Why Customers Value Self-Designed Products: The Importance of Process Effort and Enjoyment*

Nikolaus Franke and Martin Schreier

This study analyzes which factors prompt customers to attribute value to products they design themselves using mass-customization (MC) toolkits. The assumption that self-design delivers superior customer value is fundamental to the concept of MC toolkits and can be found in almost any conceptual work in this field. However, spectacular failures reinforce the practical relevance of developing a deeper understanding of why and when MC toolkits generate value for customers—and when they do not. Research to date has assumed that the closer fit between the self-designed product's characteristics and the preferences of the customer is the dominant source of value. In this research, it is asked whether the enjoyment and perceived effort of the self-design process have an additional impact on the perceived value of self-designed products. This question is interesting because one could argue that a rational actor would hardly be willing to pay ex post for an economic good already consumed. The hypotheses are tested on 186 participants designing their own scarves with an MC toolkit. After completing the process, they submitted binding bids for "their" products in Vickrey auctions. Therefore, real buying behavior, not merely stated intentions, is observed. The present study finds that the subjective value of a self-designed product (i.e., one's bid in the course of the auction) is indeed impacted not only by the preference fit the customer expects it to deliver but also by (1) the process enjoyment the customer reports, (2) the interaction of preference fit and process enjoyment, and (3) the interaction of preference fit and perceived process effort. In addition to its main effect, preference fit can be interpreted as a moderator of the value-generating effect of process evaluation: in cases where the outcome of the process is perceived as positive (high preference fit), the customer also interprets process effort as a positive accomplishment, and this positive effect adds (further) value to the product. It appears that the perception of the self-design process as a good or bad experience is partly constructed on the basis of the outcome of the process. In the opposite case (low preference fit), effort creates a negative effect that further reduces the subjective value of the product. Likewise, process enjoyment is amplified by preference fit, although enjoyment also has a significant main effect, which means that regardless of the outcome, customers attribute higher value to a self-designed product if they enjoy the process. In a way, this effect resembles of the classic story of Tom Sawyer and the fence, in which Tom manages to "frame" the tedious chore of whitewashing a fence as a rare opportunity—thus persuading his friends to pay him for letting them work. Manufacturers designing an MC system therefore are advised to designing MC toolkits in a way that they elicit positive affective reactions that make their customers value their work.

Introduction

This study analyzes which factors prompt customers to attribute value to products they design themselves using mass-customization (MC) toolkits. New communication technologies and flexible manufacturing systems have only recently started to enable companies to respond to each customer's individual preferences by providing individual products with (almost) mass-production efficiency (Pine, Victor, and Boyten, 1993). Therefore, companies like Nike and Adidas provide MC toolkits that allow customers to design their own products online. These toolkits allow trial-and-error experimentation and deliver immediate (simulated) feedback on the potential outcome of design ideas (von Hippel, 2001; von Hippel and Katz, 2002). Once a satisfactory solution is found, the design can be transferred into a firm's production system and subsequently delivered to the customer (Dellaert and Stremersch, 2005; Randall, Terwiesch, and Ulrich, 2007).

Developing and implementing such a system involves costs (Piller, Moeslein, and Stotko, 2004), and

it makes economic sense only if it also yields benefits. The assumption that self-design delivers superior customer value is fundamental to the concept of MC toolkits and can be found in almost any conceptual work in this field (e.g., Pine, 1999; von Hippel, 2001). Empirical studies conducted by Franke and Piller (2004) and Schreier (2006) confirm that the user's willingness to pay (WTP) for self-designed products can be much higher than in the case of standard products (with technical quality held constant), suggesting that MC holds the potential to be a profitable marketing strategy. On the other hand, some pioneers in the field, such as Levi-Strauss (with its "Original Spin" jeans), have discontinued their MC operations (MC-Newsletter, 2004), and some researchers have expressed doubts that empowering customers with MC toolkits generates customer value (Zipkin, 2001). This reinforces the practical relevance of research efforts aiming to explore the effectiveness of MC strategies from a consumer perspective—in particular, what is needed is a deeper understanding of why and when MC toolkits generate value for customers (Dellaert and Stremersch, 2005; Huffman and Kahn, 1998).

This research thus analyzes which factors prompt customers to attribute value to products they design themselves and thus make the customer willing to pay more for self-designed products than for their standard counterparts. In particular, it is argued that perceptions of the design process should be considered in addition to the self-designed product itself (i.e., in addition to the preference fit it delivers) (Dellaert and Stremersch, 2005; Fiore, Lee, and Kunz, 2004; Randall et al., 2007; Williams, 2004). This study specifically asks whether the perceived effort and enjoyment of the self-design process have an additional impact on the perceived value of self-designed products.

BIOGRAPHICAL SKETCHES

Dr. Nikolaus Franke is professor of entrepreneurship and innovation at Vienna University of Economics and Business (WU) and leader of the Vienna User Innovation Research Initiative (http://www.userinnovation.at). He is interested in understanding the phenomenon of creative and innovative users and researches methods that help companies using this potential.

Dr. Martin Schreier is associate professor of marketing research fellow of CROMA and CSS lab at Bocconi University in Milan, Italy. His research revolves around the design and marketing of new products and related consumer behavior. He is particularly interested in advancing new ways to harness the creative potential among users (e.g., user design, lead user research), and understanding the broader implications of customer empowerment strategies.

These research questions were formulated as hypotheses and were tested on 186 participants designing their own scarves with an MC toolkit. *Process enjoyment* is defined as a positive affective reaction elicited by the process of self-designing the product and *perceived process effort* as the subjective perception of the time and mental energy invested in designing the product (cf. Dellaert and Stremersch, 2005; Huffman and Kahn, 1998). *Perceived preference fit* is defined as customers' subjective evaluation of the extent to which the product's features correspond to their preference system (Dellaert and Stremersch; Randall et al., 2007). *Value* is conceptualized as the maximum price customers are willing to pay for a product (i.e., WTP) (Wertenbroch and Skiera, 2002). The dependent variable is calculated by taking customers' WTP for their self-designed scarf minus their WTP for the scarf they most prefer among 10 standard scarves (of identical technical quality) to capture the added value of self-designed products. WTP is measured using incentive-compatible Vickrey auctions, in which the participants' bids are sealed and the item is awarded to the highest bidder at a price equal to the second-highest bid (Vickrey, 1961). All bids were binding, which means that real money was at stake and participants eventually bought scarves if they won the auctions. This measure was used because it reduces the risk of "cheap talk" from participants when indicating perceived value (cf. Cummings and Taylor, 1999) and should therefore improve the validity of the findings.

The value customers attribute to MC toolkit-designed products was found to be impacted not only by perceived preference fit but also by process enjoyment and perceived effort. If customers perceive the process as enjoyable, they will value the resulting product more highly. This effect is independent of the product's preference fit. However, there is no corresponding main effect in perceived process effort. A closer inspection of interaction effects gives an indication of why this could be the case: customers tend to interpret effort differently depending on the success of the self-design process. If the resulting product is perceived to have a low preference fit, then effort is interpreted as a (negative) strain, which in turn (further) reduces the value of the product. If the resulting product is perceived to have a high preference fit, the effort involved is interpreted as a (positive) accomplishment, which increases even more the subjective value of the product. In sum, these findings suggest that the affective reaction induced by the design process

is important for the value customers derive from self-designed products. This has significant implications for companies that offer or plan to offer MC toolkit systems.

Why Self-Designed Products Create Value for Customers

Overview of Literature and Aim of Research

Why and when do MC toolkits generate value for customers? Research addressing this question takes different avenues. In one line of research, scholars analyze which attributes of MC toolkits generate the most value for customers. For example, Randall et al. (2007) contrast parameter-based toolkits (where users directly specify values for design parameters of the product, like the size of a personal computer's [PC's] hard drive) with needs-based toolkits (where users specify their needs, such as the wish to store a large quantity of data on the PC). They find that whereas the former seem to suit expert users the latter offer a better fit for novice users. Dellaert and Stremersch (2005) analyze the relationship among types of toolkits, perceived complexity, and product utility. They find that more modules (i.e., the number of product features to be manipulated) and more module levels (i.e., the number of alternatives per feature) do not significantly increase perceived complexity, but they do allow users to achieve higher product utility. Huffman and Kahn (1998) find that the way information is presented in MC toolkits has an effect on satisfaction. Users are more satisfied and perceived complexity is lower if information is presented on the basis of attributes (i.e., customers indicate their preferences for each product attribute) as opposed to alternatives (i.e., customers indicate their preferences by comparing complete product alternatives).

In another line of research, scholars ask which customers are most likely to derive value from MC. Fiore et al. (2004) analyze consumers' (hypothetical) willingness to design fashion products themselves with MC toolkits and find that the personality trait of "optimum stimulation level" appears to be an important predictor toward this end. Simonson (2005) proposes that mass customization might be most suited to customers who have well-defined and stable preferences, as only those customers might appreciate customized products.

Finally, Kaplan, Schoder, and Haenlein (2007) studied the newspaper market and found that consumers' base category consumption has a positive impact on their behavioral intention to buy a mass-customized product.

The aim of this paper is to complement existing research by adopting a third perspective. Instead of analyzing the consequences of particular toolkit characteristics or studying the characteristics of customers prone to using MC toolkits, the study analyzes which factors prompt customers to attribute value to products they design and thus make the customer willing to pay more for self-designed products than for their standard counterparts.

So far, the literature on toolkits and MC has primarily emphasized product-related benefits as a source of value for self-designed products (Franke and Schreier, 2008; Pine, 1999; Randall et al., 2007; von Hippel, 2001). Self-designing means that customers can adjust product features to their unique preferences. Assuming that the product features to be manipulated by the MC toolkit are of any relevance to customers, the resulting product should exhibit higher preference fit than standard products of the same technical quality. It is a straightforward economic argument that such products also generate superior value for customers (Franke and von Hippel, 2003). Although the preference fit argument used to be the dominant explanation for a potential value increment of self-designed products (Franke, Keinz, and Steger, 2009), recent research has added more subtle psychological factors including, for example, pride feelings of having made it oneself (Deng and Hutchinson, 2009; Franke, Schreier, and Kaiser, 2010; Moreau and Herd, 2010; Norton, 2009).

A large number of MC systems emphasize the fact that customers take an active role in the buying process as they are the designers or cocreators of the product. Therefore, in explaining why customers value products they design using such MC toolkits, it is argued that the design process and the psychological reaction elicited by the process should be considered in addition to the subjective evaluation of the self-designed product itself (i.e., in addition to the preference fit it delivers) (Dellaert and Stremersch, 2005; Fiore et al., 2004; Randall et al., 2007; Williams 2004). Therefore, this research asked whether the design process and the psychological reaction elicited by the process–particularly the perceived effort and enjoyment of self-designing–have an additional impact on the perceived value of MC products.

Process Effort and the Value of Self-Designed Products

First, the process of customers designing their own product involves effort. They actively engage in potentially strenuous and time-consuming problem-solving activities (Huffman and Kahn, 1998; von Hippel, 2001), such as how the toolkit works, which actions lead to which outcomes, and which predefined design modules exist. Choice task complexity theory (Bettman et al., 1990; Johnson and Payne, 1985) suggests that the number of cognitive steps necessary for consumer decision making will increase perceived complexity (Bettman et al.), which in turn requires greater consumer effort (Johnson and Payne).

High effort in a process might therefore reduce the value a customer obtains (Wright, 1975). While it is plausible that high expected effort decreases the ex ante likelihood that customers will engage in self-design processes (Dellaert and Stremersch, 2005; Huffman and Kahn, 1998), it is not clear why the perception of high effort should impact the value attributed to the resulting product once the process is finished. By the time the final buying decision is made, process effort is already sunk. What remains is a product with a certain perceived preference fit. From a strictly economic perspective, sunk effort should not impact the value the customer derives from the product.

However, it is argued that the negative affect elicited by the strenuous customization process (e.g., "That was hard work") might carry over to the evaluation of the process outcome and thus bias customers in their WTP. This is consistent with affect as information literature, which suggests that people tend to misconstrue their affective reactions to extraneous stimuli as reactions to the product under evaluation (Pham, 1998; Schwarz and Clore, 1983). When consumers evaluate products, they rely in part on feelings originating from relevant as well as irrelevant sources, such as salesperson friendliness, in-store music, scents, and weather (Bosmans, 2006). When customers assess the value of products they have designed, their valuations might be also impacted by the negative affect elicited by the perceived effort of the self-design process. Therefore,

H1: The higher the perceived process effort of self-designing a product with an MC toolkit, the lower the value customers attribute to the self-designed product (measured as WTP relative to the WTP for a standard product).

Process Enjoyment and the Value of Self-Designed Products

A similar argument can be made for the other dimension of process perception—that is, the enjoyment customers might derive from the self-design process. At first sight, this appears redundant, as work is defined as disutility in the conventional economic model; therefore, situations involving high effort would correspond to low enjoyment and vice versa. In reality, however, it is often observed that work is done voluntarily, and, obviously, people derive benefits despite the effort involved. Programmers contributing to innovative open-source software (Hertel, Niedner, and Herrmann, 2003) and users engaging in joint offline product development (Franke and Shah, 2003) point to the "fun" involved in certain activities and show that this enjoyment is an important motivator for people to engage in these activities. Enjoyment is more than the absence of effort; although the perception of effort and enjoyment might be (negatively) correlated, they are conceptually independent. Beyond the mass of activities that are either enjoyable or strenuous, many processes are both (e.g., climbing mountains, writing academic articles) or neither (e.g., short and uncomplicated "routine" processes such as dialing a telephone number or pressing a button). Therefore, including both dimensions of the process experience appears to be justified. Tests of discriminant validity show that these considerations are correct.

A number of authors have proposed that customers who engage in designing their own products will experience such positive emotions during their interaction with the MC toolkit. Huffman and Kahn (1998, p. 509), for example, suggest that "some consumers may find learning their preferences about a product to be fun," and Dellaert and Stremersch (2005, p. 226) presume that consumers might "enjoy mass customizing a product."

Theoretical support for the existence of such positive emotional reactions can be drawn from self-determination theory (Gagné and Deci, 2005; Ryan and Deci, 2000), which states that people have a need to feel competent and autonomous and that certain activities satisfy these needs (Gagné and Deci). The enjoyment associated with an action might be highest if the outcome is endogenous to the activity (Kruglanski, 1975). In this way, behavior and rewards become strongly associated, so that the behavior itself is experienced as rewarding (Freitas and Higgins,

2002). Studies on self-service technologies have already revealed that one of the reasons customers prefer an active role in the production of services is the enjoyment they derive from it (Dabholkar, 1996; Dabholkar and Bagozzi, 2002; Meuter et al., 2005).

As in H1 (in which it is established why negative affect might impact the perceived value of the product), it is conjectured that customers might carry this positive affect over to their valuation of the self-designed product (Pham, 1998; Schwarz and Clore, 1983). Thus,

> H2: The higher the perceived process enjoyment of self-designing a product with an MC toolkit, the higher the value the customer attributes to the self-designed product (measured as WTP relative to the WTP for a standard product).

Study Method

Overview of Procedure and Sample

For this study, six PCs were prepared to enable participants to design their own scarves using a real MC toolkit. The participants were 186 management students from the authors' university. As a result, data is biased in favor of young and fairly adept persons who are familiar with the Internet. At the same time, however, this particular group also represents the majority of business-to-consumer (B2C) toolkit users (Franke and Piller, 2004). The participants (50% females) were 23 years old on average (SD = 3.02) and had a monthly disposable income of 300 to 400 euros.

The participants were first shown a set of 10 standard scarves. They were asked to choose the one standard product they liked most and measured their WTP for that product. The participants were then introduced to the functionality of the toolkit, after which they started their individual design processes. The setting ensured that no interaction between participants was possible during the entire study. There was no time limit, and participants were offered free coffee and soft drinks to create a natural environment that came close to sitting at their own PCs at home. Once they had finished, they were asked to compare their self-designed product with the standard product they had chosen previously, to fill out a questionnaire containing items to measure independent variables, and to indicate their WTP for the self-designed product. This allowed the use of intraindividual difference between WTP for the self-designed product and WTP for the most preferred (chosen) standard product as a dependent variable; this difference is referred to as delta-WTP.

Research Objects

The MC Toolkit. A toolkit typical of B2C markets that allows the user to design individual scarves (http://www.wildemasche.de) was selected. The toolkit offers a huge set of predefined design options (more than 66 background designs and more than 140 pieces of clip art), and the user can create any text in different colors, sizes, and styles. In the design process, the user can move elements back and forth until the desired placement is found. The toolkit provides the user with some very basic design tools, such as a paintbrush or a pen to create drawings. Overall, this toolkit allows customers to adapt the design of the scarf to their individual preferences. Functional changes (e.g., different types of wool) are not possible. In terms of usability and design freedom, this toolkit does not differ from most B2C MC toolkits, and it is largely congruent with the general conceptualization of toolkits as described by von Hippel (2001).

The Reference Products. To measure delta-WTP on the individual level, it was necessary to define reference objects. For this purpose, participants were asked to choose among 10 randomly chosen standard products from the same company. The participants were informed that the standard scarves were of exactly the same technical quality as the self-designed products and differed only in the design aspect. The appropriateness of the standard sets was tested in a pilot study (n = 48) preceding the main study. When interviewing the participants, it was found that all of them had identified a reasonably satisfactory product in these sets and evaluated them as highly realistic offers.

Measurement

Dependent Variable. As noted already, the dependent variable is delta-WTP: the intraindividual difference between WTP for the self-designed product and WTP for the most preferred (chosen) standard product. To measure the two WTP levels for each participant, Vickrey auctions were employed. In this type of auction, the participants' bids are sealed, and the bidders are unaware of the other bids. The item is awarded to highest bidder at a price equal to

the second-highest bid. Thus, the winner pays less than the highest bid (Vickrey, 1961). This mechanism is incentive compatible, which means that the dominant strategy of a bidder is to reveal one's actual maximum WTP (Cox, Robertson, and Smith, 1982; Hoffmann et al., 1993). Empirical studies have confirmed the high validity of Vickrey auctions as a technique to measure consumer's WTP for private goods (Noussair, Robin, and Ruffieux, 2004).

In both auctions, the bids were binding, which means that participants signed an agreement to buy the product if their bid turned out to be the highest. It was explained to the participants that if they won both auctions (i.e., for the standard and for the self-designed product), chance would decide which of the two products the participant would receive. This helped to discourage strategic behavior, for example, bidding high on one product and low on the other (Rothkopf and Teisberg, 1990). One week after data collection, the winners of the two auctions were informed about the outcome and asked to pay the price (the second-highest bids were 49 euros for the self-designed scarf and 30 euros for the standard scarf), which they readily did.

To test the validity of the measurements, the study followed the procedure proposed by Wertenbroch and Skiera (2002). WTP for the self-designed scarf should be positively correlated with the participants' general interest in such a customized product and with the perceived importance of the aesthetic design of a scarf (both measured on a five-point scale where 1 = very low and 5 = very high). As expected, positive and significant correlations were found ($r = .12$ and $r = .15$, respectively; $p < .05$). Moreover, WTP for the self-designed scarf was correlated with WTP for the standard scarf. As both measures should be affected by the participants' general WTP for the underlying product category and by situation-specific variables (e.g., bidding on a product at university), a valid measurement would require a positive correlation between those two WTP measures. Indeed, a strong and significant correlation was found ($r = .58$, $p < .001$). In sum, this indicates a valid measurement of the dependent variable.

Independent Variables. In the research model perceived preference fit, which is seen as the main value driver of self-designed products in the literature, is included. This construct is operationalized as a reflective latent variable as it is obviously impossible to calculate this fit "objectively" by subtracting fulfillment from requirements specified along each product

attribute. First, aesthetic products contain very many attributes. Second, these fits along each product attribute cannot simply be aggregated as there are probably numerous interactions among attribute levels. Third, preference structures of individuals are almost likely multimodal. Therefore, the study proceeded similarly to Franke and Schreier (2008) and Randall et al. (2007), who measure preference fit as a composite subjective impression. Perceived preference fit and perceived process effort (H1) were measured using three items (adapted from Dellaert and Stremersch, 2005; Randall et al.). Perceived process enjoyment (H2) was measured using five items (taken from the established Intrinsic Motivation Inventory; see http://www.psych.rochester.edu/SDT).

All items are listed in Table 1 (all but one item are measured on five-point scales where 1 = strongly disagree and 5 = strongly agree; one item in the preference fit dimension is measured on a 10-point scale).

All three scales yield an alpha greater than .70, which points to a satisfactory degree of reliability. Exploratory factor analyses (EFAs) for each variable show that the explained variance of the first factor extracted is greater than 50% in all three cases and that the respective factor loadings are greater than .70 throughout (see Table 2).

Convergent validity was assessed by subjecting the three latent constructs to confirmatory factor analysis

Table 1: Measurement Items

Construct	Items
Preference Fit	- I like the design of my self-designed scarf.[a] - I am satisfied with my self-designed product.[a] - Please compare your self-designed scarf with the best standard scarf (the one you have chosen).[b]
Process Effort	- Designing this product required much effort[a] - Designing this product was exhausting.[a] - I perceived designing this product as "costly" (in terms of time and effort).[a]
Process Enjoyment	- I enjoyed this design activity very much.[a] - Designing was fun.[a] - I thought designing the product was quite enjoyable.[a] - Designing this product was very interesting.[a] - This design activity was fun.[a]

[a] Measured on five-point scales (1 = strongly disagree; 5 = strongly agree).
[b] Measured on a 10-point scale (my self-designed scarf . . . 1 = is equivalent to the standard scarf; 10 = is much better than the standard scarf).

Table 2: Measurement Results for Independent Variables

	M (SD)[a]	Alpha (EV)[b]	Factor Loading[c]	(1)	(2)	(3)
(1) Preference Fit	3.75	.78	> .70	.67[d]	.01[f]	.25
	(.86)	(62.16)	> .80**			
(2) Process Effort	1.93	.81	> .70	−.11[e]	.52	.04
	(.82)	(63.94)	> .50**			
(3) Process Enjoyment	3.66	.88	> .70	.50**	−.19*	.59
	(.85)	(59.57)	> .60**			

[a] Composite scores (averaged means; 1 = low; 5 = high).
[b] Explained variance (percent) of first extracted factor (EFA).
[c] Factor loadings based on EFA (first figure) and CFA (second figure).
[d] Average variance extracted (based on CFA; on the diagonal).
[e] Simple correlations (below the diagonal).
[f] Squared correlations (above the diagonal).
* $p < .05$.
** $p < .01$ (two-sided).

(CFA). The overall measurement model achieves satisfactory fit ($\text{chi}^2/\text{df} = 1.80$; goodness-of-fit index [GFI] = .94; adjusted goodness-of-fit index [AGFI] = .90; incremental fit index [IFI] = .96; comparative fit index [CFI] = .96; root mean square error of approximation [RMSEA] = .07). It is found that all factor loadings are positive ($> .50$) and significant ($p < .01$) and that the average variance extracted (AVE) exceeds the threshold value of .50 for all three variables. These findings indicate convergent validity.

Discriminant validity is assessed using both EFA and CFA. In subjecting all items in the three variables to EFA, three factors were extracted that confirm the three theoretical constructs; all items show factor loadings of $> .50$ for the "expected" factor and factor loadings of $< .40$ for the "unexpected" factors. Using the CFA results, the AVE was compared with squared correlations for all relevant pairs of factors (Fornell and Larcker, 1981). The results reveal that the AVE in each measure is clearly higher than the squared correlations for all pairs of factors, which again provides support for discriminant validity. Overall, it is concluded that the measurement of independent variables is also valid. In testing the hypotheses, composite scores (averaged means) for the independent variables were used. The descriptive statistics and intercorrelations of the measures are shown in Table 2.

Findings

Descriptive Findings: The Value Customers Attribute to Self-Designed Products

In the descriptive findings on WTP measurement (Figure 1), a significant and very large intraindividual delta-WTP is found. Whereas the mean WTP for a self-designed scarf comes to 10.21 euros (SD = 9.23), the mean WTP for the chosen standard scarf is only 5.35 euros (SD = 5.93) ($p < .001$; t-test for paired samples). Therefore, the average WTP for the self-designed scarf is 191% of the average WTP for the most preferred standard scarf. Substantial variance was also found in intraindividual delta-WTP (SD = 7.51), which indicates that some participants were willing to pay far more for MC products than for standard products, whereas others did not discriminate very much between the two options in terms of WTP. This underscores the importance of research aiming to analyze which perceptional factors lead to high or low attributions of value to products self-designed with a given MC toolkit.
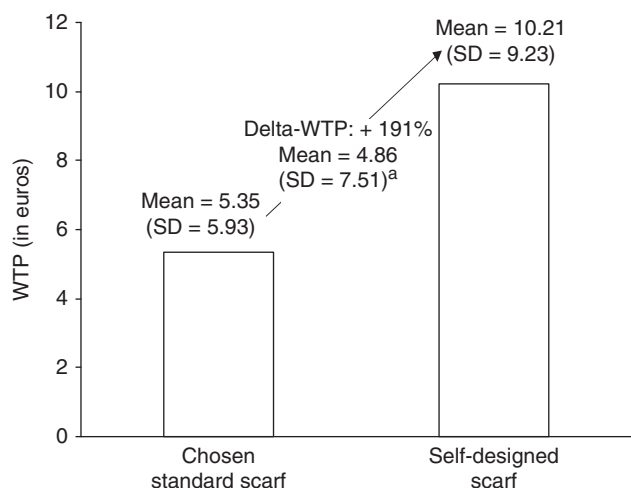
Figure 1: The Value of Self-Design[a]
[a] Mean difference is significant at $p < .001$ (t-test for paired samples).

Test of Hypotheses: The Effects of Product and Process Perception on Delta-WTP

H1 and H2 were tested using ordinary least squares (OLS) regressions with delta-WTP as the dependent variable and with preference fit, process effort (H1), and process enjoyment (H2) as predictor variables. Overall, two of the three paths prove to be significant (Table 3). First, support was found for the impact of perceived preference fit that is in line with extant research. The higher the perceived preference fit of the self-designed product, the higher the perceived economic value increment measured as delta-WTP ($b = 1.31$; $p < .05$). Second, H1 cannot be confirmed. Customers do not carry negative affect over from perceived process effort to their product evaluation as hypothesized ($b = .47$; n.s.). Third, H2 can be confirmed: The participants' delta-WTP was influenced heavily by their enjoyment of the product design process ($b = 2.46$; $p < .01$).

Exploratory Analysis: Does Perceived Process Effort Really Have No Effect?

Hypothesis tests show that perceived process effort has no main effect on the perceived value of the product, meaning that H1 had to be rejected. In this section, possible reasons why this is the case are explored.

One plausible ex post explanation is the existence of interaction effects between the independent variables. It may well be that the participants do not have a clear, preexisting, and consistent sense of whether the process and their perceived effort represent a good (value-generating) or bad (value-reducing) experience. Research into the construction of preferences reveals that in many situations people do not know a priori what they like or dislike or whether an experience is good or bad (Fischhoff, 1991; Slovic, 1995). Instead, people tend to "construct" the criteria when confronted with a concrete situation and situational factors, and certain cues might impact the construction process heavily. This effect is illustrated by the classic story of Tom Sawyer and the fence, in which Tom manages to "frame" the tedious chore of whitewashing a fence as a rare opportunity—thus persuading his friends to pay him for letting them work. In a recent study, Ariely, Loewenstein, and Prelec (2006) showed that such effects are not fictional: simple nonnormative cues manipulate participants to interpret the same task (e.g., listening to Ariely reciting poetry) as either a desirable experience for which they are willing to pay or an unpleasant task for which they demand to be paid.

In the present study's setting, it is surmised that the outcome of the process might serve as such a cue. If the self-designed product actually exhibits a close fit to customers' preferences (i.e., they really like what they designed), they might interpret the effort involved as something positive, like a mountaineer who makes it to the top of the mountain and retrospectively interprets all the laborious hours of climbing and sweating as a (positive) achievement in which pride can be taken. If such a mountaineer fails (i.e., does not reach the top), he or she might interpret a similar process as (negative) as drudgery. Similarly, customers who fail to self-design a product they like might be negatively biased in their ex post interpretation of the process. In MC settings, it is therefore

Table 3: Results

	Test of Hypotheses DV: delta-WTP		Exploratory Analysis DV: delta-WTP	
	b	SE	b	SE
Preference Fit	1.31	.58**	1.53	.58***
Process Effort (H1)	.47	.51 n.s.	.67	.51 n.s.
Process Enjoyment (H2)	2.46	.59***	2.67	.59***
Interactions:				
Preference Fit × Process Effort	-	-	.91	.50*
Preference Fit × Process Enjoyment	-	-	1.11	.46**
R/R^2	.44/.19		.47/.22	
Change in R^2 (F-Value)	.19 (14.132)***		.04 (4.081)**	

* $p < .10$.
** $p < .05$.
*** $p < .01$ (two-sided).

reasoned that subjective success in customers designing their product (i.e., the closeness of preference fit achieved) moderates the value they derive from process effort at the moment of the buying decision. A similar argument can be made for process enjoyment: if the product design turns out to look just as customers desire, this might amplify the positive perception of the process (and vice versa). It is therefore analyzed whether in addition to its main effect the perceived preference fit attained moderates the effect of process enjoyment and perceived process effort on WTP.

Technically, this is done by using moderated regression analysis (Aiken and West, 1993). The composite scores of the independent variables were standardized, the interaction terms created, and a hierarchical regression conducted (with the interaction terms entered in the second step of the analysis, as suggested by Frazier, Tix, and Barron, 2004). The findings are summarized in the second part of Table 3.

The main finding is the existence of significant interaction effects. First, a moderately significant interaction between preference fit and perceived process effort is found ($b = .91$; $p < .10$). Second, also a significant interaction effect between preference fit and process enjoyment is found ($b = 1.11$; $p < .01$). To examine the nature of these interactions more closely, the predicted values of delta-WTP for representative groups were plotted (-1 SD and $+1$ SD from the means of perceived preference fit and process effort and enjoyment, respectively; see Aiken and West, 1993).

It is particularly interesting to see how the interpretation of effort is impacted by the preference fit achieved (Figure 2). In cases where participants failed to self-design a scarf they liked (low preference fit; represented by the lower line in Figure 2), a higher level of perceived effort does lower their perceived value of the product (the predicted delta-WTP for self-designed vs. standard product is reduced from 3.12 to 2.64 euros), as conjectured in H1. Effort in such situations appears to be interpreted as an "expense" that further reduces the value of the product.

An entirely different situation arises when participants actually manage to self-design a product with a high perceived preference fit (represented by the upper line in Figure 2). In such situations, higher levels of perceived effort even have a positive effect on value (the predicted delta-WTP for self-designed vs. standard product increases from 4.35 [low process effort] to 7.52 euros [high process effort]). This strongly supports the previous considerations: if customers successfully manage to self-design a product they like,
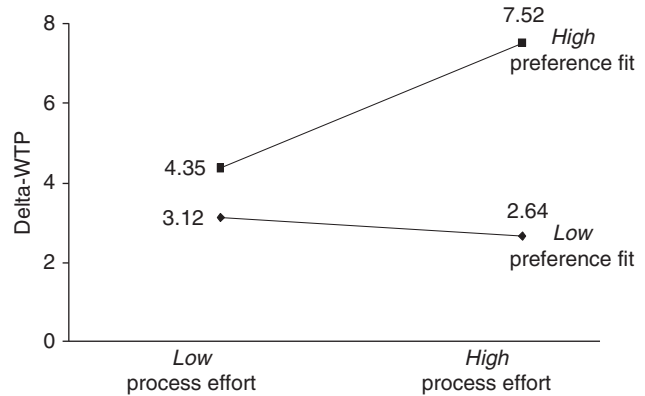

Figure 2: How Preference Fit Moderates the Effect of Process Effort on Delta-WTP

then effort is interpreted as a (positive) achievement, whereas unsuccessful effort is interpreted as (negative) drudgery.

The interaction effect is also visible in the case of process enjoyment (Figure 3). If the outcome of the self-design process exhibits a high preference fit (represented by the upper line in Figure 3), then process enjoyment also generates substantial value (the predicted delta-WTP for self-designed vs. standard products increases from 2.15 [low process enjoyment] to 9.72 euros [high process enjoyment]). This effect is weaker where lower preference fit is perceived in the outcome of the self-design process (represented by the lower line in Figure 3; predicted delta-WTP increases from 1.32 [low process enjoyment] to 4.44 euros [high process enjoyment]).

Discussion

The aim of this study was to complement the existing literature on MC by analyzing how perceptions of the
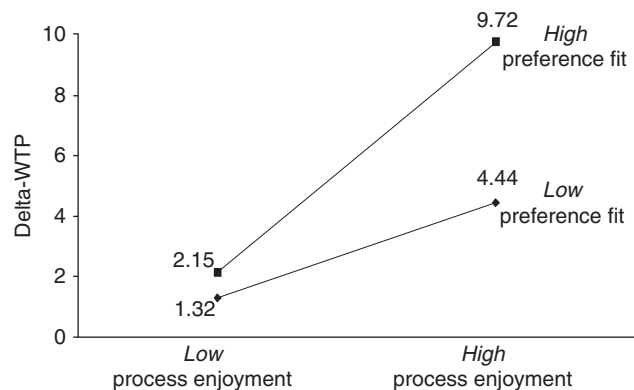

Figure 3: How Preference Fit Moderates the Effect of Process Enjoyment on Delta-WTP

self-design process impact the subjective value of self-designed products. It is found that the subjective value of a self-designed product, measured as WTP (which is "hard currency"), is impacted not only by the preference fit customers expect it to deliver but also by (1) the process enjoyment they report, (2) the interaction of preference fit and process enjoyment, and (3) the interaction of preference fit and perceived process effort. Perceived process effort alone does not have an independent impact. These findings and their implications are discussed herein.

First, support was found for the newly proposed process enjoyment hypothesis. The perceived enjoyment of self-designing a product leads to a higher WTP for the resulting product, regardless of the preference fit achieved. This may seem surprising at first, as the benefit from an activity per se should be sunk when the activity is finished. A rational actor would hardly be willing to pay ex post for an economic good already consumed. The effect found becomes more understandable if the psychological factor of customers' affective response is introduced. A positive and rewarding process experience creates a positive "mood," which is carried over to the assessment of product value. The result is a product perceived as more valuable due to the enjoyable self-design process.

The perceived process enjoyment was measured ex post, when the process was already finished and the participants were ready to make their WTP assessments. This was done in that way because this moment is crucial in the eyes of the manufacturer: if the subjective value of the product is higher than the price, customers will probably buy the product; if the subjective value is lower, they will not. At that moment, the (longitudinal) experience of the past process is integrated into customers' (ex post) evaluation. It seems plausible, however, that customers might undergo different levels of enjoyment during the process, with feelings ranging from initial enthusiasm (= high enjoyment) to frustration (= low enjoyment) along the way to attaining a positive feeling (= high enjoyment) in the end. It is not clear how these different levels are integrated to form an affective reaction once the process is finished and the buying decision is being made. It would be very interesting to measure the (potentially different) affective reactions during the design process in a longitudinal study; such information could, for example, enhance the understanding of why these processes are abandoned.

It has also been hypothesized that perceived process effort could induce a negative affective response, which in turn might impact the assessment of product value (process effort hypothesis). However, no support for such an effect has been found, and thus this hypothesis had to be rejected.

To understand this "nonfinding" more fully, interaction effects were examined more closely, which revealed that perceived preference fit attained exhibits significant interaction effects with process enjoyment as well as perceived process effort. Hence, preference fit is interpreted as a moderator of the value-generating effect of process evaluation: in cases where the outcome of the process is perceived as positive (high preference fit), this causes customers to interpret the process effort as a positive accomplishment, and this positive affect adds (further) value to the product. It appears that the perception of effort stemming from the self-design process as a good or bad experience is partly constructed on the basis of the outcome of the process.

In the opposite case (low preference fit), effort creates a negative effect that further reduces the subjective value of the product. These two opposing effects (process effort has a positive or negative effect on WTP, depending on the preference fit of the resulting product) might be the reason no independent main effect of perceived effort was observed: there is no such independent effect. Perceived effort is interpreted ex post on the basis of the outcome.

Process enjoyment is also amplified by preference fit. However, the moderator changes only the magnitude of the main effect, not its direction. Overall, these findings indicate that—in addition to the resulting product—process enjoyment and even perceived effort can also generate value for customers when they self-design a product using an MC toolkit. However, it is important to bear in mind that the cross sectional nature of the data precludes hard tests of causality. Moreover, the interaction effects were introduced post hoc. This suggests that there is a need for further studies, in particular controlled experiments and longitudinal studies that repeatedly measure the affective reactions of customers designing their own products using MC toolkits.

The importance of the process bears clear relevance for companies that offer or plan to offer MC systems. The value customers derive from self-designed products was measured as their WTP, which determines the price that can be obtained on the market. Hence, WTP is "a key element in the profit equation and therefore is directly linked to profitability" (Homburg, Koschate, and Hoyer, 2005, p. 84). The finding

that the affect caused by the self-design process is highly important for the WTP of the resulting product bears the conclusion that it is not sufficient to design MC toolkits in such a way that they allow customers to design products according to their preferences (e.g., Franke et al., 2010; Moreau and Herd, 2010). Toolkits should also stimulate positive affective reactions and at the same time keep negative effect to a minimum. A number of scholars have already begun to analyze how the latter can be achieved (e.g., Huffman and Kahn, 1998; Randall et al., 2007), and the findings reported here underscore the importance of their endeavors.

There does not seem to be any academic research devoted to the question of how MC toolkits should be designed to trigger positive affective reactions of customers during their self-design activities. In light of the underlying findings, this is likely to be an important task for future research in the field of MC. It is believed that much can be learned from the literature on users' affective responses to computer games (e.g., Johnson and Wiles, 2003), to the Internet (e.g., Wallace, 1999), or to computers and software in general (Picard, 1997). However, the specific nature of the MC self-design process, in which an object to be bought is created virtually (distinct from "normal" user–computer interaction), calls for specific theory-based empirical research.

In all conclusions, however, one has to bear in mind that the reported findings are based on a single toolkit in a single product category. Therefore, this analysis should be repeated in other fields using a broad set of toolkits with different attributes. Another possibility would be to vary toolkit attributes systematically in controlled experiments and to measure their interplay with sources of customer value (i.e., process effort as well as enjoyment and preference fit). Researchers such as Franke et al. (2010), Dellaert and Stremersch (2005), Randall et al. (2007), and Huffman and Kahn (1998) have already begun that task, and integrating process perceptions (both effort and enjoyment) in future models is recommended. Such studies appear highly promising because it seems likely that affective responses during the self-design process impact not only the value of MC products at the end of the process but also the progression of the self-design process. If the design task is perceived as enjoyable, users might also try harder to achieve a satisfactory outcome and will be less likely to abandon the design task and "leave the shop empty-handed."

Another necessary research task would be to analyze which types of customers are likely to be impacted by which sources of value. It seems very plausible that the reported findings are moderated by personality variables such as optimum stimulation levels (Fiore et al., 2004) or need for uniqueness (Franke and Schreier, 2008). Moreover, situational variables such as product involvement (Franke, Keinz, and Steger, 2009) as well as experience with and expertise in self-design might also play an important role (Dellaert and Stremersch, 2005; Kaplan et al., 2007; Randall et al., 2007). Obviously, it will be necessary to conduct additional research on the important phenomenon of customers actively designing their own products, its inherent patterns of value generation, and its consequences for firms.

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