WHEN ARTIFICIAL FEEDBACK HURTS
—
EMPIRICAL EVIDENCE FROM COMMUNITY-BASED CONFIGURATION SYSTEMS

Completed Research Paper

Christian Hildebrand
Center for Customer Insight
University of St. Gallen
christian.hildebrand@unisg.ch

Jan R. Landwehr
Center for Customer Insight
University of St. Gallen
jan.landwehr@unisg.ch

Andreas Herrmann
Center for Customer Insight
University of St. Gallen
andreas.herrmann@unisg.ch

Abstract

Mass Customization technologies are increasingly becoming social and allow for inter-individual exchange processes such as community-based configuration systems online. But while companies foster community interactions and open their configuration systems, it is not clear (1.) how virtual interactions influence individuals' subjective product satisfaction, since their final decision may not be based on their own exclusive preferences, and (2.) how these usually anonymous feedback processes may directly affect individuals' perception of their own selves. We applied an experimental research design in a virtual community environment and provide evidence that anonymous feedback significantly influences consumers' decision behavior and that increased deviations from an initial decision negatively affects individual product satisfaction. Moreover, we revealed new theoretical and practical insight that feedback effects can directly and negatively influence individuals' perception of self-worth and that common affirmation strategies may backfire and finally result in considerably lower self-esteem and satisfaction.

Keywords: Consumer decision making, Experimental economics, Online communities

Introduction

The last few decades of information systems (IS) research considerably advanced our understanding of why, how, and when individuals join virtual communities (e.g., Lakhani and Von Hippel 2003; Lin 2006; Preece et al. 2004), what motivates individuals to contribute knowledge within these often anonymously online environments (e.g., Ma and Agarwal 2007; Wasko and Faraj 2005), and the way these interactions may influence individuals' offline behavior (e.g., Bickart and Schindler 2001; Kavanaugh et al. 2005). In addition, research efforts in recent years have underlined the major importance of examining the degree of social influence on individual decision, consumption, and usage behavior (e.g., Agarwal et al. 2008). Thus, although these virtual interactions may lack important social cues of real social interactions, they nevertheless affect our everyday decisions with significant influence on individual and economic behavior (e.g., Kleinberg 2008; Kozinets 2002; Mayer 2009; McAlexander 2002).

A new direction within this latest socially enriched IS research is related to the integration of user communities within consumer self-design processes (e.g., Franke et al. 2008; Wu 2010). Understanding how virtual peer influence affects individual decision behavior is of fundamental importance, as companies such as Threadless or Lego not only offer highly sophisticated toolkits for user self-designs but also motivate users to post their configurations within the community and revise configurations with other users (see http://www.threadless.com and http://www.designbyme.lego.com). However, although we see increasing growth of these community-based business models, it remains unclear: (1.) how virtual interactions influence individuals' subjective product satisfaction, since their final decision may not be based on their own exclusive preferences, and (2.) how these usually anonymous feedback processes may directly affect individuals' perception of their own selves.

We address these research questions by applying an experimental research design in a virtual community environment. This experimental setting allows us to influence and manipulate the dimensions in question directly (e.g., the difference between the initial user preference and community feedback) while controlling for potentially confounding other factors in a real setting (e.g., different content and nuances in the tone of a message). We programmed an online community framework that allowed us to systematically manipulate the information we presented to participants. Overall, our results show that anonymous feedback significantly influences consumers' decision behavior. In addition, we also found that the more individuals deviated from their initial decision, the lower their final product satisfaction. Most importantly, individuals' deviation was significantly moderated by their degree of self-esteem. A follow-up study revealed new theoretical and practical insight that feedback effects can directly and negatively influence consumers' perception of self-worth and that common affirmation strategies may backfire and result in considerably lower self-esteem and satisfaction.

Literature Review

Online Social Interactions and Individual Decision Behavior

The development of technologies allowing users to connect with each other and share their ideas, discuss various personal topics of everyday life, or search for information for planned purchases led to the broad development of virtual online communities (e.g., Brown et al. 2007). In this regard, the first stream of research helped to understand users' general motivation to engage in these types of virtual environments (e.g., Lakhani and Von Hippel 2003; Preece 2001). In addition to this motivational view of the first years of online community research, the research efforts of the following years particularly focused on the inherent business value of these networks, such as increasing consumers' brand loyalty (e.g., McAlexander et al. 2002; Thompson and Sinha 2008), generating new product ideas (e.g., Nambisan and Baron 2007), implementing community-based customer support (e.g., Dholakia et al. 2009) as well as finally influencing consumers' purchase intentions (e.g., De Valck et al. 2009; Kozinets 2002).

However, although past research enriched the motivational aspects of interacting in virtual systems and assessed the economic potential of harnessing social networks from a business perspective (Kane et al. 2009), we understand less about the psychological influence of these interactions and respective feedback

effects through computer-mediated interactions (De Valck et al. 2009). Although we better understand what drives consumers to participate in online communities and their intention to share ideas with others, what we can expect if consumers receive direct feedback on their ideas, the products they design and want to share with others, or their opinions on given topics is far less understood (Moreau and Herd 2010). For example, past research has shown that receiving community feedback when designing mass customized products increases customers' satisfaction as well as individual willingness to pay (Franke et al. 2008). In particular, Franke and his colleagues revealed empirical evidence that the influence of external and anonymous users had considerable positive effects on consumers' decision outcome. Unfortunately, less known is consumers' reaction to distant and probably non-confirming feedback. Although previous research revealed evidence that consumers may heavily discount too-deviant feedback (Yaniv 2004), recommendations from hardly known others can significantly affect individual decision behavior (e.g., Chevalier and Mayzlin 2009; Dellarocas 2003). Thus, although we may conclude that informational influence may hold in virtual worlds, the direct effect in terms of a normative influence on final choice, the satisfaction with this choice, and the influence of this external feedback on the individual are far less understood.

The last aspect regarding others' influence on one's perception of oneself through anonymous computer-mediated communication is of interest on a broader level. Since it follows that informational cues are inherently multidimensional (e.g., Stern 1994), individuals have to process at least two dimensions of information: a neutral informational dimension that is context specific and intended to help the receiver in making a better decision (i.e., helping to design a respectable product) and the implicit judgmental dimension as it inherently carries more or less implicitly the sender's personal preferences and values in contrast to the receiver (i.e., something is not good enough and has to be optimized). As a result, irrespective of the sender's initial intention, the decisional context of the receiver, and her personal view regarding the decision in question, the receiver's impression of herself may change (perhaps also regarding the sender). Since individuals exchange information, comment on each other, and give feedback in nearly every virtual online setting (forums, discussion boards, blogs, social network sites, shopping sites with comment functions, etc.), better understanding of how computer-mediated, usually anonymous, information may affect users' inner representation of themselves and their behavioral outcome dimensions afterwards is needed.

This is of particular interest for the domain of self-designable products in a mass customization context since it is usually assumed that the increasing heterogeneous demand for customizable products is based on the increasing pursuit of individuality and distinctiveness on the individual level (Franke et al. 2008). Thus, we would suspect that consumers are less prone to external social influence in a virtual setting since it is generally assumed in the marketing literature that consumers design these products according to unique preferences (e.g., Randall et al. 2007). Nevertheless, the business practices and new technological developments of the last few years have shown that modern product configurators are increasingly becoming social and configuration processes are becoming permeable (e.g., Wu 2010), explicitly underlining the intertwining of technological and social networks (Agarwal et al. 2008).

Overall, researchers have shown that community members exchange information in terms of directly commenting on posts (e.g., Lampe and Johnston 2005), rating individual user designs (Franke et al. 2008), or evaluating and refining ideas and the like (e.g., Franke and Shah 2003). Thus, we may also link these findings to the research stream that these virtual interactions may have a strong influence on future participation and future success for the respective community itself (Bateman et al. 2010). For example, previous research revealed considerable evidence that inter-individual comments within the community affects the participation probability on the individual level and the future success of the respective community in general (e.g., Vasalou et al. 2008).

Protective Adaptation and the Role of Self-Esteem

In addition to these past IS- and marketing-related research findings, the past decades of social and personality psychological research can be related to this stream of research to explain the underlying psychological dimensions of these previously discussed influence processes (e.g., Gilbert et al. 1998). On a general level, research has shown that individuals regularly apply unconscious coping strategies that protect individuals from possible external influences. In particular, people are strongly motivated to adapt to protective adaptation strategies and construe mentally driven re-interpretations of situations to lessen

the effect of potentially threatening information on the individuals' self-worth (e.g., Koole et al. 1999). This strong human motivation helps to cope with the numerous threats and failures of everyday life (e.g., Schmeichel and Martens 2005). For example, people refuse to adopt threatening health information (Sherman et al. 2000), perceive themselves as responsible for positive but not for negative outcomes (Taylor 1983), and strongly discard distant types of feedback that are systematically different from their own (Yaniv 2004).

In this regard, Steele's (1988) seminal work established the so-called theory of self-affirmation and provided a theoretical framework for these previous effects. The fundamental argument of this theory is that individuals are willing to pursue a positive view of themselves and are adaptive in maintaining and protecting their perceived self-integrity. In particular, he states that individuals strive to "maintain a phenomenal experience of the self [...] as adaptively and morally adequate, that is, as competent, good, coherent, unitary, stable, capable of free choice, capable of controlling important outcomes" (p. 262). As a result, individuals' motivation to protect themselves can lead to defensive processing strategies by which external information is strongly discounted (e.g., Kunda 1990).

The role of individuals' self-esteem has become increasingly important in this stream of research (e.g., Steele et al. 1993). For example, Steele et al. (1993) showed that individuals with a high degree of self-esteem have stronger protective resources to cope with threatening information than individuals with lower self-esteem (see also Nail et al. 2004). Thus, although past research underlined individuals' broadly applied self-protective strategies, examining them in the context of computer-mediated communication within our field of IS research and explaining feedback effects on the individual level in virtual environments will be of interest.

Furthermore, lay intuition about how to encourage users within a community who may receive less positive feedback from other users—which may lead to significantly less participation in the future (e.g., Lampe and Johnston 2005)—could lead to simple enhancement strategies to motivate users to join the community and participate again. In this regard, recent findings in the area of the previously discussed self-affirmation theory suggests that affirmations related to the threatening act can result in backfiring effects in terms of increased resistance and dissonance (Sherman et al. 2009). Thus, from a practical as well as theoretical point of view, examining how to change users' motivation and self-perception with applied affirmation strategies will be elusive.

Development of Hypotheses

Since we have initially discussed the current state of research and relevant findings, we will now discuss our derived hypotheses and the underlying conceptual framework. We will derive our hypotheses directly from existing research findings within the relevant research streams and will test our hypotheses systematically in two subsequent studies.

In general, we will examine external computer-mediated and simulated social influence on users' individual decision behavior. In this regard, Tversky and Kahneman (1974) highlighted the fundamental role of anchoring and adjustment effects in human decision behavior. In essence, numerous studies on cognitive biases and heuristics revealed empirical evidence that exposing individuals to decision-relevant as well as non-relevant stimuli leads to the subtle assimilation of final judgments toward to a previously considered reference point (e.g., Strack and Mussweiler 1997). Most importantly, it has been shown that these anchoring effects influence a tremendous variety of decisions, ranging from consumers' price decisions and legal judgments of attorneys or judges to general probability assessments, influencing experts as well as non-experts, and still remain if people are informed about these biases (e.g., Kahneman 1992).

This leads us to the prediction that also consumers in a choice-related decision will adapt their final decisions to the reference point of an external community recommendation. In particular, we predict that the deviation from an initial choice is determined by the distance between the individual's initial preference and the deviation of the community recommendation. Thus, we predict:

Hypothesis 1: The greater the distance of an external recommendation from the user's initial self-designed product, the greater the revision of the initial choice.

Second, whether possible preference revisions may systematically influence consumers' degree of ex post product satisfaction is not clear. Extending Moreau and Herd's (2010) recent findings, we predict that social comparison processes induce external ego-threatening information on individuals' initial configuration and makes the weighting of external feedback and already revealed initial preferences increasingly mentally exhausting. Thus, balancing one's own preference as well as a deviant external community recommendation may result in an increase in discomfort and feelings of inconsistency. Based on the robust findings of previous inconsistency theories (e.g., Higgins 1987), we predict that this revealed dissonance effect will reduce the perceived product satisfaction of the focal decision-maker.

Hypothesis 2: The higher individuals' deviation from their initial self-design, the lower their final satisfaction with the decision outcome.

According to the previously discussed findings in the domain of social and personality psychology, individuals with more positive views of themselves may have more resources to resist external influences (Steele 1988). We adapt these findings to the virtual context of computer-mediated influence processes and predict that individuals are less prone to being influenced by externally induced community recommendations in the case of higher self-esteem and will be more satisfied with their self-designed product irrespective of previous deviations. Thus, we predict:

Hypothesis 3: The higher individuals' self-esteem, (a) the lower the influence of external feedback and (b) the higher individuals' satisfaction with their self-designed product.

These particular hypotheses (H1, H2, H3) will be tested as part of study 1.

Thus far, we have assumed that individuals' perception of self-worth is a stable personality trait measured before any experimental manipulation. What is less clear so far is what we can expect regarding the direct influence of distant external feedback on individuals' self-perceptions. With reference to the previously noted theories of inconsistency (e.g., Higgins 1987), a variety of studies have shown that aligning incompatible self-beliefs with external expectations can lead to strong emotional vulnerabilities (e.g., Aronson 1968). In particular, perceiving the discrepancy between the current state of the self (in terms of attitudes or behavior (e.g., choices)) and the current state of others has been found to be associated with individual discomfort and feelings of resentment (Higgins 1987). Building on these previous findings of a revealed negative influence of perceiving this incompatibility between the self and consumers' social environment, we predict that receiving deviant community recommendations will lead to a decrease in self-evaluations and perceptions of self-worth:

Hypothesis 4: The higher the distance of externally induced feedback, the lower individuals' subsequent perception of self-worth.

Finally, as externally induced feedback may reduce individuals' satisfaction and perception of self-worth, we examine strategies for consumer self-affirmation in a virtual environment. According to past research, positively affirmed individuals may experience increased satisfaction and self-esteem (Correll et al. 2004). Thus, giving positive affirmation leads to reasserting individuals' perceived self-integrity when coping with threatening information (Fein and Spencer 1997). However, it has been shown in the area of attitude change that the importance of the affected domain of interest is an important moderator of the relationship of external stimuli and attitude change (Boninger et al. 1995). In the area of effective self-affirmation, Sherman and colleagues (2009) recently showed that affirming individuals in areas of high

personal importance that are highly salient to participants and related to the decision context led to negative affirmation effects since the intended positive affirmation resulted in an increase in availability of participants' inconsistent behavior (see also Crocker and Park 2004). For example, a mother who is highly experienced as a teacher and was influenced recently to try new educational methods will perceive a larger threat to her self-perception when reminded about applying these methods that are not considered as central in her view of educational practice, due to the interaction of the increased salience of the respective domain and her own level of expertise. As a result, we predict that affirming individuals positively will backfire and result in a negative influence on self-worth for individuals with high domain knowledge due to the high personal relevance for those individuals and the process of reminding them of their previous inconsistent behavior. Thus, we finally predict:

Hypothesis 5: Positive affirmation for high-knowledge users will result in a backfiring effect in terms of a lowered degree of self-worth.

Figure 1 illustrates the relationship of all discussed hypotheses, their respective measures, and the predicted direction of influence. Note that hypothesis 5 will of course test for the respective main effects, but the proposed interaction and its predicted negative effect on self-esteem are primarily of theoretical interest.
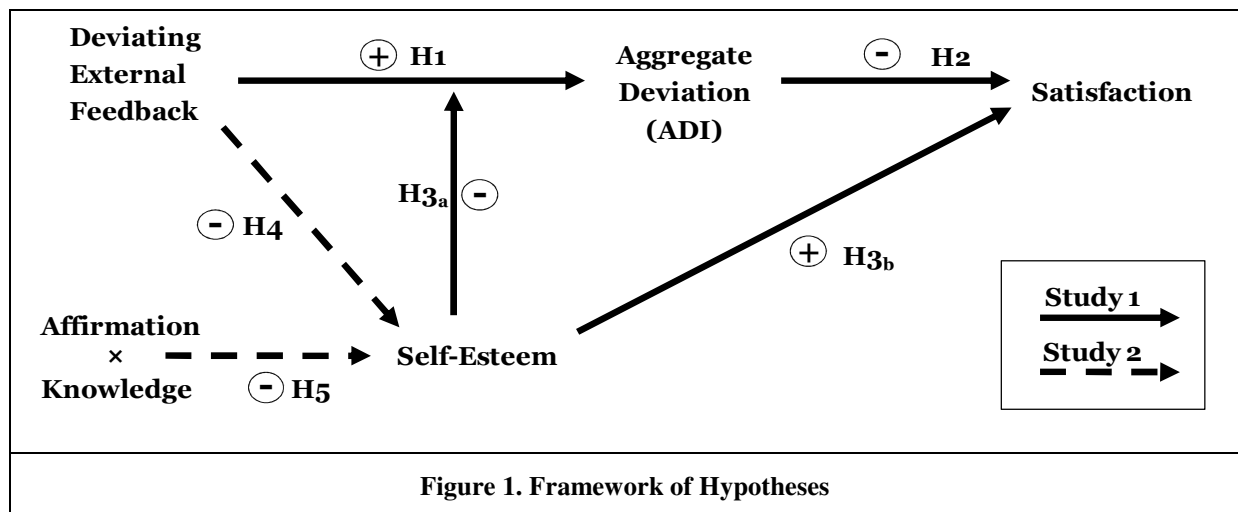

Figure 1. Framework of Hypotheses

Empirical Studies

To test our derived hypotheses, we conducted a series of online experiments in a systematically manipulated community framework. In the next section, we introduce the general study design first and present the details of our realistically framed experimental setting. As part of study 1, we focused (1.) on the general influence of external feedback on individual decision behavior and (2.) the moderating role of individuals' perception of self-worth. Thereafter, as part of study 2, we examined the (1.) direct effect of external influence on individuals' self-esteem and (2.) evaluated strategies for consumer self-affirmation.

Study Design and Community Framing

To manipulate inter-individual interactions and choices, we developed and programmed a community framework where all controlled experiments were run. Since we programmed the back- and frontend of our community platform, we were able to systematically vary the manipulated type of feedback with simple java code and stored participants' answers in SQL databases during the time of the experiment. We implemented our community framework as a virtual shopping environment with a jewelry configurator as a specific application. We chose the jewelry domain as our experimental product category due to its high social visibility. Our main interest is to test social influence patterns in an identity-signaling product

category that can be easily perceived by others (Berger and Heath 2007), and Eagly and Carli's (1981) meta analysis of gender differences in influenceability revealed no divergent effects when controlling for surveillance of the respective situation.

Within the member area, participants were introduced to the general procedure of the study and were presented our self-developed and manipulable Flash-based product configurator to tailor an individual pair of earrings, consisting of 188 items overall in four categories (ear hook, small, medium, and large jewelry items) that were carefully pre-tested with 32 participants and confirmed to be the market-wide dominant earring jewelry items at the time of the study. During the configuration process, participants chose a jewelry item in each of the four presented categories. Figure 2 shows the final frontend of our programmed community environment.

Figure 2. Frontend of Community and Flash-Based Jewelry Customization Configurator

In general, we applied a two-step approach for all experiments as follows: in the first phase of all experiments, participants designed their personal earring, answered several survey-based questions, and were informed that one of our community members would be randomly chosen to provide individual recommendations for the participants' initial configuration. After a time lag of 48 hours, participants received an email and were re-invited to look at their community feedback within the member area and were given the opportunity to re-configure their first design if needed. Both studies were very strictly incentive compatible as participants were informed that they would take part in a raffle to win their self-designed earring.

Study 1 – Virtual Influence Mechanisms and the Protection Role of Self-Esteem

As part of the first study, we will examine our previously derived hypotheses 1 to 3. In particular, we will assess the influence of deviating community recommendations on participants' final deviation with regard to their initial configuration of a self-designed earring (H1), the impact of possible subsequent deviations on consumers' satisfaction (H2), and the moderating role of individuals' self-esteem (H3).

Experimental Design and Procedure

Participants were introduced to the study's general procedure and then presented to our Flash-based jewelry product configurator to design their individual pair of earrings. After participants completed their self-design process, they answered a self-esteem scale (see the next section in further detail) and several demographic questions. At the end of the study, participants were told that their configuration had been forwarded to a community member and that they would receive individual feedback. Finally, participants were told that they would be re-invited automatically to participate in the second part of the study. We programmed a server script that automatically re-invited participants after 48 hours. To maximize the perceived verity of our manipulations, participants were primed after their first configuration by answering questions about their favorite color, fashion preferences as well as eye and hair color that would be also forwarded to a community member. In the second phase of the experiment, participants logged in to the member area and read their recommendation on the start page. Participants received a standardized and anonymous feedback message without any specific arguments for or against their first configuration; we manipulated only the presented recommendation based on individuals' choices in the first phase.

Participants were randomly assigned to one of two groups: the first group received a recommendation that was only slightly different from their first choice and changed by only one jewelry item per category. In particular, each jewelry item in all four categories (ear hook, small, medium, and large jewelry items) had a unique index value increasing from left to right. Participants in the low deviation manipulation received a recommendation that was changed by only one index value, whereas the high deviation condition skipped a minimum of 50% of the complete scale of the category. For example, if an individual chose item No. 2 of 10 possible items within the category, she received a recommendation of item No. 3 in the small deviation condition and item No. 7 in the high deviation condition. We applied an algorithm that automatically calculated the respective differences within each category and presented participants with the systematically manipulated recommendation at the beginning of the second phase. Figure 3 shows a concrete example for a given user.

Figure 3. Feedback-Example Presented to Participants in the Second Phase of the Experiment
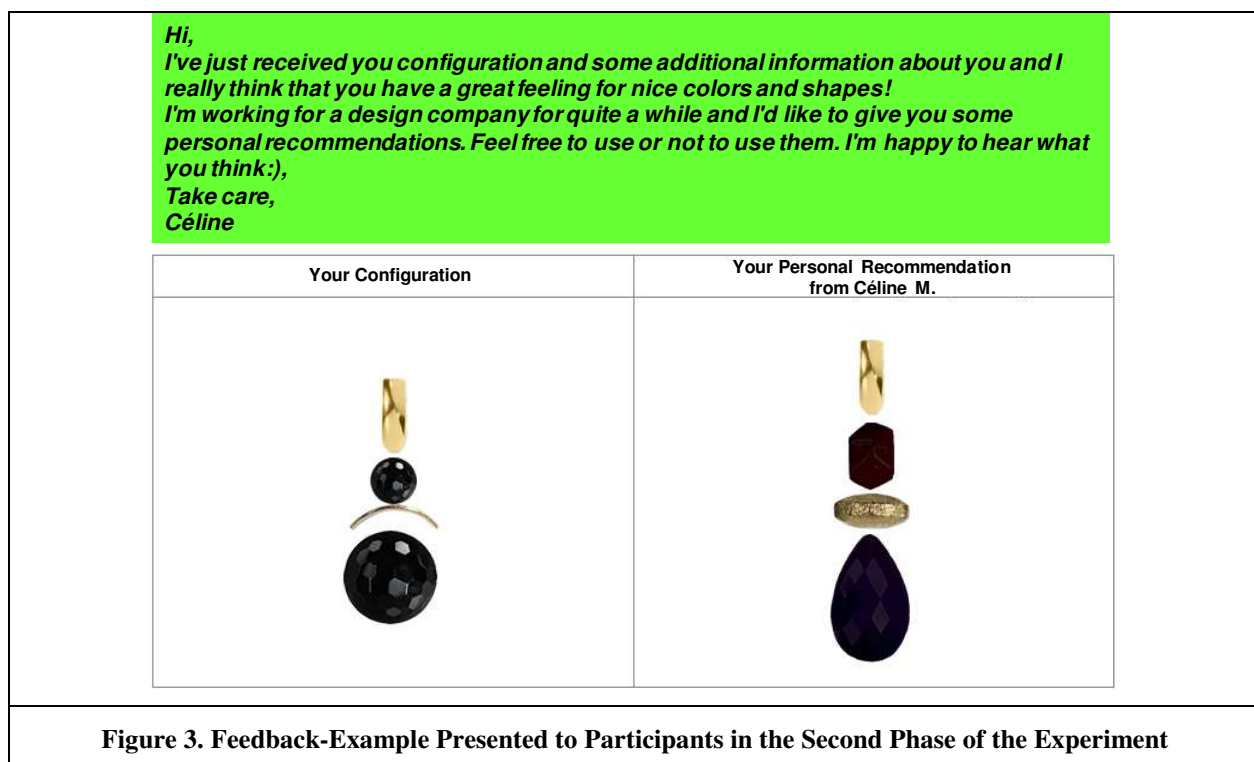
A total of 792 female participants were recruited from an online consumer panel to take part in the study ($M_{Age} = 37$, SD = 10).

Measurement and Manipulation Check

To measure the degree of influence on choice, we applied a weighted Euclidean distance measure according to Shocker and Srinivasan (1974) and classical preference modeling procedures, since (1) positive and negative deviations from the initial configuration and (2) the inter-individual heterogeneity of the category importance have to be considered, e.g., low deviations within highly important categories and vice versa. Thus, our algorithm estimated the Euclidean distance between the initial and final decision first and then weighted this difference with an individual weighting parameter that corresponded to the participant's stated importance of each category. All individual weights sum up to one. We will call this metric in the following the aggregate deviation index (ADI):

$$\mathrm{ADI}_i = \sum_c^C \sqrt{(\tau_{ic}(t_1) - \tau_{ic}(t_2))^2} \times \omega_{ic}$$

with the choice of item τ by individual i in category c, at time t_1 and t_2 and the individual category importance ω. Furthermore, we measured individuals' satisfaction with the self-designed product with reference to Homburg, Koschate, and Hoyer's (2005) introduced scale. The latent construct was condensed by a single factor that accounted for 81% of explained variance and high scale consistency ($\alpha = .92$). Individuals' degree of self-esteem was measured according to Rosenberg's (1965) scale with positive and negative self-esteem assessment and a total of 74% of explained variance and appropriate scale reliability ($\alpha = .82$).

We carefully evaluated the effectiveness of our feedback manipulation. As expected, participants perceived the feedback of the anonymous community member within the highly deviant manipulation as significantly different from their initial configuration ($M_{\text{High Deviation}} = .22$ vs. $M_{\text{Low Deviation}} = -.20$, $t(790) = 5.998$, $p < .001$). Thus, the effectiveness of our experimental manipulation was confirmed.

Results and Discussion

To test our specified hypotheses, we conducted a moderated mediation analysis to measure all dependencies at once and to ensure a higher statistical power (Preacher et al. 2007) (note that every specified hypothesis could be tested by applying linear models or ANOVAs but with the disadvantage of increasing a type II error of statistical testing). As expected, we found a significant effect for the degree of deviation from individuals' initial preference by presenting highly distant feedback ($B_{\Delta\text{Preference}} = .05$, $t(788) = 8.214$, $p < .001$). Thus, although participants designed their individual earring in the first phase, introducing anonymous and systematically manipulated feedback led to significant changes in the participants' final choice, supporting hypothesis 1. Furthermore, this increased deviation resulted in a significant decrease in individuals' final satisfaction with their decision outcome ($B_{\text{ADI}} = -.19$, $t(787) = 4.618$, $p < .001$). Hence, hypothesis 2 is statistically supported as well. In general, the path from external deviant feedback to individuals' final satisfaction was found to be mediated by individuals' degree of deviation (ADI) as indicated by a significant Sobel test ($z = -3.517$, $p < .001$). Overall, hypotheses 1 and 2 support our hypothesis that although individuals deviate from their initial choice and no social costs or relevant social ties were present, the individuals' free will of deviation resulted not in an increase of satisfaction but rather in a final decrease. This recalls our theoretical discussion of possible self-affirmation strategies in a virtual context, and we will address this point in the second study in further detail. Most importantly, and as predicted, the moderation of individuals' self-esteem on ADI was significant as well ($B_{\Delta\text{Preference} \times \text{Self-Esteem}} = -.03$, $t(788) = -2.498$, $p < .05$). This supports our theoretical argument that individuals' self-esteem operates as a corrective procedure within influence processes and leads to stronger reliance on individuals' initial preference. Thus, hypothesis 3a is empirically supported. Furthermore, we also found the predicted positive effect of individuals' self-esteem on the outcome satisfaction with the self-designed product ($B_{\text{Self-Esteem}} = .23$, $t(787) = 2.926$, $p < .05$), confirming our discussion that individuals' perception of self-worth may function as a "psychological immune system", protecting individuals from external influence processes. Thus, hypothesis 3b is finally supported as well.

Table 1. Results of Hypotheses 1 to 3 (Moderated Mediation Model)				
Predictor	Estimate	SE	*t-Value*	*p*
Aggregate Deviation (ADI) **(Mediator Model)**				
Constant	.539	.066	8.214	< .001
ΔPreference (ΔPref)	.046	.013	3.547	< .001
Self-Esteem (SEST)	.093	.070	1.352	.177
ΔPref × SEST	-.034	.014	-2.498	.013
Product Satisfaction **(Dependent Variable Model)**				
Constant	.115	.080	1.440	.150
ADI	-.192	.042	-4.618	< .001
ΔPref	.006	.015	.392	.695
SEST	.234	.080	2.926	.004
ΔPref × SEST	.003	.016	.203	.839

Overall, our findings of the first study revealed new insight that anonymous computer-mediated feedback leads to significantly deviating choice behavior. This effect occurred without particular community norms, social intimacy, or anticipation of any future social costs—just setting a community recommendation as a reference point alters individuals' choice behavior and final satisfaction with their self-designed product. This generalizes (1.) the application of traditional social influence and anchoring studies within a virtual context and (2.) the direct influence of virtual interactions on individual decision making. The latter is of major importance since De Valck et al. (2009) underlined the caveat of previous studies that relied on retrospective and self-stated measures regarding community influence on individuals' decision behavior.

As part of the next study, we will examine the direct effect of external feedback on individuals' perception of self-worth and will test strategies for user self-affirmation in order to deal with the drawback of decreasing satisfaction after relying on external recommendations.

Study 2 – The Direct Influence of Artificial Community Feedback on Self-Esteem

Study 1 revealed new empirical evidence that individuals are prone to systematically deviate from their initial preference after receiving externally induced and manipulated feedback on their initially self-designed product. In accordance with our predictions, this effect was significantly moderated by users' degree of self-esteem. In the next study, we will apply generally the same study design as before but will explicitly measure the effect on users' perception of self-worth in the second phase of the experiment. In particular, we will assess the influence of external community feedback on individual self-esteem by applying a pre-feedback measure in the first phase and a post-feedback measure in the second phase. This allows us to study the effect of community influence on individuals' self-perception (H4) and possible affirmation strategies on the individual level (H5).

For this second study, a total of 283 female participants were recruited from an online consumer panel (M_{Age} = 36.5, SD = 10).

Experimental Design and Procedure

Similar to our first study, participants designed their initial earring, answered the self-esteem scale, and were automatically re-invited after 48 hours. After the participants received their manipulated recommendation (the same manipulation of low vs. high deviation as in study 1), they were given the

opportunity to reconfigure their product if needed. Subsequent to possible reconfigurations, participants were randomly assigned to one of two groups: an experimental group that received self-affirming cues with an affirming text message that assured individuals' perception that they had designed a beautiful configuration and was emotionally enriched by pictorial cues, underlining individual happiness and freedom. In contrast, the second group was set as control group and received no information at all. At the end of the experimental manipulations, participants answered the self-esteem measure again and several other scales.

Measurement and Manipulation Check

We measured the degree of self-esteem based on the same scale as in study 1. Participants answered the respective items before (the pre-feedback measure of the first experimental phase) and after our manipulations (the post-feedback measure within the second phase). The positive and negative items of the self-esteem scale within the first phase accounted for 66% of explained variance and were aggregated by a single measure with appropriate scale reliability (α = .75). The post-feedback measure of self-esteem of the second phase revealed similar and consistent results (70% of explained variance, α = .77). The satisfaction measure was based on the same items as in study 1, and the scale consistency was confirmed as well (87% of explained variance, α = .95). In addition, we measured individuals' degree of domain knowledge according to Flynn and Goldsmith's (1999) scale. The construct was condensed by a one-factor solution with a high 81% explained variance and appropriate reliability (α = .88).

Again, we evaluated the effectiveness of our feedback manipulation before analyzing the data. As expected, participants perceived feedback from the anonymous community member of the highly deviant manipulation as significantly different from their initial configuration ($M_{High\ Deviation}$ = .20 vs. $M_{Low\ Deviation}$ = -.21, $t(281)$ = 3.520, $p < .01$). Thus, the effectiveness of our experimental manipulation was confirmed again.

Results and Discussion

As part of hypothesis 4, we predicted that external feedback will reveal a negative influence on individuals' perception of self-worth, confirming the notion that highly distant feedback contains an implicit psychological threat to the initial preference of a decision maker. To test this hypothesis, we specified a multiple mediation model (see Figure 4). As expected, our results revealed empirical evidence that anonymous, distant feedback—without stating any reasons regarding the participants' first choice—revealed a strong and negative influence on individuals' perception of the self ($B_{Self-Esteem\_post}$ = -.26, $t(279)$ = -2.156, $p < .05$). Note that both groups were not statistically different from each other when tested for differences in the pre-feedback measure in the first phase ($B_{Self-Esteem\_pre}$ = .02, $t(279)$ = .198, $p > .83$). This effect emphasizes that (1.) anonymous virtual feedback can significantly decrease individuals' self-esteem and, (2.) as a result, may also influence relevant individual dimensions that are not directly related to the choice at hand. Thus, hypothesis 4 is empirically supported. Moreover, we also replicated the negative effect of ADI and the positive effect of self-esteem on satisfaction (B_{ADI} = -.16, $t(279)$ = -2.009, $p < .05$; $B_{Self-Esteem}$ = .25, $t(279)$ = 3.676, $p < .001$). Overall, the total effect of the meditation model was significant (z = 2.553, $p < .05$), and contrasts for ADI and individuals' self-esteem revealed that the meditational effects were of equal strength ($contrast_{ADI\ vs.\ self-esteem}$ = .008, z = .173, $p > .85$).
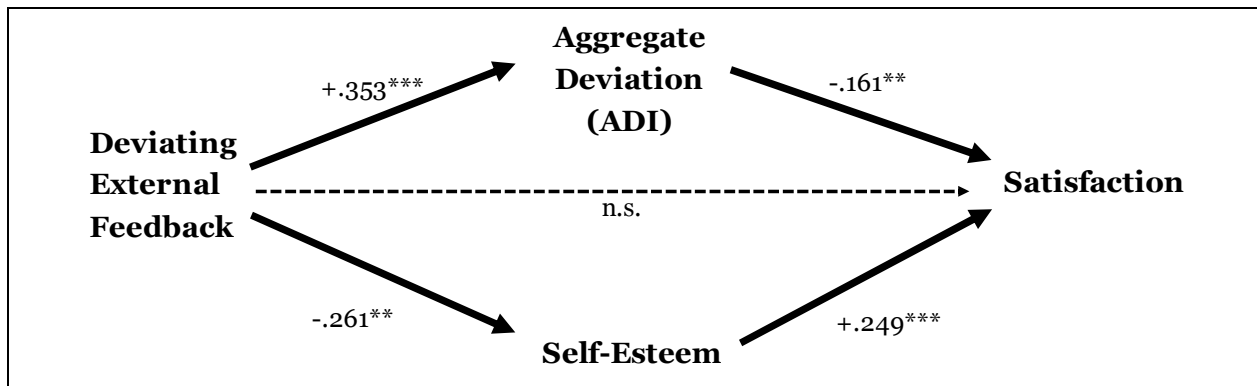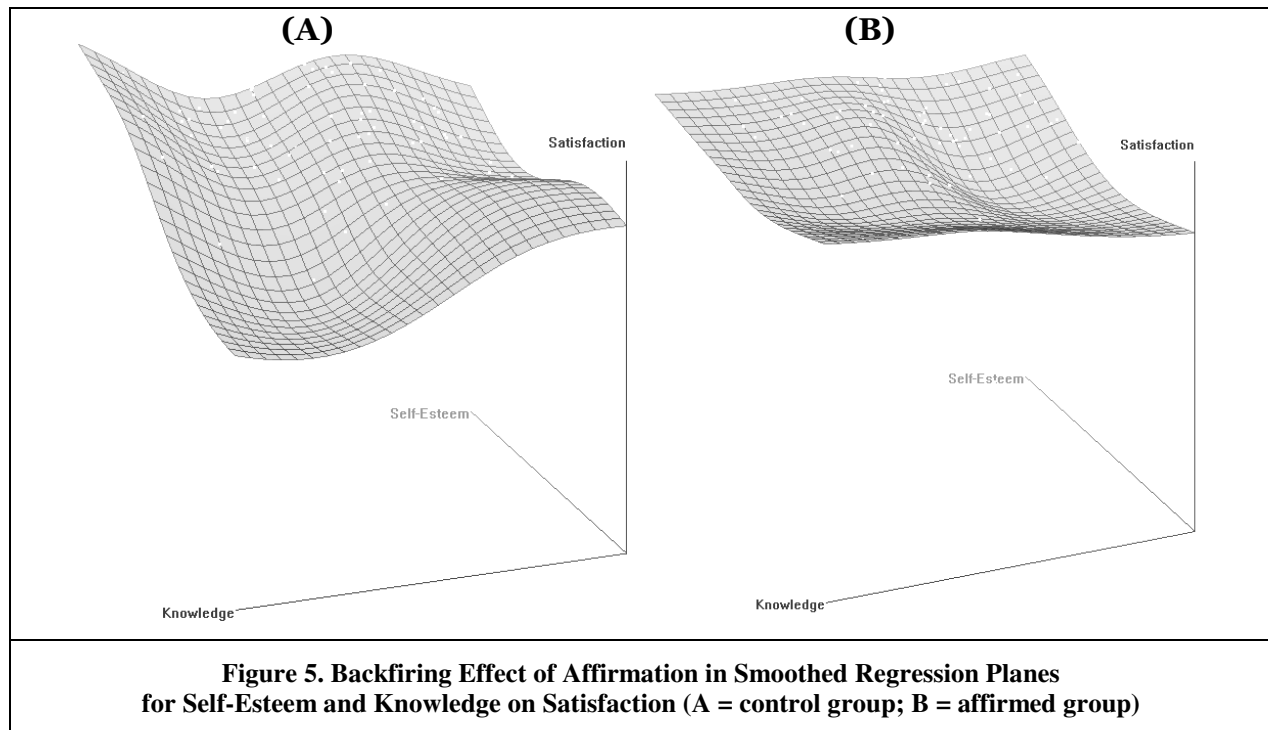
Figure 4. Negative Impact of External Feedback on Individuals' Self-Esteem (Multiple Mediation Model)
(Note — *** p < .01, ** p < .05)

As part of hypothesis 5, we predicted that common affirmation strategies might backfire as a function of individuals' degree of domain familiarity. To test this hypothesis, we applied a linear model with individuals' self-esteem as the dependent variable and our experimental affirmation (affirmation vs. no affirmation) and individuals' degree of domain knowledge as the independent variables. As expected, the interaction term of affirmation × knowledge was statistically significant ($B_{Affirmation \times Knowledge}$ = -.30, t(279) = -2.410, p < .05) and in the predicted direction: affirmed individuals experienced a negative effect on their personal perception of self-worth the higher their personal domain knowledge was. Both main effects alone had no significant influence on perceived self-worth ($B_{Affirmation}$ = -.001, t(279) = -.01, p > .90; $B_{Knowledge}$ = .14, t(279) = -.13, p > .88). This supports our prediction that lay beliefs about addressing and affirming individually important dimensions of life may backfire, as such beliefs remind decision makers of their personal susceptibility to external influence, making the inconsistent previous behavior highly salient. Thus, hypothesis 5 is statistically supported as well.

We also tested the extendibility of this backfiring effect by analyzing the combined effects (self-esteem and knowledge) on satisfaction and the role of affirmation. We applied a linear model for all main effects and interactions, and in line with our previous results, the higher-order three-way interaction of affirmation × self-esteem × knowledge was marginally significant and again in a negative direction ($B_{Affirmation \times Self\text{-}Esteem \times Knowledge}$ = -.28, t(275) = -1.867, p = .06). To aid interpretation of the three-way interaction, we illustrate the difference by showing the three-dimensional surface plots in Figure 5 (see West et al. (1996) for further recommendations). Both regression planes show that satisfaction is always positively associated with increasing self-esteem irrespective of knowledge ($B_{Self\text{-}Esteem}$ = .35, t(275) = 3.981, p < .01) and that a larger positive increase in satisfaction for affirmed participants compared to non-affirmed participants occurred only in the region of low self-esteem with increasing knowledge ($B_{Affirmation \times Knowledge}$ = .35, t(275) = 2.499, p < .05, holding self-esteem constant). However, and in line with our previous results, when both factors increased, the affirmed group achieved a lower overall satisfaction than the control group.

**Figure 5. Backfiring Effect of Affirmation in Smoothed Regression Planes
for Self-Esteem and Knowledge on Satisfaction (A = control group; B = affirmed group)**

Overall, our results finally underlined that external feedback may directly influence individuals' perception of self-worth in a negative way. This is of major importance for at least two reasons: (1.) virtual interactions and comments by often unknown users may significantly influence individual decision and participation behavior, and (2.) since individuals strive to maintain a positive image of themselves, computer-mediated communication systems and increased interaction with others as part of a community, distant project teams and the like, may be influenced within computer-mediated communication systems in a similar and predictable way as in real-life situations. Furthermore, strategies of providing affirmative information have to be reflected with respect to the importance of the domain for the respective individual. For example, directly asking an expert member of an idea-sharing community to participate in a new project while knowing that she received less positive feedback on her last contribution might be less effective compared to activating seemingly unrelated dimensions, such as checking other relevant domains that were stated within the user profile by providing a gift card for the respective service of interest or suggesting a project that is not closely related to the previous and probably negatively connoted project.

Discussion and Conclusion

Theoretical Implications

From a theoretical perspective, our studies revealed new insight that anonymous computer-mediated communication can reveal a direct influence on choice (study 1, hypothesis 1). This may generalize previous findings of classical social influence studies (see Wood (2000) for a review) and their implication for IS research. In particular, our manipulations of deviant feedback did not contain any fundamental argument why participants should consider the recommendation—the mere presence of a manipulated recommendation resulted in a considerable revision of choice and participants' initial preference. Furthermore, we found that these deviations led to systematic negative effects in terms of decreasing product satisfaction (study 1, hypothesis 2 and replication in study 2). Thus, influencing individuals in at least a virtual context may result in less desirable effects in the long run. This raises general questions for online as well as offline social influence studies since the major dependent variable usually is the influence in terms of adoption of a certain product or service but not the post decisional analysis *after* this

adoption. In general, we would also like to point out that the broader link of psychological constructs and theories may enhance our understanding of given theories and the relation to IS research. Developments of integrating normative constructs and the like in the eminent Technology Acceptance Model support this notion (e.g., Venkatesh et al. 2003). In this regard, we showed that individuals' self-esteem is a significant moderator of influence processes (study 1, hypothesis 3) that results in lower dependency on third-party opinions. The measurement of pre and post self-esteem with reference to external influence also revealed that the mere presence of a distant recommendation is able to reveal a direct negative influence on individuals' perception of self-worth (hypothesis 4). Thus, it must not necessarily be a direct offense or a negative feedback of other individuals—the presence of a strongly deviating recommendation may also contain the implicit information "what you did was not good enough". In addition, our results concerning the backfiring effects of positive affirmations may lead to less desired effects than previously intended (hypothesis 5), which at least calls for further assessment of applied affirmation strategies in a virtual context.

We also see a methodological implication. Previous research has considerably enriched our understanding of the qualitative relationships about why users participate in communities and that users may be influenced in behaviorally relevant dimensions. However, on a methodological level it was noted (De Valck et al. 2009) that these links may not be exclusively reliable since survey-based methods are inherently based on measuring past behavior, or more precisely, the remembered past behavior. The use of controlled experiments may allow us to vary only the factors of theoretical interest while holding other influences as constant as possible. This allows us to establish the inherent causal link of directed hypotheses. Integrating modern tools with moderate programming and development effort enables us to run highly realistic experiments online. In essence, we see great potential for including more experimental research designs as soon as the general link between the theoretical entities of interest is established with previous qualitative or survey-based research.

Practical Implications

From a practical point of view, our results elucidated that interactions and recommendations of hardly known (or in our case explicitly manipulated) users may reveal a strong influence on individual decision behavior without the need to establish a strong social intimacy or shared goals between participants. Consider the case of a design contest or a start-up community where users can design a specific object of interest, show it within their personal profile, and may receive comments from other members. Now imagine that a user has posted her first one or two personal designs and is curious about reading what other members of the community might think and how they rank her self-designed object. We suspect that a rating with three out of five stars may motivate for a positive discussion but that it also can lead to feelings of rejection without knowing these other members personally and as a result may significantly influence this user's probability of posting new designs, engaging in discussions with other users, and in the long run her survival probability of staying within the community. We expect that these subtle mechanisms of social evaluation—without directly addressing someone personally—may considerably influence his or her behavior in the future. Since retaining and engaging new members are key dimensions in community practice, our results may guide practical strategies of a sort of "sentiment controlling". For example, companies could implement simple algorithms to measure users' activities and interaction (text based or ratings of designs, etc.) with other community members. Text-based comments could further be categorized with natural language-based text mining algorithms (e.g., positive, negative, neutral comments). In the second step, these variables could be regressed on members' inter-temporal participation rate and discussion activity. After the first few weeks, community owners could establish a threshold for reporting probably as negatively affected classified cases. This reporting system could build the basis for further cross-checks and the relation of lower participation, activity, etc. and past interactions between community members. An analysis of these data and a detailed reporting could help community owners to understand the qualitative influence of community interactions and their link to quantitative results, as possible reasons for lowered retention or participation rates.

Limitations and Future Research

To stimulate further research, we finally discuss the limitations of our results and derive new areas of research for future studies. First, we used a product category with high social visibility. Although it might be reasonable to extend our results to other socially visible categories (e.g., digital devices such as cell phones, cameras, and the like), it will be important to see if the same social influence processes can be virtually constructed for less socially visible domains such as financial products or products such as toothpaste, shampoo, or other fast-moving consumer goods.

Second, our research context was embedded only within a specific domain of a product customization community. It would be important to see if our results can be generalized for other research contexts. For example, we suspect that our results can also be applied to virtual collaborations of distant project teams and the analysis of how team effectiveness may change as a function of the type of reciprocal evaluations, the tone of commenting on each other, and the like. We could also imagine applications in learning-oriented communities and the way students comment on each other and in measuring the degree of learning success, community participation, and cooperation or helpfulness.

This leads us to a third aspect, the degree of social intimacy. In particular, it would be interesting to see if the effect of negative influence of deviating feedback on individuals' perception of self-worth and the increased choice deviation after receiving feedback (studies 1 and 2) is the same for members who already know each other. Although the latter anchoring effect may remain, it may follow that the first effect changes: individuals may hold more or less unconscious "friendship idiosyncrasies" that allow these individuals to deal with potential critiques.

From a fourth point of view, a more in-depth analysis of how users apply internal preference revision rules is needed and how these revisions evolve over time. Since we cannot rule out the possibility that consumers may have perceived the given recommendation in accordance with the feedback-prime of the first phase (e.g., answering questions about favorite color, fashion style, etc.), future research may focus more strongly on explaining the fundamental process of including exogenous information on internal preference formation and the underlying mental calculations of balancing both dimensions.

Finally, we have to note that our study was conducted in a Western society. It would be interesting to see how our effects are moderated by cultural influences. In particular, it would be of major interest to analyze how individuals of more collective-oriented societies deal with and respond to these virtually constructed influence processes.

Acknowledgments

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Appendix

Summary Statistics

Table 2. Summary Statistics Study 1 and Study 2						
	Study 1			**Study 2**		
Variable	Median (SD)	IQR	Min Max	Median (SD)	IQR	Min Max
Knowledge [a]	-	-	-	.02	1.44	-1.92 2.48
Self-Esteem pre (SEST pre) [a]	.09	1.46	-3.71 1.69	.06	1.46	-3.00 2.06
Self-Esteem post (SEST post) [a]	-	-	-	.14	1.35	-3.16 1.67
Aggregate Deviation (ADI)	.48 (.83)	1.15	.00 4.10	.60 (.88)	1.10	.00 5.80
Satisfaction [a]	.24	1.34	-3.49 .99	.19	1.42	-4.19 1.16
Age (in Yrs.)	36 (9.39)	16	18 65	37 (9.50)	16	19 52
Income Class (€) [b]	4 (2.13)	3	1 9	4 (2.16)	4	1 9
(Note — a=latent Variable (all standard deviations are equal to one and centered at zero); b=Income Class: 1={<1.2k}; 2={1.2k - 1.5k}; 3={>1.5k - 2k}; 4={>2k - 2.5k}; 5={>2.5k - 3k}; 6={>3k - 3.5k}; 7={>3.5k - 5k}; 8={>5k - 7k}; 9={>7k})						

List of Scales

Satisfaction Scale (adapted from Homburg, Koschate, and Hoyer (2005)):

1. All in all, I'm satisfied with my earring configuration.

2. My earring configuration meets my expectations.

3. The earlier scenario compares to an ideal earring configuration.

4. Overall, I feel very good about my recent earring configuration.

Domain Knowledge Scale (adapted from Flynn and Goldsmith (1999)):

1. I know pretty much about jewelry.

2. Compared to most other people, I know less about jewelry. (*reverse coded*)

3. When it comes to jewelry, I really don't know a lot. (*reverse coded*)

Self-Esteem Scale (adapted from Rosenberg (1965)):

1. I feel that I have a number of good qualities.

2. On the whole, I am satisfied with myself.

3. I take a positive attitude toward myself.

4. I do not have much to be proud of. (*reverse coded*)

5. At times I think I am no good at all. (*reverse coded*)

6. I certainly feel useless at times. (*reverse coded*)