EMPOWERING DIGITAL INFORMATION CONSUMERS: THE EFFECTS OF SELF-EFFICACY, OPTIMUM STIMULATION LEVEL AND PERCEIVED INTERACTIVITY ON VALUE IN USE

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INTRODUCTION

Service-dominant logic suggests that consumers are always co-creators of value, and that consumer value is determined not only at the point of purchase of a good or service, but also as the product is used or consumed. Further, consumers' own operant resources, such as their skills or motivations can help augment this value in use.

In a digital environment, interactivity provides consumers with a mechanism for customizing their view of digital information, thereby enabling value co-creation and enhancing value in use. In recent years, research suggests that consumer perceptions of interactivity are better predictors of consumer response to interactive digital environments than measures of actual, or "objective" interactivity. However, the reasons for differing perceptions of interactivity remain largely undiscovered. Addressing this gap in the literature, we propose that two operant resources available to consumers, self-efficacy (perceived skill) and optimum stimulation level (OSL, trait motivation) are critical for understanding perceptions of interactivity and thus, perceptions of the value of digital products. Specifically, we propose that self-efficacy and OSL enhance perceptions of interactivity by making consumers more willing to explore an interactive environment and take advantage of the value co-creating potential of a digital product's interactive elements.

We demonstrate the effect of self-efficacy and OSL on value in use of a digital product by assessing their impact on consumers' willingness to pay (WTP). In this way we assess the proposal that self-efficacy and OSL do not enhance WTP directly in digital environments but instead do so indirectly by enhancing perceptions of interactivity. Extending this logic, we further propose that indirect effects of self-efficacy and OSL on WTP become stronger when the actual or "objective" interactivity of a digital good is greater since the potential for these operant forces to facilitate the co-creation of value is higher.

THEORETICAL BACKGROUND

Theoretical and empirical research in consumer value co-creation suggests that consumers' operant resources, such as their skills and knowledge (Vargo & Lusch, 2004), are key drivers of consumers' willingness to try co-creating activities, such as cooking at home (Xie, Bagozzi, & Troye, 2008) or customizing a product (Franke, Keinz, & Steger, 2009). Self-efficacy, which refers to a person's belief in their ability to accomplish a task (Bandura, 1977, 1997), can be viewed as such an operant resource (Hilton, 2008; Vargo & Lusch, 2004; Xie, et al., 2008). Self-efficacy is an important driver of user adoption of technological innovations because people who believe they have the capability to use a technology successfully find it easier to use and will be more likely to adopt it (Ellen, Bearden, & Sharma, 1991; Venkatesh, 2000). In the same way, self-efficacy may enhance consumers' willingness to interact with a digital system, augmenting their perceptions of value from the system.

Optimum stimulation level can also be viewed as a form of operant resource. OSL refers to the optimal level of stimulation that a person strives to establish or maintain (Berlyne, 1960; Steenkamp & Baumgartner, 1992; Steenkamp & Burgess, 2002). Consumers with a high OSL typically exhibit higher levels of exploratory behaviors (Fiore, Lee, Kunz, & Campbell, 2001; Joachimsthaler & Lastovicka, 1984; Raju, 1980; Steenkamp & Baumgartner, 1992; Steenkamp & Burgess, 2002), and thus may be more motivated to explore a highly interactive digital environment. However, despite the effects of OSL documented in the literature, the potential for OSL as a driver of value co-creation activity has not been studied and research examining the effect of OSL in a digital environment is limited (Fiore, Lee, & Kunz, 2004).

Our main thesis is that consumer perception of interactivity mediates the effect of self-efficacy and OSL on value in use. A rich and timely context for testing this thesis is the domain of digital books, magazines, and newspapers. Information in print form is purchased on an "as is" basis. It typically needs to be consumed in a linear fashion. On the other hand, once print is converted to digital form, there is an opportunity to add elements of interactivity, such as hyperlinks, interactive menus, pop-up windows, and animation, providing consumers an opportunity to interact with and control their information consumption experience. In the service-dominant logic literature, customization is viewed as a way for consumers to create value for themselves, and has been shown to impact consumers' appraisal of value beyond simply increased preference fit (Franke, Schreier, & Kaiser, 2010; Fuchs, Prandelli, & Schreier, 2010). It has been argued that interacting with a web site or other

interactive digital medium is a form of customization because interactivity permits consumers to modify and customize their view with a facility that is not possible in more static digital environments (Liu & Shrum, 2002) and thus perceptions of interactivity may also enhance consumers' ability to create value for themselves.

While little-studied in the context of digital information products (Kirk, Chiagouris, & Gopalakrishna, 2012), interactivity in the context of web sites, advertisements, and online shopping has been shown to have a positive impact on consumer response (e.g., Liu & Shrum, 2009). Additionally, recent research suggests that consumer perceptions of interactivity are better predictors of consumer response than measures of actual, or "objective" interactivity (e.g., Liu, 2003; McMillan, Hwang, & Lee, 2003; Song & Zinkhan, 2008; Wu, 2006), and that perceived interactivity mediates the effect of objective interactivity on consumer attitude towards a website or other digital medium (Wu, 2005).

However, just because a digital medium includes interactive elements does not mean consumers will perceive it to be interactive. The complex and idiosyncratic nature of perceived interactivity suggests that understanding the role of key individual differences, such as OSL and self-efficacy, in perceptions of interactivity (Bucy & Tao, 2007; Dholakia & Zhao, 2009; Johnson, Bruner, & Kumar, 2006; Yoo, Lee, & Park, 2010; Yoon, Choi, & Sohn, 2008), would contribute not only to the literatures on co-creation of value and perceived interactivity but also to marketing practice (e.g., segmentation and targeting). We propose that while consumers high in OSL perceive greater interactivity, the effect is stronger when self-efficacy is high (vs. low).

Information is service (Watson, Pitt, Berthon, & Zinkhan, 2002), and it has been suggested that digital information products, in particular, may be better viewed as a service than as a traditional good (Kirk, et al., 2012; Lovelock & Gummesson, 2004). Willingness to Pay is a common measure of the value a consumer ascribes to a product (Franke, et al., 2009; Franke, et al., 2010; Fuchs, et al., 2010; Norton, Mochon, & Ariely, 2011), and can also be viewed as a measure of value in use (Hinterhuber, 2004).

If perceived interactivity is the mechanism that enables consumers to create value for themselves in a digital environment, it is reasonable to assume that this effect would be present in a highly interactive environment, but not necessarily in a digital environment with low levels of interactivity. Thus, we predict that objective "machine" level of interactivity moderates the impact of perceived interactivity on WTP.

RESEARCH METHODOLOGY

Design and Participants. A single-factor (low or high interactivity) between-subjects online experimental design was used, and digital textbooks were chosen as the experimental context. A total of 779 undergraduate and graduate students at a major northeastern university participated in the experiment in exchange for a chance to win a $100 gift card.

Materials. Consistent with prior research (cf. Liu & Shrum, 2009; Sohn, Ci, & Lee, 2007; Wu, 2005), two levels of interactivity were created (low and high) by manipulating the presence or absence of interactive elements. A low-interactivity textbook, comparable to what might be found on an Amazon Kindle, was described as a print textbook in digital form, with text that can be highlighted with a mouse or annotated by typing. A high-interactivity textbook was described in a similar manner, with the addition of highly interactive elements such as interactive graphics, pop-up windows, chat rooms, video, and search boxes.

Procedure. Participants received an email link directing them to the study. They were randomly assigned to either a low or high interactivity condition. After initial questions about their print textbook purchase habits, including the average price they typically paid, participants were shown one of two descriptions of a new digital textbook (Koukova et al. (2008). After reading the digital textbook description and responding to product-related questions, participants completed measures pertaining to self-efficacy, optimum stimulation level, and demographics.

Measures. Perceived interactivity was measured with a three-item, 7-point Likert-type scale adapted from Liu (2003), including a measure of each of the three theorized facets of perceived interactivity most commonly found in the literature: perceived control, two-way communication, and responsiveness (Cui, Wang, & Xu, 2010; Dholakia & Zhao, 2009; Liu, 2003; Liu & Shrum, 2009; McMillan, et al., 2003; Song & Zinkhan, 2008; Wu, 2006; Yoo, Lee, & Park, 2010; Yoon, Choi, & Sohn, 2008). Self-efficacy concerning the use of digital textbooks was measured with a three-item, 9-point Likert-type scale adapted from Ellen, Bearden, and Sharma (1991). Willingness to Pay was operationalized as the reservation price or maximum amount of money a participant is willing to pay for a given product (Folkes & Wheat, 1995; Franke, et al., 2009)

and, following prior research (Franke, et al., 2009; Fuchs, et al., 2010), was measured by soliciting the maximum price the participant would pay for the digital textbook.

RESULTS AND ANALYSIS

Reliability and Validity. Confirmatory factor analysis with maximum likelihood estimation was conducted to examine the reliability and validity of the measures. Items with low factor loadings were dropped to purify the measures (e.g., Noordhoff, Kyriakopoulos, Moorman, Pauwels, & Dellaert, 2011; Ping Jr, 2009). As a result, the two reverse-scored OSL items were dropped from the measure, consistent with previous reports of low reliability due to these items (Steenkamp & Burgess, 2002). The measurement model was adequate (CFI = .986; RMSEA = .039; NFI = .979) and the items exhibited evidence of reliability (Cronbach alpha's >.80 and composite reliabilities > .60). Average variance extracted exceeded .50 for each latent construct, providing evidence of discriminant validity (Fornell & Larcker, 1981).

OSL × Self-Efficacy Interaction. Following Ping (1995, 2003, 2007), OSL and self-efficacy were mean-centered and then a measurement model was estimated to obtain the parameters to be used to specify the loading and measurement error variance of the interaction term. A single, average indicator for the interaction term was created using the product of the average latent OSL score and the average latent self-efficacy score. A second full measurement model was then specified containing all latent variables and the OSL × self-efficacy interaction term, using the fixed loading and measurement error variance values calculated previously. The interaction term was allowed to correlate freely with all the latent variables in the model, and as expected, model fit remained good (chi square = 133.509, $df = 49$, CFI = .986; RMSEA = .036; NFI = .978).

Control Variables. Education, age, income, and gender have been shown to impact OSL and thus were included as control variables for OSL (Raju, 1980; Steenkamp & Burgess, 2002). No significant effects were found, likely due to the homogeneity of the student participants, and thus the variables were removed from further consideration. The average price participants reported paying for print textbooks was included as a control variable for WTP. Further, consistent with literature suggesting that age of the consumer affects responses to digital information products (Kirk, 2011; Kirk, et al., 2012), age was also included as a control variable.

Structural Model Assessment. The overall fit of the hypothesized model was good (chi square = 210.441, $df = 78$, CFI = .978, NFI = .966, RMSEA = .035). Additionally, the path coefficients corresponding to the proposed relationships exhibited the predicted signs and were statistically significant. First, the path from OSL to PI was positive and significant ($p < .001$), indicating that participants with higher OSL perceived greater interactivity (see Figure 1). As expected, this main effect was qualified by a significant, positive interaction with self-efficacy ($p < .001$), indicating that the effect of OSL on PI increases with greater self-efficacy. Also as expected, the path from PI to WTP was positive and significant ($p < .001$), supporting the notion that perceptions of interactivity drive perceptions of value in use, as measured by WTP, even after accounting for age and reference price as control variables (p's < .01). To assess the mediating role of perceived interactivity, we freed the direct paths from self-efficacy, OSL, and their interaction to WTP and estimated a new model. While the overall fit of this model was acceptable (chi square = 204.896, $df = 75$, CFI = .979, NFI = .967, RMSEA = .036), freeing the direct paths did not significantly improve the fit ($\Delta\chi^2(3) = 5.5$, $p > .10$). Further, while the path from the interaction of self-efficacy and OSL to PI remained significant ($p < .001$), the direct path from the interaction term to WTP was not significant ($p = .741$). This suggests that the interaction effect on WTP is fully mediated by PI. We also observed that the direct path from self-efficacy to WTP was not significant ($p = .431$) while the direct path from OSL to WTP was significant ($p = .041$).

Objective Interactivity as a Moderator. To test the effect of objective interactivity as a moderator, the data were split into two groups of high and low interactivity (as manipulated) and the mediation model was respecified, with good model fit (chi square = 308.164, $df = 150$, CFI = .974, RMSEA = .034, NFI = .952). Group-level parameter estimate differences were tested for statistical significance, and as hypothesized, the effect of perceived interactivity on WTP is significantly greater in the high-interactivity condition ($p < .01$). Specifically, perceived interactivity did not significantly effect WTP when objective interactivity was low but had a significant, positive effect (see Table 1).

DISCUSSION

Theoretical and empirical research suggests that value to consumers is generated not just in purchase, but through use of the product or service (Prahalad & Ramaswamy, 2004; Vargo & Lusch, 2004). As operant resources (Hilton, 2008; Vargo & Lusch, 2004), self-efficacy and OSL may serve as antecedents to perceived interactivity by giving digital consumers the motivation and skills to be more willing to explore an interactive environment and take advantage of the value co-creating potential of a system's interactive elements.

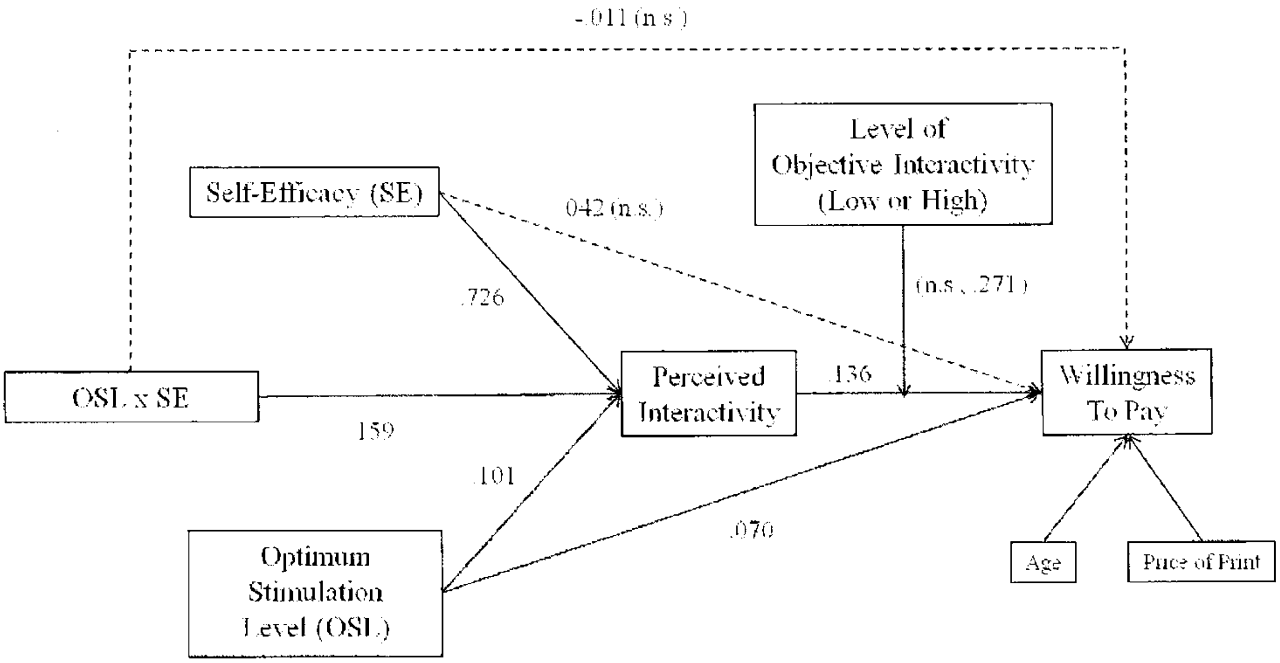
Supporting our conceptualization, the results of this study provide important new contributions to the literature on both the co-creation of value and on perceived interactivity. This study offers the first empirical evidence of the impact of personal differences of self-efficacy and OSL as antecedents to perceived interactivity along with WTP as a consequence, with perceived interactivity fully mediating the impact of self-efficacy on WTP. Results also suggest that objective levels of interactivity are an important moderator, and that it is only under conditions of high levels of interactivity that consumers have the tools available to co-create value for themselves, reflected in the ability of perceived interactivity to impact consumers' appraisal of value. This study provides empirical support of a conceptualization of self-efficacy and OSL as operant resources (Vargo & Lusch, 2004; Xie, et al., 2008) that enable consumers to maximize their own creation of value when using a digital product by enhancing their perceptions of interactivity.

Table 1: Group-Level Standardized Parameter Estimates (significant differences only)

	Low Interactivity		**High Interactivity**		
	Estimate	*P*	*Estimate*	*P*	*z-score*
WTP ← Price Print	.342	.000	.465	.000	3.297***
WTP ← PI	..015	.855	.271	.000	2.193**
WTP ← Age	-.173	.000	.004	.923	3.032***
R^2	.568		.302		

*** *p*-value < .001; ** *p*-value < .01

Figure 1: Structural Model with Standardized Path Coefficients.



References available upon request.