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## Research Note

# Investigating the Influence of the Functional Mechanisms of Online Product Presentations

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Internet-based interactive multimedia technologies enable online firms to employ a variety of formats to present and promote their products: They can use pictures, videos, and sounds to depict products, as well as give consumers the opportunity to try out products virtually. Despite the several previous endeavors that studied the effects of different product presentation formats, the functional mechanisms underlying these presentation methods have not been investigated in a comprehensive way. This paper investigates a model showing how these functional mechanisms (namely, vividness and interactivity) influence consumers' intentions to return to a website and their intentions to purchase products. A study conducted to test this model has largely confirmed our expectations: (1) both *vividness* and *interactivity* of product presentations are the primary design features that influence the efficacy of the presentations; (2) consumers' perceptions of the diagnosticity of websites, their perceptions of the compatibility between online shopping and physical shopping, and their shopping enjoyment derived from a particular online shopping experience jointly influence consumers' attitudes toward shopping at a website; and (3) both consumers' attitudes toward products and their attitudes toward shopping at a website contribute to their intentions to purchase the products displayed on the website.

*Key words*: virtual product experience; functional control; vividness; interactivity; online product presentation
*History*: Vallabh Sambamurthy, Senior Editor; Joseph Valacich, Associate Editor. This paper was received on October 4, 2005, and was with the authors $8\frac{1}{2}$ months for 3 revisions.

## 1. Introduction

This study proposes and tests a model that depicts how the functional mechanisms underlying online product presentation methods affect consumers' intentions to return to a website, and their intentions to purchase products from that website.

Providing detailed product information is essential to the success of electronic commerce (e-commerce). Generally, consumers want to access all information that might be necessary for evaluating products to make informed product choices (O'Keefe and McEachern 1998). Szymanski and Hise (2000) have found that product offerings and product information are important antecedents of consumers' satisfaction with their online shopping experience. Similarly, the amount and variety of product information are found to be key factors that influence website success, according to a series of studies that developed and validated website usability, design, and performance metrics (Palmer 2002).

Given these facts, online firms have been pursuing and developing better product presentations to improve the quality of the product information that they deliver to consumers. The current de facto standard for presenting products involves the use of textual information and static images. However, it is increasingly evident that the leanness of text and static images cannot convey rich information, such as the dynamic characteristics of products. This constraint, fortunately, might be alleviated by incorpo-

rating more multimedia features to enrich online product presentations (Raney et al. 2003). Toward this end, many commercial websites currently employ video clips to portray product features dynamically and continuously. For instance, at Mercedes-Benz's website (www.mbusa.com), online customers can watch Flash-based (Macromedia Inc.) video demonstrations that display cars in motion. By hearing sounds related to driving, the customers can "experience" the cars better by "feeling" their speed. Human narration is also employed at some websites to augment video demonstrations by explaining product details to customers. At www.mattracks.com, which sells tanklike tracks to consumers who want to convert the tires on their $4 \times 4$ vehicles, consumers can view video clips of tracks used in different road conditions while listening to narrations that explain how the tracks provide traction and mobility.

Interactive technologies can also be used to depict product information in a more "realistic" manner to enable consumers to "feel, touch, and try" products, similar to a physical shopping environment (Jiang and Benbasat 2005, Li et al. 2001, Suh and Lee 2005). For instance, at Timex's website, consumers can observe a watch's appearance by rotating it in a 3D environment and by zooming in and out of its image. They can also examine the watch's features by pressing its functional buttons and observing the watch's reactions. This type of shopping experience, which aims at simulating direct product experiences (Kempf and Smith 1998), is referred to as *virtual product experience* (VPE).

Consumers' perceptions of products and their shopping experiences vary in response to different methods of presenting product information, such as static image formats, video formats, and VPE formats. In particular, several empirical studies have investigated the extent to which different presentation formats affect consumers' product understanding, attitudes toward products, shopping enjoyment, and flow (Jiang and Benbasat 2005, Li et al. 2003, Lightner and Eastman 2002, Raney et al. 2003). Although these studies have demonstrated the different impacts of various product presentation formats, the underlying mechanisms of how product presentations influence consumer behavior have not been adequately explained.

The present study thus aims at understanding how online product presentations affect consumer behavior via their interface design characteristics. Specifically, three major issues are investigated in this study:

(1) *The major design characteristics that influence the effectiveness of product presentations*. This study characterizes product presentations by the degree to which they provide *vividness* and *interactivity*, which together are labeled *functional mechanisms* of online product presentations. The prime objective of this research is to test whether or not vividness and interactivity affect online consumers' perceptions of their shopping experience and shopping intentions, and if so, to what extent.

(2) *The factors that determine consumers' attitudes toward shopping at a website*. Anchoring on the cognitive-affective framework (Ajzen 2001), we investigate what cognitive beliefs and affective responses are influential in an online product purchasing context. In particular, we attempt to identify the factors that can influence consumers' attitudes toward shopping at a website.

(3) *The antecedents of online consumers' purchase intentions*. Most studies related to consumers' purchase behavior have assumed that purchase intentions are the direct outcome of consumers' attitudinal evaluations of products. Other studies have implied that consumers' favorable online experiences may also be important to consumers' satisfaction with shopping (Mathwick and Rigdon 2004, McKinney et al. 2002). The present study thus looks at how purchase intentions are shaped jointly by both product judgment and shopping experience.

This paper is organized as follows. Section 2 reviews the existing literature on interactivity and vividness. Section 3 develops a research model that demonstrates how product presentations affect consumer behavior through the enhancement of interactivity and vividness. Section 4 describes the research method applied in the present study, including the study's setting and data collection procedures. Section 5 reports the data analyses conducted to test the research model. The implications, contributions, and limitations of this study and directions for future research are discussed in §6.

## 2. Roles of Interactivity and Vividness

This paper addresses two functional mechanisms of online product presentations, namely, *interactivity* and *vividness* (Coyle and Thorson 2001, Steuer 1992). Interactivity is defined as "the extent to which users can participate in modifying the form or content of a mediated environment in real time" (Steuer 1992, p. 84). Vividness is "the representational richness of a mediated environment as defined by its formal features; i.e., the way in which an environment presents information to the senses" (Steuer 1992, p. 81). The two major features correspond to two independent and distinct facets of online product experience, respectively: The way in which consumers interact with products (*interactivity*) and the representational quality of how product information is conveyed to consumers (*vividness*).

### 2.1. Literature on Interactivity

A high level of interactivity in an information system provides users with autonomy in determining the material they want to examine and the pace at which they want to proceed, as well as providing synchronous feedback that permits users to carry on a two-way communication with a system (Kettanurak et al. 2001, Teo et al. 2003). Autonomy and flexibility give users a sense of control (Ariely 2000), whereas synchronous and suitable feedback provides users with prompt acknowledgement of their input. Therefore, high interactivity can instill and reinforce positive user attitudes toward a system and using the system, and it can enhance user competence and self-efficacy in gathering information (Kettanurak et al. 2001).

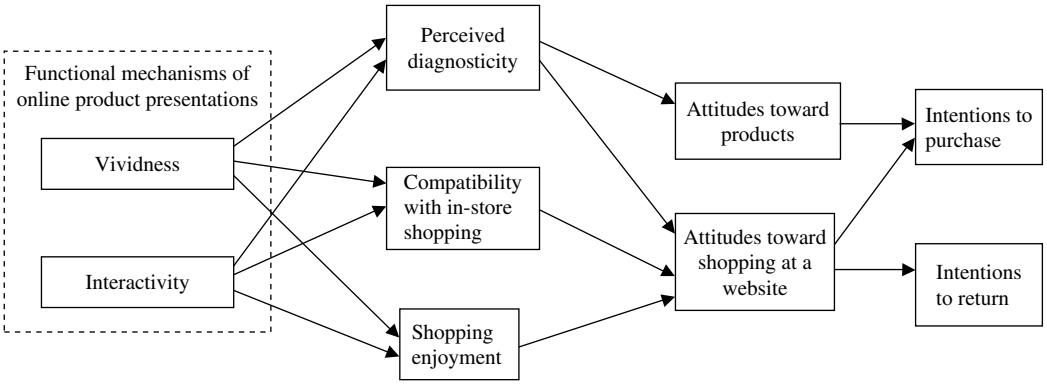
In particular, researchers have investigated interactivity exhibited in online product presentations, i.e., consumers' virtual interactions with products. Schlosser (2003) has referred to this particular type of interactivity as *object interactivity*, and she has argued that "object interactivity should not be confused with other forms of user interaction with the machine" (p. 185), because object interactivity deals directly with product features, rather than website navigation and pace control. Schlosser has also found that interactivity with virtual products can help produce mental imagery of how a product can be consumed, thus improving consumers' purchase intentions. Fiore et al. (2005) examined the effects of interactivity with products, which allowed consumers to alter and customize a product's design features, background, context, and viewing angle or distance. They found that the interactivity could enhance consumers' global attitudes toward online stores and willingness to purchase from the stores. In terms of designs that enhance interactivity, Schlosser (2003) and Jiang and Benbasat (2005) have proposed that direct manipulation can be embedded within product presentations to allow consumers to manipulate online product images, i.e., to control perspectives and distances when examining a product's appearance, or to sample a product's features by pressing its functional buttons using a mouse.

### 2.2. Literature on Vividness

Vividness is "likely to attract and hold our attention and to excite the imagination to the extent that it is (a) emotionally interesting, (b) concrete and imagery provoking, and (c) proximate in a sensory, temporal, or spatial way" (Nisbett and Ross 1980, p. 45). Kisielius and Sternthal (1984, 1986) have used the *availability-valence hypothesis* to explain the effect of vividness: *availability* is taken to refer to the ease with which presented information can be accessed from memory, whereas *valence* refers to the favorableness of information. More vivid information is more likely to engage people in cognitive elaboration, compared to the same information presented in a pallid format, because vivid information is more interesting and prompts a more thorough review and more elaborate encoding processes (Nisbett and Ross 1980). Thus, in decision making, substantially more pathways become engaged in processing vivid information, likely affecting people's attitudinal judgments, although the positive or negative natures of the judgments depend on the valence of the information.

In the context of designing online product presentations, vividness refers to the representational quality of product demonstrations. A vivid product presentation exposes consumers to more information cues about a product and stimulates more sensory channels than a pallid product presentation. Usually, multimedia is employed to create a sense of vividness of product presentations (Jiang and Benbasat 2005). Lim et al. (2000a) have correspondingly identified two unique characteristics of multimedia: rich

**Figure 1 Research Model**




language and complementary cues. Specifically, they have argued that multimedia can bring together "the symbolic and processing capabilities of various media" and thus create "a richer symbolic system of communication" (p. 118). They have also suggested that different information cues in multimedia (e.g., verbal and nonverbal cues) do not compete with each other for limited cognitive resources, but complement each other and strengthen the overall impact of the information conveyed.

## 3. The Research Model and Hypotheses

This study investigates the effects of the functional mechanisms of online product presentations that are exhibited via *interactivity* and *vividness*. Specifically, the proposed model is shown in Figure 1.

### 3.1. Effects of Interactivity and Vividness on Cognitive Beliefs

In their study of online product experience, Jiang and Benbasat (2005) have used the construct *perceived diagnosticity* to represent consumers' perceptions of the ability of a website to convey relevant product information that can assist them in understanding and evaluating the quality and performance of products sold online. Measurement of perceived diagnosticity is particularly important in the present study, inasmuch as enhancing consumers' abilities to evaluate products is a prominent goal driving design improvements in product presentations (O'Keefe and McEachern 1998).

Another construct *compatibility* is adapted from Moore and Benbasat (1991) in their study of user intentions to adopt IT innovations. Compatibility defined in this study as the extent to which consumers believe their online shopping experiences are consistent with their existing styles, habits, and past experiences in *physical* shopping environments, is included in the research model. Jarvenpaa and Todd (1996–1997) have first extended the concept of compatibility to online shopping contexts. They demonstrated that the compatibility of an online shopping experience with consumers' shopping habits and product evaluation styles in physical in-store shopping is a key factor associated with the adoption of e-commerce, particularly when online shopping experiences cannot sufficiently enable consumers to evaluate product quality. Peterson et al. (1997) have also suggested that more advanced technologies, such as 3-D technologies, are needed to provide customers with product experiences that are similar or compatible with their physical product trial experiences.

Prior research (discussed in §2.2 above) has revealed that vivid presentations can portray products more concretely and convey more information cues than pallid presentation formats, because vividness involves nonverbal language and multiple sensory channels (Lim et al. 2000a, Nisbett and Ross 1980). Therefore, the more vivid a product presentation, the richer the product information exposed to consumers. In addition, because vividness is usually associated with *salience* (Taylor and Thompson 1982), more-vivid product presentations can attract higher levels of attention from consumers than less-vivid ones

(Kisielius and Sternthal 1984, 1986), i.e., consumers are more likely to focus on examining products that are presented vividly. Therefore, because vivid product presentations can increase information richness and engage consumers in processing information, they will be likely to improve consumers' product understanding. Therefore,

Hypothesis 1. *Increased vividness in product presentations enhances perceived diagnosticity.*

Inasmuch as vividness portrays information concretely and in great detail, consumers are more likely to perceive product presentations as realistic and their online shopping experiences as more closely similar to their physical shopping experiences. The use of multimedia to simulate real products has already been supported by some empirical studies. Urban et al. (1997, 1996), for example, used multimedia-based product presentations to predict the market share of new products before the products were introduced into the market. They found that because multimedia could portray products vividly and "with a high degree of realism," it could simulate real user experiences and thus lead to more accurate market predictions. Therefore,

Hypothesis 2. *Increased vividness in product presentations enhances consumers' perceptions of the compatibility of online shopping with in-store shopping.*

Past research has indicated that interactivity benefits online product design by enabling consumers to actively acquire information in their own personalized ways, thus facilitating consumers' learning processes (Jiang and Benbasat 2005). Consumers are able to examine the information content that they wish to learn about, and they can skip the content they already know about or do not want to learn about immediately, i.e., they can match available information content to their particular needs (Ariely 2000). Furthermore, system-delivered feedback can increase consumers' attention and encourage self-regulated learning (Kettanurak et al. 2001). When consumers are examining online products, they must pay attention to how products react to their inputs both to understand the product and to properly interact with them. For example, a user may be interested in seeing what takes place when a button is pressed on a PDA's representation on the screen. Therefore, consumers are more aroused and motivated to learn when a product dynamically generates and delivers feedback to consumers, and consequently consumers are likely to form a clearer mental image of how the product works and understand the product better (Jiang and Benbasat 2005, Schlosser 2003). Therefore,

Hypothesis 3. *Increased interactivity in product presentations enhances perceived diagnosticity.*

If consumers are able to interact with an online product and its features, they are more likely to feel that the virtual experience is similar to, or compatible with, their physical product trials. Hutchins et al. (1986) have argued that in an interactive interface, "manipulating a representation can have the same effects and the same feel as manipulating the thing being represented" (p. 99). Schlosser (2003) has suggested that consumers' direct interactions with virtual products result in feelings that the interaction events are occurring in a physical world, thus blurring the boundary between virtual and physical reality.

Hypothesis 4. *Increased interactivity in product presentations enhances consumers' perceptions of the compatibility of online shopping with in-store shopping.*

### 3.2. Effects of Interactivity and Vividness on Affective Response

Prior research has suggested that consumers' feelings of *shopping enjoyment* significantly influence their behavior in physical in-store shopping experiences (Babin et al. 1994). This is particularly true in the context of a product trial, when consumers have direct sensory contact with physical products (Kempf 1999). Similarly, research in e-commerce has also revealed that consumers' shopping enjoyment is a key aspect of their online shopping experiences (Jarvenpaa and Todd 1996–1997, Koufaris 2002). For instance, Wolfinbarger and Gilly (2001) have used the construct website *playfulness* to describe the extent to which a website can lead to shopping enjoyment. They have argued that "higher playfulness associated with experiential behavior results in a more positive mood, greater shopping satisfaction, and a higher likelihood of impulse purchasing" (p. 35).

Higher vividness is often associated with more information cues and more sensory channels, and therefore it generally is more emotionally attractive

(Nisbett and Ross 1980). Miller and Marks (1997), for example, have compared three imagery-evoking strategies in radio advertising—sound effects (highest vividness), vivid verbal messages (a medium level of vividness), and instructions to imagine (lowest vividness)—and their influences on consumers' affective responses. They found that sound effects exerted greater influence in enhancing positive affective responses than did vivid verbal messages, and vivid verbal messages exerted greater influences than did mere instructions. Therefore,

Hypothesis 5. *Increased vividness in product presentations enhances consumers' shopping enjoyment.*

An interactive system is likely to provoke positive affective feelings toward the system for two reasons. First, users are able to exert their autonomy over a system, thus experiencing a sense of fulfillment. Second, users' affect is aroused by the exploratory nature of the experience as well as by the interactive and lively system stimuli (Kettanurak et al. 2001). For example, Fiore et al. (2005) observed consumers' reactions when they interacted with virtual models, i.e., selecting different clothing images, trying them on a virtual model, and seeing what they would look like if worn on this body. They found that such image interactivity significantly increased consumers' pleasure. Therefore,

Hypothesis 6. *Increased interactivity in product presentations enhances consumers' shopping enjoyment.*

### 3.3. Formation of Attitudes Toward Shopping at a Website and Return Intentions

The proposed research model adopts a cognitive-affective approach to explain the formation of consumers' *attitudes toward shopping at a website*, which refer to their overall evaluations of a shopping experience at a particular website. The cognitive-affective approach has been applied in numerous prior studies and was found to be useful in characterizing human responses in a holistic way (Bodur et al. 2000, Eagly et al. 1994, Kempf 1999). Ajzen (2001) suggests that a popular position for studying attitudes is based on the multicomponent view of attitudes, which assumes that attitudes are influenced by cognition as well as affect. This is consistent with, and probably more general than, the theory of reasoned action (Fishbein and Ajzen 1975) and Technology Acceptance Models (TAM) (Davis 1989) and United Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh et al. 2003), which focus more on people's cognitive beliefs but are comparable to extended TAM models, such as Koufaris (2002), which integrates affective aspects with the classical TAM.

In the context of online product evaluation, perceived diagnosticity represents consumers' cognitive belief that a website facilitates their product understanding (Jiang and Benbasat 2005). Higher perceived diagnosticity means that consumers are more capable of understanding products and can make more informed purchase decisions, thus more effectively accomplishing their shopping goals. Hence, consumers' favorable cognitive beliefs that a Web shopping experience is informative for them in acquiring product information will improve their attitudes toward shopping at that website. This reasoning is also consistent with prior findings that a system that improves the understandability of information would enhance users' satisfaction with the usage of that system (McKinney et al. 2002).

Hypothesis 7. *Perceived diagnosticity positively affects consumers' attitudes toward shopping at a website.*

A key concern related to current online shopping is that consumers cannot feel, touch, and try products as they are able to do in physical shopping environments (Burke 2002, Peterson et al. 1997). Hence, online consumers would prefer online shopping that allows them to experience products in the same way they engage with the products in physical shopping environments, so that they can maintain their entrenched styles and habits to evaluate online products (Jarvenpaa and Todd 1996–1997). Therefore,

Hypothesis 8. *Consumers' perceptions of the compatibility of online shopping with in-store shopping positively affect consumers' attitudes toward shopping at a website.*

Prior marketing literature has suggested that hedonic value is important and essential to consumers' online shopping experience (Mathwick and Rigdon 2004). For example, McKinney et al. (2002) have suggested that the degree to which a website is visually attractive, fun, and interesting is perceived as part of the website's system quality, which directly

affects consumer satisfaction. Similarly, Raney et al. (2003) have suggested that entertainment features that enhance shopping enjoyment improve consumers' attitudes toward shopping at a website, and consequently increase their intentions to return to the site. Therefore, the more enjoyment consumers derive from a shopping experience, the more likely that customers would prefer their online shopping experience.

Hypothesis 9. *Shopping enjoyment positively affects consumer attitudes toward shopping at a website.*

An important success factor for an e-commerce website is consumers' intentions to return to the website, representing the potential capability of the website to generate future sales (Koufaris 2002). According to the theory of reasoned action (Fishbein and Ajzen 1975), people's attitudes are among the direct determinants of their behavioral intentions. Therefore,

Hypothesis 10. *Consumers' attitudes toward shopping at a website positively affect their intentions to return to the website.*

### 3.4. Formation of Attitudes Toward Products and Purchase Intentions

The research model also contains constructs concerning products displayed online. In particular, *attitudes toward products* refer to consumers' overall evaluations of products, and *intentions to purchase* assess the likelihood that customers will complete purchases on particular websites.

If consumers believe that a product experience is more diagnostic, it is likely that their beliefs about the products will be stronger and held with more confidence (Kempf and Smith 1998). Prior research indicates that consumers' cognitive evaluations of products are positively associated with the strength of their beliefs and confidence in their own evaluations of product attributes (Smith et al. 1998, Smith 1993). It follows that if the advocated product information is *favorable*,[1] as is often the case when online firms promote their products, higher perceived diagnosticity will enable consumers to understand the positive product information more thoroughly and better, thereby improving consumers' cognitive evaluation of products, which further leads to more positive attitudes toward the products. Therefore,

Hypothesis 11. *Perceived diagnosticity influences consumers' attitudes toward products.*

We hypothesize that consumers' intentions to purchase are determined by two factors: their attitudes toward products and their attitudes toward shopping. In general, favorable attitudes toward a product lead to higher intentions to purchase the product simply because consumers can perceive the benefit of consuming the product (Fishbein and Ajzen 1975); furthermore, favorable attitudes toward shopping may be likely to engage consumers in performing the shopping behavior, which reinforces the likelihood of purchase (Heijden et al. 2003, Jarvenpaa et al. 2000). Therefore,

Hypothesis 12. *Consumers' attitudes toward products positively affect their intentions to purchase the products from a website.*

Hypothesis 13. *Consumers' attitudes toward shopping at a website positively influence their intentions to purchase the products from the website.*

## 4. Research Method

### 4.1. Study Setting

The primary objective of this paper is to conduct an investigation of the impact of vividness and interactivity on the efficacy of online product demonstrations. In practice, there is more than one specific Web interface design that can enhance interactivity and vividness. Hence, the analysis conducted in this paper does not focus on specific designs, but rather on understanding the influence of the two key constructs, vividness and interactivity, that can be implemented via different designs.

In order to increase the generalizability of the results, two products were used in the study: a sports watch (the Timex Rush) and a PDA (model Palm Pilot M515). Sports watches and PDAs are characterized by their particular functionalities or operational behaviors, and therefore are suitable for a particular type of

[1] In a pretest conducted for this study, we asked 12 participants to evaluate different functions of the watch and the PDA used in the study as objectively as they could. The results have revealed that individual evaluations of each product function and overall evaluations of each product were all positive (mean = 6.08, based on a seven-point Likert scale).

VPE technology: *functional control*, which allows consumers to sample various product functions (Jiang and Benbasat 2005).

We utilized websites that would represent the range of variance that is possible when designing sites with different levels of vividness and interactivity. Therefore, the research model was tested in a survey involving websites that used different product presentation conditions: (1) multiple static images, (2) video without narration, (3) video with narration, and (4) virtual product experiences. The four conditions are widely used in current e-commerce websites and reflect a wide range of interactivity and vividness.

The image condition represented product information through multiple static images. The video condition represented product information through continuous video demonstrations, including dynamic visual stimuli such as rotations of the products and other changes in the display, with corresponding sound effects, such as a watch's alarm, if the products were designed to emit sounds. One version of the video condition used textual information to explain product features; another version employed narration instead.

In the VPE condition, product information was represented using *functional control* (Jiang and Benbasat 2005), because it is becoming increasingly prevalent for websites to present dynamic simulations of product functions. Under this condition, users were able to try various functions of the sports watch and the PDA. For example, a user could press the buttons of the sports watch to try setting the time, or to use the stopwatch, timer, or alarm, simply by clicking on their computer mouse. The watch reacted according to users' inputs by changing its display or by emitting a sound. A user could also use her mouse as a stylus to point to different areas of the PDA screen, to add new contact addresses or appointments, to perform calculations, or to compose email messages. The PDA reacted as the real product did, i.e., it changed its screen display and emitted sounds when the "stylus" touched the screen.

These presentation methods entail varying degrees of vividness and interactivity. The two video conditions and the VPE condition are expected to have higher levels of vividness than static images, because video and VPE employ continuous visual stimuli and sound effects (Coyle and Thorson 2001). On the other hand, the video condition was expected to stimulate the same level of interactivity as the image condition, but a lower level than VPE. Despite these format differences, the four conditions presented equivalent product information content, including all product functionality information.

### 4.2. Data Collection Procedures

One hundred seventy-six subjects were recruited from a West Coast public university. Prior to the study, the subjects were informed that they would each receive $15 as a reward for their participation. They were also told that they would be consulted on their shopping experiences upon their completion of the study, and that the quality of their comments would determine a one-in-four chance for them to win a $50 bonus.

The subjects were each assigned randomly to one of the conditions: static images, video with narration, video without narration, and VPE formats, with 44 in each, and were asked to examine the products as if they were shopping and deciding whether to complete a purchase or not. Because two products were presented on the websites, the order in which the subjects examined the products was randomized, such that half of the participants examined the sports watch first, while the other half examined the PDA first. These above procedures were repeated for the two products. Appendix 1 reports the measurements used in the questionnaire.[2] All measurement items used seven-point Likert scales.

## 5. Data Analysis

### 5.1. Subject Information

The 176 subjects were recruited from 12 academic disciplines, representing very diverse backgrounds. Among the student subjects, 92 (52.3%) were female and 84 (47.7%) were male. Six were graduate students, the rest were undergraduates. The average age was 21.6, and there was no significant difference in

[2] There are no objective measurement scales for vividness and interactivity. Although we have expectations that one format will be higher on interactivity or vividness than another, the degree of such differences are manifested in subjects' perceptions of vividness and interactivity.

terms of age, Internet experience, and familiarity with online shopping across the four treatment conditions.

### 5.2. Examination of Variation of Vividness and Interactivity

Based on the responses from the 176 participants, vividness scores ranged from 1 to 7 with a mean of 4.5 and a variance of 1.2, and interactivity scores ranged from 1 to 7 with a mean of 4.1 and a variance of 2.7. Overall, the websites used were able to create an adequate amount of variation in these measures in order to test the research model adequately.

ANOVA tests were further conducted to check whether the manipulation of different levels of interactivity and vividness was successful. The results indicate that the four treatment conditions significantly affect subjects' perceptions of interactivity ($p < 0.01$) and vividness ($p < 0.01$). Post hoc multiple comparisons using the Sheffe tests indicate two levels of perceptions of interactivity (Table 1). Subjects in the static-image, video-without-narration, and video-with-narration conditions perceived a low level of interactivity, whereas those in the VPE condition perceived a high level of interactivity. Multiple comparisons also indicate two levels of perceived vividness (Table 1). Specifically, the static-image condition is associated with a low level of vividness, while the other three conditions have a high level of vividness. The manipulation checks support our previous assumption of the independence of vividness and interactivity by revealing that variation in vividness, such as that between the static-image condition and the two video conditions, does not affect interactivity, and that variation in interactivity, such as that between the two video conditions and VPE, does not affect vividness.

**Table 1 Homogeneous Subsets Based on ANOVA**

| | Vividness Subset for alpha = 0.05 | | Interactivity Subset for alpha = 0.05 | |
|---|---|---|---|---|
| Group | 1 | 2 | 1 | 2 |
| Condition 1 (multiple-static-images) | 3.20 | | 3.05 | |
| Condition 3 (video-with-narration) | | 4.75 | 3.51 | |
| Condition 2 (video-without-narration) | | 4.94 | 3.56 | |
| Condition 4 (VPE) | | 5.16 | | 6.24 |
| Sig. | 1.00 | 0.115 | 0.172 | 1.00 |

### 5.3. Model Testing

The research model was tested using *Partial Least Squares*[3] (PLS) with PLS Graph 3.0. It was first tested using data from the sports watch and then, separately, data from the PDA. Because no significant differences were found between the two sets of data in terms of the 13 hypotheses tested, data on the two products were combined to increase the sample size and the generalizability of results. The analysis described below is based on the combined data set.

**5.3.1. Measurement Model.** Assessments of measurement models should examine: (1) individual item reliability, (2) internal consistency, and (3) discriminant validity (Barclay et al. 1995). A general method for checking individual item reliability involves checking whether individual item loadings are above 0.6 or, ideally, 0.7 (Barclay et al. 1995, Chin 1998). The measurement items in the present study's model generally load heavily on their respective constructs (Table 2), with loadings above 0.7, thus demonstrating adequate reliability.

Composite reliability and Cronbach's alpha scores are reported in Table 3. Because all reliability scores are above 0.7 (Nunnally 1978), the internal consistency criteria are met.

The third step to assess the measurement model involves examining its discriminant validity. Off-diagonal elements in Table 3 represent correlations of all latent variables, whereas the diagonal elements are the square roots of the average variances extracted (AVE) of the latent variables. For adequate discriminant validity, the AVE of any latent variable should be greater than the variance shared between the latent variable and other latent variables (Barclay et al. 1995), i.e., the diagonal elements should be greater than corresponding off-diagonal ones. Data shown in Table 3 therefore satisfy this requirement.

[3] PLS is a component-based structural equation modeling technique that facilitates simultaneous tests of measurement models and structural models (Barclay et al. 1995). PLS was chosen over LISREL due to "its ability to model latent constructs under conditions of non-normality and with small to medium sample sizes" (Chin et al. 2003, p. 197).

**Table 2 Loadings and Cross-Loadings of Measures**

| | VIV | INT1 | PD | CMPT | ENJOY | AS | AP | IR | IP |
|---|---|---|---|---|---|---|---|---|---|
| VIV1 | **0.72** | 0.37 | 0.35 | 0.30 | 0.35 | 0.25 | 0.23 | 0.28 | 0.18 |
| VIV2 | **0.87** | 0.56 | 0.46 | 0.42 | 0.61 | 0.42 | 0.33 | 0.49 | 0.36 |
| VIV3 | **0.80** | 0.34 | 0.44 | 0.32 | 0.43 | 0.32 | 0.22 | 0.40 | 0.22 |
| VIV4 | **0.80** | 0.48 | 0.41 | 0.38 | 0.60 | 0.52 | 0.31 | 0.46 | 0.39 |
| INT1 | 0.59 | **0.95** | 0.46 | 0.36 | 0.54 | 0.40 | 0.29 | 0.43 | 0.33 |
| INT2 | 0.43 | **0.91** | 0.34 | 0.28 | 0.44 | 0.31 | 0.23 | 0.36 | 0.31 |
| PD1 | 0.45 | 0.43 | **0.87** | 0.50 | 0.47 | 0.48 | 0.49 | 0.57 | 0.36 |
| PD2 | 0.45 | 0.32 | **0.86** | 0.47 | 0.43 | 0.48 | 0.48 | 0.58 | 0.31 |
| PD3 | 0.42 | 0.36 | **0.82** | 0.45 | 0.41 | 0.42 | 0.35 | 0.49 | 0.30 |
| CMPT1 | 0.43 | 0.35 | 0.53 | **0.89** | 0.45 | 0.52 | 0.42 | 0.54 | 0.37 |
| CMPT2 | 0.40 | 0.32 | 0.52 | **0.91** | 0.46 | 0.54 | 0.42 | 0.53 | 0.46 |
| CMPT3 | 0.34 | 0.23 | 0.41 | **0.82** | 0.38 | 0.42 | 0.33 | 0.38 | 0.34 |
| ENJOY1 | 0.57 | 0.44 | 0.55 | 0.44 | **0.89** | 0.67 | 0.54 | 0.66 | 0.56 |
| ENJOY2 | 0.57 | 0.48 | 0.52 | 0.50 | **0.93** | 0.70 | 0.58 | 0.68 | 0.57 |
| ENJOY3 | 0.62 | 0.51 | 0.42 | 0.46 | **0.92** | 0.62 | 0.50 | 0.57 | 0.59 |
| ENJOY4 | 0.59 | 0.53 | 0.44 | 0.43 | **0.94** | 0.63 | 0.51 | 0.58 | 0.58 |
| AS1 | 0.43 | 0.35 | 0.49 | 0.54 | 0.68 | **0.95** | 0.62 | 0.67 | 0.60 |
| AS2 | 0.50 | 0.41 | 0.51 | 0.55 | 0.70 | **0.95** | 0.64 | 0.69 | 0.62 |
| AS3 | 0.42 | 0.32 | 0.54 | 0.51 | 0.61 | **0.90** | 0.55 | 0.68 | 0.58 |
| AP1 | 0.35 | 0.29 | 0.48 | 0.42 | 0.55 | 0.59 | **0.93** | 0.53 | 0.66 |
| AP2 | 0.29 | 0.25 | 0.47 | 0.40 | 0.53 | 0.58 | **0.92** | 0.54 | 0.59 |
| AP3 | 0.33 | 0.25 | 0.52 | 0.43 | 0.53 | 0.64 | **0.95** | 0.57 | 0.62 |
| IR1 | 0.45 | 0.38 | 0.56 | 0.47 | 0.64 | 0.71 | 0.56 | **0.86** | 0.60 |
| IR2 | 0.45 | 0.35 | 0.56 | 0.47 | 0.56 | 0.60 | 0.49 | **0.90** | 0.45 |
| IR3 | 0.51 | 0.43 | 0.62 | 0.55 | 0.59 | 0.63 | 0.52 | **0.92** | 0.46 |
| IP1 | 0.35 | 0.35 | 0.25 | 0.38 | 0.58 | 0.53 | 0.54 | 0.42 | **0.86** |
| IP2 | 0.30 | 0.32 | 0.35 | 0.43 | 0.53 | 0.56 | 0.59 | 0.50 | **0.88** |
| IP3 | 0.30 | 0.27 | 0.40 | 0.37 | 0.50 | 0.58 | 0.59 | 0.52 | **0.83** |
| IP4 | 0.32 | 0.23 | 0.29 | 0.34 | 0.52 | 0.52 | 0.55 | 0.50 | **0.82** |

*Notes.* VIV: Vividness; INT: Interactivity; PD: Perceived diagnosticity; CMPT: Compatibility; ENJOY: Enjoyment; AP: Attitudes toward products; AS: Attitudes toward shopping at a website; IR: Intentions to return; IP: Intentions to purchase.

Another criterion for adequate discriminant validity requires that loadings of indicators on their respective latent variables are higher than loadings of other indicators on these latent variables and the loadings of these indicators on other latent variables. The loadings and cross loadings presented in Table 2 demonstrate adequate discriminant validity.

**5.3.2. Structural Model.** Bootstrap resampling was performed on the structural model to examine path significance levels.[4] Figure 2 presents the results based on PLS analysis.

[4] Two resampling methods are available in PLS Graph 3.0: Jackknife and Bootstrap. Both methods were used in data analysis and showed no significant difference.

Overall, PLS analyses generally confirm that vividness and interactivity of product demonstrations are the driving forces of consumers' intentions to return to a particular website and their intentions to purchase products. All hypotheses are supported by data analysis. As expected, both vividness and interactivity of product demonstrations significantly enhance perceived diagnosticity, compatibility, and shopping enjoyment. Further, both the cognitive and affective responses jointly improve consumers' attitudes toward shopping at a website, which, in turn, enhances their intentions to return to the website. Perceived diagnosticity significantly affects consumers' attitudes toward products, which together with attitudes toward shopping at websites are the determinants of intentions to purchase. In terms of their relative power, the comparison of path coefficients shows that vividness exerts a stronger influence than interactivity on perceived diagnosticity (path coefficients: 0.40 versus 0.21), compatibility (path coefficients: 0.37 versus 0.14), and shopping enjoyment (path coefficients: 0.49 versus 0.26).

**5.3.3. Additional Analysis.** Because perceived diagnosticity measures consumers' understanding of products, one might be concerned about the potential effects of participants' *prior experience with products* on perceived diagnosticity, a relationship not considered in the research model. The reason for this absence is that perceived diagnosticity is defined as consumers' perceptions of the ability of a website to help them understand products, rather than consumers' product knowledge. Therefore, although participants' prior product experience (e.g., their familiarity with the products) might affect their knowledge of the products, it seems unlikely that it will affect participants' perceptions of website capability in helping consumers with product understanding. As a supplementary part of data analysis, we included participants' familiarity with products as an antecedent of perceived diagnosticity in the research model. PLS results show that the link between familiarity and perceived diagnosticity is very small (path coefficient: −0.05) and not significant.[5]

[5] We also examined, for example, whether or not consumers' familiarity with products moderates the effect of interactivity on

**Table 3 Internal Consistency and Discriminant Validity of Constructs**

| | Composite reliability | Cronbach's alpha | Vividness | Interactivity | Diagnosticity | Compatibility | Enjoyment | Attitude (shopping) | Attitude (product) | Intention return | Intention purchase |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Vividness | 0.88 | 0.81 | **0.80** | | | | | | | | |
| Interactivity | 0.93 | 0.85 | 0.56 | **0.93** | | | | | | | |
| Diagnosticity | 0.89 | 0.80 | 0.52 | 0.44 | **0.85** | | | | | | |
| Compatibility | 0.91 | 0.85 | 0.45 | 0.35 | 0.56 | **0.87** | | | | | |
| Enjoyment | 0.96 | 0.94 | 0.64 | 0.53 | 0.52 | 0.49 | **0.92** | | | | |
| Attitudes (shopping) | 0.95 | 0.93 | 0.48 | 0.39 | 0.55 | 0.57 | 0.71 | **0.93** | | | |
| Attitudes (product) | 0.95 | 0.93 | 0.35 | 0.28 | 0.53 | 0.45 | 0.58 | 0.65 | **0.93** | | |
| Intentions (return) | 0.91 | 0.87 | 0.52 | 0.43 | 0.65 | 0.56 | 0.68 | 0.73 | 0.59 | **0.89** | |
| Intentions (purchase) | 0.91 | 0.87 | 0.37 | 0.34 | 0.38 | 0.45 | 0.63 | 0.65 | 0.67 | 0.66 | **0.85** |

# 6. Concluding Comments

## 6.1. Theoretical Contributions

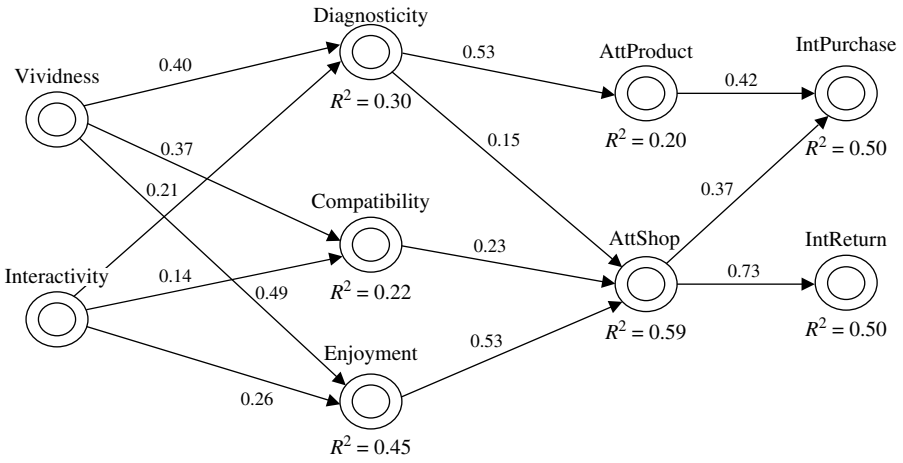
In response to the call for human-computer interaction (HCI) research (Carey et al. 2004, Zhang et al. 2002), this research provides a bridge between HCI and information systems (IS) by investigating the functional mechanisms of online product presentations. Most prior studies have evaluated product presentation methods by comparing them to other alternative interface conditions, an experimental approach that is effective for evaluating a technology as a whole, but sheds little light on the functional mechanisms of the technology, therefore providing little guidance concerning its design (Hevner et al. 2004). For example, even though prior studies have found that VPE technologies benefit consumers, they either do not identify what constitute the key design aspects of online product presentations (Li et al. 2002, 2003; Suh and Lee 2005) or do not explicate how each design aspect works and what the relative contributions of different design aspects are (Jiang and Benbasat 2005), although researchers and designers generally want to understand *how a technology works* over and above its outright effects (Hevner et al. 2004).

This study makes contributions to IS research by clearly separating the two aspects of online product presentation design: interactivity—i.e., the way in which consumers interact with products—and vividness—i.e., the representational richness of products' reaction to consumer input. Both interactivity and vividness are essential to any online product presentation technologies, such as videos and VPE technologies. Therefore, in this study we are not investigating any specific technologies as prior studies did (e.g., Jiang and Benbasat 2005, Suh and Lee 2005), but focusing on the common design factors underlying generic online product presentation technologies. This is similar to having different types of specific communication media technologies, such as e-mail, voice, video conferencing, etc., that can be characterized by different levels of *media richness* dimensions, such as *feedback*, which characterizes the responsiveness of a two-way interaction, and *cue multiplicity*, which represents the number of different ways in which the same information is communicated (Daft and Lengel 1986, Daft et al. 1987). Whereas product presentation methods (e.g., functional control, which, in the case of a watch, allows one to simulate how its alarm is set and sounds) is parallel to the communication technologies utilized (e.g., e-mail), interactivity and vividness are parallel to feedback and cue multiplicity, respectively. In fact, many studies have investigated feedback and cue multiplicity concurrently (Dennis and Kinney 1998, Kahai and Cooper 2003), which provides further evidence that the perspective used in the present study is valid and justifiable.

Furthermore, this study has proposed and tested a structural model that depicts how an online product presentation format exerts its influence on consumers and therefore is able to assess the *relative* effects of vividness and interactivity. In particular, the comparison of path coefficients of the PLS model reveals

perceived diagnosticity using partial correlation analysis. Results show that interactivity is significantly correlated with perceived diagnosticity when familiarity is controlled, whereas familiarity is not significantly correlated with perceived diagnosticity when interactivity is controlled. This suggests that familiarity does not play a role in the relationship between interactivity and perceived diagnosticity.

**Figure 2 PLS Test of the Research Model**




*Note.* All path coefficients are significant ($p < 0.05$).

that vividness is more than twice as effective as interactivity: in improving consumers' understanding of products (i.e., perceived diagnosticity), in enhancing consumers' beliefs that their virtual experiences are compatible with their physical shopping behavior (compatibility), and in improving their shopping enjoyment. Therefore, these findings not only shed light on the comparison of the effectiveness of interactivity and vividness toward a better understanding of products displayed online, but also offer insights to designers and reveal the trade-offs they can apply (see §6.2 for details).

Also, compared to previous studies that focus only on particular technologies (Jiang and Benbasat 2005, Suh and Lee 2005), this study investigates vividness and interactivity as affected by a range of product presentation methods, including static images, video-with-narration, video-without-narration, and functional control. In particular, the use of the two video presentation conditions, which have generally been overlooked by prior studies, is expected to enhance the representativeness of the vividness of online product presentation methods and increase the generalizability of findings.

Although prior research has suggested that vividness and interactivity are two determinants of telepresence (Steuer 1992), telepresence was not incorporated in the research model. This is because telepresence describes the feeling of "being there" in a virtual environment (Steuer 1992). Because this study deals with the understanding of individual products, rather than an environment (e.g., a shopping mall), the feeling of "being there" is deemed to be of comparatively less relevance. In contrast, compatibility, rooted in technology adoption literature (Moore and Benbasat 1991) and adapted to the context of online shopping (Jarvenpaa and Todd 1996–1997), represents people's perceptions of the extent to which a product experience is similar to or consistent with their *physical product experience*; hence, it can be considered a surrogate for telepresence in the current research context.

In addition, the findings of the present study lend substantial support to the cognitive-affective model (Babin et al. 1994; Eroglu et al. 2001, 2003). Specifically, two cognitive beliefs—namely, perceived diagnosticity and compatibility—are identified as antecedents of attitudes toward shopping at a website in the context of online product demonstrations. If consumers believe that a particular website can help them understand and evaluate products, and if they believe shopping on the website is congruent with their existing styles, habits, or experiences in physical shopping, then they will form more positive attitudes toward shopping at the website. The results also support the hypothesis that shopping enjoyment contributes significantly to consumers' attitudes toward shopping. In fact, path coefficients in PLS reveal that, compared to perceived diagnosticity (path coefficient = 0.16) and compatibility (path coefficient = 0.21), shopping

enjoyment exhibits significantly stronger influence (path coefficients = 0.55). This finding further justifies that enhancing consumers' affective reactions should be targeted as an important consideration in e-commerce website design (McKinney et al. 2002).

Supporting previous findings that consumers' attitudes toward products positively affect their intentions to make a purchase, this study has also found that consumers' purchase intentions are shaped by their attitudes toward shopping at a website. This finding not only confirms that experience is an essential and critical component of online shopping (Mathwick and Rigdon 2004), but suggests that consumers may form different purchase intentions simply because they like or dislike shopping at a website. Therefore, it is possible that consumers may likely purchase from a website that provides an attractive shopping experience; or, consumers may not want to buy a product because they dislike the shopping experience at a website even though the product itself is perceived to be good.

### 6.2. Practical Contributions

The relative effects of interactivity and vividness have significant implications for designing online product demonstrations. Because increasing the vividness of product presentations—e.g., by adding video, audio, or image animation—is more effective than increasing the interactivity of the presentations—e.g., by implementing direct manipulation features—it appears that Web designers, under constraints of limited resources, should focus more on enhancing vividness design than on interactivity design. In fact, actual decisions about the assignment of design resources should also involve the consideration of the resources and efforts required to design vividness and interactivity. In the current technological environment, designs of vividness are generally better supported and require less effort than designs of interactivity. For example, many current Web development tools, such as Macromedia's Flash and Apple's QuickTime, simplify the design of Web applications by enabling designers to easily create vivid and rich media, including animation, MP3 audio, and high-quality videos. In contrast, these tools offer relatively limited support for interactivity design. For example, although they enable designers to insert standard interactivity on a graphic interface with relative ease, for example, by providing tools to display new contents or to control video and sound, designers must write application scripts on their own if they desire special interactivity with online products because users' interactions with online product demonstrations are disparately heterogeneous across different products.

Overall, because vividness is more effective than interactivity and vividness design is relatively easier than interactivity design, we recommend a focus on vividness, rather than on interactivity, in designing online product demonstrations. This recommendation is especially relevant when online firms have tight software design and development budgets. In this case, video-based product demonstrations may be an easier and more cost-effective choice than VPE. The priority on vividness design also helps explain the status of current e-commerce websites that have high-vividness and high-interactivity product demonstrations (i.e., VPE) and high-vividness/low-interactivity ones (e.g., video), but lack low-vividness/high-interactivity product demonstrations.

Our recommendation that Web designers, in general, should focus more on vividness than on interactivity should be applied with caution, because it does not imply, in any sense, that interactivity design is not important. Evidently, the path coefficient calculated in PLS analysis suggests that interactivity has a significant effect on shopping enjoyment and perceived diagnosticity. Therefore, upon improving presentation vividness, designers are encouraged to enhance the interactivity of product demonstrations, i.e., to develop VPE applications. However, an optimal level of interactivity may depend on the need and complexity of specific product demonstrations. It would be up to designers, case by case, to decide whether the benefits obtained through enhanced interactivity are worth the additional design efforts.

### 6.3. Limitations

This study investigates the influence of the functional mechanisms of online product presentations that are exhibited via vividness and interactivity. The structural research model was tested by surveying users' responses toward four product presentation conditions with progressive increases in vividness and interactivity. The use of a survey method in a laboratory environment to test a structural model is not

uncommon, because controlled experimental settings can minimize the effects of other confounding factors (see Mackenzie and Spreng 1992, Wang and Benbasat 2005, Lim et al. 2000b, McKinney et al. 2002, Kempf and Smith 1998, for example). However, because the study did not adopt a full-factorial design (i.e., it did not have the "high vividness and low interactivity" condition[6]), the applicability of results is limited because the exogenous variables measured did not include the effects due to this condition.

There are two major reasons why this study does not isolate and manipulate vividness and interactivity as separate factors. Firstly, in practice, there lacks a condition of high interactivity and low vividness (e.g., it is rare and, in fact, quite artificial for a consumer to interact with a PDA whose dynamic behavior can only be exhibited through static pictures). Therefore, due to the concern of generalizability of findings, which is critical to a survey-based study, we decide not to have an artificial high vividness and low interactivity condition in the survey. Secondly, because the objective of this paper is to investigate the effects of the variations in interactivity and vividness on those modeled variables, our empirical method would be effective as long as sufficient variations of interactivity and vividness could be generated by the empirical approach utilized (which is evident in our findings). That is, we are interested in changes in consumer behavior corresponding to the variation of interactivity and vividness that are generated as an outcome of the product presentation interfaces available, but not interested in the differences between experimentally defined specific low and high interactivity (or vividness) treatment conditions.

Our results support that both interactivity and vividness exhibit significant effects on consumer behavior. In general, our assumption is that interactivity is moderately and appropriately applied to designing online product presentations. In other words, if it is abused or overused in design, its effects may be negative. For example, too much interactivity may create a cognitive load on consumers during their sampling of product functions, thus unfavorably affecting their shopping experiences.[7] Hence, the conclusion of this study should be viewed with caution.

The findings of this study are expected to be generalized to online presentations for *experience products* that cannot be fully evaluated without directly feeling, touching, and trying the products (Nelson 1974). For such products, high levels of interactivity and vividness are desired in order to portray detailed product information (Jiang and Benbasat 2005). In contrast, for *search products* that can be evaluated through secondhand sources, such as advertising, catalogs, and verbal descriptions (Nelson 1974), static images and text are generally sufficient to present product information (Peterson et al. 1997). Furthermore, within the scope of experience products, the findings are best applied to products with functionality features. This is because the products chosen in our study (i.e., a sports watch and a PDA) have various functions as their main features, and consequently they were demonstrated by functional control, a particular type of VPE technology. Therefore, it is possible that the relative importance of interactivity and vividness may change for other types of experience products.

### 6.4. Suggestions for Future Research

As mentioned above, the research model was tested using four treatment conditions with progressive increase of vividness and interactivity. To clearly separate the effects of these two design aspects, the next step could be to adopt $2*2$ factorial design by manipulating vividness and interactivity separately. In addition, while the present study has revealed the relative effects of vividness and interactivity on various consumer perceptions, the findings are exploratory due to the paucity of solid theories to compare the two functional mechanisms. It is thus hoped that future research can investigate this issue more thoroughly. It would also be interesting to investigate the specific theories and processes that can guide the practical design of interactivity and vividness, such as suggested by Walls et al. (2004). Moreover,

[6] As noted in §6.2, the priority on vividness design helps explain the status of current e-commerce websites that have high-vividness and high-interactivity product demonstrations (i.e., VPE) and high-vividness/low-interactivity ones (e.g. video), but lack low-vividness/high-interactivity product demonstrations.

[7] In fact, we also measured subjects' perceived ease of use of shopping websites, and found that in general they perceived the websites to be very easy to use (on average: 6.11/7), implying the absence of unfavorable impacts due to overly high levels of interactivity.

interactivity and vividness are two criteria for characterizing the format of online product presentations, but they do not provide a comprehensive view. Other aspects of product presentations, such as the appropriate design of presentation content, also deserve researchers' and practitioners' attention.

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## Appendix 1. Measures

### Measures of constructs

*Interactivity*: Two items were created to measure interactivity.
1. I am able to interact with this product.
2. The product can respond to my input on this Web interface.

*Vividness*: Four items were created to measure vividness.
1. The product demonstration on this website is animated.
2. The product demonstration on this website is lively.
3. I can acquire product information on this website from different sensory channels.
4. This website contains product information exciting to senses.

*Perceived diagnosticity*: One item was adapted from Jiang and Benbasat (2005). The other two were created for this study.
1. This website is helpful for me to evaluate the product.
2. This Web interface is helpful in familiarizing me with the product.
3. This Web interface is helpful for me to understand the performance of the product.

*Compatibility*: Three items were adapted from Moore and Benbasat (1991).
1. Evaluating the product on this website is compatible with how I evaluate products in physical stores.
2. Evaluating the product on this website fits well with the way I like to evaluate products in physical stores.
3. Familiarizing myself with the product on this website is similar to my product evaluation style in physical stores.

*Shopping enjoyment*: Four items were adapted from Koufaris (2002).
1. I find my experience with this website interesting.
2. I find my experience with this website enjoyable.
3. I find my experience with this website exciting.
4. I find my experience with this website fun.

*Attitudes toward shopping at a website*: Four items were adapted from Grazioli and Jarvenpaa (2000) and Coyle and Thorson (2001).
1. I like shopping on this website.
2. Shopping on this website is a good idea.
3. Shopping on this website is appealing.

*Attitudes toward products*: The first two items were adapted from Kempf and Smith (1998), whereas the third one was developed for this study.
1. The product that I've just examined is good.
2. I have formed a favorable impression toward the product that I've just examined.
3. I like the product that I've just examined.

*Intentions to return*: Three items were adapted from Coyle and Thorson (2001).
1. Next time I need to shop for a sports watch, I would like to use this website.
2. Next time I need to shop for a sports watch as a gift for a friend, I would like to use a website with characteristics similar to those of this website.
3. I would use websites with similar characteristics to those of this website in the future.

*Intention to purchase*: Four items were adapted from Coyle and Thorson (2001).
1. It is likely that I will buy this product.
2. I will purchase the product the next time I need a sports watch.
3. Suppose that a friend calls me to get my advice in his/her search for a sports watch; I would recommend him/her to buy the product.
4. I will definitely try this product.

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