



# How People's Appreciation of Products Is Affected by Their Knowledge of the Designers' Intentions

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Products result from processes that are guided by designers' intentions for what the products should be, what they should be like and what they should do. People might infer these intentions more or less accurately from the products' form, or they might learn about them from a variety of sources such as advertisements and other marketing materials. Whether inferred or learned, knowledge of design intentions might influence the way in which people regard and appreciate products. Despite this possible influence, design research has not empirically addressed the questions of whether intention knowledge affects product appreciation and, if so, how. We investigated these questions by conducting two studies using a mixed-methods approach. Study 1 provided experimental evidence that intention knowledge has an effect on product appreciation. Study 2 explained this effect with interview data showing that intention knowledge affects product appreciation in three ways: it influences the perception of the product, enables an evaluation of the intention and also an evaluation of the product as a means to fulfill the intention. These findings are relevant to design research and practice in providing the grounds for a deeper understanding of the role that intention knowledge plays in product appreciation.

**Keywords** – Design Intention, Design Knowledge, Intention Knowledge, Product Appreciation, Product Experience, User Experience.

**Relevance to Design Practice** – This paper indicates that product appreciation is influenced by knowledge of the intentions that guide design processes. Designers and other product developers should consider what intentions are to be communicated and what media might be best used for this communication, whether this is through products themselves or other channels.

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## Introduction

Products result from processes that are guided by designers' intentions for what the products should be, what they should be like and what they should do. Design research has paid special attention to human-centered intentions, which have been the subject of various studies (Crilly, Moultrie, & Clarkson, 2009; Fokkinga, Hekkert, Desmet, & Özcan, 2014; Tromp, Hekkert, & Verbeek, 2011). This research indicates that a product can be designed not only with the intention of making practical life easier, e.g., facilitating a routine task, but also with the further intention of eliciting a certain experience, attitude or behavior from people. For instance, a spoon is designed to bring food to the mouth, but also to enrich the sensory experience of dining by triggering perceptions of color, texture and volume (Figure 1). A watch is designed to give the time of day, but also to stimulate a seize-the-day attitude by reminding people of their own mortality (Figure 2). A basin is designed to enable hand washing, but also to promote responsible water consumption behavior by making visible an immediate consequence of such consumption (Figure 3). People can infer such intentions directly from the products (Crilly, 2011a, 2011b), learn about them from statements made by the designers, or from press releases, marketing campaigns, instruction manuals, critical reviews, word of mouth and other sources of information. By people, we mean anyone who engages in product experience, whether this is an active user or simply a perceiver, recognizing that designers and others who professionally engage with designed products also

take on the roles of user or perceiver. Irrespective of its source and accuracy, people's intention knowledge might affect their appreciation of a product. Yet, design research has not empirically addressed the questions of whether intention knowledge affects product appreciation and, if so, how. This paper aims to fill this gap by examining the ways in which people appreciate products when they take into account the reasons underlying their design.

Regarding a product as resulting from intentions involves acknowledging that the product is not just an object, but an artifact (Dipert, 1993; Hilpinen, 1992). People are thought to adopt a design stance and take an essentialist perspective when encountering an artifact. Dennett (1989) introduced the notion of a design stance to describe how people predict the behavior of an object on the assumption that the object will behave as it is supposed to behave. One interpretation of this is that people consider that an artifact performs a function because it has been designed for a purpose by a designing agent (Vermaas, Carrara, Borgo, & Garbacz, 2013). People intuitively see the intention

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of this agent as defining the artifact's essence, the deeper causal property that justifies the objective features of the artifact (Bloom, 1996; see also Bloom, 2000). Furthermore, when regarding an artifact, people attain pleasure from thinking about its essence and not just from perceiving those features (Bloom, 2011). Several studies provide evidence of people's essentialist understanding of artifacts (for a review, see Kelemen & Carey, 2007). There is evidence that this understanding emerges in the early stages of a child's development (Preissler & Bloom, 2008) and that it operates across cultures (Barrett, Laurence, & Margolis, 2008). Based on these studies, we assume that a designer's intention can intuitively be regarded as the essence of a product and that knowledge of this intention can therefore affect how that product is appreciated.

Design research has not empirically examined the influence of intention knowledge on product appreciation, but studies in art and literature indicate that knowledge about an artifact affects the perception of the artifact in a number of ways. Some evidence has already been provided that knowing the intention of an artifact's creator affects the assessment of the artifact's quality; for example, whether the artifact is judged to be art (Jucker, Barrett, & Wlodarski, 2014) or good art (Hawley-Dolan & Young, 2013). However, previous studies have not focused on the relationship between artifact *appreciation* (as contrasted to any kind of artifact perception) and *intention* knowledge (as contrasted to any kind of knowledge). On the one hand, they have shown that the general perception of an artifact can be affected by intention knowledge. For instance, there is evidence that people find a literary metaphor more meaningful when the metaphor is credited to an intentional poet, rather than to a computer program acting randomly (Gibbs, Kushner, & Mills, 1991) and that the understanding of a satirical text is enhanced by inferential knowledge about the author's intentions (Pfaff & Gibbs, 1997). On the other hand, these studies have shown that artifact appreciation can be affected by general knowledge provided to participants in various forms of information. For instance, there is evidence that people appreciate a painting more when they are also provided with the artist's verbal statement (Specht, 2010) and that the appreciation of abstract artworks in particular, which are more difficult to interpret than figurative artworks, increases when the artworks are presented with titles (Leder, Carbon, & Ripsas, 2006). A subset of these studies has shown that providing people with titles or with contextual or stylistic information about an artwork affects their appreciation of the work aesthetically (e.g., Cupchik,



Figure 1. Tableware as Sensorial Stimuli (2012) by Jinhyun Jeon. Reprinted with permission.



Figure 2. The Accurate (2007) by Crispin Jones. Reprinted with permission.



Figure 3. Poor Little Fish (2009) by Yan Lu. Reprinted with permission.

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Shereck, & Spiegel, 1994; Millis, 2001; Temme, 1992). Building on this previous research, we examine the prediction that people's appreciation of an artifact is influenced by their knowledge of the intentions underlying the artifact's creation.

In conceptualizing how intention knowledge influences appreciation, we consider both the previously mentioned empirical studies and also a developmental theory of art understanding (Parsons, 1987). Based on this theory, a distinction can be made between appreciating a product because of *what* intention it fulfills and appreciating a product because of *how* it fulfills that intention. While the former involves judging the intention as defining the essence of the product, thus extending this judgment of the intention to a judgment of the product itself, the latter involves judging the product as a means to fulfill the intention independently of any judgment of the intention. Hence, intention knowledge might affect product appreciation by enabling either an evaluation of the intention or an evaluation of the product as a means to achieve the intention, i.e., an evaluation of the product-intention relationship. The design literature acknowledges that a product can be appreciated in the latter sense as it identifies maximum-effect-for-minimum-means as a core principle of aesthetic appreciation (Hekkert, 2006; Hekkert & Leder, 2008). According to this principle, a product is aesthetically pleasing when it is perceived to be the minimum means to achieve a maximum effect. Even without consideration of this minimum–maximum ratio, the means–effect relationship is considered to be an important criterion for aesthetic appreciation (Boselie & Leeuwenberg, 1985). Thus, by enabling an evaluation of the product as a means, intention knowledge (knowledge of the intended effect) might influence product appreciation in an aesthetically relevant way.

To test the prediction that intention knowledge affects product appreciation and to further investigate this phenomenon, we conducted two studies that addressed the research questions: *Does intention knowledge influence the appreciation of products?* and, if so, *How?* As a whole, these studies were conceived according to a mixed-methods approach in the form of a sequential explanatory design (see Creswell, 2009). First, a quantitative study (Study 1) was conducted to find experimental evidence of the influence of intention knowledge. Second, a qualitative study (Study 2) was conducted to explain the results of Study 1 with interview data. This mixed-methods approach thus combines the benefits of experimental exactness and descriptive richness, both of which are necessary to measure and understand the phenomenon we are interested in.

We had to make a number of decisions with regards to the many variables that define products, intentions and people. In making these decisions, we focused on consumer products and on the designers' intentions for how those products should elicit certain experiences, attitudes or behaviors. Since different people might infer different design intentions from a product, the effect of inferred intentions is difficult to assess experimentally. As such, we provided our participants with explicit information about the designers' intentions, thus eliminating the need for inference, even if not preventing it. The intention information was provided in the form of textual statements and the products were represented with images. This is in line with studies in art appreciation that

have used texts and images to represent artworks and the stories behind them (e.g., Bordens, 2010; Leder et al., 2006; Specht, 2010). We required our participants to have a minimum level of design literacy because reflecting on designers' intentions and being articulate about them is a more difficult task for those unused to thinking and talking about the processes from which designed products result. To that end, we selected design students as participants.

## Study 1

### Method

#### *Participants*

A total of 60 students in Industrial Design Engineering from Delft University of Technology took part in this study in return for 10 Euros each. There were 20 males and 40 females, with an average age of 20.00 years ( $SD = 1.70$ ).

#### *Design*

To examine if intention knowledge influences product appreciation, we used a pre-test/post-test control-group experimental design, combining a 2 by 2 between-subjects design and a within-subjects design. The procedure involved random assignment of each participant to one of two conditions: knowledge and no-knowledge. In both conditions, the participants pre-rated and post-rated products on an appreciation scale. Participants in the knowledge condition first rated the products without being provided with statements about the designers' intentions and then gave a second rating after being informed about those intentions. Participants in the no-knowledge condition rated the products twice without being provided with any statements about the designers' intentions.

#### *Materials*

Fifteen pairs of product images and intention statements were used as stimulus materials in the study. These materials were selected from projects developed between 2002 and 2011 by students in Industrial Design Engineering from Delft University of Technology. The selection was made with consideration to three factors. Firstly, the projects had been developed with the Vision in Product design method (Hekkert & Van Dijk, 2011), for which students have to explicitly define and record their intentions in writing and then translate them into a product solution. Secondly, the projects represented a wide range of design domains and product kinds (physical and virtual, static and dynamic). Thirdly, the projects were expected to be unknown to the participants, thereby avoiding the influence of prior knowledge.

The research team made the intention statements consistent in length and informational content. Each of the resulting texts comprised between 35 and 45 words divided into two sentences. One sentence presented the designer's intention and the other emphasized the properties that described the product as a means to fulfill that intention. The product images comprised computer renderings and photographs of physical prototypes. The images and statements were printed on A4 paper in portrait orientation,

with the images measuring 10 by 15 centimeters and the statements presented in 12-point font. Thumbnails of these images and the accompanying statements are presented in the Appendix. For the remainder of this paper, we refer to these materials as the product(s) and the intention(s), and identify them with letters from A to O as in the Appendix.

**Procedure**

To ensure close supervision of the participants, the study was conducted in groups of four to eight participants, requiring 12 groups in total. The study was conducted in the research labs of the Faculty of Industrial Design Engineering at Delft University of Technology. When entering the labs, the participants were taken through a standard procedure to establish their informed consent and were randomly assigned to one of the two conditions, while balancing age and gender between the conditions. A scale was provided to participants to rate each of the products from 1 (*not at all*) to 7 (*very much*) on the following five items: liking, beauty, attractiveness, pleasingness and niceness. These five items were taken from an existing scale of aesthetic appreciation (developed by Blijlevens, Thurgood, Hekkert, Leder, & Whitfield, 2014), which was adapted to measure general product appreciation for the purpose of this study. Five distractor items were also used to prevent ratings being affected by the participants' awareness of the focus of the study. All participants first rated the products only, which took between 20 and 25 minutes. When all the participants had completed the ratings, they were instructed to perform a distraction task for 5 minutes with the purpose of preventing memorization or recall of the stimuli and the ratings. Following this, the participants in the knowledge condition rated all products again, but this time products were presented together with the intention statements. This rating task also took 20 to 25 minutes. Participants in the no-knowledge condition rated the products again without the statements, which took between 15 and 20 minutes. The order in which the products and scale items were presented was randomized between the participants to prevent order effects. In both conditions, the whole procedure took no more than 60 minutes.

**Results**

The ratings of the scale items were averaged for each participant to obtain composite ratings of product appreciation. This data was analyzed according to the methodological requirements specific to a pre-test/post-test control-group experimental design (see Kumar, 2005). This involved subtracting pre-ratings from post-ratings for each of the conditions and conducting the core statistical analyses with the resulting difference ratings.

To examine if intention knowledge had an effect on product appreciation, absolute values of the difference ratings were submitted to an independent-samples *t*-test. The test revealed a significant difference in the ratings between the knowledge ( $M=0.80, SD=0.81$ ) and the no-knowledge ( $M=0.48, SD=0.54$ ) conditions;  $t(777.85) = -7.06, p < .001$ . This indicates that intention knowledge did have an effect on product appreciation. The effect size for this analysis ( $d = .47$ ) was found to exceed Cohen's (1998) convention for a small effect ( $d = .20$ ).

To learn if the effect was positive or negative, relative values of the difference ratings were submitted to another independent-samples *t*-test. This test revealed that the appreciation ratings in the knowledge condition ( $M = 0.21, SD = 1.12$ ) were significantly higher than the ratings in the no-knowledge condition ( $M = -0.11, SD = 0.71$ );  $t(758.57) = -5.17, p < .001$ . Thus, intention knowledge had an overall positive effect on product appreciation. The effect size for this analysis ( $d = .34$ ) was also found to exceed Cohen's (1998) convention for a small effect ( $d = .20$ ).

With the aim of examining the distribution of the effect across the 15 products, we averaged the difference ratings obtained per product in each condition and subsequently subtracted the average difference ratings in the no-knowledge condition from those in the knowledge condition. In this way, we obtained a measure of the effect that intention knowledge had on the appreciation of each of the products. Figure 4 illustrates how the effect varied across products, from larger to smaller. It also shows that the effect was negative for only two products (A and E).

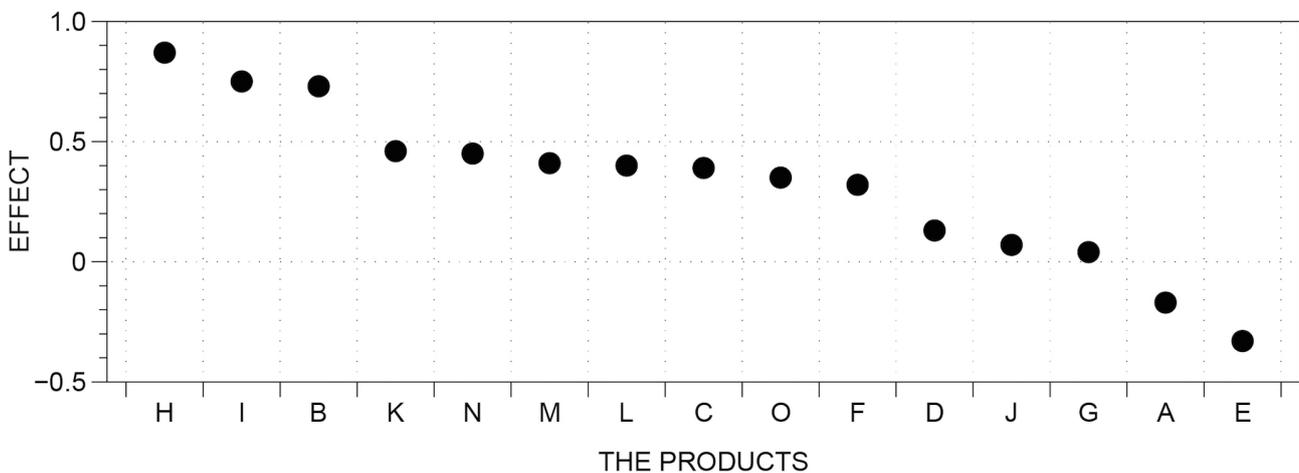


Figure 4. Effect of intention knowledge on product appreciation.

In addition, a simple regression analysis was performed with ratings in the knowledge condition to examine if pre-ratings predicted difference ratings, i.e., if the extent to which products were appreciated when just looking at their images predicted the extent to which their appreciation was affected by intention knowledge. A preliminary paired-samples *t*-test conducted for the no-knowledge condition revealed a significant difference between pre-ratings and post-ratings. We therefore corrected the difference ratings of the knowledge condition with the use of average difference ratings obtained per product in the no-knowledge condition (ratings from the no-knowledge condition were only used as a corrective to the ratings from the knowledge condition; they were not used directly in the regression analysis). The analysis revealed that the pre-ratings were a significant predictor of the (corrected) difference ratings ( $\beta = -0.50, p < .001$ );  $R^2 = .25$ ,  $F(1, 448) = 147.29, p < .001$ . The lower the pre-ratings were, the more product appreciation increased.

## Discussion

In support of our prediction, Study 1 provided experimental evidence that intention knowledge has an effect on product appreciation. It further revealed that this effect was positive, in line with studies in which knowledge about a literary or artistic work enhanced the perception of the work in terms of comprehension (e.g., Leder et al., 2006; Pfaff & Gibbs, 1997) and meaningfulness (e.g., Gibbs et al., 1991; Russell, 2003), particularly when the work was relatively difficult to interpret. The increase in product appreciation might be understood along these lines; its distribution across the products might be explained not only in relation to how much the products were appreciated by just looking at their images, as the regression analysis showed, but also in relation to how difficult they were to interpret by just looking at their images. Take, for instance, products B and G, which were respectively the subjects of relatively large and small increases in appreciation (see Figure 4). If the image of product B was more difficult to interpret than that of product G, the appreciation of product B could increase more than that of product G as a result of intention knowledge.

The increase in product appreciation might also be explained by a general positive evaluation of the intentions as such, or by a general positive evaluation of the products as means to fulfill the intentions. Since the former evaluation is easier to make than the latter, as it requires evaluating *what* intention a product fulfills and not *how* the product fulfills that intention, the increase in product appreciation could most likely be explained by it. This would imply that the participants appreciated the intentions and extended this appreciation to the products, without examining if or how the products could fulfill those intentions. Specht (2010) provides evidence of a similar process. He found that the same artist's statement increased the interestingness and liking of the artwork with which it was paired, regardless of which artwork this was. We mentioned that the intentions used as stimuli included the aim of eliciting certain experiences, attitudes and behaviors from people. The increase in product appreciation might therefore be explained by an overall positive judgment of these intended experiences, attitudes and behaviors. The effect

distribution across the products could also be interpreted in these terms. Experiences, attitudes and behaviors associated with social integration (intention B) might have been judged more positively than those associated with the predictability of everyday life (intention G). This would explain why the appreciation of product B increased more than the appreciation of product G. To explore these possible ways in which intention knowledge influences product appreciation, we conducted an interview study using a subset of the stimuli from Study 1.

## Study 2

### Method

#### Participants

A total of 33 students in Industrial Design Engineering from Delft University of Technology took part in this study voluntarily. There were 22 males and 11 females, with an average age of 23.80 years ( $SD = 1.73$ ). None of the participants for Study 2 had been involved in Study 1.

#### Design

Each participant was interviewed individually using an approach that included both closed and open questions. Closed questions were used to collect data that would permit quantitative analysis and could therefore be compared with data collected in Study 1. Open questions were used to explore the ways in which intention knowledge affects product appreciation. We adopted a semi-structured approach (see Breakwell, 2006), which provided the opportunity to explore unanticipated themes by asking questions that were driven by participants' responses to the stimuli (see Törrönen, 2002). When a participant brought up an unexpected and potentially relevant theme, the interviewer would explore this theme by asking unscripted, follow-up questions. As such, although the overall structure of the interviews was consistent across all the participants, there was also the flexibility to pursue and clarify responses that were unique to individual participants.

#### Materials

This study reused the stimulus materials identified B, C and G in the Appendix. This selection was made on the basis of three criteria. Firstly, Study 2 aimed at explaining the general finding of Study 1, i.e., a positive effect of intention knowledge on product appreciation, which was recorded for all cases except for A and E (see Figure 4). Secondly, products B, C and G varied in the degree to which their appreciation ratings increased after intention knowledge was provided: for B, the increase was relatively large; for C, medium; and for G, small (see Figure 4). Thirdly, in comparison to other products for which appreciation increased to a similar extent, they were better represented by the images used as stimuli, partly because they were physical and static rather than virtual or dynamic, and partly because they had been built and photographed as prototypes rather than only rendered in software.

**Procedure**

The 33 interviews were conducted in a well-lit, private meeting room in the Faculty of Industrial Design Engineering at Delft University of Technology. After being taken through a standard procedure to establish their informed consent, the participants were shown one of the products and asked (Q1) *Do you like or dislike this product?* After answering, they were provided with the corresponding intention. Once they had read it, they were asked (Q2) *Does this [intention] change how much you like this product: yes or no?* If they answered *yes*, they were asked (Q3) *Does it [the intention] make you like the product less or more?* After answering, they were asked (Q4) *Why?* Finally, they were confronted with the question (Q5) *What do you think of this product as a means to achieve this [intention]?* This last question was included to prompt the evaluation of the product as a means, a theme that we did not expect to emerge automatically from Q4. Unscripted questions were asked when unanticipated themes emerged. This procedure was repeated for each of the three products, the presentation order being counterbalanced across participants to avoid order effects. The average duration of the interviews was 27 minutes. The interviews were audio-recorded and transcribed verbatim.

**Results**

In total, 248 answers to the closed questions were recorded: 99 (3 products times 33 participants) for Q1, 99 (3 products times 33 participants) for Q2, and 50 (cases in which Q2 was answered affirmatively) for Q3. These answers were coded in a binary manner: *like* and *dislike* for Q1, *yes* and *no* for Q2, and *more* and *less* for Q3. The results, as presented in Table 1, were consistent with those of Study 1. Product appreciation was high to begin with and increased with intention knowledge. Furthermore, appreciation was initially very similar between the products, but increased the most for B and the least for G.

The transcripts of the open questions Q4 and Q5 were reviewed iteratively and submitted to thematic analysis (see Braun & Clarke, 2006). This analysis was conducted following a general inductive approach (see Thomas, 2006), with less interest in the prevalence of responses and more interest in the relevance of those responses to the research question *How does intention knowledge influence product appreciation?* The following themes were identified: perception of the product, evaluation of the intention and evaluation of the product as a means to fulfill the intention. The first and second themes were derived from answers to Q4, while the third was mainly derived from answers to Q5.

These three themes were used to structure the literature review presented earlier, but they are not explicitly identifiable in the literature itself.

In the following analysis, we describe the themes with reference to the participants' statements. During the interviews, the participants made gestures towards the stimuli and used pronouns such as *it*, *this* and *that* to refer to them. These partial utterances left an incomplete audio record and transcript. To address this, we substitute the relevant gestures and pronouns in the statements quoted according to the meaning intended by the participants. These and other editorial substitutions or additions appear within square brackets. At the end of each quotation, the statements are identified with a combination of a number and a letter provided within parentheses. Numbers from 1 to 33 identify the participants who are speaking. Letters B, C and G are used to identify the stimulus materials to which they are referring in each of their statements. For instance, (17B) identifies an utterance by participant 17 about materials B. Whether the participant is referring to the product or the intention is evident in the quotation itself.

**Perception of the product**

The participants often explained increased product appreciation in terms of the products becoming more interesting, comprehensible and meaningful. This indicates that intention knowledge influences product appreciation because it affects the perception of a product in various ways.

Increased interestingness, which participants reported for product B only, was described in statements such as: *“that’s really interesting, I didn’t see that at first [...] I think I like [the product] more because it has an element of surprise that I wasn’t expecting [...] [the intention] is opening my mind to something new”* (17B); *“[the product] is more interesting now [...] this [intention] makes me look at it in a different way, so I want to look at it more”* (19B). Intention knowledge triggered the participants' interest because it revealed something unforeseen about the product.

Increased comprehension, which participants reported more frequently for product B and less frequently for products C and G, was expressed in utterances like: *“you appreciate [the product] more because you know what it’s for”* (24B); *“[the product] makes more sense to me”* (5C); *“first I thought [the product] was just a nice shelf and now, you understand it better”* (13G). Intention knowledge improved the participants' comprehension of the products insofar as it revealed their purpose. This is in line with

**Table 1. Results obtained from the closed questions.**

Question	Prevalent answer	Counts per product (prevalent answer/total)			Total counts
		B	C	G	
(Q1) Do you like or dislike this product?	like	30/33	30/33	29/33	89/99
(Q2) Does this [intention] change how much you like this product: yes or no?	yes	21/33	16/33	13/33	50/99
(Q3) Does it [the intention] make you like the product less or more?	more	18/21	13/16	6/13	37/50

the theory that people's understanding of artifacts is based on an understanding of the intention motivating the artifact's creation, since this intention explains the artifact's objective features.

Increased meaningfulness, which participants reported for all three products, was described in statements such as: "[the product] really has a deeper meaning behind [it]" (18B); "[the intention] gives [the product] a more positive meaning" (6C); "[the product] seems to have a hidden significance now" (23G). It seems that intention knowledge generally enhanced the meanings that the participants had attributed to the products when just looking at their images. At times, however, when product appreciation decreased, the participants explained this decrease in terms of a change in the meaning of the products. For instance, one participant explained:

[The intention] kind of takes away the liberty of this chaotic shape, which is beautiful in itself [...] It's like a piece of art; if you let it speak for itself, whoever can see it can attribute [their] own meaning, but then if you get another meaning that you weren't expecting or that you didn't want, it kinds of ruins... It takes something away from it. (17G)

This statement suggests that intention knowledge can decrease product appreciation when it reveals something about the product that contradicts people's initial perception of it, including their expectation of what the product should be and what it should do.

### Evaluation of the intention

The participants frequently explained increased product appreciation in terms of a positive evaluation of the intentions. They generally judged intention B and especially C to be good, as revealed in their utterances: "[the intention] is a good cause" (15B); "the product supports a good cause [intention]" (24C); "I really like the good intentions behind [the product]" (14C). In these statements, the term good has a moral connotation; it indicates that the experiences, attitudes and behaviors suggested by the intentions were judged to be morally virtuous. By extension, the intentions were judged to be morally virtuous too. Some other statements further revealed that this judgment of the intentions evoked happiness:

The word you'd put with such a function [the intention] would be *beautiful* or *good* because it elicits some feeling... It's connected with something you want to cherish or how you want to help people and those are all things that make you feel happy. I'd say helping people is a very beautiful thing, so in such a way it would be a very beautiful product. (10C)

By contrast, when explaining decreased product appreciation, the participants referred to intention G in the following way: "I kind of dislike the purpose [intention] because I don't like to be that predictable" (14G); "I don't understand why you want to have this aim [intention]" (2G); "I'm not sure if that [intention] is a good thing" (18G). In these cases, the experiences, attitudes and behaviors suggested by the intention were questioned and judged negatively. Consequently, the intention was also evaluated negatively.

The participants projected their evaluation of the intention onto the product as if they perceived the intention to be the defining essence of the product. If the intention was judged positively, the product was also judged positively, as in the following statements: "I'd say [the product is] also beautiful because the thought [the intention] behind it is beautiful, what you want to achieve with it" (2B); "I like [the product] more because I really like the idea [the intention]" (11C). If the intention was judged negatively, the product was also judged negatively, as in the statement: "if [the product] has an aim [intention] like this, I don't like it [...] I don't like the aim" (32G). This simple correspondence between the evaluation of the intention and the evaluation of the product characterizes this second theme and distinguishes it from the third, which is more complex and therefore requires lengthier explanation.

### Evaluation of the product as a means to fulfil the intention

When explaining increased product appreciation, the participants evaluated the products on how well they realized the intentions from which they had resulted. The participants often used the term *good* to characterize all three products in this sense. For instance, they stated: "I think [the product] achieves [the intention] very good" (11B); "I think [the product] is a good means" (3C); "[the product] is a good design to achieve this goal" (8G). In these cases, *good* did not necessarily imply that the product or the intention were judged to be virtuous, but rather that the product had the capacity to fulfill the intention, i.e., to work. This capacity was frequently mentioned by the participants in utterances like "this [product] works" (7C) and "I think [the product] works really well" (3G).

The participants further explained their increased product appreciation by saying that the products would work efficiently. This is evident in statements such as: "I think efficiency can be beautiful [...] an efficient use of material is aesthetically pleasing [because] you're sure that [the product] is optimized" (15C); "efficiency can be beautiful [...] it gives you a certain feeling of satisfaction" (33C). These comments on efficiency suggest that one of the key principles governing the evaluation of the product as a means is, as anticipated, maximum-effect-for-minimum-means. Other comments, such as "[the product is] innovative" (32B) and "[the product is] a new, fresh, funny way of dealing with a known problem" (24C) revealed that the participants' increased product appreciation was also based on a judgment of the products as novel or unusual means to realize the intentions behind them.

The participants revealed that the evaluation of the product as a means was independent of the evaluation of the intention as such. Some of them judged the product positively even when they judged the intention negatively, as the following statements show: "I like the product, but not especially the goal, [still] I think [the product] is a good way of doing it [fulfilling the intention]" (4G); "the aim itself is not one that I specifically like, but more the idea that [the product] is designed for this goal, it's more that I like the link between the design [the product] and the idea [the intention]" (31G). In cases where product appreciation decreased,

the participants made clear that this decrease did not necessarily involve a negative evaluation of the intention. For instance, some uttered: *"I dislike [the product] a bit more now [...] I don't see this aim being achieved [...] I think it's a good idea [intention], but this [product] won't really work"* (28C); *"if this is the goal, I would dislike [the product] a bit more because I don't see this purpose translated [...] the aim [the intention] is good, the aim is purposeful, but the product doesn't fulfill the aim"* (15C). In each case, the participants accepted the intentions as goals and then assessed the products as the means to achieve those goals.

The participants revealed that the evaluation of the product as a means was relative, but not just because it involved an assessment of the product in relation to the intention to be fulfilled. On the one hand, they further assessed the product in relation to alternative known or imagined products (or means) by which the same (or a similar) intention could presumably be fulfilled. For example, they said: *"I think there are multiple ways to do that [fulfill the intention], this [product] is one of them"* (20C); *"there must be a better way [to fulfill the intention]"* (2G); *"this is a nice topic [intention], but I would implement it in a different way"* (17G). On the other hand, they further assessed the product in relation to alternative known or imagined intentions that could presumably be fulfilled by the same (or a similar) product (or means). For instance, although product C is not an ordinary trash bag, one of the participants categorized it as such and thought of an intention relevant to products of that category, i.e., recycling, which could be contrasted with the original designer's intention, i.e., altruism. This participant said:

I would imagine that this [product] would cost more [than an ordinary trash bag]. I would imagine that this would be more eco-unfriendly and I think that the big aim or the big thing you aim for with trash bags [the most relevant intention is] that you recycle as good as possible [...] For the goal as a trash bag, [the product] doesn't correspond. (15C)

The previous statements indicate that the evaluation of the product as a means is grounded in a set of perceived alternatives for both the product and the intention.

## Discussion

Through interview data, Study 2 revealed that intention knowledge affects product appreciation in at least three ways. It influences the perception of the product, enables an evaluation of the intention and enables an evaluation of the product as a means to fulfill the intention. Study 2 also explained the reason why the effect of intention knowledge on product appreciation was found to be positive in Study 1. In general, intention knowledge enhanced the participants' perception of the products as it made them perceive the products to be more interesting, comprehensible and meaningful. It also led them to make positive judgments of both the intentions as such and the products as means to realize these intentions. Since products B, C and G were all judged to be good means, the differences in the extent to which appreciation increased across them can be explained by how much their

perception was enhanced and how valuable the corresponding intentions were found to be. The perception of product B was enhanced the most, probably because the image of this product was the hardest to interpret with no intention knowledge. Intention G was the only one judged negatively as the participants did not embrace or support the experiences, attitudes and behaviors associated with it. Although the stimulus materials for this study were chosen attending to the overall positive effect identified in Study 1, the appreciation of products B, C and G did not always increase. In this sense, Study 2 further clarified why intention knowledge does not necessarily affect product appreciation positively (see products A and E in Figure 4). Gaining knowledge of design intentions might diminish the perception of a product. It might even make the product less comprehensible. Alternatively, the intention itself might be evaluated negatively or knowledge of that intention might permit a negative evaluation of the product as a means to achieve it.

We have examined how intention knowledge affects product appreciation considered as a whole, but the results of Study 2 suggest that this knowledge can lead to distinct kinds of appreciation or judgments of liking. Firstly, an enhanced perception of the product, which entails a better understanding of what the product is meant to be and do, seems to lead to a cognitive appreciation of it. This kind of appreciation emerges from being able to make more sense of the product, perhaps by categorizing it by taking into account the designer's intended purpose. In a similar way, Russell (2003) has acknowledged that part of the pleasure attained from looking at a painting emerges from interpreting it successfully by picking up the artist's message. Secondly, an evaluation of the intention as being morally virtuous seems to lead to an appreciation of the value that the product embodies, i.e., to a moral appreciation of the product. Jordan (2000) has argued that people can attain pleasure from perceiving products in this way, as embodiments of their values; for example, from perceiving a product made from bio-degradable materials as an expression of environmentalism. Thirdly, a positive evaluation of the product as a means seems to lead to an appreciation of the product that can be considered aesthetic as this kind of appreciation is linked to a perception of qualities that are known to cause aesthetic pleasure, i.e., aptitude or the capacity to perform a task (Parsons & Carlson, 2008; Tatarkiewicz, 1980), efficiency or maximum-effect-for-minimum-means (Hekkert, 2006; Hekkert & Leder, 2008) and novelty (Berlyne, 1971; Hekkert, Snelders, & van Wieringen, 2003). Even though the appropriateness of the labels *cognitive*, *moral* and *aesthetic* could be disputed, these labels serve to emphasize the very different ways in which intention knowledge affects product appreciation.

## General Discussion

Research in the design field had not empirically addressed the questions of whether intention knowledge affects product appreciation and, if so, how. We addressed these questions by conducting two studies using a mixed-methods approach. Study 1 provided experimental evidence that intention knowledge has

an effect on product appreciation. Study 2 explained this effect with interview data showing that intention knowledge affects product appreciation in three ways. It influences the perception of the product, enables an evaluation of the intention and also an evaluation of the product as a means to fulfill the intention. These findings provide an understanding of the role that intention knowledge plays in product appreciation and this understanding can in turn open new perspectives on design practice.

Our findings suggest that designers, marketers and others involved in product development should consider what design intentions are to be communicated and what media might best be used for this communication, whether that is the products themselves, advertisements or other channels. Organizations should not take for granted that people engaging with their products perceive their intentions, but should instead evaluate whether those people can infer those intentions directly from the products' properties or interpret them successfully when explicit sources of information are available. Furthermore, they should assess whether knowledge of their intentions supports or jeopardizes the comprehension of their products, whether their intentions are in line with people's personal or social values and whether their products can be aesthetically appreciated as means to realize these intentions, e.g., for their efficiency. This last issue questions the traditional assumption that aesthetics only concerns the visual properties of products, rather than the way these properties, and even those that are not visual, relate to perceived intentions.

The findings from our studies should be interpreted with respect to the decisions we made concerning the operationalization of variables, the use of stimulus materials and the selection of participants. Since intention knowledge gained through inference would be difficult to control experimentally, we focused on intention knowledge that resulted from explicit statements of intent. This improves the consistency and internal validity of our findings and further enhances the ecological validity of the results when considering contexts in which intention knowledge is provided by adverts or other media. However, we cannot make specific claims about the effect that inferential knowledge has on product appreciation, particularly when this knowledge contradicts that gained through explicit sources of information. In addition, we cannot make very specific claims about the components of product appreciation because we treated this as an overall appreciation. We would like to emphasize that, although some liking judgments are very broad or general, others could be interpreted as more specifically cognitive, moral or aesthetic. With regards to stimuli, we used products and intentions with certain qualities and we represented them with images and texts. Our participants were, for example, unable to assess the true effectiveness of the products; they simply made a judgment of that effectiveness on the basis of the product images. The extent to which our findings were influenced by factors such as these is unknown. As for the participants, we selected design students because we were confident that they would be able to consider and describe products in intentional terms. Whether our findings

also hold for lay people's evaluations of products requires further study. Nevertheless, by examining an articulate and design-literate group in the first instance, we were able to derive and explore themes relevant to product appraisals and those themes can now be used to structure or analyze studies with other groups.

Considering the specific decisions upon which our studies were based, a number of studies could be conducted to challenge or extend our findings. These studies could adopt a variety of methodological approaches, including experimental, observational and introspective methods. Such studies should take into account the sources of intention knowledge, the different aspects of product experience that can be affected by such knowledge, the perceived qualities as well as the representations of both products and intentions used as stimuli, the level of design literacy of the participants and the expertise they have with specific product categories. These studies could address a variety of research questions, relevant to various areas of design research and practice. For example, a possible question for social design is: *Does people's knowledge of the intentions behind products that are designed to influence behavior make those products more or less likely to trigger the intended response?* A question for design aesthetics might be: *How does the principle of maximum-effect-for-minimum-means explain the aesthetic appreciation of products where the product is the means and the designer's intention is the (intended) effect?* By addressing such questions, we will learn more about how people perceive and evaluate products when they recognize that those products are not just objects that exhibit certain properties, but artifacts that have been intentionally designed.

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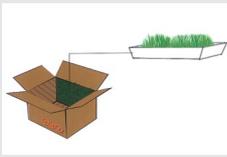
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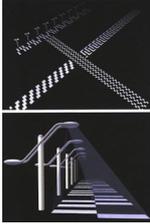
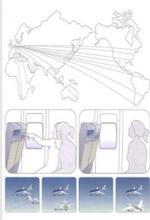
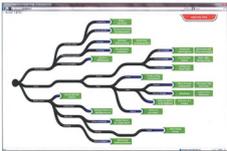
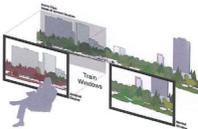
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## Appendix (Stimulus Materials)

Details	Materials	The products	The intentions
Airmail (2010) by Novi Rahman	A		This is a smart phone application that delivers messages to their intended recipients when they arrive at locations specified by the senders. It was designed with the aim of helping people to feel closer to each other.
Cross-Cultural Memory Game (2007) by Sara Emami	B		This is a memory game in which pairs of cards are not identical, but feature similar elements of the Dutch and Middle Eastern cultures. It was designed with the aim of making inhabitants of The Netherlands aware of their similarities instead of their differences.
De Goedzak (2009) by Simon Akkaya	C		This is a partially transparent bag where things that are no longer used, but are still in good condition, can be left on the street for anyone to pick them up. It was designed with the aim of enabling people to be generous towards strangers.
Feet and Greet (2009) by Willem Lysen	D		This is a cover that can be pulled over the train seat to put one's feet up and then removed to offer the seat to a fellow traveler. It was designed with the aim of transforming train travelers' antisocial behavior into a social act.
Kook Bord (2011) by Merel Pick	E		This is an online application in which meals can be planned and cooked together in a virtual kitchen environment. It was designed with the aim of inspiring people to build a social community by sharing and cooperating with each other.
Packaging Box (2010) by Radoslav Gulekov	F		This is a postal packaging box whose side and bottom panels are biodegradable flowerpots filled with earth and grass. It was designed with the aim of encouraging people to respectfully integrate nature in their daily life.
Patroon (2004) by Asako Takahashi	G		This is a kitchen cupboard where everyday products can be stored in separate compartments according to their exact shapes. It was designed with the aim of helping people appreciate the comfortable predictability of daily household tasks.
Steentjes (2009) by Anna Noyons	H		This is a range of natural maternity products whose bio-based packages can be turned into safe toys. It was designed with the aim of encouraging new parents to build a trustworthy base for raising their child.

Details	Materials	The products	The intentions
Street Lighting (2002) by Rogier Hartgring	I		This is a street lighting system that projects different patterns on different roads and city areas. It was designed with the aim of enabling people to find their way home comfortably and safely during nighttime.
The Ifiyer (2005) by Karen Zeiner	J		This is a seat-integrated display that shows the planes crossing the current flight path and their destination. It was designed with the aim of enabling flight passengers to experience the freedom of mental traveling within the limited space of an aircraft.
The Tree of Talents (2010) by Femke Heikamp	K		This is a website that allows people to articulate their skills and get in contact with those who are in need of them. It was designed with the aim of making inhabitants of unprivileged neighborhoods see the value of their talents.
Ticket Game (2009) by Chetan Shivarama	L		This is a train ticket with a visual puzzle that can only be played while traveling. It was designed with the aim of stimulating train travelers to experience happiness by being focused on the present rather than on the time of arrival to their destination.
Time-Wrap (2009) by Jay Yoon	M		This is a digital display that is integrated to train windows and occasionally shows movie clips of the outside scenery from another season. It was designed with the aim of triggering memories and self-reflection in people.
Venturi Tunnel (2002) by Mark van der Woning	N		This is a bicycle path that submits bikers to something unexpected by either pushing or pulling them suddenly depending on the wind direction. It was designed with the aim of giving neighbors a reason to talk to each other again.
Water Transport Hub (2011) by Eleni Soerjo	O		This is a water transport hub where travelers are not isolated from the surrounding wind, water and sky. It was designed with the aim of making people in Rotterdam feel connected with the environment and rediscover the essence of things.