Interactivity as Self-Expression: A Field Experiment with Customization and Blogging

S. Shyam Sundar*[+], Jeeyun Oh*, Saraswathi Bellur*, Haiyan Jia*, Hyang-Sook Kim*

*Media Effects Research Laboratory The Pennsylvania State University, University Park, PA 16802, USA

[+]Department of Interaction Science Sungkyunkwan University, Seoul, Korea

{sss12, jzo120, sxb979, huj116, hxk256}@psu.edu

ABSTRACT

A paradigmatic quality of interactive interfaces is that they allow users to express themselves, thereby converting message receivers into communication sources. We define this quality as Source Interactivity [26, 29], and test its effects on user experience with a field experiment (N=141) of a portal site featuring cosmetic customization, functional customization and blogging (active versus filter). In demonstrating the psychological influence of source-based interactivity on such outcomes as user engagement, sense of agency, sense of community, intrinsic motivation and attitudes toward the interface, we discuss how designers can use them for creating interactive tools for self-expression.

Author Keywords

Interactivity; Customization; Blogging; User Engagement.

INTRODUCTION

In acknowledging that interactivity in media interfaces has fundamentally reshaped human-computer interaction [29], researchers and designers have sought to distinguish between different kinds of interactive tools as they address a fundamental empirical question: What kinds of interactivity work in which ways under what circumstances? Among the myriad conceptualizations of interactivity, the one that dramatically changes the nature of communication is its ability to allow the user to go beyond being a mere receiver of messages and actually serve as a source. Modern interactive media offer plenty of opportunities for users to act as gatekeepers, recommenders and even creators of messages. For example, Google News allows readers to customize their choice of news categories to display and also set individualized preferences for news sources. Thus, users are able to actively dictate not only the genres of news content that they encounter but also how and from whom they receive it. From simple display and ringtone settings on one's mobile phone to more complex sharing and privacy options on a social networking site, designers are bestowing users with more choice and control. While such customization features allow the users to gatekeep information for themselves, interactive tools of social media enable them to go a step further and serve as a source for others, by bookmarking, forwarding, tagging, commenting, tweeting and blogging information. The phenomenal growth of blogging services is a testimony to the powerful psychological appeal of users themselves serving as communication sources [24, 25].

Conceptually, customization and content creation mirror the functions of journalistic sources in traditional media (namely, gatekeeping and story-telling), and can therefore be seen as imbuing "sourceness" to users. They represent two different forms of "source interactivity," defined as the extent to which users are enabled by the interface to serve as primary sources (and/or gatekeepers) of information [26, 29]. Greater source interactivity allows users to actively dictate the source, nature, form and content of interaction, with higher agency and control [25]. In this way, source interactivity serves as a tool for self-expression, be it in the form

of indicating preferences or generating messages.

Operationally defining interactivity in this way could be potentially useful not only for researchers interested in the user experience of interactivity but also for designers seeking user-centered design goals. Making the user the source of communication and affording greater self-expression can be meaningful objectives for designers of interactive tools. Source interactivity could perhaps occupy a distinct position in UI design, quite apart from the plethora of tools that simply offer manipulation of the interface without an emphasis on self-expression. However, this would require empirical verification of source interactivity as a psychologically salient dimension of UX. Will users recognize the different forms of source interactivity as tools of self-expression? Are some tools more desirable than others? Is there a source-interactivity threshold beyond which user experience is affected adversely? The larger question is: What are the individual and cumulative effects of different forms of source interactivity on user experience?

An answer to this question requires us to examine different tools of self-expression within the same interface rather than separately, as has been done in previous research. With this in mind, we conduct a user study of an interface that offers two forms of customization (functional and cosmetic) and also gives users the opportunity to express themselves by either generating self-created content (active blogging) or sharing other-created content (filter blogging). We situate these different forms of source interactivity along a continuum of self-expression (discussed in the next section). This source-interactivity continuum serves as a basis for addressing the practical implications of our study: How do different forms of source interactivity, and the subsequent scope for self-expression that they offer, inform the psychology of HCI? What can we learn about interfaces of portals (e.g., iGoogle, Netvibes) and other systems that allow users to actively customize and express themselves? How do we build affordances that can foster a sense of "sourceness" and its allied outcomes?

SOURCE INTERACTIVITY CONTINUUM

Source interactivity is the degree to which the user is able to actively serve as a source of communication, rather than passively consume prepackaged information as a receiver. Websites that offer no opportunities for the user to customize information rank low on source interactivity whereas those that allow users to express themselves would score high [26]. Therefore, we think of source interactivity as a continuum of self-expression that is made possible by specific affordances of interactive interfaces such as customization. By customizing, users are actively browsing, selecting, organizing and making the interaction their "own" unique experience. This can be achieved in two ways: Functional and Cosmetic. Functional customization involves tailoring features mainly to fulfill task-based goals, whereas cosmetic customization is presentation-driven, such as changing hair color of an avatar, setting cell phone screen savers, desktop background, and so on [18]. At the higher end of the source interactivity continuum, users are not only managing and organizing content, but also actively disseminating and creating content of their own. It could be in the form of uploading YouTube videos, writing blogs, collaborating on Wikipedia, reviewing products and services, and many other Web 2.0 affordances that imbue users with a sense of "sourceness." Here again, a distinction could be made between sharing existing content with others and creating new content, with the latter scoring higher on "sourceness." Operationally then, customization (be it cosmetic, functional, or both) signals higher source interactivity than a non-customizable interface, while sharing content would rank higher and creating original content even more so, on a continuum of the degree of self-expression afforded by the interface.

An open empirical question is the degree to which these different forms of source interactivity contribute to users' sense of agency (or perceived ability to assert themselves). Studies using the *agency model of customization* [24, 25, 28] have identified two key psychological mechanisms—sense of control and sense of identity—that enable users to feel agentic [19]. By applying this to the source interactivity continuum, we can expect greater levels of identity and control when users engage in blogging compared to

customizing content. However, a practical question facing the interface designer is whether to include both customization and content-generation features (such as blogging) on the same interface. Is it desirable to include all possible forms of source interactivity on a given interface in order to boost its overall affordance of self-expression? Do some forms of source interactivity evoke a higher sense of control, while others evoke a higher sense of identity? Are they cumulative, or alternatively, is it possible that one type of source interactivity may counteract another?

To answer these and other questions, we conducted a field experiment that examined three forms of source interactivity on a personalized portal site that was especially created for this study (cf. Method section)--Functional customization (operationalized as the extent to which users can choose and edit task-based widgets); Cosmetic customization (operationalized as the affordance for users to modify the look of the interface); and Blogging (operationalized as the extent to which users can recommend existing content or create new content).

While previous research has examined the effects of blogging and customization separately [e.g., 8, 24, 26, 28], we study them together on the same interface. This enables us to test both their unique and interaction effects, allowing us to advance existing knowledge of source interactivity and offer practical guidelines pertaining to ideal combinations of customization and content-generation features on an interface. In the sections below, we review prior studies that allowed us to derive testable hypotheses for constructive replication.

PSYCHOLOGICAL EFFECTS OF CUSTOMIZATION

Our notion of self, and related psychological factors such as self-esteem, self-representation, and self-identity, have a profound influence on the ways in which we think, feel and behave [9]. Several studies in the fields of psychology and communication show how linking messages to one's values and beliefs can increase one's identity and sense of personal relevance [22]. Interactive technologies can do the same by letting users customize the interface. Indeed, studies have shown that customization holds strong emotional and cognitive appeal to users. For instance, when users were told to modify the characteristics of a conversational agent, they perceived the customized agent as more likable, trustworthy and useful, even though the customizability was only an illusion [34]. Another study showed that customization increases task efficiency in data management and reduces mental demand of users [23], even considering the extra time needed to customize the interface. Users of a personalized My Yahoo! page showed better attitudes towards the website than their counterparts who used a non-customized version of the same site [16]. Enjoyment of online gaming was also found to be elevated among users who were allowed to customize their avatars [3]. Customization in e-learning websites has been shown to enhance perceived group support and foster interactions with peers [35].

So what is it that makes customization so appealing to users? Recent studies have identified some of the key psychological factors [19, 28], including sense of control, sense of identity, and sense of agency. Sense of control is the extent to which the user feels in charge of the interaction with an interface. Sense of identity refers to the degree to which users perceive that the end product of their customization efforts is a reflection of themselves (values, ideas, beliefs, etc.). Sense of agency is a measure of "sourceness", i.e., the extent to which the user feels they are being an active agent, initiating actions [28, 29]. In fact, a study comparing websites with personalized features to those with customizable features [28] showed that sense of agency imbued by user-initiated customization, rather than system-initiated tailoring, is key to inducing better attitudes toward customizable websites. Taken together, these studies show why customizing their own portal is likely to influence users' sense of identity and sense of agency, thereby inducing more positive attitudes toward the portal site. Thus, we propose the following hypotheses:

> H1: Higher degree of functional customization will result in higher sense of identity (H1a), higher sense of agency (H1b), and more positive attitudes towards the site (H1c).

H2: Higher degree of cosmetic customization will result in higher sense of identity (H2a), higher sense of agency (H2b), and more positive attitudes towards the site (H2c).

PSYCHOLOGICAL EFFECTS OF BLOGGING

Since their advent in 1991 [33], blogs have played a significant role in the domain of user-generated content [14]. In its role either as a form of personal journaling or one of filtering external events [32], blogging enables users to create and/or share content. In general, blogging is associated with positive outcomes. Researchers have found that various forms of blogging, such as video blogs, personal journals, political and collaborative blogs, increased users' likelihood of interacting with other users within online communities (e.g., following blog rolls), which in turn resulted in a greater number of other social interactions, such as participation in community forums [14]. Similarly, active bloggers who create and share their own stories demonstrated a greater level of attachment to the community, as compared to non-bloggers [4].

Akin to the roles played by sense of identity, control and agency in driving the effects of customization, psychological empowerment via sense of community and sense of agency has characterized the perceived effects of blogging [8, 24]. A collaborative blog website of a university yielded a greater sense of community among students who participated in the blogging program [8]. Another study showed that the type of blogging–originally creating content and sharing it (active blogging) or sifting content from other sources and sharing it (filter blogging)– makes a difference in users' psychological experiences. Specifically, active blogging led to an increased sense of community, which in turn influenced one's feelings of being autonomous, whereas filter blogging increased one's sense of agency and subsequently made them feel a sense of influence over others in the community [24]. Based on this, we proposed the following hypotheses for study:

H3a: Active blogging will result in higher sense of community than filter blogging

H3b: Both active and filter blogging will result in a similar level of sense of agency.

H3c: Both active and filter blogging will result in a similar level of positive attitudes towards the portal site.

While previous research has studied blogging in isolation, we investigate how it interacts with other affordances of self-expression on the interface, such as functional and cosmetic customization. Theoretically, this also highlights a key distinction between users acting as a source for self (i.e., customization) versus others (i.e., blogging).

RQ: How do the different types of source interactivity vary in usability (RQ1), perceived competency (RQ2), intrinsic motivation to use the site (RQ3), and behavioral intention to use the site (RQ4)?

SOURCE INTERACTIVITY AND USER ENGAGEMENT

In recent years, scholars have emphasized the importance of moving beyond usability concerns toward understanding user experience, and design interfaces to make them engaging to users [11]. User engagement has been defined as a psychological state of being involved, absorbed, immersed, or being in a flow-like state [5, 7, 12, 21]. Higher levels of source interactivity, such as customization. have been shown to foster interactions among students [35], presence among game players [3], and perceived involvement in website users [16]. These psychological outcomes are likely to contribute to a heightened level of *absorption*, defined as a state of deep involvement with an interface that includes temporal dissociation, focused immersion, heightened enjoyment, and control [1].

Apart from such self-reported indicators, recent work on engagement has included behavioral metrics that can

objectively reflect the degree to which users are engaged in the task at hand. For instance, Businessweek.com calculated user engagement based on the number of comments per posting on their website [30]. Other scholars have devised a user engagement metric in social networking sites that is calculated on the basis of the weighted sum of activities ranging from simple log-ins to writing forum messages [2]. Considering that deeply engaged users would be more willing to exert effort and manage their online activity, creating their own content (via blogging) would be the highest form of engagement that such users show in personal dashboard sites. Beyond the individual level, responding to other users' questions and blogposts will also contribute in sparking further discussion and contributions from others users as well [6]. In keeping with this, we operationalize the behavioral dimension of user engagement as the number of comments and replies generated by study participants during the course of our study.

> RQ: How do the different types of source interactivity features vary in the degree of absorption (RQ5), and the number of comments (RQ6)?

METHOD

To address our research questions and hypotheses, we conducted a 3 (Functional customization: no vs. low vs. high) × 2 (Cosmetic customization: absent vs. present) × 2 (Blogging: active vs. filter) fully factorial field experiment wherein human subjects used the test site for two weeks.

Participants

Study participants were recruited by posting an ad in the local newspaper. All participants went through the informed consent procedure prior to their participation. After successful completion of the study, they were offered a monetary compensation of $35 in the form of gift cards. In all, 141 participants (108 females) took part in this study, with mean *age* of 45.13 years, over three periods of data collection in Spring, 2011.

Procedure

All participants were first asked to fill out a pretest questionnaire that asked about their general technology usage and previous experience with portal sites. Using a randomization script, we assigned participants to one of the 12 experimental conditions. One day before the study started, they received an instructional email with the link to one of our stimulus websites, login information, introduction of the website functions, and an activity table listing all possible activities to perform on the website. With the information from the instructional email, participants were expected to start browsing and interacting with the website for two weeks. During the two weeks, participants were requested to log into the website for at least 20 minutes every day. To make the experience realistic and to create a sense of readership, a number of confederates interacted with the participants as if they were Portal users as well, but in fact no interaction among participants was possible or allowed.

To ensure interaction between participants and the websites, we assigned various tasks to participants on a daily basis. In Week 1, participants received emails with specific tasks every day, whereas in Week 2, they were allowed to interact with the site freely. (In the second round of data collection, the order was reversed to counter-balance the effect of emailing). The email suggested that participants try out one of the features on the website, e.g., "Did you know that you could check the weather on your portal via the Tools Gadget? The Weather tool lets you view the weather for State College. It gets real-time weather information from weather.com and updates automatically every minute. It also provides three-day forecast. If you have not tried it yet, feel free to explore this gadget today!"

Repeated post-test questionnaires were sent to the participants at the end of the first week and second week. Participants with 0 logins were excluded from the study after Week 1; those who were inactive or who did not respond to the questionnaire were reminded through email.

Stimuli

Twelve stimulus websites were created using the WordPress platform to test the effects of functional customization, cosmetic customization and blogging. On every website, there were four tabs: Homepage, blogs, Q&A, and Portal feeds. Several features were listed on the navigation bar, including Portal home, my blog, change theme (only available in Cosmetic Customization), change avatar, and play music. See Figure 1 for an example.

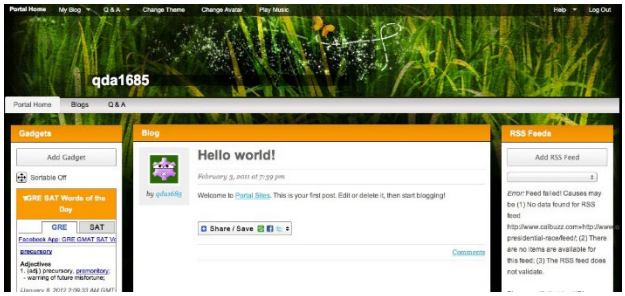

Figure 1. Sample Portal homepage

On the homepage, there were three columns: gadgets, blog, and RSS feeds. A total of six default gadgets were present on the homepage, including Email (Gmail/Hotmail/Yahoo!), Date and Time, Google News, YouTube, Wikipedia and Weather. These were chosen from the most-used list in the iGoogle gadgets directory. Users were also given a list of default RSS feeds covering seven major categories such as technology, business, and politics. We chose the top-ranked blog for each of the categories from technorati.com. Other default functions included rearranging the three columns (gadgets, blog, and RSS feeds) or rearranging gadgets or feeds within the column, changing avatar, listening to Pandora, and posting on a Q&A board.

On the main menu bar, the Blogs tab allowed participants to see the latest blog posts. The Q&A tab showed the discussion board where participants could post questions or answers; however, they did not see posts from other participants. They could only see posts from the confederates, thus keeping content constant.

Other than these default features and functions, the websites had different settings, so participants in different conditions were allowed to perform certain types of activities with regard to adding/editing gadgets and RSS feeds, changing website themes, and engaging in active or filter blogging (see next section on "Independent Variables"). Nine video tutorials and text instructions were accessible under the "Help" tab, covering all site features, so participants could refer to them as needed.

Independent Variables

The three independent variables—functional customization, cosmetic customization, and blogging—were manipulated to vary the level of source interactivity on the stimulus websites. Baseline level of "source-ness" was achieved by default features, including the setting of display name, uploading an avatar, and choosing the type of music to play on the Portal website.

Functional customization was operationalized as the affordance of changing—choosing, adding or removing— the functional features, such as gadgets and RSS feeds, on the website. In this study, it had three levels: no vs. low vs. high. In control condition, or "no" condition, no functional customization options, but only the preset of default gadgets and RSS feeds were provided. In the low condition, participants were allowed to pick one of three widgets from each of the nine categories (News, Tools, Communication, Lifestyle, etc.). Similarly, users were given links to the Top-3 RSS feeds, as rated by technorati.com and were asked to select one RSS feed from each one of five categories (technology, business, politics, entertainment, etc.). In the high condition, participants were directly linked from their Portal homepage to Google Gadgets

Directory (http://www.google.com/ig/directory), where they could search and choose from more than 220,000 gadgets. For RSS feeds, they were allowed to use a RSS search engine (www.rsssearchhub.com) to look for any topic or any source to subscribe. The total number of gadgets and RSS feeds present on the homepage were the same in all conditions. (Apart from adding equivalence across conditions, this also helped in ensuring that the Portal's appearance would not get cluttered with several widgets and feeds, inadvertently leading to negative usability issues).

Cosmetic customization was operationalized as the affordance of tailoring the look of the website. The experimental (present) condition allowed participants to choose from six WordPress blog themes (see Figure 1 for example), whereas in the control (absent) condition, participants were unable to change from the default blue theme. A number of themes were pretested, and the six chosen ones were rated about medium in attractiveness.

User-generated content, operationalized as *Blogging* in this study, had two forms: filter blogging and active blogging. Filter blogs allowed participants to choose a news source and a message to re-disseminate with their comments or additional information. A "blog it" button appeared whenever participants moused-over an RSS feed. Clicking the button would directly add the link and the first few sentences from that feed to their blog post. They could then add their own preface before publishing the post. Active blogs, on the other hand, did not necessarily have outbound linking, but allowed participants to write about any topic of their choice. The two types of blogs differed in the extent to which participants were able to choose a topic to write about freely, and thus the degree of "sourceness" that they perceived during the practice of blogging.

Dependent Variables

In the post-test questionnaires, we measured the following variables using 9-point Likert-type scales.

Website Assessments

Participants were asked to make quick evaluations of the websites in terms of *perceived interactivity*, *perceived customization*, and *usability*.

Attitudinal and Behavioral Responses

We measured participants' *attitudes* towards each of the features on the websites as well as towards the Portal website. Attitudinal measures towards the website included questions asking participants' agreement with the following eleven descriptors: appealing, useful, positive, good, favorable, attractive, exciting, pleasant, likable, high quality, and interesting [27].

To measure *behavioral intention* towards portal, 10 questions asked about the likelihood that participants would perform the following behaviors in the future: "bookmark the website for future use", "recommend it to others", "visit it again in the future" and so on [13].

Psychological Mechanisms

Absorption was measured by self-reported level of temporal dissociation: "Time appeared to go by very quickly", "I lost track of time", and "I spent more time than I had intended" [1]. *Sense of agency* was measured using three items describing feeling of an assertive voice: "I feel that I have control over my own voice", "I feel that I am able to assert myself", and "I feel I have a distinct voice" [24]. *Sense of identity* was measured using six items such as "I feel the website reflects my personal identity", "the website is now a true representation of who I am", and "the website fits my image" [24]. *Sense of community* was measured using seven items including "this website has made me feel that I am part of a community", "this website has induced a feeling of belonging in me", and "I experience a sense of kinship when going through this site" [16]. Participants were asked to self-report *perceived competency* of managing the website as well. There were six questions which included "I think I was pretty good with handling the website", and "I am satisfied with my performance." We also asked if participants were *intrinsically motivated* to engage with the websites via 14 questions such as "I am doing it for my own good", "I am supposed to do it" (reverse-coded), and "I believe

that this activity is important for me" [10].

Interaction Measures

Log data were collected automatically to record participants' login times, browsing duration, number of gadgets added/deleted, etc. One of the behavioral measures that could reflect their engagement with the websites and other "users" was the *number of comments*, which was a sum of the *number of comments* that they posted on others' blog entries and the *number of answers* that they posted on the Q&A discussion board. The number of blogposts created by each user could not be included in our user-engagement metric since our study instruction required the participants to create at least one blogpost each day. It is important to note here that the "other users" in the study were not other participants in the sample. Instead, a team of researchers posed as other users of the Portal. They followed a predetermined experimental protocol to manage the blogging tasks and instructions to sustain the blogging manipulation in the study.

Control Variables

Power usage was measured by participants' perceived capability in managing technologies in general. Twelve questions were asked, including "I think most of the technological gadgets are complicated to use", and "I have to have the latest available upgrades of the technological devices that I use" [20]. *Previous experience* with Portal-like websites and blog sites were measured. 23% of our participants had used iGoogle services before the study, and 17% had blog accounts with services like Blogspot or WordPress. We also measured how *agentic* people felt that they normally were in their everyday conduct. The following three items were used: "I get to make my own decisions in my life", "I feel in control when I work", and "I am competent in my own field."

RESULTS

A 3 (Functional customization: no vs. low vs. high) x 2 (Cosmetic customization: absent vs. present) x 2 (Blogging: active vs. filter) repeated measures analysis of covariance (ANCOVA) was conducted, with power usage, individualism, sense of agency in life, previous usage of iGoogle and blogs, age and gender of the participants entered as covariates, and the time of questionnaire administration (Week 1 or Week 2) as the repeated factor.

Effects on Perceived Customization and Interactivity

For perceived customization and perceived interactivity, the score was averaged across the two weeks.

*Perceived customization***:** Both low functional customization (M = 5.79) and high functional customization (M = 5.66) were rated higher than the control condition (M = 4.76), F (2, 136) = 3.44, $p < .05$, $\eta^2 = .16$. Cosmetic customization elicited higher ratings of perceived customization (M = 5.72) than the control condition (M = 5.09) at a marginally significant level, F (1, 136) = 3.42, $p = .06$, $\eta^2 = .16$.

Perceived interactivity: Participants in the high functional customization condition scored higher on perceived interactivity (M = 6.61) than those in control condition (M = 5.41), with participants in the low level of functional customization condition scoring in the middle (M = 6.30), F (2, 136) = 5.16, $p < .01$, $\eta^2 = .21$. Participants in the active blogging condition (M = 6.49) scored higher on perceived interactivity than their counterparts in the filter blogging condition (M = 5.72), F (1, 136) = 6.10, $p = .05$, $\eta^2 = .21$.

Effects on Sense of Identity, Agency, and Community

H1a and H2a (Sense of identity): Participants reported higher sense of identity under low functional customization (M = 3.47, SE = .56) than high functional customization (M = 3.30, SE = .50) or control conditions (M = 2.46, SE = .56) across two weeks, F (2, 120) = 3.62, $p < .05$, $\eta^2 = .24$. Tukey's HSD post hoc test showed that the difference between low and control conditions was significant at $p < .05$. Neither the

cosmetic customization feature nor the blogging type showed any effects on identity.

H3a (Sense of community): As predicted by H3a, the participants who were involved in active blogging reported greater sense of community ($M = 2.72$, $SE = .50$) than those involved in filter blogging ($M = 2.05$, $SE = .53$) across two weeks, F (1, 120) = 4.53, $p < .05$, $\eta^2 = .25$. Interestingly, functional customization also influenced the sense of community such that low level of functional customization imbued greater sense of community in users ($M = 2.90$, $SE = .56$) compared to the high level of the feature ($M = 2.45$, $SE = .50$) and the control condition ($M = 1.79$, $SE = .56$). Low and control conditions were significantly different.

H1b, H2b, and H3b (Sense of Agency): As shown in Figure 2, there was a significant three-way interaction between all three types of source interactivity. Low level of functional customization elicited higher sense of agency than other conditions when it was combined with both cosmetic customization and active blogging features ($M = 7.95$, $SE = .63$) (right side), but created less sense of agency than others when there was only active blogging but no cosmetic customization available ($M = 6.93$, $SE = .63$) (left side), F (2, 120) = 3.28, $p < .05$, $\eta^2 = .25$.

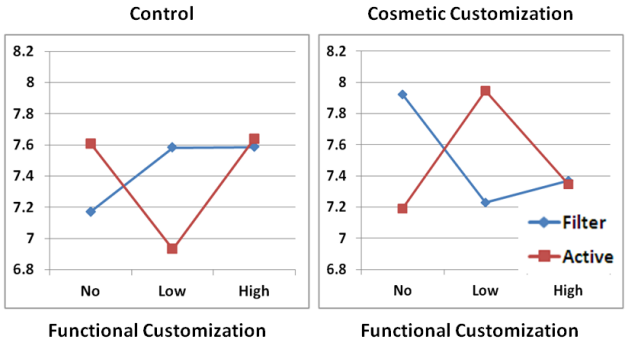

Figure 2. Three-way interaction effect on sense of agency

H1c, H2c, and H3c (Attitude towards the portal): Participants who used cosmetic customization reported more positive attitudes towards the site ($M = 4.77$, $SE = .50$) than those in the control condition ($M = 3.98$, $SE = .48$) across the two weeks, F (1, 120) = 6.74, $p < .05$, $\eta^2 = .24$. Likewise, participants who did active blogging showed more positive attitudes ($M = 4.67$, $SE = .47$) than those who did filter blogging ($M = 4.08$, $SE = .50$), F (1, 120) = 4.09, $p < .05$. Functional customization did not significantly influence participants' attitudes towards the portal.

RQ1 (Usability): Active blogging ($M = 5.89$, $SE = .39$) was found to be more usable than filter blogging ($M = 5.34$, $SE = .41$) across two weeks, F (1, 120) = 5.14, $p < .05$, $\eta^2 = .20$. No effects were found for either type of customization.

RQ2 (Perceived competency): Participants who did active blogging reported feeling more competent to use the portal website ($M = 6.46$, $SE = .44$) than those who did filter blogging ($M = 5.77$, $SE = .46$), F (1, 120) = 6.32, $p < .05$, $\eta^2 = .22$. Other source interactivity features did not significantly influence the level of perceived competency.

RQ3 (Intrinsic motivation to use the portal): Participants in the active blogging condition were more intrinsically motivated to use the portal website ($M = 5.31$, $SE = .47$) than those in the filter blogging condition ($M = 4.65$, $SE = .50$), F (1, 120) = 4.87, $p < .05$, $\eta^2 = .19$. In addition, a significant time-by-condition effect, F (1, 120) = 4.31, $p < .05$, showed that participants without cosmetic customization were less intrinsically motivated to use the portal site in Week 2 ($M = 4.36$) than in Week 1 ($M = 5.10$), with no difference for those given cosmetic customization.

RQ4 (Behavioral intention to use the portal): A significant two-way interaction between functional customization and the type of blogging activity was found, F (2, 120) = 6.46, $p < .01$, $\eta^2 = .26$ (Figure 3). When

participants did active blogging, the higher the level of functional customization, the higher their behavioral intention to use the portal site. In contrast, there was a curvilinear effect of functional customization for filter blogging.

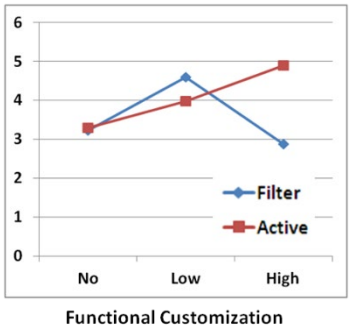

Figure 3. Two-way interaction effect on behavioral intention

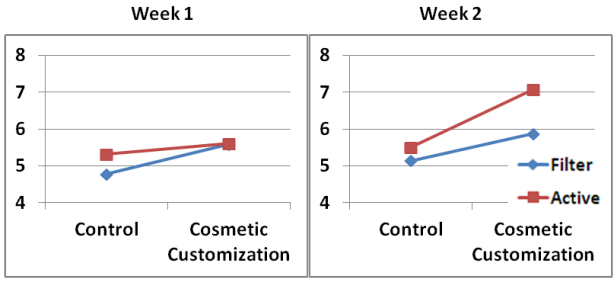

Figure 4. Time-by-cosmetic-by-blogging interaction effect on absorption

RQ5 (Absorption): Two significant three-way interactions emerged: time-by-cosmetic-by-blogging (Figure 4), and time-by-functional-by-blogging (Figure 5). As shown in Figure 4, participants reported being more absorbed in Week 2 (M = 7.08, SE = .60) than Week 1 (M = 5.61, SE = .65) when they had both cosmetic customization and active blogging, with other conditions remaining almost the same over two weeks, F (1, 120) = 4.77, $p < .05$, $\eta^2 = .21$. Also, they reported being less absorbed when they had the highest level of functional customization but only had filter blogging in their portal sites in Week 1, compared to other conditions (left side of Figure 5). In Week 2, active blogging increased the level of absorption for those who had the medium level of functional customization (right side of Figure 5), F (2, 120) = 3.86, $p < .05$.

RQ6 (Number of comments): A significant two-way interaction between cosmetic customization and blogging, F (1, 120) = 4.69, $p < .05$, $\eta^2 = .14$, revealed that while participants in the cosmetic customization condition commented more when they were asked to do filter blogging whereas their counterparts in the non-cosmetic control condition commented more when they were asked to do active blogging (Figure 6).

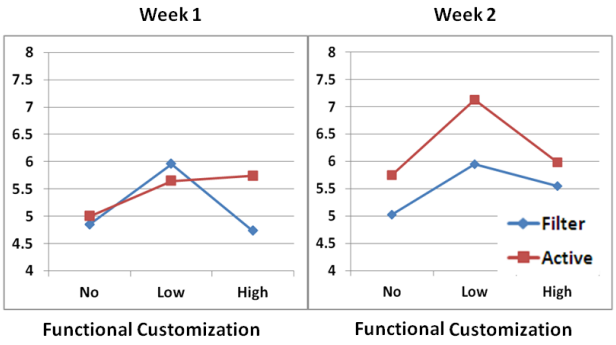

Figure 5. Time-by-functional-by-blogging interaction effect on absorption

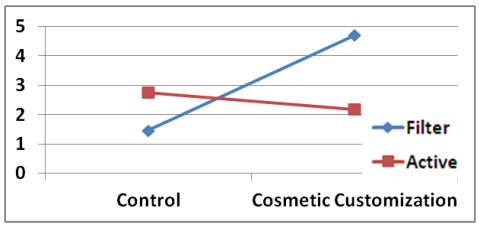

Figure 6. Two-way interaction effect on the number of comments

SUMMARY & DISCUSSION

The primary objective of the study is to understand the individual and cumulative effects of different forms of source interactivity on user engagement and experience. Our results show that self-expression in the form of making cosmetic changes to the interface and engaging in active, rather than filter, blogging resulted in several favorable outcomes. Functional customization, however, was preferred in moderation. These findings are qualified by several interaction effects between the three source-interactivity affordances, some over time.

Active blogging and cosmetic customization sustain user-engagement

At the end of two weeks, active blogging was more likely to sustain users' level of absorption than filter blogging, especially when it was combined with cosmetic customization or a modicum of functional customization. Therefore, one way to engage users over time is to provide options for creating personal content along with options for customization, but with a moderate number of choices. When users made use of colored themes and patterns to customize their Portal cosmetically, their intrinsic motivation sustained over the entire duration of the study. In contrast, the intrinsic motivation of those without the Change Theme option decreased over time. Although the study site offered only six options of customizable themes to choose from, even this small pool was effective in keeping the users motivated and engaged. The "sleeper effect" [17] for cosmetic customization suggests that allowing users to express their aesthetic taste can sustain their interest even after the novelty wears off. The implication for interface designers is obvious—include cosmetic customization options whenever possible. In addition, our study showed that the combination of active blogging and cosmetic customization was most powerful in sustaining user absorption over two weeks (Fig. 4), with a larger effect size. Therefore, designers may want to combine active blogging with customizable options.

Effortful customization could result in decision fatigue that could be combated with active self-expression

The relative difficulty of filter blogging was found to be detrimental when combined with unlimited choices

of gadgets and feeds, i.e., high functional customization. This reduced usability of filter blogging manifested itself in the form of lower behavioral intentions (Fig. 3). On the positive side, active blogging appears to enhance the appetite for performing effortful functional customization. Allowing free self-expression appears to energize users to engage in effortful customization activities related to task. Filter blogging, on the other hand, peaked at low level of functional customization, thereby suggesting that interface features that call for selection and filtering have a threshold, crossing which may mean losing repeat visitors to the site. Theoretically, this implies greater need for decision-making—and hence "decision fatigue" [31]—during the course of filter blogging, and should therefore be avoided on interfaces that call for other forms of effortful decision-making, particularly given the effect size of this interaction.

Cosmetic customization could stimulate user participation, in lieu of active self-expression

The higher number of comments (in the form of replies to others' blog posts) generated by users in the filter blogging condition shows that users' need for self-expression is so strong that it drives them to produce more comments when they are deprived of one type of source interactivity (i.e., no scope for active blogging) while given the other (cosmetic customization)—a decent-sized effect considering all the noise factors of a field experiment. Hence, designing community-oriented websites is not always a matter of adding countless options for communicating with others; rather, the key is to ensure that users do not expend all their self-expression by active blogging and instead reserve some of it for more social forms of self-expression as well, such as commenting. As our findings suggest, offering some customization options in the interface, without providing blog-like features for content generation, can stimulate other types of participation in community forums on the site, such as commenting and replying to other users. This role of cosmetic customization as a stimulant of user participation can be effectively leveraged by designers of online communities.

Customizing from a convenient choice-set encourages sense of community

Our study revealed an interesting behavioral pattern with respect to functional customization and users' choice-set behaviors. We found that a pre-selected, shorter set of choices is likely to be better for users than an exhaustive list that displays a vast array of choices. This echoes other findings in studies of human choice behavior [15]. In our study, users in the high functional customization condition, who were given an unlimited choice-set for adding gadgets and feeds, did not appreciate the opportunity, even though they rated it as highly interactive. In terms of overall user experience, the optimal level of functional customization was the low level, which fostered greater sense of community than both high and control conditions. Thus, another way to build sites that evoke a sense of community (apart from active blogging) is by providing cues that give users an impression of selecting and choosing from a shared, predetermined list of gadgets and content, ideally with ratings and other cues about quality. In practice, several sites and services employ such cues, in the form of Most Emailed News Stories, Critics' Top Movie Picks, and so on.

Non-linear combinations of source-interactivity features are needed to build a sense of agency

Participants' sense of agency was at its highest when optimal levels of all three forms of source interactivity were present together: low, rather than high, level of functional customization (i.e. limited number of choices), presence, rather than absence, of cosmetic customization, and active, rather than filter, blogging. Removing cosmetic customization from this combination of source-interactivity features was particularly detrimental to users' sense of agency. In general, users can be made to feel like active agents of action by offering different forms of source interactivity features that complement each other and contribute to their self-expression needs. In fact, the 3-way interaction with sense of agency reveals that different combinations of the three forms of source interactivity can affect user experience in different ways. For example, active blogging leads to higher sense of agency when accompanied by both cosmetic customization and (some amount of) functional customization or neither, compared to the presence of one or the other. In addition, a high level of functional customization does serve to make the user feel more agentic, but only in the absence of cosmetic customization. These findings suggest carryover as well as threshold effects among the different forms of source interactivity, which provide ready guidelines to designers who will now have to worry about how

certain combinations of source-interactivity features may be more empowering than others. It means that they will need to think about self-expression tools on the interface in terms of toggle effects rather than as a cumulative affordance leading linearly to positive outcomes.

Power of active blogging substantiates the source interactivity continuum

Active blogging was rated as more interactive than filter, verifying our continuum of source interactivity—when the user is able to actually generate new content, they perceive a higher level of interactivity in the interface than when they are simply filtering, bookmarking or forwarding existing content. What's more, they found the relatively simpler affordance (often just a text field with a Publish button) more empowering. Even though the task of coming up with one's own topic to write about and actually composing something to say may seem onerous, our participants rated active blogging as higher in usability compared to the convenience of simply pressing the Blog It button that often appears next to already published articles. These users also had a higher sense of community, were more intrinsically motivated to use the site and had more positive attitudes towards it. The active-blogging feature alone was quite powerful enough in creating a sense of community ($\eta^2 = .25$), whereas evoking a sense of agency of similar effect size required all three source-interactivity features to operate in tandem. An obvious design implication is that simple text-field options, whereby users can write and publish online, can go a long way in enhancing the quality of UX, particularly for building community, as evidenced by the dramatic popularity of Twitter and the Status Update function in Facebook. From a psychological point of view, the height of customization appears to be when users can generate their own content, thus extending the scope of the agency model [25]. Under the model, if making active choices and decisions via functional customization contributes to a sense of control, cosmetic customization and active blogging provide a heightened sense of identity. Thus, self-expression achieved either via asserting one's identity or via more active control of functional choices allows for a creation of sense of agency that is key in explaining source-interactivity outcomes. For designers of customizable interfaces, this means an emphasis on letting the user be the source of new content rather than simply a selector of preset options.

CONCLUSION

Even though our two-week long user study provided perceptual verification of the source-interactivity continuum, the effects of each of the three components were anything but straightforward when considered together in one interface. While the affordance of active blogging appears to gratify the need for self expression, and cosmetic customization serves to maintain user interest in the interface, filter blogging provides lesser self-expression by comparison, and like functional customization, seems to require greater decision-making, resulting in a reduction of perceived agency. Therefore, more is not necessarily better for these affordances, and designers will need to find an optimal level. The challenge is to provide sufficient opportunities for expression without undermining user control. In conclusion, conceptualizing interactivity in terms of making users the source of communication offers designers an opportunity to devise interface tools specifically geared toward self expression, and thereby influence a number of psychological outcomes that are novel in UX studies, such as perceptions of agency, identity, community and engagement, with important implications for their attitudes toward the interface, intrinsic motivation to use it and intention to reuse it.

ACKNOWLEDGEMENTS

This research is supported by the U. S. National Science Foundation (NSF) via Standard Grant No. IIS-0916944 and by the Korea Science and Engineering Foundation under the WCU (World Class University) program funded through the Ministry of Education, Science and Technology, S. Korea (Grant No. R31-2008-000-10062-0). We thank NSF REU awardees, Ann Sciandra and Ashley Gabel, for their assistance.

REFERENCES

1. Agarwal, R. and Karahanna, E. Time flies when you're having fun: Cognitive absorption and beliefs about information technology usage. *MIS Quarterly 24*, 4 (2000), 665-694.
2. Baghaei, N., Kimani, S., Freyne, J., Brindal, E., Berkovsky, S. and Smith, G. Engaging families in lifestyle changes through social networking. *International Journal of Human-Computer Interaction 27*, 10 (2011), 971-990.
3. Bailey, R.W., and Bolls, P. How avatar customizability affects children's arousal and subjective presence during junk food-sponsored online video games. *CyberPsychology & Behavior 12*, 3 (2009), 277-283.
4. Baker, J.R. and Moore, S.M. Blogging as a social tool: A psychosocial examination of the effects of blogging. *CyberPsychology & Behavior 11,* 6 (2008), 747-749.
5. Busselle, R. and Bilandzic, H. Fictionality and perceived realism in experiencing stories: A model of narrative comprehension and engagement. *Communication Theory 18*, 2 (2008), 255-280.
6. Cheng, R., and Vassileva, J. User motivation and persuasion strategy for peer-to-peer communities. In *Proc. HICSS'38* (2005), Hawaii, USA, 193-202.
7. Csikszentmihalyi, M. *Flow: The psychology of optimal experience*. New York: Harper and Row, 1990.
8. Firpo, D., Kasemvilas, S., Ractham, P. and Zhang, X. Generating a sense of community in a graduate educational setting through persuasive technology. In *Proc. Persuasive Technology*, ACM Press (2009), Article 41.
9. Flemming, M.A. and Petty, R.E. Identity and persuasion: An elaboration likelihood approach. In M. A. Hogg & D. J. Terry (Eds.), *Attitude, behavior, and social context: The role of norms and group membership*. Mahawah, NJ: Erlbaum, 2000.
10. Guay, F., Vallerand, R.J., and Blanchard, C. On the assessment of situational intrinsic and extrinsic motivation: The situational motivation scale. *Motivation and emotion 24,* 3 (2000), 175-213.
11. Hassenzahl, M. and Tractinsky, N. User experience: A research agenda. *Behavior and Information Technology 25*, 2 (2006), 91-97.
12. Higgins, E.T. Value from hedonic experience and engagement. *Psychological Review 113,* 3 (2006), 439– 460.
13. Hu, Y. and Sundar, S.S. Effects of online health sources on credibility and behavioral intentions. *Communication Research 37*, 1 (2010), 105-132.
14. Huang, C., Shen, Y-Z., Lin, H-X. and Chang, S-S. Bloggers' motivations and behaviors: A model. *Journal of Advertising Research 47*, 4 (2007), 472-484.
15. Iyengar, S. and Lepper, M. When choice is demotivating: Can one desire too much of a good thing? *Journal of Personality and Social Psychology 79* (2000), 995–1006.
16. Kalyanaraman, S. and Sundar, S.S. The psychological appeal of personalized content in Web portals: Does customization affect attitudes and behavior? *Journal of Communication 56* (2006), 110–132.
17. Kumkale, G.T. and Albarracin, D. The sleeper effect in persuasion: A meta-analytic review. *Psychological Bulletin 130* (2004), 143-172.
18. Marathe, S.S. and Sundar, S.S. The 'me' revolution in mediated communication: Investigating the psychology of cosmetic and functional customization. In *Proc. International Communication Association*, 2011.
19. Marathe, S.S. and Sundar, S.S. What drives customization? Control or identity? In *Proc. CHI 2011*, ACM Press (2011), 781-790.

20. Marathe, S.S., Sundar, S.S., Bijvank, M.N., et al. Who are these power users anyway? Building a psychological profile. In *Proc. International Communication Association*, 2007.

21. O'Brien, H.L., Toms, E.G., Kelloway, E.K. and Kelley, E. Developing and evaluating a reliable measure of user engagement. In *Proc. American Society for Information Science and Technology*, 2008.

22. Petty, R.E. and Cacioppo, J.T. Involvement and persuasion: Tradition versus integration. *Psychological Bulletin 107* (1990), 367-374.

23. Rivera, D. The effect of content customization on learnability and perceived workload. In *Proc. CHI '05 extended abstracts on Human factors in computing systems*, ACM Press (2005), 1749–1752.

24. Stavrositu, C., and Sundar, S.S. (2008). Can blogs empower women? Designing agency-enhancing and community-building interfaces. In *Proc. Ext. Abstracts CHI 2008*, ACM Press (2008), 2781-2786.

25. Sundar, S.S. Self as source: Agency and customization in interactive media. In E. Konijn, S. Utz, M. Tanis, and S. Barnes (Eds.), *Mediated interpersonal communication* (pp. 58-74). New York: Routledge, 2008.

26. Sundar, S.S. Social psychology of interactivity in human-website interaction. In A. N. Joinson, K.Y.A. McKenna, T. Postmes, and U-D. Reips (Eds.). *The Oxford handbook of Internet psychology*, (pp. 89-104). Oxford University Press Oxford, UK, 2007.

27. Sundar, S.S., Kalyanaraman, S. and Brown, J. Explicating website interactivity: Impression-formation effects in political campaign sties. *Communication Research 30* (2003), 30-59.

28. Sundar, S.S., and Marathe, S.S. Personalization versus customization: The importance of agency, privacy, and power usage. *Human Communication Research 36* (2010), 298–322.

29. Sundar, S.S., Xu, Q., and Bellur, S. Designing interactivity in media interfaces: A communications perspective. In *Proc. CHI 2010,* ACM Press (2010), 2247-2256.

30. Ulken, E. Measuring user engagement: Lessons from BusinessWeek. *Online Journalism Review.* http://www.ojr.org/ojr/people/eulken/200904/1696/.

31. Vohs, K.D., Baumeister, R.F., Schemeichel, B.J., Twenge, J.M., Nelson, N.M. and Tice, D.M. Making choices impairs subsequent self-control: A limited-resource account of decision making, self-regulation, and active initiative. *Journal of Personality and Social Psychology 94* (2008), 883-989.

32. Wei, L. Filter blogs vs. personal journals: Understanding the knowledge production gap on the Internet. *Journal of Computer-Mediated Communication 14* (2009), 532–558.

33. Winer, D. *The history of weblogs*. 2002. http://oldweblogscomblog.scripting.com/historyOfWeb logs.

34. Xiao, J., Stasko, J., and Catrambone, R. The role of choice and customization on users´ interaction with embodied conversational agents: Effects on perception and performance. In *Proc. CHI 2007*, ACM Press (2007), 1293-1302.

35. Yu, F.-Y. Scaffolding student-generated questions: Design and development of a customizable online learning system, *Computers in Human Behavior* 25, 5 (2009), 1129-1138.