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SPECIAL ISSUE ARTICLE

Post-adoption buffering effects of innovative product aesthetics

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Innovative aesthetic product appearances can create buffering effects in the pre-adoption phase that lead consumers to base their expectations on the aesthetics rather than on objective information about innovative products. How do innovative aesthetics influence product experience in the post-adoption phase? Using longitudinal post-adoption data from early adopters of an electric car model, this study shows that consumers' perceptions of innovative aesthetic value buffer the effect of product-related hedonic experience on attitudes towards the product. The more value consumers derive from innovative product aesthetics post-adoption, the less they ground their attitudes on actual hedonic experience. Product managers thus should opt for designs that grant aesthetic utility over time. Innate consumer innovativeness levels moderate the buffering effect, such that the effect of aesthetic innovative product evaluations on the relationship between experienced hedonic utility and attitude is stronger for more innovative consumers. Innovative consumers are especially sensitive to innovative aesthetic value, so in their co-creation efforts, managers should seek out these customers, because doing so can increase early adopters' long-term product satisfaction and word of mouth, both of which expand the breadth of diffusion for the innovations.

KEYWORDS

buffering, hedonic, innovation, innovative aesthetics

1 | INTRODUCTION

Marketing research and practice have acknowledged the importance of product aesthetics as a source of competitive advantage (Liu, Li, Chen, & Balachander, 2017). Product form is a crucial means to influence consumer behaviour (Creusen & Schoormans, 2005; Homburg, Schwemmler, & Kuehnl, 2015). For decades, innovation research has been highlighting the need to meet customers' expectations regarding product innovations' usefulness and relative advantage (Rogers, 2010; Venkatesh, Thong, & Xu, 2012). However, to convince consumers of the utility of novel products, aesthetic appearance often is even more relevant than objective information, because the visual comes first. Visual cues provide reliable information, in that they represent a fast and direct form of experience, using the consumer's own senses (Bloch, 1995). Therefore, managers leverage their innovative products'

appearance to create buffering effects in the pre-adoption phase and reduce the relevance of objective, product-related information (Hoegg & Alba, 2011).

Although knowledge about adoption intentions and decisions is broad and deep, insights into consumer perceptions in the post-adoption phase are notably scarce (Rogers, 2010), likely due to data accessibility limitations. That is, we know that an innovative aesthetic impression increases purchase intentions (Truong, Klink, Fort-Rioche, & Athaide, 2014), but we do not know the extent to which this influence affects consumer behaviour after the product has been adopted. From a pessimistic perspective, there might be no long-term buffering effect of innovation aesthetics, because actual post-adoption usage experiences could replace aesthetic cues as relevant indicators of products' advantages. In this case, the initial buffering effect even might backfire after the adoption phase, such

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as if exaggerated, design-induced expectations fail to match the actual experienced utility (Churchill & Surprenant, 1982). There also is some reason to be more optimistic though. Research shows that product design informs customer satisfaction in the post-adoption phase (Chitturi, Raghunathan, & Mahajan, 2008) such that managers still might count on a buffering effect of innovation aesthetics in the post-adoption phase.

A substantial share of early adopters are innovative consumers (McDonald & Alpert, 2007). Consumer innovativeness is a personality trait that causes people to seek out the new and different (Bartels & Reinders, 2011; Hirschman, 1980; Steenkamp & Gielens, 2003). When innate consumer innovativeness exerts a moderating effect, marketing managers likely can optimize innovation aesthetics to meet the long-term preferences of innovative consumers and thus improve attitudes towards product innovations among a substantial segment of early adopters. Building on this prior research into the buffering effect in innovation marketing (Hoegg & Alba, 2011) and the influences of consumer innovativeness in the purchase context (Bartels & Reinders, 2011; Bruner & Kumar, 2007; Truong et al., 2014), we address two research questions:

1. Is there a buffering effect of perceived aesthetic value, moderating the relationship between product experience and attitude in the post-adoption phase?
2. Does this buffering effect vary in strength according to consumers' level of innate innovativeness?

To address these questions, we build on two ideas. First, like the influence of innovative aesthetics in the pre-adoption period, a post-adoption buffering effect might reduce the relevance of objective information for product evaluations. In a post-adoption context, the

central objective information is consumers' first-hand experience with innovations' hedonic and functional performance. When consumers derive more aesthetic value from innovative products, it might reduce the relevance of their product experience in determining their product attitudes in the long term. Second, Truong et al. (2014), in considering a derivative of the more general consumer innovativeness trait, show that innovative consumers' adoption intentions are linked to their perceptions of the aesthetic appearance of the focal innovation. Thus, consumer innovativeness seemingly might moderate the buffering effect in the post-adoption phase.

As our theoretical contribution, we seek to clarify the interplay among perceived aesthetic value, hedonic and functional product experience, and product attitudes in the innovation post-adoption phase. We predict that perceived aesthetic value exerts a buffering effect on the relationship between product experience and attitude; we also note the role of innate consumer innovativeness in this context. Innate consumer innovativeness should strengthen the buffering post-adoption effect of product aesthetics on hedonic experience but weaken it in relation to functional experience. In turn, managers might leverage aesthetic value to increase purchase intentions, as well as to buffer the relevance of post-adoption product experience over time. When targeting innovative consumers, they could effectively rely on long-term product fun, via aesthetic value, though they also must be careful to provide long-term functional performance.

After providing the conceptual background for our study, we derive hypotheses and illustrate the conceptual framework, as detailed in Figure 1. We then explain the sample and applied methods. Furthermore, we detail how this study contributes to theory while also offering important implications for innovation practitioners. We finally discuss the limitations of this study and suggest some directions for further research.

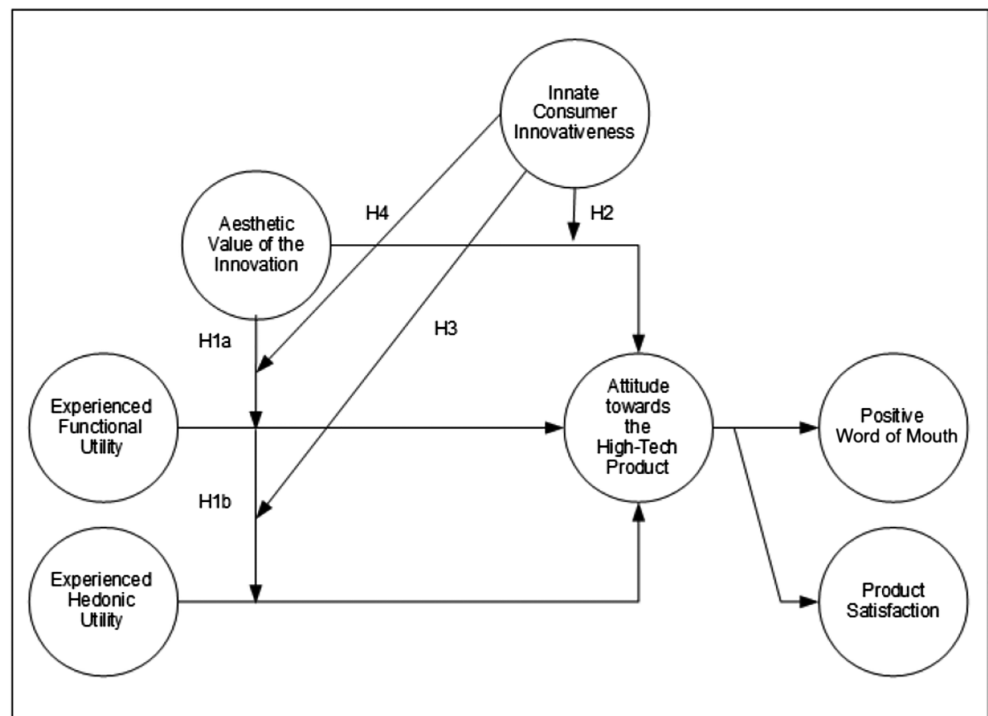


FIGURE 1 Conceptual framework

2 | THEORETICAL FRAMEWORK

2.1 | Relevance of innovative product aesthetics

A growing number of studies in marketing focuses on product aesthetics and its various consequences to companies' product strategies (Candi, Jae, Makarem, & Mohan, 2017; Chen, 2019; Liu et al., 2017). Despite the existence of today's rich body of literature on product aesthetics in marketing, the number of studies on product form in the context of product innovations is still small relative to its importance. Many studies on innovative design focus on the "form follows function" principle and address how firms can aesthetically optimize features to overcome adoption hurdles (Townsend, Montoya, & Calantone, 2011). Innovations must be perceived as useful, easy to learn, and relatively advantageous (Rogers, 2010; Venkatesh et al., 2012)—and aesthetics in innovation research get addressed as a means to this end. Before adoption, consumers rarely have opportunities to test the product though. Consumers instead rely on visual cues to make their product judgements, because appearance offers an initial experience of the product, according to one's own senses (Chitturi et al., 2008; Radford & Bloch, 2011). Consumers infer usefulness, fun or meaning from product design, which comprises "the form characteristics of a product that provide utilitarian, hedonic, and semiotic benefits to the user" (Bloch, 2011, p. 378). Hence, the innovation literature started to systematically address the consequences of innovative form beyond feature optimization and discovered the potential of aesthetics to convey information about utilitarian or hedonic benefits on a more holistic level (Rindova & Petkova, 2007). Chitturi et al. (2008) show that design is relevant at the moment of adoption and then also influences consumers' post-adoption behaviour. Perceptions of functional design aspects also prompt consumers' prevention orientations, which ultimately influence their satisfaction. Perceived hedonic design benefits instead evoke their promotion orientations and can lead to post-adoption delight. Therefore, the visual appearance of products has a strong influence on early adoption decisions, then influences the post-adoption product experience of the early adopters (Bloch, 1995; Chitturi et al., 2008). According to Bloch (1995), consumers respond to product forms in various ways, but overall, an appraisal of a product form leads to an aesthetic response, defined as a "deeply felt experience that is enjoyed purely for its own sake without regard for other more practical considerations" (Holbrook & Zirlin, 1985, p. 21). We refer to consumers' aesthetic response using the term "aesthetic product evaluation", to highlight the value derived solely from liking the product's appearance.

2.2 | Buffering effect of perceived innovative aesthetics

Before their adoption, consumers can infer utility from product design but also from product descriptions and word of mouth. As soon as they have adopted the product, consumers start to gather experience, such that they learn by using the newly adopted product. Shih and

Venkatesh (2004) show that greater experience affects the variety and rate of product usage. Consumers' utility also can be differentiated, as experienced hedonic or functional utility (Voss, Spangenberg, & Grohmann, 2003). Perceptions of functional utility stem from rational evaluations of the product's usefulness; hedonic utility in the post-adoption phase instead relies on experienced product fun. Both types of utility contribute to attitudes towards the product (Voss et al., 2003), and consumers' appraisals of aesthetic value influence this attitude formation process too. According to elaboration likelihood framework, consumers' aesthetic product evaluations serve as peripheral cues or issue-relevant arguments. Aesthetic value refers to both hedonic and functional aspects of a product (Bloch, 1995; Bloch, Brunel, & Arnold, 2003; Lam & Mukherjee, 2005; Petty & Cacioppo, 1986): The concept of aesthetic value entails sensory aspects of design and signals hedonic utility, comprised of "those facets of consumer behavior that relate to the multisensory, fantasy and emotive aspects of one's experience with a product" (Hirschman & Holbrook, 1982, p. 92). Aesthetic value also points to the functional purpose of a product, because visual appearance is a hint of functional performance. In the example Bloch (1995) offers, a race horse is perceived as most beautiful when it is running. Aesthetic value therefore signals functional utility, or benefits "derived from functions performed by products" (Voss et al., 2003, p. 310).

According to Hoegg and Alba (2011), product form can create a halo effect on consumers' adoption decisions. When consumers like the innovation's functional appearance, they overestimate its usefulness, even if they gain information about its actual performance. Drawing on appearance bias research in social psychology (Hassin & Trope, 2000; Landy & Sigall, 1974; Langlois et al., 2000), Hoegg and Alba (2011) suggest that, just as personal attractiveness biases judgements of leadership skills or work quality, consumers' inferences based on product form have the potential to override considerations of objective product-related information. Along the same lines, we argue that visual aesthetics remain influential in the post-adoption phase, such that a buffering effect exists in the long term (Nisbett & Wilson, 1977). Similar principles that lead consumers to judge a product by its design rather than by its technical specifications are likely to affect their post-adoption product evaluations too: Consumers derive information about product usefulness and product fun from their aesthetic impressions (Creusen & Schoormans, 2005), so the main difference between the pre- and post-adoption phase is consumers' experience with the product. Before adoption, substantial uncertainty exists regarding true product performance, but in the post-adoption phase, consumers have first-hand experience with the product's fun and functionality. They are certain about the absolute level of hedonic and functional utility an innovation can provide. If visual impressions substitute for objective product-related information in the pre-adoption phase (Hoegg & Alba, 2011) the product's aesthetic value similarly might reduce the relevance of first-hand product-related experiences in the post-adoption phase. Therefore, an aesthetic response to an innovation could reduce the influence of actual product-related experience on post-adoption attitudes. A buffering effect, as identified in the adoption phase, thus might exist in the

post-adoption phase too. The influence of consumers' actual experience with the product on their attitudes towards the product should become weaker when they derive more aesthetic value from the product throughout the post-adoption phase.

H1. The better the consumers' aesthetic product evaluation, the weaker the effect of their experienced (a) functional and (b) hedonic utility on attitudes towards the product in the post-adoption phase.

2.3 | Innate consumer innovativeness and innovative aesthetics

Consumers adopt innovations for multiple reasons. Socio-demographic variables offer strong explanatory power, such that early adopters tend to be well educated and have a high socioeconomic status (Im, Bayus, & Mason, 2003; Rogers, 2010). However, they are not totally homogeneous. Midgley and Dowling (1978) argue that disproportionately many early adopters can be characterized by their higher levels of consumer innovativeness as a personality trait, which creates a desire to seek out the new and different (Hirschman, 1980). McDonald and Alpert (2007) therefore propose a stronger research focus on consumer innovativeness, due to its great potential for targeting early adopters. By moving beyond socio-demographics, innovation marketers could leverage what we know about psychologically innovative consumers and maximize the word of mouth that early adopters spread. The consumer innovativeness trait invokes some marketplace dynamics, by motivating consumers to demand innovation. In contrast, without any psychological desire to adopt novel products, "consumer behavior would consist of a series of routinized buying responses to a static set of products" (Hirschman, 1980, p. 283).

According to Steenkamp and Gielens (2003), consumer innovativeness is a generalized trait that positively affects the probability that consumers will try novel products and services. A close conceptual relationship thus exists between innate innovativeness and behavioural innovativeness. Behavioural innovativeness means the relative earliness of consumers' adoption in the overall diffusion process (McDonald & Alpert, 2007). The cohort of early adopters consists of people who are all behaviourally innovative, in the sense that they adopt a novel product long before members of the cohorts of early and late adopters in the market. As Midgley and Dowling (1978) point out, the score on the generalized consumer innovativeness trait increases a consumer's probability of being among the early adopters of a product. We therefore focus on consumer innovativeness as a generalized, innate, psychological trait, considering the close connection between the trait and the behaviour. This trait perspective offers the richest stream of research on consumer innovativeness (Bartels & Reinders, 2011) and enables us to focus on general psychological effects, relevant to the adoption decisions of all cohorts of early adopters.

Purchase intentions are higher among innovative consumers when products have an innovative product form (Truong et al., 2014).

The influence of perceived innovative aesthetics on purchase intentions therefore increases with consumers' levels of innovativeness. Attitudes towards a product at the time of the adoption decision, as well as in the post-adoption phase, depend on judgements of visual aesthetics (Chitturi et al., 2008). We therefore argue that consumer innovativeness increases the relevance of perceived aesthetic value in the post-adoption attitude formation process.

H2. The effect of aesthetic product evaluations on attitudes towards the product in the post-adoption phase is stronger for customers with a high level of innate consumer innovativeness.

The relevance of innovative aesthetics for innovative consumers likely affects the post-adoption buffering effect we have predicted. Consumer innovativeness is focused on hedonic utility, and it is manifest in hedonic behaviours (Hirschman, 1980; Hirschman & Holbrook, 1982). More innovative consumers engage in more novelty and variety seeking, because of the hedonic utility they experience through these behaviours (Arnold & Reynolds, 2003; Childers, Carr, Peck, & Carson, 2001). Bloch (1995) argues that product aesthetics lead to both affective and cognitive responses. Innovative consumers also value innovative product appearance more than other customers, as manifested in their greater liking of product innovations (Truong et al., 2014). Noble and Kumar (2010) argue that affective responses result from holistic sensory properties rather than from utilitarian cues at the attribute level. The overall impression of a product leads to an affective reaction. Therefore, for innovative consumers, the holistic affective impression should carry over to the post-purchase phase. In line with these findings, we predict that consumer innovativeness strengthens the hedonic dimension of the buffering effect. The hedonic aspect of an innovation's aesthetic also should lead to a stronger reduction of the influence of hedonic product experiences on attitudes towards the product among innovative consumers.

Hoegg and Alba (2011) show that functional expectations derived from visual cues can reduce the influence of objective performance information in consumers' evaluation process. However, in the post-adoption phase consumers have moved beyond first impressions and learned from experience about the innovation's actual performance. Hedonic factors drive early adopters' intentions to explore novel technologies, but during the post-adoption phase the importance of functional factors increases (Magni, Taylor, & Venkatesh, 2010). In the post-adoption phase, expectations encounter actual experience and provoke an evaluation process (Churchill & Surprenant, 1982). Yet, consumers' cognitive responses to product aesthetics continue to trigger reasoning about the products' functional performance (Noble & Kumar, 2010). The increase in accessibility of actual performance cues might finally annihilate the functional dimension of the buffering effect for innovative consumers. In fact, it might eventually backfire, as innovative consumers give aesthetic cues more weight with respect to product evaluation, than others. A discrepancy between the functional look and the actual performance could hence for innovative consumers be more severe after purchase than for consumers which rely less on product form during the adoption process. Additionally,

Bruner and Kumar (2007), investigating a domain-specific derivative of the general consumer innovativeness trait, argue that consumer innovativeness leads to a stronger focus on the product. Besides aesthetics, innovative consumers adopt for reasons related to the product, rather than due to social influences. Innovative consumers care more strongly than others about a novel product and its properties. Due to their deeper reasoning about product performance and product features, innovative consumers may be less affected by the buffering effect pertaining to this functional experience. The buffering effect, reducing the influence of experienced functional utility on attitudes thus should be weaker for innovative consumers.

- H3.** The buffering effect of aesthetic product evaluation on the influence of experienced hedonic utility on attitudes towards the product in the post-adoption phase is stronger for customers with a high level of innate consumer innovativeness.
- H4.** The buffering effect of aesthetic product evaluation on the influence of experienced functional utility on attitudes towards the product in the post-adoption phase is weaker for customers with a high level of innate consumer innovativeness.

3 | METHODS

We chose the BMW i3 car as the focal innovation in this study. In 2014, it was still radically new in both its construction and design, such that its innovative aesthetics differed from those of conventional cars (Bubna & Wiseman, 2016; Knoll, Vilimek, & Schulze, 2014). To the best of our knowledge, it was the only innovation of this kind which was launched at the time of our study. Other models, like the BMW i8, had not been introduced to consumers before the middle of 2014. Furthermore, this product can be safely considered as a radical innovation as it is a battery electric vehicle which up to 2015 still constituted a novel market segment in Germany. This product is thus ideal for investigating the research questions related to the post-adoption effects of aesthetic responses in the context of product innovations.

3.1 | Study design

We conducted a three-wave online survey among a sample of early adopters, namely, customers who purchased their vehicles before the middle of 2015, or within one and a half years of its market launch. We decided to conduct a panel study instead of a cross-sectional survey to cover the post-adoption phase rather than obtaining just a singular post-purchase impression which would have been more prone to be affected by consumers' situational aspects. As common in panel research, the number of survey waves was set to three as a trade-off between efficiency and cost (Vaisey & Miles, 2017). Back in 2015, the market for electric vehicles in Germany was just beginning; there were no subsidies or tax benefits for buyers of electric cars. The study

design aims to investigate the interplay of customers' aesthetic evaluations of product innovations and innate consumer innovativeness in the post-adoption context. The longitudinal structure resulting from gathering repeated measures from the same consumers over time enables us to control for time-invariant unobserved heterogeneity by using fixed effects (Wooldridge, 2010). The interaction terms between the time-invariant variable that measures innate consumer innovativeness and the repeatedly measured aesthetic product evaluations reveal the influence of the personality trait in the particular context. Basically, the person-specific means over time model $\bar{y}_i = \beta\bar{x}_i + \alpha_i + \bar{\epsilon}_i$ is subtracted from the error components model $y_{it} = \beta x_{it} + \alpha_i + \epsilon_{it}$ which yields the demeaned equation $y_{it} - \bar{y}_i = \beta(x_{it} - \bar{x}_i) + (\epsilon_{it} - \bar{\epsilon}_i)$ and partials out time constant person-specific effects. Let $G \in \{0,1\}$ be the group dummy, β the treatment effect of $G = 0$ and δ the difference in the treatment effect of $G = 1$. The person-specific means over time model involving the interaction between G and x_{it} is $y_{it} = \beta x_{it} + \delta(G_i \times x_{it}) + \alpha_i + \epsilon_{it}$ (Brüderl and Ludwig, 2019). After demeaning, the estimate δ of the interaction term identifies the moderation effect between the group dummy *innate consumer innovativeness* and the varying construct *aesthetic value of the innovation*. Note that, due to the demeaning procedure, regression models with interaction effects between unit-specific and time-varying variables, as they are common in panel research (e.g. Ludwig & Brüderl, 2018), do not possess estimators pertaining to the unit-specific variable. Hence, the direct effect of innate consumer innovativeness is not identified but controlled for.

3.2 | Data collection

In a short pre-survey ($N = 325$), we asked participants about their demographics and measured the innate consumer innovativeness psychological trait. The pre-survey did not contain items to be measured repeatedly and was intended to be a cross-sectional study on customers of this innovation in general which served several purposes within a greater research project this study has been part of. The research project focused on exploring the needs of early adopters of electric vehicles in Germany, hence all participants of this study were German. To reach out to potential participants, we tried to provide each customer of the focal product in Germany with information materials about our project at the point of sale. At the end of the questionnaire of the pre-study, we invited the participants to also take part in our main study, the longitudinal surveys. We contacted customers who gave us their consent two weeks later with the first wave of the panel. Next, we contacted the customers again three months later, after they had gained more usage experience. The time gaps were equivalent for all participants. Finally, we reached out to the same respondents six months later. These gaps were partly chosen on practical grounds in the context of the research program as well as driven by literature on use diffusion. The concept of use diffusion means that in the post-adoption phase, consumers learn to use the product. The emerging usage pattern can be quite different from what consumers initially expected (Shih & Venkatesh, 2004). However, compared to the topics of other panel studies, like for example

trajectories in education, product usage patterns emerge in a rather short period of time. Hence, repeatedly measuring product-related experiences on the scale of several month seemed to be more appropriate than on the scale of years. Consumers who responded to all three survey waves entered the final sample. We imputed missing values on any single items that were part of multi-item scales using the scale mean of the specific respondent. Comparing several imputation methods, Shrive, Stuart, Quan, and Ghali (2006) report that individual mean imputation yields reliable results that come close to far more advanced alternatives such as multiple imputation by chained equations, if the number of missing values is below 10%. The procedure applied to 0.67% of all measured values. For this longitudinal study, this procedure prevented 64 cases from being excluded from the analysis. The sample of early adopters ultimately consisted of 179 respondents.

3.3 | Data analysis

The study measures are listed in Table 1. The constructs were measured using 6- and 7-point, multi-item, Likert-type agreement scales, as well as a semantic differential scale. The items in each scale appeared in a completely randomized order to minimize the risk of measurement bias. To avoid biasing the measure of consumer innovativeness with consumers' implicit theories about the investigation, we included this measure in the pre-survey. The constructs in the longitudinal study were measured repeatedly across all three study waves. Table 2 shows Pearson correlations between measures, Heterotrait-Monotrait ratios as well as Cronbach's α values. All measures were reliable with Cronbach's α above 0.70 as well as discriminately valid with Heterotrait-Monotrait ratios below the conservative threshold of 0.85 (Henseler, Ringle, & Sarstedt, 2015).

TABLE 1 Measures

Measure	Scale items	Reference
Innate Consumer Innovativeness (ICI)	(1) In general, I am among the first to buy new products when they appear on the market. (2) I am usually among the first to try new products or brands. (3) I enjoy taking chances in buying new products. (4) When I discover a new product on the shelf, I am tempted to give it a try.	Steenkamp and Gielens (2003)
Aesthetic Value of the Innovation (AEVI)	(1) poor-looking/nice-looking, (2) displeasing/pleasing, (3) unattractive/attractive, (4) beautiful/ugly (r), (5) conventional/innovative, (6) usual/futuristic, (7) tame/arousing	adapted from Lam and Mukherjee (2005)
Attitude towards the High-Tech Product (AHTP)	(1) I like the product. (2) The product is impressive, (3) desirable, (4) advanced, (5) cutting-edge technology.	Tybout et al. (2005)
Experienced Hedonic Utility (EXH)	Using this product is... (1) fun, (2) exciting, (3) delightful, (4) thrilling, (5) enjoyable.	Uhrich, Schumann, and von Wangenheim (2013)
Experienced Functional Utility (EXF)	Using this product is (1) effective, (2) helpful, (3) practical.	Uhrich et al. (2013)
Satisfaction with the Product (PSAT)	How satisfied are you with the following aspects of the product? (1) appearance, (2) safety, (3) price, (4) quality, (5) power, (6) features, (7) driving fun, (8) charging frequency, (9) driving range, (10) road capability	Brown, Barry, Dacin, and Gunst (2005)
Positive Word of Mouth (PWOM)	(1) In the last three months, I "talked up" the product to people I know. (2) In the last three months, I often spoke favourably about the product.	Arnett, German, & Hunt (2003)

Notes: Cronbach's $\alpha \geq 0.70$ for all measures in all waves. ICI, AHTP, EXP, EXF, PSAT, PWOM measured on 6-point Likert scales ranging from totally disagree to totally agree; AEVI measured on 7-point semantic differential with value-related items 1–4 from Lam and Mukherjee (2005) and items pertaining to the innovative appearance 5–7; EXH and EXP measured on Likert scales instead of semantic differentials; PSAT from Brown et al. (2005) with additional product specific items 7–10; AHTP from Tybout et al. (2005) as reported in Bruner (2009).

Consumer innovativeness is uncorrelated with attitude towards the product, which is the dependent variable we use subsequently in the multiple linear regression models. This insignificant direct relationship with attitude towards the product leads us to understand innate consumer innovativeness as a pure moderator variable (Sharma, Durand, & Gur-Arie, 1981).

4 | RESULTS

4.1 | Descriptive results

Table 3 shows the summary statistics. The average participant is 52 years of age ($M = 51.93$, $SD = 9.49$), with 163 male and 16 female respondents in the sample. Furthermore, 59% of respondents have a graduate degree. These characteristics are in line with the properties of early adopters we know from diffusion of innovation theory (Rogers, 2010), and they also fit well with the results of other studies in Germany focusing on early adopters of electric vehicles (Wietschel, Dütschke, Funke, Peters, & Plötz, 2012). Our regression models feature individual fixed effects, such that our estimates stem from the within-subject variance in all three survey waves. The temporal distance between survey waves was three months, so the measures systematically vary on a small scale. Attitude toward the product varies between -0.93 and 0.28 within individuals ($Min = -0.93$, $Max = 0.80$, $SD = 0.28$). Positive word of mouth exhibits the greatest variation from the individual means ($Min = -2.33$, $Max = 2.67$, $SD = 0.38$). Consumer innovativeness, measured on a 6-point Likert scale, has a mean value of 3.53 ($M = 3.53$, $SD = 1.06$). Although this study features a sample of early adopters, who should exhibit a greater likelihood of being innovative (Midgley & Dowling, 1978), we still find substantial natural variance in consumers' innate innovativeness. In fixed effects regression models, effect heterogeneity can be modelled on a group level by allowing for an interaction between the treatment and the group. Hence, we group innate consumer innovativeness into high (> 3.50) and low values (≤ 3.50) at the median of the continuous measure.

TABLE 2 Correlation matrix, discriminant validity, and reliability

	1.	2.		3.		4.		5.		6.		
	<i>r</i>	<i>HTMT</i>	<i>r</i>	<i>HTMT</i>	<i>r</i>	<i>HTMT</i>	<i>r</i>	<i>HTMT</i>	<i>r</i>	<i>HTMT</i>	<i>r</i>	α
ICI												.79
AEVI	-.03	.13										.82
EXH	.02	.15	.38***	.47								.83
EXF	-.15***	.20	.24***	.35	.39***	.58						.74
AHTP	.01	.09	.47***	.61	.70***	.84	.44***	.59				.81
PSAT	-.05	.16	.45***	.56	.52***	.68	.43***	.58	.52***	.64		.75
PWOM	-.03	.06	.24***	.32	.41***	.54	.38***	.52	.48***	.60	.47***	-

Notes: $N \times T = 537$ ($T =$ three waves with $N = 179$ respondents); $r =$ Pearson correlation coefficients; HTMT = Heterotrait-Monotrait ratios; $\alpha =$ Cronbach's α ;

*** $p < .001$, ** $p < .01$, * $p < .05$.

TABLE 3 Summary statistics

Variables	Min	Max	Median	Mean	SD
ICI	1.25	6.00	3.50	3.53	1.06
AHTP	3.40	6.00	5.40	5.37	0.55
AEVI	3.14	7.00	5.86	5.73	0.77
EXH	3.00	6.00	5.60	5.32	0.66
EXF	3.33	6.00	5.00	5.17	0.65
PSAT	3.20	6.80	5.90	5.85	0.52
PWOM	3.00	6.00	6.00	5.51	0.68
AGE	24.00	80.00	51.00	51.93	9.49
GENDER	0.00	1.00		0.09	
INCOME	0.00	1.00		0.30	
EDUC	0.00	1.00		0.59	

Notes: $N \times T = 537$ ($T =$ three waves with $N = 179$ respondents), AGE = age; GENDER = gender dummy, where 1 indicates female and 0 male respondents; EDUC = education dummy, where 1 is a graduate degree and 0 is no graduate degree; INCOME = income dummy, where 1 is household net income above €7500 per month and 0 is below €7500 per month.

4.2 | Early versus late respondents

We conducted an analysis of early versus late respondents to check for a potential bias due to the attrition rate, which is a common problem in longitudinal studies (Winer, 1983). That is, respondents might drop out from one measurement wave to the next for non-random reasons, which would lead to self-selection biases in the longitudinal study. We obtained 247 valid online interviews in the first wave. The final sample consists of 179 customers who participated in all three survey waves, so the overall attrition rate is 27%, leaving 68 non-respondents. To test for potential self-selection bias, we compared the respondents to non-respondents statistically, based on the first survey. The results in Table 4 do not indicate that the samples differ in terms of their gender, education or income composition. We also compared the means using Welch's t-test and find significant mean differences only in age and attitude towards the product: Respondents were a little bit younger ($M_{Non-Respondents} = 54.64$, $M_{Respondents} =$

51.93) and had slightly more positive attitudes ($M_{Non-Respondents} = 5.17$, $M_{Respondents} = 5.37$) in the first survey wave. Critically though, we find no self-selection bias in relation to innate consumer innovativeness, and the samples are largely comparable, so our final sample does not appear to be affected by a serious self-selection bias.

4.3 | Hypotheses tests

To prepare for the subsequent hypotheses tests, all of which involve interaction effects, we first estimated basic models that showed the influence of product-related hedonic and functional usage experience, aesthetic value (M1), and its interaction with consumer innovativeness (M2) on attitudes towards the high-tech product. We checked the models in terms of Gauß-Markov assumptions which hold, except for a constant error variance. Hence, we use cluster robust covariance matrices throughout to account for heteroscedasticity (MacKinnon & White, 1985). Additionally, the Breusch Pagan Lagrange multiplier test for time-fixed effects turned out insignificant ($p > 0.10$), so there is no need to include controls for the sequence of panel waves. We show the regression results in Table 5. Model M1 shows that the independent variables all are significantly and positively related to attitude towards the product. The influence of experienced hedonic utility ($\beta = .20$, $p < .001$), functional utility ($\beta = .17$, $p < .001$), and aesthetic product evaluation ($\beta = .13$, $p < .01$) on attitudes towards the product is significant. In model M2, we investigate the potential positively moderating effect of innate innovativeness on the relationship between consumers' aesthetic evaluation of the innovation and attitude, as postulated in H2. The interaction term between innate consumer innovativeness and aesthetic evaluation emerges as positive and significant ($\beta = .20$, $p < .01$). We thus cannot reject H2.

Model M3 extends M1, and we estimated it to test H1b, namely, the prediction of an effect of consumers' aesthetic evaluation of the innovation that buffers the influence of product-related hedonic experience on consumers' attitudes towards the product. The interaction term in M3 between experienced hedonic utility and aesthetic

evaluation negatively influences the effect of experienced hedonic utility on attitudes towards the product ($\beta = -.09$, $p < .05$), in support of H1b. Model M4 includes three two-way interactions in preparation for M5. Model M5 features a negative three-way interaction term between consumer innovativeness, experienced hedonic utility and perceived aesthetic value of the innovation ($\beta = -.18$, $p < .05$). The buffering effect systematically varies with consumers' levels of innovativeness and is stronger for more innovative consumers. We fail to reject H3. To foster interpretability of this three-way interaction, we break the sample down into a sample of highly innovative customers and a sample of customers with below or equal median values in innate consumer innovativeness. We specify models M5.2 – M5.5, shown in Table 6, to interpret the hedonic buffering effect in both sub-samples. Model 5.5 shows that the interaction between aesthetic value and experienced hedonic utility is negative in the part of the sample consisting of consumers with above median scores in innate consumer innovativeness ($\beta = -.18$, $p < .01$). There is no evidence for the existence of a hedonic buffering effect for customers with low scores in innate innovativeness ($\beta = .00$, $p > .10$).

Next, we discuss the results of model M6, which provides the tests of H1a and implicitly also for H4, related to the relationship between attitudes towards the product and experienced functional utility. For H1a, regarding the buffering effect of consumers' aesthetic evaluations on the relationship between experienced functional utility and attitudes, we estimated M6. The interaction term between perceived aesthetic value and experienced functional utility was negative and only marginally significant ($\beta = -.08$, $p < .10$). We therefore reject H1a. Consequently, we also reject H4.

To illustrate the relevance of attitude towards the high-tech product, we estimated the influence on positive word of mouth and customer satisfaction. Again, both models include fixed effects for every respondent, such that we only specify the direct effect of attitudes on the respective outcome variable. Attitude towards the product significantly and positively influences the amount of word of mouth spread by customers ($\beta = .36$, $p < .001$, $R^2 = .07$), as well as consumer satisfaction ($\beta = .17$, $p < .001$, $R^2 = .03$). This low explanatory power might reflect the conceptual distance between attitude and satisfaction. That is, attitude reflects product liking, whereas satisfaction represents a rational evaluation of the product's strengths and weaknesses. When all other time-invariant variables are controlled, the relationship turns out to be weak.

TABLE 4 Analysis of early versus late responders

Variables	Non-responders		Responders		t-test	
	M	SD	M	SD	t-value	p-value
AGE	54.65	9.57	51.93	9.49	1.99	0.05
GENDER	0.11		0.09			
EDUC	0.65		0.59			
INCOME	0.31		0.30			
ICI	3.62	1.27	3.53	1.06	0.53	0.59
AHTP	5.17	0.67	5.37	0.55	-2.09	0.04
AEVI	5.75	0.78	5.73	0.77	0.18	0.85
EXH	5.27	0.75	5.32	0.66	-0.54	0.58
EXF	5.28	0.64	5.17	0.65	1.22	0.22
PWOM	5.57	0.74	5.51	0.68	0.65	0.51
PSAT	5.70	0.71	5.85	0.52	-1.66	0.09

Notes: $N = 247$ (responders $N = 179$, non-responders $N = 68$)

5 | DISCUSSION

Customers care about product aesthetics for more than just functional reasons – they do so, before and after purchase. Aesthetic preferences affect consumer behaviour and consequently companies' product strategies. Recent research investigates the consequences of consumers' aesthetic preferences to the overall marketing mix (Candi et al., 2017; Chen, 2019; Liu et al., 2017). However, innovation research has its difficulties keeping up with these latest theoretical developments in the greater marketing literature: Innovation theory

TABLE 5 Fixed effects panel regressions predicting attitude toward the high-tech product

	M1	M2	M3	M4	M5	M6
AESV	0.13** (0.04)	0.03 (0.06)	0.61** (0.23)	0.50* (0.22)	0.02 (0.31)	0.55* (0.22)
EXH	0.20*** (0.04)	0.20*** (0.04)	0.70** (0.22)	0.71** (0.22)	0.20 (0.31)	0.20*** (0.04)
EXF	0.17*** (0.04)	0.17*** (0.04)	0.17*** (0.04)	0.17*** (0.04)	0.17*** (0.03)	0.62* (0.24)
AEVI x EXH			-0.09* (0.04)	-0.09* (0.04)	0.00 (0.06)	
ICI x AEVI		0.20** (0.07)		0.20** (0.08)	1.14** (0.40)	
ICI x EXH				-0.03 (0.08)	0.95* (0.40)	
ICI x EXH x AEVI					-0.18* (0.07)	
AEVI x EXF						-0.08 (0.04)
R ²	0.17	0.19	0.18	0.20	0.21	0.18

Notes: $N \times T = 537$ ($T =$ three waves with $N = 179$ respondents); all models include individual fixed effects. Cluster robust standard errors in parentheses. *** $p < .001$, ** $p < .01$, * $p < .05$.

TABLE 6 Fixed effects panel regressions on median split samples predicting attitude toward the high-tech product

	Low ICI				High ICI			
	M5.2		M5.3		M5.4		M5.5	
	Coef.	SE	Coef.	SE	Coef.	SE	Coef.	SE
AEVI	0.03	(0.06)	0.01	(0.34)	0.24***	(0.06)	1.17***	(0.30)
EXH	0.20***	(0.06)	0.18	(0.36)	0.20***	(0.06)	1.16***	(0.31)
EXF	0.21***	(0.06)	0.21***	(0.06)	0.13**	(0.06)	0.13**	(0.05)
EXH x AEVI			0.00	(0.06)			-0.18**	(0.07)
N	285		285		252		252	
R ²	0.15		0.15		0.23		0.27	

Notes: Regressions on the two samples obtained from the median split on ICI. $N_{lowICI} = 285$ ($T = 3 \times N = 95$ respondents); $N_{highICI} = 252$ ($T = 3 \times N = 84$ respondents). The models include individual fixed effects. Cluster robust standard errors in parentheses. *** $p < .001$, ** $p < .01$, * $p < .05$.

traditionally: (i) has a strong focus on optimizing products in terms of usability and perceived ease of use, (ii) to facilitate adoption (Rogers, 2010; Venkatesh et al., 2012). First, the focus on perceived ease of use limits today's understanding about how emotional benefits derived from innovative aesthetics besides from inferences about functionality affect consumer behaviour. Second, the focus on adoption causes studies into consumers' post-adoption behaviour to be relatively underrepresented with respect to the relevance of this phase in the diffusion process. Our study attempts to address these apparent gaps by going beyond adoption and exploring the consequences of innovative aesthetics in the post-adoption phase.

This study deals with the effect of consumers' aesthetic evaluation of product innovations in post-adoption phases. Using longitudinal data from early adopters of an electric car in Germany, we have shown that the perceived aesthetic value causes a buffering effect in the post-adoption phase. The more positively consumers evaluate the innovations' visual aesthetics, the weaker the dependence of their attitude on actual product-related hedonic usage experiences. The innate personality trait of consumer innovativeness also systematically influences the impact of this perceived aesthetic value on attitudes. When consumers seek out and purchase novel products, the influence of an aesthetic product evaluation is stronger on their attitudes, throughout the post-adoption phase. Consequently, innate consumer

innovativeness moderates the buffering effect of aesthetic product evaluations on the relationship between experienced hedonic utility and attitude. Innate consumer innovativeness influences the buffering effect such that a hedonic buffering is stronger for consumers with higher scores in this personality trait. However, we could not confirm our prediction that innate consumer innovativeness would weaken the buffering effect for experienced functional utility.

5.1 | Theoretical implications

This study offers three key contributions to theory about the role of consumer innovativeness and product form for product innovation adoption decisions. First, we show that the aesthetic value of innovations remains strongly relevant to innovative consumers, beyond the moment of adoption. The more consumers purchase novel products, the greater is the influence of their aesthetic product evaluation on their attitudes towards the product. The aesthetic thus exerts a strong influence on purchase intentions (Truong et al., 2014) and has a more general effect on innovative customers' experience, including their post-purchase product appraisal. Innate consumer innovativeness is a prevalent trait among early adopters (McDonald & Alpert, 2007; Midgley & Dowling, 1978), and many prior studies regard innovative

consumers as opinion leaders (Girardi, Soutar, & Ward, 2005; Goldsmith, Flynn, & Goldsmith, 2003; Goldsmith, Kim, Flynn, & Kim, 2005). Later adopters rely on the early adopters' experiences when considering their own purchases. Our finding that consumers' aesthetic evaluation of innovations is a stronger driver of the attitudes of more innovative consumers therefore is highly relevant to the diffusion of innovation theory (Rogers, 2010).

Second, we extend research into the role of product design in the innovation adoption process (Chitturi et al., 2008; Creusen & Schoormans, 2005; Hoegg & Alba, 2011) by identifying a buffering effect in the post-adoption phase. In the post-adoption attitude formation process, consumers assign less weight to their own objective usage experience when they like the products' innovative aesthetics better. Before adoption, consumers' evaluations of the product form create a buffering effect that induces them to infer product functionality from the innovative product form, even if those consumers also have access to objective information about the product's true performance. In the post-adoption phase, product fun turns from a subjective expectation into objective information, such that consumers gather first-hand information about fun and product functionality. This first-hand experience represents objective information, overlaid by visual impressions in the attitude formation process. The buffering effect thus reduces the influence of the consumers' experience of product fun in the attitude formation process. Our results also hint that there might exist a buffering effect pertaining to experienced functional utility, similar to the results from Hoegg and Alba (2011). However, this effect only turned out marginally significant ($p < .10$, H1b) perhaps due to insufficient power and thus could not be confirmed.

Third, we extend existing research on both the buffering effect (Hoegg & Alba, 2011) and the interplay of consumer innovativeness and aesthetics (Truong et al., 2014). Combining these research streams, we determine that the buffering effect of product form only exists for hedonic experiences when consumers are more strongly characterized by their innate consumer innovativeness personality trait. Innate innovativeness relates closely to hedonic types of behaviour (Hirschman, 1980; Hirschman & Holbrook, 1982), and hedonic motives often guide the shopping behaviours of innovative consumers (Childers et al., 2001). Accordingly, we find that the post-adoption buffering effect reduces the influence of experienced product fun on attitudes when consumers are more innovative. We anticipated that innate consumer innovativeness would increase consumers' awareness of experienced functional utility, because innovative consumers reason more about functionalities. Therefore, we expected a weaker buffering effect of functional experience. Although the results of our correlation analysis indicate that innate innovativeness leads to poorer evaluations of experienced functional utility in the post-adoption phase, we could not find enough empirical support for the hypothesis that an effect buffering functional utility exists ($p < .10$, H1b). We posit that aesthetic evaluations might occur on the holistic product level (Noble & Kumar, 2010), rather than on the level of individual features. Therefore, the buffering effect of product form would operate on the global level too, and even influence innovative consumers' functional experience. To find a significant negative effect, we would

likely need to investigate buffering effects at the concrete level of functional experience, using specific, isolated features and the perceived value of single design elements.

5.2 | Managerial implications

This study also offers three important managerial implications. *First*, we show that consumers' aesthetic evaluation of innovations creates a long-term buffering effect, dissociating product attitude from actual product-related experiences. Therefore, managers need to recognize that innovative aesthetics are more than a means to convince consumers to adopt. Marketing practice in an innovation setting usually entails providing consumers with rational arguments about product advantages and usefulness. We show that innovations' aesthetic value continues to exert important influences in the post-adoption phase too. Innovation aesthetics are a manageable factor, relevant to both adoption and the post-purchase product experience. We therefore recommend that managers actively cocreate product forms with potential customers to generate innovative aesthetics that those consumers will appreciate or even fall in love with over time (Hoyer, Chandy, Dorotic, Krafft, & Singh, 2010), such as when a product's aesthetics set a new design trend.

Second, when selecting partners for cocreation efforts dedicated to developing innovative aesthetics, we recommend finding consumers who frequently purchase novel products, because their higher levels of innovativeness should increase their chances of being among the early adopters of any innovation (McDonald & Alpert, 2007). Members of cohorts early in the diffusion process have higher average values of innate consumer innovativeness than do later adopters. If they seek to match the aesthetic tastes of potential early adopters, managers should interview consumers with high innate innovativeness scores and invite them to cocreation workshops. To screen the population, they might use standardized psychometric scales that can measure consumer innovativeness (Steenkamp & Gielens, 2003).

Third, more innovative consumers are affected more strongly by the buffering effect, dissociating product-related hedonic experience from attitude in the post-adoption phase. Managers thus can strengthen the buffering effect on product fun for these customers. Considering the greater level of innate innovativeness among early adopters, the level of hedonic utility provided by product innovations thus may be less decisive than generally assumed.

5.3 | Limitations and further research

This study has some limitations that suggest avenues for further research. For example, we investigated only one innovative product and its aesthetic value, which offered the advantage of being able to study the within-subject variance in a longitudinal survey to reveal the existence of a buffering effect. However, it restricted our study to a single product design. Our general focus on aesthetic value suggests a question about whether certain aspects within the product form

concept might be optimized to strengthen the buffering effect. Further research should systematically compare products with different product forms in the pre- and post-adoption phases to strengthen theoretical understanding of the buffering effect. In the pre-adoption phase, researchers could investigate the relative impact of aesthetic facets, such as product newness or product complexity, on the buffering effect, compared with the influence of objective, product-related information. In the post-adoption phase, field experiments with novel products exhibiting different product forms could be conducted to investigate the influence of product newness and complexity on the buffering effect as it relates to customers' first-hand usage experience with products.

We also focused on the interplay of innate consumer innovativeness with perceived aesthetic value. Further research might look more specifically at the interplay of consumer innovativeness and buffering effects before adoption. As Truong et al. (2014) show, perceived product newness is an aesthetic quality that resonates with consumer innovativeness before product adoption. Researchers should investigate if consumer innovativeness also has a moderating effect on the buffering effect in a purchase context.

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