Exploring sustainability liability/asset effects: The role of product category and type of green attribute

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The role of product category and type of green attribute

Abstract

This paper builds on the assumption that consumers make *positive* inferences about a product's functional quality when a green attribute is introduced in a *gentle* category, and that they will make *negative* inferences about functional quality when sustainability is introduced in a *strong* category. Findings from two experimental studies show that perceived functional quality is a significant mediator mechanism explaining positive (negative) effects of green attributes on product preferences in gentle (strong) product categories. We also document type of green attribute (central vs. peripheral) as a moderator of this effect. Specifically, a green attribute that is central to the product's functionality (i.e. chemicals in a cleaning product), as opposed to peripheral (i.e. the packaging of a cleaning product) generates stronger liability (asset) effects in a strong (gentle) category. Results suggest that liability/asset effects of green attributes are contingent on consumer segments.

Keywords: *Sustainability liability, functional quality, inference making*

Track: *Social Responsibility & Ethics*

1. Introduction

Introducing a green product attribute can reinforce or reduce the perceived value of other product attributes, depending on the product category. For example, organic attributes in the food category may increase perceptions of nutritional quality (Olsen et al. 2014), whereas recycled rubber in car tires may reduce perceptions of their functional quality (Luchs et al. 2010). Luchs et al. (2010) explain this category influence by theory of benefit congruity, founded on the idea that sustainability as a concept is more strongly associated with gentleness-related product benefits (e.g. mild, soft) than with strength-related product benefits (e.g. powerful, tough). Therefore, when consumers seek strength-related benefits, they may prefer less sustainable products, whereas if consumers value gentleness-related benefits, sustainability is likely to enhance product preference (Luchs et al., 2010). The negative effect of a sustainable product attribute on product preference has become known as 'the sustainability liability' (Luchs et al., 2010). Although the potential of negative effects of sustainability has been addressed in prior research (Lin & Chang, 2012; Luchs, Naylor, Irwin, & Raghunathan, 2010; Newman, Gorlin, & Dhar, 2014), there is a need for research on the boundary conditions and mediating mechanisms for this effect. In this research, we focus on two boundary conditions for the sustainability liability effect: product category and type of green product attribute. Two experimental studies test sustainability effects in strong and gentle categories when the green attribute is either central or peripheral. The first study is an online survey-experiment conducted on a student sample. To replicate findings from study 1 in a more representative sample, study 2 was set out in the field, using physical products with fictitious labels.

2. Theoretical background and research hypotheses

2.1 Product category as a boundary condition

Whether consumers use sustainability to make positive or negative inferences about the product's quality is likely to depend on the category to which the product belongs. Specifically, we argue that consumers make *positive* inferences about quality when sustainability is introduced in a *gentle* category, and that they will make *negative* inferences about quality when the sustainability is introduced in a *strong* category. The studies by Lin and Chang (2012) and Luchs et al. (2010) document a negative relationship between sustainability and perceived product quality in strength-related product categories (car tires and hand sanitizer). Lin and Chang (2012) show that green products are perceived as less effective than regular products, and that this effect explains increased usage of green (vs regular) products. Although implied by their discussions of the sustainability liability effect,

none of the studies referred to above test whether functional quality mediates effects on product preferences. In accordance with Luchs et al. (2010), we predict that sustainability is a liability in the strong product category. Therefore, we aim to test the prediction that functional quality mediates the effects of sustainability on preference in both strong and gentle product categories. Based on this discussion, we propose the following hypotheses:

H1: The regular (vs. green) product is preferred in the strong product category

H2: The green liability effect predicted by H1 is mediated by perceived functional quality

H3: The green (vs. regular) products are preferred in the gentle product category

H4: The green superiority effect predicted in H3 is mediated by perceived functional quality

2.2 Attribute centrality as a boundary condition

Gershoff and Frels (2015) define attribute centrality as those features of a product that represent defining characteristics of the product concept or category. Their main prediction is that environmental benefits associated with central attributes increases overall perceived product greenness compared with identical environmental benefits associated with less central attributes. The centrality concept relates to Keller's (1993) distinction between product-related and non-product-related attributes. Product-related attributes refer to the ingredients necessary for performing the function that consumers seek from the product, whereas non-product-related attributes are external aspects, such as packaging, price, and user imagery. Therefore, in our research, we define attribute centrality in reference to the product's functionality. This is important, because consumers' trade-off evaluations are made between greenness and functionality. Hence, the more strongly the green attribute is associated with the functionality of the product, the stronger is the green liability effect in strong product categories. However, since greenness is likely to be a quality indicator in the gentle category, the more central the green attribute is to the functionality of the product, the stronger the positive quality effect. Specifically, we expect that the green *quality* effect in the gentle category is stronger when the green attribute is central (vs. peripheral), while the perceived *quality* of the strong product decreases when the green attribute is central (vs. peripheral). Similarly, we expect that *preference* for the regular (vs. green) product in the strong product category is stronger when the green attribute is central (vs. peripheral), while *preference* for the green alternative in the gentle product category is stronger when the green attribute is central (vs. peripheral).

H5: The green liability effect on a) product preference and b) functional quality in the strong category is stronger when the green attribute is central (vs. peripheral)

H6: The green superiority effect on a) product preference and b) functional quality in the gentle category is stronger when the green attribute is central (vs. peripheral)

3. Study 1

The first purpose of study 1 is to test perceived functional quality as the mediator mechanism explaining the negative effect of sustainability in the strong product category and the positive effect of sustainability in the gentle product category. The second purpose is to test whether the sustainability liability in the strong product category, and the sustainability superiority effect in the gentle category, is moderated by the type of green attribute the product holds (central vs. peripheral).

3.1 Stimuli, procedures and measures

Four hundred thirty-six students enrolled in a business graduate school participated in an online survey-experiment set up in Qualtrics. The sample consisted of 61% males and 39% females, and the average age was 23.8 (SD = 2.9). The experiment is a mixed within-between subjects design with product category (gentle vs. strong) as the between-subjects factor and type of green attribute (central vs. peripheral vs. regular baseline) as the within-subjects factor. Participants were randomly assigned to one of the pre-tested product categories (body lotion or drain opener). In accordance with Keller's (1993) definition of product-related and non-product-related attributes, we manipulated the central green attribute using the description "100% natural ingredients" and the peripheral green attribute using the description "100% recycled material". To measure perceived functional quality, the respondents were asked to indicate "how would you rate the ability of these products to moisturize dry skin?" (Body lotion)/"How would you rate the ability of these products to open clogged pipes?" (Drain opener). We measured product preference by asking participants to rate the likelihood that they would choose each of the different alternatives if they were in need for a body lotion/drain opener. To control for social desirability in participants' answering, we included a second measure of product evaluation, asking participants to rate the likelihood that each alternative will be a success in the market. As a manipulation check, we included a measure of product greenness, using two items from Gershoff and Frels (2015). Additionally, we included two control items capturing the respondents "green profile".

3.3 Results

Pairwise comparisons with planned contrasts of the preference scores for the three products show that participants in the strong product category condition had higher preferences for the regular product ($M_{regular}$ = 5.30, SD =1.37) compared to both the central

green attribute ($M_{central}$ = 4.23, SD = 1.56, $p < .0001$) and the peripheral green attribute (M = 5.02, $p < .05$). The data support H1. Comparing preference scores for the gentle category shows that participants, contrary to our expectations (H3), did not prefer the green products ($M_{central}$ = 5.10, SD = 1.55; $M_{peripheral}$ = 4.50, SD = 1.49) to the regular product ($M_{regular}$ = 4.98, SD = 1.40). In accordance with Luchs et al. (2010), we also tested preferences from an other-perspective by asking participants to evaluate the likelihood of market success. Pairwise comparisons in the two category conditions did not yield different results compared to the personal preferences measure (for mean scores, see table A1 in the appendix).

As expected, the regular product in the strong category is perceived as significantly more effective ($M_{regular}$ = 5.86, SD = 1.26) compare to both the central green attribute product ($M_{central}$ = 4.25, SD = 1.36, $p < .0001$) and the peripheral green attribute product ($M_{peripheral}$ = 5.33, SD = 1.32, $p < .0001$). To test whether differences on perceived functional quality mediates effects on product preference, we applied the MEMORE macro for SPSS (Montoya & Hayes, 2017), which estimates indirect effects for within-subjects designs. Bootstrap analyses with 5,000 samples (Preacher & Hayes, 2008) show a significant negative indirect effect of the central green attribute (vs regular) through perceived product on product preference in in strong category (β = -.962, SE = .16, 95%CI = -1.281, -.666), and a significant indirect effect of the peripheral green attribute (vs regular) on product preference through functional quality (β = -.240, SE = .14, 95%CI = -.397, -.117). Therefore, the data lend support to H2. In the gentle product category, we do not find the expected difference between the regular and green products on perceived functional quality. Hence, H4 is not supported by the data. To test H5-H6, we created a difference score for quality perceptions and product preference for the regular product compared to the two green products. Because the two green attributes differ significantly on overall perceived product greenness, we controlled for the greenness difference score. Paired-sampled t-test shows that the difference between the regular and central green attribute on product preference is significantly greater than the difference score between the regular and peripheral green attribute ($M_{difference\ score\ for\ Central\text{-}Regular}$ = -1.07., $M_{difference\ score\ for\ Peripheral\text{-}Regular}$ = -.28, t (211) = -7.66, $p < .0001$), supporting H5a. The same pairwise comparisons are significant concerning functional quality ($M_{difference\ score\ for\ Central\text{-}Regular}$ = -1.62., $M_{difference\ score\ for\ Peripheral\text{-}Regular}$ = -.53, t (211) = -10.74, $p < .0001$), supporting H5b.The difference scores in the gentle category show an advantage of the central (vs peripheral) green attribute relatively to the regular product on product preference ($M_{difference\ score\ for\ Central\text{-}Regular}$ = .13., $M_{difference\ score\ for\ Peripheral\text{-}Regular}$ = -.48, t (223) = 5.21, p <

.0001) and functional quality ($M_{difference\ score\ for\ Central\text{-}Regular}$ = .14., $M_{difference\ score\ for\ Peripheral\text{-}Regular}$ = -.52, t (223) = 6.96, p < .0001), supporting H6a-b.

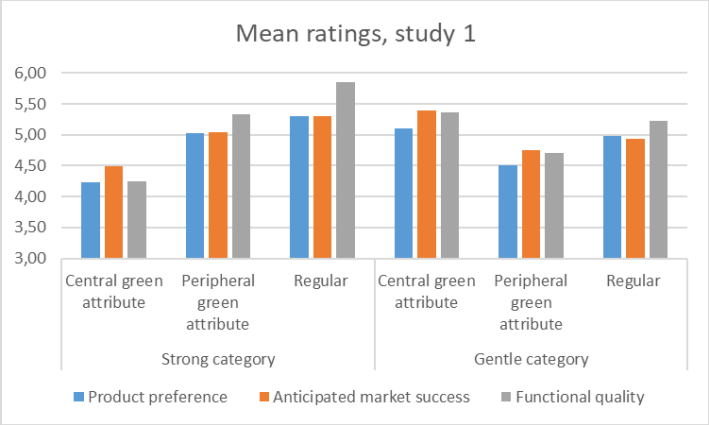

Figure 1: Mean ratings study 1

4. Study 2

The primary objective of study 2 is to test the research hypotheses on a representative sample in a setting closer to an actual purchase decision. In study 2, the aim was to set up the experiment closer to a real shopping situation, using physical products, while remaining experimental control. In collaboration with the largest Norwegian producer of fast moving consumer goods, we created a fictitious brand name and used physical bottles with different labels corresponding to the experimental conditions. This also gave us the opportunity to include a physical measure of perceived functional quality; specific amount of product required to solve a functional problem (i.e. open clogged pipes).

4.1 Stimuli, procedures and measures

191 customers at a large shopping mall were recruited to the experiment, of which 181 completed the survey. The participants' age ranged from 15 to 78, with an average of 36 years old. 33.7% were males and 66.3 were females. The products (body lotion and drain opener) were real bottles, and their shape were typical of the product categories. We relabeled the bottles for the purpose of the experiment. All products were given the fictitious brand name 'Sera'. We used the same descriptions as in study 1 to manipulate type of green attribute ("100% natural ingredients" and "100% recycled material"). To ensure realism of the design, while maintaining experimental control, the bottles were designed in collaboration with product managers at the fmcg company. Participants were randomly assigned to one of the two product categories by the online survey program. We measured product preference,

perceived market success, perceived functional quality, and product greenness[1] in the same way as in study 1. In this study, we also included a physical measurement task, where participants were asked to indicate how much of each product they thought would be necessary to solve a specific functional problem. Since price perceptions may influence green choices, we included perceived price differences as a control variable in this study. We also asked participants were asked to identify which of two environmental problems they regarded as representing the greatest threat to the environment, where the first problem was related to the central green attribute (i.e. natural ingredients), and the second problem relates to the peripheral green attribute (i.e. recycled material).

4.2 Results

Planned comparisons of mean product preference scores in the strong category show no significant differences between the products ($M_{central}$ = 4.72, $M_{peripheral}$ = 4.74, $M_{regular}$ = 4.98). Therefore, contrary to study 1, the data does not support H1. There are also no differences between the products on perceived market success ($M_{central}$ = 4.83, $M_{peripheral}$ = 4.67, $M_{regular}$ = 4.41). The same analyses for the gentle category show that, as predicted, participants prefer the central green attribute product ($M_{central}$ = 5.39) to the regular product ($M_{regular}$ = 3.95 $p < .0001$). However, the peripheral green attribute is not significantly more preferred compared to the regular product ($M_{peripheral}$ = 4.10). The peripheral attribute is however anticipated to be a greater market success than the regular product ($M_{peripheral}$ = 4.72, $M_{regular}$ = 3.83, $p < .0001$), as is the central green attribute ($M_{central}$ = 5.46, $p < .0001$). Therefore, the data supports H3 when the green attribute is central, but for market success as the dependent variable, both green attributes scores higher than the regular product. As expected, the regular product in the strong category is perceived as significantly more effective ($M_{regular}$ = 5.64) compare to both the central green attribute product ($M_{central}$ = 4.35, $p < .0001$) and the peripheral green attribute product ($M_{peripheral}$ = 4.79, $p < .0001$). A bootstrap analysis with 5,000 samples shows in indirect effect of the central green attribute (vs regular) on product preference through functional quality (β = -1.261, SE = .25, 95%CI = -1.778, -.823), and an indirect effect of the peripheral green attribute (vs regular) on product preference through functional quality (β = -.653, SE = .19, 95%CI = -1.084, -.310). Hence, despite the lack of total effect of the green (vs regular) products on product preference, there are indirect effects through quality, lending support to H2.

[1] Study 1 used two items from Gershoff and Frels (2015) to measure perceived product greenness in study 1. In study 2, we also included the third item from the original scale: "This product should be labelled environmentally friendly", hence using the full original scale.

In the gentle category, the central green attribute is as expected perceived as significantly more effective compared to the regular product ($M_{central}$ = 5.21, $M_{regular}$ = 4.52 $p < .0001$). Mediation analysis using bootstrapped confidence intervals shows that functional quality significantly mediates the preference for the central green (vs regular) product (β = .545, SE = .16, 95%CI = .260, .902). Contrary to the expectations, the peripheral green attribute is regarded as significantly less effective than the regular product ($M_{peripheral}$ = 4.25, $p < .05$). Hence, H4 is supported only for the central green attribute. Comparing mean scores across the three products for the physical measurement task shows that participants guessed a significantly higher amount for the central green attribute product ($M_{central}$ = 234,7 ml) compared to the regular product ($M_{regular}$ = 205,9 ml; $p < .05$). However contrary to the first quality measure, the peripheral green attribute product was not evaluated as less effective on this functional quality measure ($M_{peripheral}$ = 200,8 ml). We performed a mediation analysis to test whether the new measure of functional quality also mediates effects on product preference, and a bootstrap analysis confirm that the central green (vs regular) product has a negative effect on product preference through the perceived amount of product needed to solve the functional problem (β = -.210, SE = .14, 95% CI = -.521, -.002). Hence, H4 is confirmed for the central green attribute using both measures of perceived effectiveness. The measuring task had to be performed differently for the gentle category. 44% of the participants responded that they did not think there was a difference between the products with respect to amount needed to moisturize dry skin. Of the 56% who responded 'yes' to a difference, 60% rated the central attribute as the least amount needed. The peripheral green product and the regular product had a similar ranging, suggesting overall the same result as for the first functional quality measure. We predicted an increased liability effect for the central green attribute in the strong category (H5) and a stronger superiority effect for the central green attribute in the gentle category (H6). Because there were no significant differences between any of the strong products concerning product preference, the data does not support H5a. However, a paired-sampled t-tests shows that the difference between the regular and central green attribute on functional quality is significantly greater than the difference score between the regular and peripheral green attribute ($M_{difference\ score\ for\ Central\text{-}Regular}$ = -1.29, $M_{difference\ score\ for\ Peripheral\text{-}Regular}$ = -.86, $t(89) = 2.69$, $p < .01$), supporting H5b. In the gentle category, the preference for the green product is significantly stronger compared to the regular product when the green attribute is central (vs peripheral) ($M_{difference\ score\ for\ Central\text{-}Regular}$ = 1.44., $M_{difference\ score\ for\ Peripheral\text{-}Regular}$ = .15, $t(90) = -6.09$, $p < .0001$), supporting H6a.

Similarly, the perceived functional quality is significantly higher compared to the regular product when the green attribute is central (vs peripheral) ($M_{\text{difference score for Central-Regular}} = .692$, $M_{\text{difference score for Peripheral-Regular}} = -.264$, $t(90) = 6.06$, $p < .0001$). Therefore, the data support H6a-b.

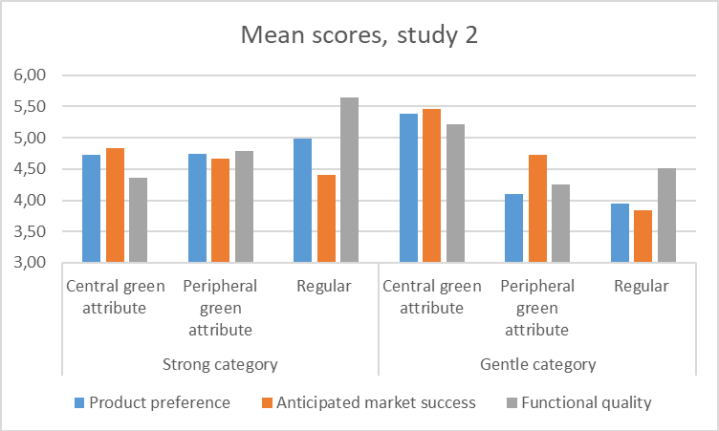

Figure 3: Mean ratings study 2

5. Discussion

Contrary to study 1, study 2 did not replicate the negative effects of sustainability on product preference for strong products. Perceived functional quality was still higher for the regular (vs green) products, and there were indirect negative effects of the green products (vs regular) on product preference through functional quality. In addition, participants measured a significantly higher amount of the central green attribute (vs regular), which also was a significant mediator mechanism for product preference. In trying to explain the difference between the two studies on product preference in the strong category, we tested whether demographic characteristics of the more representative sample in study 2 may have influenced the results. When controlling for age, we find the predicted difference between central green and regular product on product preference ($F = 5.36$, $p < .05$). Surprisingly, older customers prefer the green alternatives to the regular product, which seem to be attenuating the liability effect in this study. Age did not influence the difference between peripheral and regular products. Luchs et al. (2010) documented the sustainability liability effects only on student samples. The findings presented in our study emphasize the importance of conducting research on representative samples when investigating sustainable consumption. For the gentle product category, participants preferred the central green attribute product, as predicted. In study 1, we found this effect only for female consumers. Although the main effect is significant in study 2, we replicate the same gender effect as in study 1. Thus, the central green attribute (relatively to the regular product) is more strongly preferred by female

consumers. Study 2 does not replicate the unexpected negative effect of the peripheral green attribute (vs regular product) on product preference. However, we do find the same negative effect on perceived functional quality.

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Appendix

Table A1: Mean scores study 1

	Strong (N = 212)			**Gentle** (N = 224)		
Measures	*Central*	*Peripheral*	*Regular*	*Central*	*Peripheral*	*Regular*
Product pref.	4.24 (1.56)	5.02 (1.39)	5.30 (1.37)	5.10 (1.55)	4.50 (1.49)	4.98 (1.40)
Market success	4.49 (1.24)	5.04 (1.21)	5.29 (1.20)	5.39 (1.15)	4.75 (1.23)	5.29 (1.20)
Functional qual.	4.25 (1.36)	5.33 (1.32)	5.86 (1.26)	5.36 (1.31)	4.70 (1.28)	5.22 (1.21)
Prod. greenness	5.66 (1.24)	5.97 (1.08)	2.81 (1.08)	5.06 (1.24)	6.11 (0.94)	3.16 (0.99)

Note: Mean scores with SD in parenthesis

Table A2: Mean scores study 2

	Strong (N = 90)			**Gentle** (N = 91)		
Measures	*Central*	*Peripheral*	*Regular*	*Central*	*Peripheral*	*Regular*
Product pref.	4.72 (1.88)	4.74 (1.88)	4.98 (1.80)	5.38 (1.57)	4.10 (1.83)	3.95 (1.70)
Market success	4.83 (1.63)	4.67 (1.65)	4.42 (1.60)	5.46 (1.21)	4.73 (1.56)	3.84 (1.47)
Functional qual.	4.36 (1.43)	4.79 (1.50)	5.64 (1.28)	5.21 (1.26)	4.25 (1.50)	4.52 (1.46)
Amount[a]	234.7 ml (121.3)	200.9 ml (95.0)	206.0 ml (116.4)	60%	15%	25%
Prod. greenness	5.56 (1.47)	4.70 (1.58)	2.46 (1.55)	5.04 (1.27)	5.78 (1.19)	2.69 (1.39)

Note: Mean scores with SD in parenthesis. [a]For the gentle category, amount is shown as the percentage of participants that indicated the lowest amount needed. Lowest rating indicates highest perceived functional quality