The influence of the product's durability and attractiveness, contamination risk and consumers' environmental concern on purchase intentions of refurbished and new products . In C. Fitzpatrick (Ed.), *4th Conference on Product Lifetimes and the Environment (PLATE)* (pp. 1-6). University of Limerick.  
<https://doi.org/10.31880/10344/10172>

#### Important note

To cite this publication, please use the final published version (if applicable).  
Please check the document version above.

#### Copyright

Other than for strictly personal use, it is not permitted to download, forward or distribute the text or part of it, without the consent of the author(s) and/or copyright holder(s), unless the work is under an open content license such as Creative Commons.

#### Takedown policy

Please contact us and provide details if you believe this document breaches copyrights.  
We will remove access to the work immediately and investigate your claim.

## Buying new or refurbished? The influence of the product's durability and attractiveness, contamination risk and consumers' environmental concern on purchase intentions of refurbished and new products

T.S. Wallner<sup>(a)</sup>, L. Magnier<sup>(a)</sup>, R. Mugge<sup>(a)</sup>

a) Delft University of Technology, Delft, The Netherlands

**Keywords:** Refurbished products; contamination; environmental concern, product durability, purchase intentions.

### Abstract:

This research investigates how a durable and attractive product appearance, the perceived contamination risk, and consumers' environmental concern influence the purchase intentions of refurbished products. Consumers often have lower purchase intentions of refurbished products because they associate them with lower durability and fear that they are contaminated with a former user's traces. The environmental friendliness and lower price incentivise consumers to purchase refurbished products. Limitations of prior research are that it has focused strongly on qualitative research, and a comparison to the factors influencing the adoption of new products is lacking. This research contributes by investigating which factors significantly influence the purchase intentions of refurbished products. It additionally aims to uncover how these factors differ from those influencing purchase intentions of new products.

In an online survey, we exposed 351 participants to a blender or headphones and informed them that the product was either new or refurbished. Two versions for each product were created to vary in terms of durability and attractiveness. Participants rated multi-item constructs on products' durability, attractiveness, contamination risk, their environmental concern and indicated their purchase intentions. The results indicate that product-related factors, such as durability and attractiveness, are important across the different phases of a circular life. Other factors, such as the contamination risk and the consumers' environmental concern, however, play an essential role in the decision to purchase refurbished products specifically. Underlining the cleanness of refurbished products and that they are a sustainable choice could be worthwhile strategies for increasing the desirability of refurbished products.

### Refurbishment of consumer electronics in the circular economy

Refurbishment is a key strategy for the lifetime extension of products in the circular economy (Geißdörfer, 2017). Products that consumers no longer desire or need are collected and then refurbished. Refurbishment entails that the products are cleaned, tested, and repaired before they are being resold to consumers (Pigosso, 2010). While there is an established market for refurbished cars and bicycles, other refurbished consumer goods, such as headphones or blenders, are often seen as less desirable compared to new products (Mugge, Safari, & Balkenende, 2017).

Consumers often have lower purchase intentions for refurbished products because

they associate them with lower performance and durability (van Weelden, Mugge, & Bakker, 2016; Baxter et al., 2017). Consumers additionally fear that refurbished products are contaminated with traces of a former user, and they lack a thrill of newness when purchasing them. A durable and attractive product appearance was suggested to enhance the desirability of refurbished radios, headphones and coffee makers (Wallner, Magnier, & Mugge, 2020) because these appearances could decrease the perceived risks that consumers associate with refurbished products. Furthermore, the environmental friendliness, extended warranties and lower price incentivise consumers to buy refurbished products (Mugge, Jockin, & Bocken, 2017).

A limitation of prior research is that it has focused strongly on qualitative research, and a comparison to the factors influencing the adoption of new products is lacking. This research contributes by investigating how product appearance-related factors (durable and attractive product appearance), perceived contamination risk and the consumers' environmental concern influence the purchase intentions of refurbished products. It additionally aims to uncover how these factors differ from the factors influencing purchase intentions of new products.

### **The influence of product appearance**

Consumers make inferences on a product's utility and quality based on its appearance (Crilly, Moultrie, & Clarkson, 2004; Creusen & Schoormans, 2005). For example, consumers perceive objects that are heavy or look heavy to be of higher quality than light products because they associate the product's weight with strength and robustness. Consumers associate this robustness with a higher likelihood that the product will function for a long time (Mugge, Dahl, & Schoormans, 2018, van Rompay et al., 2014). Associations that consumers have with products can be described as product semantics (Krippendorff & Butter, 1984). Product semantics are 'symbolic qualities of man-made shapes in the cognitive and social context of their use' (Demirbilek & Sener, 2003, p.3). Considering that semantics change with a product's context, a product with certain appearance-related characteristics may be perceived differently in a refurbished state because the context was changed through the use and refurbishment process.

#### *1.1. The influence of an attractive product appearance*

One factor responsible for the desirability of new as well as refurbished products is an attractive product appearance. Consumers associate attractive products with higher quality, trust (Page & Herr, 2002; Veryzer & Hutchinson, 1998), and greater ease of use (Hassenzahl, 2004) than less attractive products. This stereotype is widely known as the 'what's beautiful is good principle' (Dion, Berscheid, & Walster, 1972). Products that are new and should be kept in the loop as long as possible should therefore have an attractive and timeless product appearance (Mugge, Schoormans, & Schifferstein, 2005). Especially in the context of refurbishment, this seems

relevant because refurbished products are perceived to be riskier, or in other words, trusted less by consumers. Decreasing this lack of trust in refurbished products with an attractive product appearance could enhance refurbished products' desirability. We, therefore, hypothesise that:

H1: The attractiveness of the product appearance positively influences purchase intentions of new products (H1a) and refurbished products (H1b). The effect of an attractive product appearance on purchase intentions is larger for refurbished products than for new products (H1c).

#### *1.2. The influence of a durable product appearance*

Refurbished products should optimally communicate durability to counteract the risks that consumers perceive in them. Looking back at the history of product design, some products in the past communicated durability and longevity via their design and minimised the use of valuable resources (Oestereich, 2000). An example are designs from the beginning phase of the former German Democratic Republic (GDR). After the second world war, when resources were scarce, products with a Bauhaus design were designed to be long lasting in style as well as physical durability (Schaedlich, 1984), thereby using as few resources as possible. For new products, a durable product appearance may be preferred from an environmental perspective (Achterberg, Hinfelaar, & Bocken, 2016) and may be more desirable to consumers (Mugge et al., 2018).

The topic of durability was also uncovered in qualitative research on the effects of product appearance for the acceptance of refurbished products. Refurbished products with a solid, massive product appearance were deemed desirable in a refurbished state (Wallner et al., 2020). This research, however, needs quantitative validation to understand its influence on the purchase intentions of refurbished products in comparison to new products.

We, therefore, hypothesise that:

H2: The durability of the product appearance positively influences purchase intentions of new products (H2a) and refurbished products (H2b). The effect of a durable product appearance is larger for refurbished products than for new products (H2c).

## Factors only relevant for refurbished products

### 2.1. The influence of the perceived contamination risk

Even though refurbished products are cleaned during the refurbishment process, some consumers fear that they are contaminated with traces of a former user (van Weelden et al., 2016; Baxter et al., 2017), resulting in a feeling of discomfort or even disgust. However, the higher perceived contamination risk seems strongly related to the context and the consumer itself rather than the product. Shaving razors are a good example: While most consumers would feel uncomfortable buying a second-hand razor, being groomed with a (reused) razor at a barber's shop does not seem to cause an aversive reaction. Furthermore, some consumers are more prone to feel disgusted and feel disgusted more intensely than others; this has shown to predict avoidant behaviour (van Overveld, Jong, & Peters, 2010). For new products, we do not expect there to be an effect because the contamination comes through the reuse of a product which is not the case with new products. We, therefore, hypothesise that:

- H3: Perceived contamination risk negatively influences the purchase intentions of refurbished products (H3a) but not the purchase intentions of new products (H3b).

### 2.2. The influence of consumers' environmental concern

Consumers who perceive the environmental benefits of refurbished smartphones are more inclined to purchase them (Mugge et al., 2017). This is why some consumers favour remanufactured products if they have an eco-label (Wang & Hazen, 2016; Abbey et al., 2014). The evidence for the influence of the consumers' environmental concern has, however, been conflicting. Some studies suggested that consumers' environmental concern does not predict consumers' purchase intentions of refurbished products (Chen, Wang, & Jia, 2020). Counterevidence, however, assumes that consumers know that refurbished products are the environmental choice. Whether it indeed influences the purchase intentions of refurbished products should therefore be tested. For new products, we do not expect this effect as they generally do not offer environmental benefits. We, therefore, hypothesise that:

H4: Consumers' environmental concern positively influences the purchase intentions of refurbished products (H4a), but not the purchase intentions of new products (H4b).

## Methods

### Stimuli

Although blenders and headphones are not yet commonly sold in a refurbished state, these product categories are easy to refurbish and therefore provide an interesting category when striving for a circular economy. We created twelve 3D models of blenders and headphones that varied in durability and attractiveness. The 3D models were created in several iterations of sketching and 3D modelling until we obtained headphones and blenders that sufficiently differed in durability and attractiveness. Durability was operationalised in either a slender (breakable) or massive (durable) product form. Twelve 3D models were created with SolidWorks and rendered with Keyshot to include in the pre-test.

### Pre-test

In a within-subjects design, we exposed 76 participants with experience in design (48 females; age range: 20-59, M=26.5; years of design experience: 1-35 years, M=6.14) to six blenders and six headphones. Participants rated all stimuli on several 7-point scales (see [appendices](#)). The pre-test results demonstrated that the stimuli significantly varied in attractiveness (Bell et al., 1991) and durability (Mugge, Dahl, & Schoormans, 2018) (all  $p$ 's <.05). Furthermore, the stimuli had a similar level of performance quality and ease of use (Grewal et al., 1998; Mugge et al., 2018) (all  $p$ 's >.05) to rule out that these factors would have an additional effect on our findings (see [appendices](#)).



**Figure 1. Example stimuli of breakable (slender/breakable) and solid/durable (right) headphones used in this study.**

### Participants and procedure of the main study

The hypotheses were tested with 351 participants from the United Kingdom (Age = 18-80,  $M_{Age}$  =34.92; 241 females) that were recruited via Prolific. In the survey, participants saw a picture (6x4cm) of either a white blender or black headphones that was presented as being in a new or refurbished state with a product appearance varying in durability and attractiveness. Furthermore, they read a text about refurbished products and answered questions concerning their assessment of the product.

### Scales

In the main study, we assessed the product's attractiveness with three items on a 7-point semantic differential scale (e.g., ugly-beautiful; Bell et al., 1991;  $\alpha$ =.95).

We assessed the product's durability with four items on a 7-point Likert-scale (strongly disagree-strongly agree; Grewal et al., 1998;  $\alpha$ =.92). An example item was "These headphones will last a long time".

To measure the product's contamination risk, we used four items on a 7-point semantic differential scale ("I expect that this blender will be: Not contaminated-contaminated";  $\alpha$ =.89).

The participant's environmental concern was assessed with four items on a 7-point Likert-scale (strongly disagree- strongly agree; Mugge et al., 2017,  $\alpha$ =.91). An example item was "I make a special effort to buy products that are made from sustainable materials".

We assessed the participants' purchase intentions with two items on a 7-point Likert-scale (strongly disagree- strongly agree; Dodds, Monroe, & Grewal, 1991;  $r$ =.87,  $p$ <.001). An example item was "If I would buy refurbished headphones, I would consider buying these headphones".

All items we used in the study are displayed in the [appendices](#).

## Results

To test our hypotheses, we ran two regression analyses with purchase intention as the dependent variable and attractiveness, durability, environmental concern and perceived contamination risk as the independents. Both regression models were significant (new products: see Figure 21;

$F(4,165)$ =29.81,  $p$ <.001,  $R^2$  =.42; refurbished products: see Figure 32;  $F(4,176)$ = 36.01,  $p$  < .001,  $R^2$ =.45). However, the extent to which the different factors explained the purchase intentions differed between new and refurbished products (see section 3).

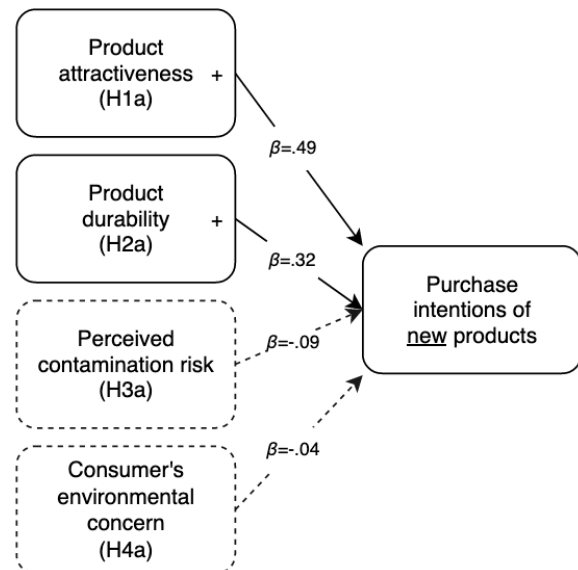
### 1. New products

#### 1.1. Product-related factors.

The attractiveness (H1a;  $\beta$ =.49,  $p$ <.01) and durability (H2a;  $\beta$ =.32,  $p$ <.01) of new blenders and headphones positively predicted the purchase intentions, providing support for H1a and H2a.

#### 1.2. Factors only relevant for refurbished products

Neither the perceived contamination risk ( $\beta$ =-.09,  $p$ >.05) nor the consumers' environmental concern ( $\beta$ =.04,  $p$ >.05) predicted the purchase intentions of new headphones and blenders, supporting H3a and H4a.



**Figure 2. Regression model showing that product-related factors, but not the perceived contamination risk and consumers' environmental concern predict the purchase intentions of new products.**

### 2. Refurbished products

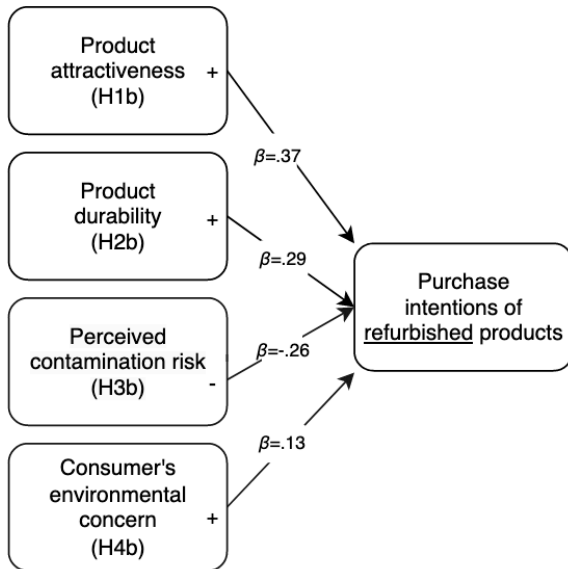
#### 1.1. Product-related factors

For refurbished headphones and blenders, we found that the attractiveness ( $\beta$ =.37,  $p$ <.01) and durability ( $\beta$ =.29,  $p$ <.01) of refurbished blenders and headphones positively predicted the purchase intentions, confirming H1b and H2b.



### 1.2. Factors only relevant for refurbished products

The perceived contamination risk had a negative effect ( $\beta=-.26$ ,  $p<.01$ ) and the consumers' environmental concern ( $\beta=.13$ ,  $p<.05$ ) had a positive effect on purchase intentions of refurbished products, confirming H3b and H4b.



**Figure 3. Regression model showing that product-related factors, perceived contamination risk, and consumer's environmental concern predict the purchase intentions of refurbished products.**

### 3. Differences between refurbished and new products

#### 3.1. Product-related factors

The influence of the products' attractiveness was not significantly larger for refurbished products than for new products ( $\beta=.37$  vs.  $\beta=.49$ ,  $t(345)=-1.34$ ,  $p>.10$ ), disconfirming H1c. The influence of the products' durability was not significantly larger for refurbished products than for new products ( $\beta=.29$  vs.  $\beta=.32$ ,  $t(345)=-.09$ ,  $p>.20$ ), disconfirming H2c.

#### 3.2. Factors only relevant for refurbished products

The perceived contamination risk was a larger (negative) predictor for the purchase intentions of refurbished products than for new products ( $\beta=-.26$  vs.  $\beta=.09$ ,  $t(345)=-4.08$ ,  $p<.01$ ), confirming H3b.

Environmental concern was a larger predictor for the purchase intentions of refurbished

products than for new products ( $\beta=.13$  vs.  $\beta=-.04$ ,  $t(345)=2.4$ ,  $p<.05$ ), confirming H4b.

### Discussion

This study investigated whether product-related factors, the consumer's environmental concern and the product's perceived contamination risk predict the purchase intentions of refurbished blenders and headphones. Our results indicated that the products' durability and attractiveness positively predict the purchase intentions for both new and refurbished products. This study supports and extends the literature on durable and attractive product appearance (Mugge et al., 2018; Wallner et al., 2020) by demonstrating the importance of these product-related factors in the refurbishment stage. Our results, however, indicated that the product's attractiveness and durability do not play a larger role in refurbished products than new products. To extend the lifetime of circular products in general, it is thus important to pay attention to products' durability and attractiveness.

However, the main contribution is that consumers' environmental concern and the perceived contamination risk influence the purchase intentions of refurbished products, whereas there are no effects for new products. This is in accordance with previous literature suggesting that refurbished products can trigger contamination concerns because of their previous use (Baxter et al., 2017; van Weelden et al., 2016). Our research is, however, the first to show that the perceived contamination risk has a quantifiable negative effect on the purchase intentions of refurbished products and that the effect is larger than the effect of the consumer's environmental concern.

While previous research has mainly focussed on increasing purchase intentions of refurbished products via the route of environmental awareness, for example, by exploring the effect of eco-labels (Wang & Hazen, 2016; Abbey et al., 2014), we argue that future research should also focus on exploring strategies to counteract the contamination risk. For example, research could explore how the design of products can be optimised for cleaning and changing parts. For headphones, one could examine whether changing the ear cushions can eliminate the perceived contamination risk.

Second, research should explore how communication about the refurbishment and cleaning process can be enhanced. Third,

research should explore whether consumer characteristics, such as disgust sensitivity, contribute to perceived contamination; and make certain consumer groups more prone to reject refurbished products.

One limitation of our study is that participants were not given a choice setting, which includes additional factors, such as the product's price and warranties. Future research could model consumers' choices more closely.

## Conclusion

To conclude, product-related factors, such as the product's durability and attractiveness, are important across the different phases of a circular life. Contamination risk and the consumers' environmental concern, however, play an essential role in the decision to purchase refurbished products specifically. Underlining the cleanness of refurbished products and that they are a sustainable choice could be worthwhile strategies for increasing the desirability of refurbished products.

## References

- Abbey, J. D., Meloy, M. G., Guide Jr, V. D. R., & Atalay, S. (2015). Remanufactured products in closed-loop supply chains for consumer goods. *Production and Operations Management*, 24(3), 488-503
- Achterberg, E., Hinfelaar, J., & Bocken, N. M. P. (2016). The Value Hill Business Model Tool: identifying gaps and opportunities in a circular network. Retrieved from: <https://www.scienceandtheenergychallenge.nl/sites/default/files/workshops/attachments/NWO%20Sc4CE%20-%20Workshop%20Business%20Models%20%20Aper%20on%20Circular%20Business%20Models.pdf>
- Baxter, W., Aurisicchio, M., Mugge, R., & Childs, P. (2017). Positive and negative contamination in user interactions. In *DS 87-8 Proceedings of the 21st International Conference on Engineering Design (ICED 17) Vol 8: Human Behaviour in Design, Vancouver, Canada, 21-25.08. 2017* (pp. 509-518).
- Bell, S. S., Holbrook, M. B., & Solomon, M. R. (1991). Combining aesthetic and social value to explain preferences for product styles with the incorporation of personality and ensemble effects. *Journal of social behavior and personality*, 6(6), 243.
- Chen, Y., Wang, J., & Jia, X. (2020). Refurbished or Remanufactured?—An Experimental Study on Consumer Choice Behavior. *Frontiers in Psychology*, 11(May), 1–11. <https://doi.org/10.3389/fpsyg.2020.00781>
- Creusen, M. E. H., & Schoormans, J. P. L. (2005). The different roles of product appearance in consumer choice\*. *Journal of Product Innovation Management*, 22(1), 63–81. <https://doi.org/10.1111/j.0737-6782.2005.00103.x>
- Crilly, N., Moultrie, J., & Clarkson, P. J. (2004). Seeing things: Consumer response to the visual domain in product design. *Design Studies*, 25(6), 547–577. <https://doi.org/10.1016/j.destud.2004.03.001>
- Demirbilek, O., & Sener, B. (2003). Product design, semantics and emotional response. *Ergonomics*, 46(13–14), 1346–1360. <https://doi.org/10.1080/00140130310001610874>
- Dodds, W. B., Monroe, K. B., & Grewal, D. (1991). Effects of price, brand, and store information on buyers' product evaluations. *Journal of Marketing Research*, 28(3), 307-319.
- Demirbilek, O., & Sener, B. (2003). Product design semantics and emotional response. *Ergonomics*, 46(13–14), 1346–1360. <https://doi.org/10.1080/00140130310001610874>
- Geißdörfer, M., Savaget, P., Bocken, N., & Hultink, E.-J. (2017). The Circular Economy: A new sustainability paradigm? *Journal of Cleaner Production*, 143, 757-768. <https://doi.org/10.1016/j.jclepro.2016.12.048>
- Grewal, D., Monroe, K. B., & Krishnan, R. (1998). The effects of price-comparison advertising on buyers' perceptions of acquisition value, transaction value, and behavioural intentions. *Journal of Marketing*, 46-59.
- Grewal, D., Krishnan, R., Baker, J., & Borin, N.A. (1998). The effect of store name, brand name and price discounts on consumers' evaluations and purchase intentions. *Journal of Retailing*, 74(3), 331.
- Hassenzahl, M. 2004. The interplay of beauty, goodness, and usability in interactive products. *Human-Computer Interaction*, 19, 319–49.
- Krippendorff, K., & Butter, R (1984). Product semantics: Exploring the symbolic qualities of form. *Innovation*, 3(2), 4-9. Retrieved from [http://repository.upenn.edu/asc\\_papers/40](http://repository.upenn.edu/asc_papers/40)
- Michaud, C., & Llerena, D. (2011). Green consumer behaviour: An experimental analysis of willingness to pay for remanufactured products. *Business Strategy and the Environment*, 20, 408-420.
- Mugge, R., Dahl, D. W., & Schoormans, J. P. L. (2018). "What You See, Is What You Get?" Guidelines for Influencing Consumers' Perceptions of Consumer Durables through Product Appearance. *Journal of Product Innovation Management*, 35(3), 309–329. <https://doi.org/10.1111/jpim.12403>
- Mugge, R., Schoormans, J. P., & Schifferstein, H. N. (2005). Design strategies to postpone consumers' product replacement: The value of a strong person-product relationship. *The Design Journal*, 8(2), 38-48.

- Mugge, R., Jockin, B., & Bocken, N. (2017). How to sell refurbished smartphones? An investigation of different customer groups and appropriate incentives. *Journal of Cleaner Production*, 147, 284–296.  
<https://doi.org/10.1016/j.jclepro.2017.01.111>
- Mugge, R., Safari, I., & Balkenende, R. (2017). Is there a market for refurbished toothbrushes? An exploratory study on consumers' acceptance of refurbishment for different product categories. *Product Lifetimes and the Environment (Plate)*, 293–297. <https://doi.org/10.3233/978-1-61499-820-4-293>
- Oestereich, Christopher. "Gute Form" im Wiederaufbau: zur Geschichte der Produktgestaltung in Westdeutschland nach 1945. Lukas Verlag, 2000.
- Page, C., and P. M. Herr. 2002. An investigation of the processes by which product design and brand strength interact to determine initial effect and quality judgments. *Journal of Consumer Psychology*, 12, 133–47.
- Palacios-Munoz, B., Peuportier, B., Gracia-Villa, L., & López-Mesa, B. (2019). Sustainability assessment of refurbishment vs. new constructions by means of LCA and durability-based estimations of buildings lifespans: A new approach. *Building and Environment*, 160, 106203.
- Pigozzo, D. C. A., Zanette, E. T., Filho, A. G., Ometto, A. R., & Rozenfeld, H. (2010). Ecodesign methods focused on remanufacturing. *Journal of Cleaner Production*, 18(1), 21–31. <https://doi.org/10.1016/j.jclepro.2009.09.005>
- Schädlich, C. (1984). The Bauhaus and the continuation of its Tradition in the GDR. *Journal of Popular Culture*, 18(3), 175.
- Van Rompay, T., F. Verdenius, V. Okken, and A. Pruyn. (2014). Appearances can be deceiving: The portrayal of weight and embodied meaning portrayal in product design. In Design & emotion conference, ed. J. Salamanca, P. Desmet, A. Burbano, G. Ludden, and J. Maya, 595–600. Bogota, Colombia: Ediciones Uniandes
- van Overveld, M., Jong, P. J. d., & Peters, M. L. (2010). The Disgust Propensity and Sensitivity Scale - Revised: Its predictive value for avoidance behavior. *Personality and Individual Differences*, 49(7), 706–711. <https://doi.org/10.1016/j.paid.2010.06.008>
- Van Weelden, E., Mugge, R., & Bakker, C. (2016). Paving the way towards circular consumption: exploring consumer acceptance of refurbished mobile phones in the Dutch market. *Journal of Cleaner Production*, 113, 743-754.
- Veryzer, R. W., and J. W. Hutchinson (1998). The influence of unity and prototypicality on aesthetic responses to new product designs. *Journal of Consumer Research*, 24, 374–94
- Wallner, T. S., Magnier, L., & Mugge, R. (2020). An exploration of the value of timeless design styles for the consumer acceptance of refurbished products. *Sustainability* 12, 1-20. <https://doi.org/10.3390/su12031213>