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SYSTEM DESIGN EFFECTS ON ONLINE IMPULSE BUYING

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Abstract

Impulse buying is usually described as a sudden, compelling, hedonically complex purchasing behavior without deliberate consideration of all information and choice alternatives. Such behavior is dominantly driven by affect-laden motives rather than rational thinking, violating the assumption of intentional behavior in dominant theories for online shopping. New theories are therefore necessary to explain online impulse buying. Drawing upon the "stimulus-organism-response" framework, we develop and empirically validate a model explaining the relationship between system design characteristics and online impulse buying. Impulse formation and enactment are modeled as a response to four organismic factors, i.e., telepresence, social presence, pleasure and arousal. These organismic variables are determined by system stimuli that are characterized as interactivity and vividness features. The research model is validated by an experiment with a 2×2 full factorial design involving 151 undergraduate students. The empirical results provide very strong support for the model. The theoretical and practical implications of these results are discussed.

Keywords: E-commerce; Impulse Buying; Website Design

Introduction

Impulse buying is usually described as a sudden, compelling, hedonically complex purchasing behavior without deliberate consideration of all information and choice alternatives (Rook 1987). As a pervasive phenomenon, impulse buying has received considerable attention in disciplines including economics (Hock and Loewenstein 1991), psychology (Verplanken and Herabadi 2001), and marketing (Beatty and Ferrell 1998). With the proliferation of electronic commerce, consumers can buy around the clock. They are exposed to a variety of multimedia stimuli that may trigger impulse behavior. Indeed, several reports based on large-scale surveys have reported evidence of online impulse buying (Donthu and Garcia 1999).

Online shopping behavior has been examined in IS field. however, most IS prior studies on online shopping was based on traditional attitude-behavior models (Gefen et al. 2003), e.g., the theory of planned behavior (Fishbein and Ajzen 1975) or technology acceptance model (Davis et al. 1989). In these models, behavior is driven by a well formed intention, which is quite different from impulse buying characterized by the lack of planning and the dominance of emotions (Verplanken and Herabadi 2001), precluding the formation of intention. Therefore, new theories need to be developed to investigate online impulse buying as distinct from rational online consumer behavior.

Although a few studies tried to investigate this phenomenon (e.g., Adelaar et al. 2003; Dutta et al. 2003; Eroglu et al. 2003; Koufaris 2002), prior research has two major limitations. Firstly, the definition of impulse buying is inconsistent and inappropriate. For instance, Koufaris (2002) regarded impulse buying as synonymous for unplanned buying. Adelaar et al. (2003) confused buying impulse with intention. Inconsistent conceptualizations prevent from comparison of different empirical results, while inappropriate conceptualization jeopardizes internal validity. Therefore, the research on online impulse buying has to first clarify the conceptualization of impulse buying. Secondly, we still lack a framework to conceptualize the role of system design in promoting online impulse buying.

The existent studies only focused on specific system design features, e.g., media format in Adelaar et al. (2003) or relied on an oversimplified framework, e.g., task related vs. task unrelated cues (Eroglu et al. 2003), which does not capture the distinctiveness of online settings and may not be sufficient for the practical relevance. Therefore, in addition to integrate the existing findings developed in the physical setting, the further development needs to fully account for the role of system design.

This study is aimed to address the theoretical voids discussed above. We first clarify the conceptualization of impulse buying. Then drawing upon the "stimulus-organism-response" framework, we develop and empirically validate a model explaining the relationship between system design characteristics and online impulse buying. Compared to the prior research, two major extensions are proposed: 1) new constructs capturing the organism associated with the computer-mediated communication, and 2) a new framework for conceptualizing system features that influence online impulse buying. This study presents both theoretical and practical contributions. Deviating from the traditional attitude-intention models, this study explores the impulsive behavior in e-commerce, which has been understudied in IS field. This study also contributes to marketing and consumer behavior literature by demonstrating system design features as a new category of cues in stimulating impulse buying. On the practical side, the proposed theoretical model provides an explicit justification for the general belief of using system design to promote online impulse buying. More importantly, the model identifies the important dimensions in system design, providing valuable guidelines for designers to effectively leverage the capacities of commercial websites.

This paper is structured as follows. We first define impulse buying and its related construct, which is followed by a discussion of theoretical foundation for this research. Drawing upon the previous literature, we propose the research model and justify the hypotheses. This is followed by a description of the experiment and a discussion of the results. In conclusion, we summarize the study, discuss the theoretical and practical implications and make suggestions for future research.

Conceptualization of Impulse Buying

In early work, impulse buying is synonymous with "unplanned buying", a purchase without a plan in advance. However, purchases might be unplanned or lack deliberation for various reasons not necessarily related to impulsivity, e.g., repeated or habitual purchases (Verplanken and Aarts 1999). Thus, the "unplanned purchase" definition has been criticized as too vague and as encompassing too many different types of behavior (Kollat and Willett 1967; Stern 1962). Stern (1962) further classified impulse buying into four types, i.e., pure impulse buying, reminder impulse buying, suggestion impulse buying and planned impulse buying. This classification, derived from behavioristic perspective, provides a comprehensive description of impulse buying behavior, but may not be sufficient to elaborate the psychological contents of impulse buying (Rook 1987). Rook (1987), on the other hand, re-conceptualized the term "impulse buying" as a narrower and more specific range of phenomena than "unplanned purchasing". According to Rook (1987), "*impulse buying occurs when a consumer experiences a sudden, often powerful and persistent urge to buy something immediately. The impulse to buy is hedonically complex and may stimulate emotional conflict. Also, impulse buying is prone to occur with diminished regard for its consequences*". As Rook and Gardner (1993) suggested, impulse buying may be regarded as an overarching term that includes common but highly changeable behavioral states and psychological trait of impulsivity. Thus the impulse buying continuum may range from highly to moderately to slightly impulsive. Highly impulsive behavior is usually termed as "compulsive buying", a kind of pathological phenomenon appearing as chronic, repetitive purchasing that occurs as a response to negative events or feelings (O'Guinn and Faber 1989). Compulsive buying is compelled and not subject to the individual's discretion, resulting in negative consequences (Mele 1987). Whereas, at the moderate or lower level, impulse buying is a typical phenomenon in contemporary retailing environments (Phillips and Bradshaw 1993) and not necessarily inducing negative results. The current research adopts Rook's (1987) conceptualization with a focus on the moderate level of impulse buying for two reasons. Firstly, this definition delineates both behavioral and psychological aspects of impulse buying. Secondly, the conceptualization of impulse buying in retailing environments usually focuses on the moderate level to provide more real-world relevance (Beatty and Ferrell 1998; Rook and Fisher 1995). Moreover, the emphasis on the extremes of impulse buying or pure impulse buying may limit the behavioral variation and pose difficulties in operationalization.

Closely related to the construct of impulse buying is "buying impulse". Derived from the conceptualization of impulse buying, Rook (1987) describes its behavioral content of "buying impulse" as a sudden, unexpected, often powerful urge to buy something immediately. Psychologically, it is characterized by spontaneity, kinetics, psychological arousal, immediacy, and primacy. Primary consuming impulses encourage immediate gratification

(Rook and Gardner 1993). Similarly, Beatty and Ferrell (1998) termed buying impulse as "the felt urge", a state of desires experienced upon encountering an object in the environment, and claim that impulse buying behavior occurs after experiencing an urge to buy and it tends to be spontaneous and without a lot of reflection. They also empirically demonstrate the necessity to separate buying impulse from actual buying behavior by showing the superior performance of the model when buying impulse is considered as the final dependent variable.

Theoretical Background

Theories explaining social action in general have been predominantly cognitive nature. The adoption of information-processing paradigm led to many insights about the cognitive foundations of controlled judgmental processes (e.g., Ajzen and Fishbein 1980), which has exerted a wide influence on the research in IS field. More specifically, the prevailing theories of online consumer behavior emphasize rationality and assume that behavior is elicited as a consequence of a decision making process. This assumption may not be held for impulse buying as it is characterized by the lack of rational thinking and the dominance of emotions (Verplanken and Herabadi 2001) and precludes the formation of intention (LaRose and Eastin 2002).

In addition to the controlled process, psychological theories have repeatedly pointed at an alternative mechanism. Strack and Deutsch (2004) explain social behavior with a 2-system model specifying a joint function of reflective and impulsive processes. The reflective system generates behavioral decisions that are based on knowledge about facts and values, i.e., intention, whereas the impulsive system elicits behaviors through associative links and motivational orientations. Compared with the reflective system, the impulsive system is faster, requires no or little cognitive efforts, and has a low threshold for processing incoming information. These advantages make the impulsive system more primacy over the reflective system. In other words, the impulsive system is always engaged in processing (by itself or parallel to operations of the reflective system) but the reflective system may not be engaged. MacInnis and Patrick (2006) extend this model to argue that impulsive behavior can be viewed as the outcome of a generalized system of self-regulation designed, in part, to control impulses. Therefore, the two systems, reflexive and impulsive systems, although are affected by different factors, interact together to determine the impulse activation.

To explain the behavior mainly driven by the impulsive system, prior studies follow the "stimuli-organism-response" paradigm, and rely on the M-R model developed by Mehrabian and Russell (1974). Buying impulse is therefore considered as an approach orientation, which in turn is driven by the immediate perceptual stimuli (Smith and Sivakumar 2004). This model relates the stimuli and resulting actions through organismic factors. Organism refers to internal processes and structures intervening between stimuli and the final action, reactions or responses emitted. Although it could include perceptual, physiological, feeling and thinking activities, Mehrabian and Russell propose three basic emotional states (acronym PAD) mediate approach-avoidance behaviors in any environment: pleasure-displeasure; arousal-non arousal; and dominance-submissiveness. Both theoretical and empirical evidence has shown that the emotional or affective state is the main driver for the motivational system (Strack and Deutsch 2003). Pleasure refers to the degree to which a person feels happy or satisfied in a place; arousal concerns the degree of stimulation caused by an atmosphere; and dominance indicates the degree to which a person feels in control of a situation and feels to have influence over his/her surroundings and others. However, because of lack of empirical support, dominance has been removed from the model (Donovan et al. 1994). Mehrabian and Russell further hypothesized that pleasure would be positively related to approach-avoidance measure, but the arousal's effects would be contingent upon the pleasure states, that is, in a pleasant environment, arousal would be positively related to approach behavior, but in an unpleasant environment, arousal would be related to avoidance behavior.

Theoretical Development

Built on the M-R model, we develop a model explaining the relationship between system design characteristics and online impulse buying. The model is illustrated in Figure 1. Impulse formation and enactment are modeled as a response to four organismic factors, i.e., telepresence, social presence, pleasure and arousal. Different from prior studies, the organismic factors are extended to include the sense of presence to reflect the efforts of system designers to reduce the physical proximity and unsociability introduced by the computer-mediated communication. In online stores, customers cannot touch, smell, taste or experience the product as they do in a physical store. They also lack person-to-person communication which is prevalent in a physical store. Such problems, however, may be alleviated through the effective system design. Although the organismic variables are the results of various stimuli, including

marketing stimuli, product stimuli, and atmospheric cues, the scope of this study is limited to the effects of system stimuli resulting from system design features as characterized by interactivity and vividness. To illustrate the role of system stimuli, other kinds of stimuli suggested in the prior research, e.g., marketing stimuli, product stimuli, and atmospheric cues, are controlled. The definition of constructs and justification of hypotheses follow.

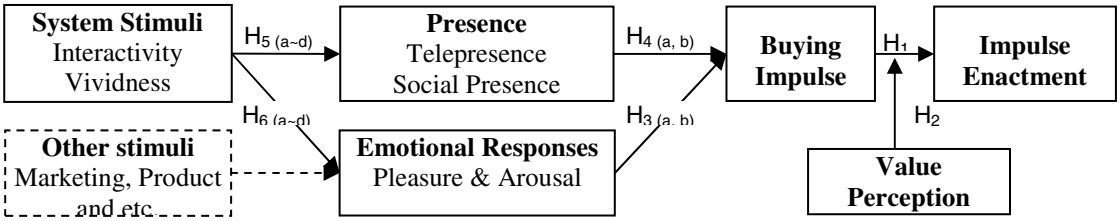

Figure 1: Theoretical Model for Online Impulse Buying

Buying Impulse and Impulse Buying

Consistent with prior studies that distinguish buying impulse from actual impulse buying (Beatty and Ferrell 1998; Rook and Gardner 1993), this research also decomposes impulse buying into two stages, i.e., motivation and enactment (Weinberg and Gottwald 1982). Buying impulse provides a motivational impetus for the subsequent buying behavior, which is similar to the role of desires in the model of goal-directed behavior (Perigini and Bagozzi 2001). "Once triggered, an impulse encourages immediate action, and the urge may be powerful and persistent" (Rook 1987). Obviously, the stronger the buying impulse, the higher is the likelihood of engaging in impulse purchasing (Beatty and Ferrell 1998). In the online context, the enactment of buying impulse is indicated by completing the transaction, and not necessarily by actual possession of the products.

H_1: the stronger the online buying impulse, the greater is the likelihood of its enactment.

Impulsive behavior can be viewed as the outcome of a generalized system of self-regulation designed, in part, to control impulses (MacInnis and Patrick 2006; Strack and Deutsch 2004). Therefore, the two systems, reflexive and impulsive systems, although are affected by different factors, interact together to determine impulse activation. Similarly, Dholakia (2000) argues that impulse buying does not preclude motivational, volitional, and cognitive psychological processes, underlying the mechanism of enactment or dissipation of impulse. For consumers, value perception, i.e., the overall assessment of the utility of a product based on perceptions of what is received and what is given (Zeithaml 1988), is one of main inputs from the reflexive system. If the value perception is consistent with the buying impulse, the consumer may view the buying impulse as harmonious with his or her goals, resources and situation and then responds reflectively through an expression of his or her buying impulse. On the contrary, the resulting dissonance between the value perception and the buying impulse may dissipate the enactment. Thus, we hypothesize that:

H_2: the enactment of buying impulse is more likely with a high value perception than with a low value perception.

Online Organism and Buying Impulse Generation

As specified in the M-R model, the approach or avoidance orientation is determined by a person's core affect which is a state that can be experienced on the dimensions of pleasure and arousal. For most affect researchers, the central features of affect are not the feeling states associated with it, but its role in motivating approach or avoidance behavior (Zajonc 1998). Specifically, pleasure serves as motivation for impulse buying while arousal impacts impulse buying through mobilization (Rook and Gardner 1993). As predicted by the M-R model, the effect of arousal is bi-direction and contingent upon pleasure. Under a pleasant environment, arousal is the cause for approach behavior; but under an unpleasant environment, arousal predicts avoidance behavior. In this research, we assume the online store as a pleasant environment for two reasons. Firstly, designers always aim to bring a compelling and enjoyable online experience to customers (Hoffman and Novak 1996). Evidence can be found in the ample research on website design, e.g., flow (Hoffman and Novak 1996) and interactivity (Teo et al. 2003). Secondly, the literature also shows that most people perceive online activities as fun and pleasant (Xia 2002). Thus it is reasonable to assume the online retailing environment as a pleasant environment, where arousal is positively

related to approach behavior. Based on the theoretical and empirical justifications presented above, we hypothesize that:
H_{3a}: the more pleasure the online customer feels, the stronger is his/her online buying impulse.
H_{3b}: the higher arousal the online customer feels, the stronger is his/her online buying impulse.

While Internet has become another important retailing channel with low cost and high convenience, it also falls short of customers' expectations to "experience" products. To alleviate this disadvantage, designers and marketing practitioners try to create a compelling experience that is vivid, involving, active, and psychologically affective (Li et al. 2001). Presence, by definition, represents such a virtual experience in that "a person fails to perceive or acknowledge the existence of a medium in his or her communication environment and responds as if he or she would if the medium were not there" (Lombard and Ditton 1997, p. 77). Two types of presence are proposed in prior research, i.e., telepresence and social presence. Telepresence or physical presence refers to the sense of being located somewhere, while social presence relates to the feeling of being together (Ijsselsteijn et al. 2000). The inclusion of presence as additional organismic factor, therefore, reflects the extent to which the system design reduces the physical and social distance associated with computer mediation.

Different from the emotional states, presence captures the online environment's effect on the physiological components of organism (Sautter et al. 2004). As the online customer has a strong sense of presence, his/her attention is less attracted by physiological stimuli from physical environments and more engaged in the virtual environment, leading to a high perceived proximity with the products (Klein 2003). The stronger sense of presence a medium affords to users, the more the medium becomes "transparent" and experiential (Grigorovici 2003). Telepresence makes online experience more imminent and compelling; while social presence makes online shoppers aware of the social context, leading to more social comparison. The shortened proximity and enhanced social comparison, according to Hock and Loewenstein (1991), increase the likelihood that the customer conducts impulse buying. Thus, we hypothesize the main effects of presence on buying impulse as follows.
H_{4a}: the stronger sense of telepresence an online customer feels, the stronger is his/her online buying impulse.
H_{4b}: the stronger sense of social presence an online customer feels, the stronger is his/her online buying impulse.

Effects of System Stimuli

System Stimuli and Presence

It has been widely accepted that interactivity and vividness are two common factors eliciting the sense of presence, i.e., telepresence and social presence (Khalifa and Shen 2004; Lombard and Ditton 1997). An interactive website enables participants to determine the material they examine and the pace with which they want to proceed (Kettanurak et al. 2001). Users with greater control over their actions tend to be more immersed in the mediated experience and therefore develop a stronger sense of presence (Witmer and Singer 1998). The positive relationship between interactivity and telepresence has received widely empirical support in different contexts, e.g., commercial websites (Coyle and Thorson 2001; Klein 2003) and online community (Khalifa and Shen 2004). Furthermore, interactivity is believed to have a positive relationship with social presence (Williams and Rice 1983). Several studies provided empirical evidence for such a relationship. For example, Garramone et al. (1986) demonstrate that the degree of social presence felt with a bulletin board system is higher for more interactive users. As well, Fortin and Dholakia (2003) empirically demonstrate that more interactive Internet ads evoke a greater sense of social presence. Accordingly, we hypothesize that:
H_{5a}: the more interactive the online stimuli, the stronger is the sense of telepresence felt by the online customer.
H_{5b}: the more interactive the online stimuli, the stronger is the sense of social presence felt by the online customer.

Vividness is often cited as an important determinant of presence (Lombard and Ditton 1997). Prior research provides much evidence supporting the positive effect of vividness on telepresence (Lombard and Ditton 1997; Steuer 1992). The more vivid the stimulation provided by the medium, the greater is the resulting sense of telepresence. Consistently, Bhatt (2004) shows that the vividness of a website enhances the user's engagement, an important indicator of telepresence. The positive relationship between vividness and social presence has been confirmed in the studies on avatar use and anthropomorphic agents (e.g., Choi et al. 2001). In a recent study, Khalifa and Shen (2004)

empirically demonstrate that vividness contributes to the formation of both telepresence and social presence. Therefore, we hypothesize that:
H_{5c}: the more vivid the online stimuli, the stronger is the sense of social presence felt by the online customer.
H_{5d}: the more vivid the online stimuli, the stronger is the sense of telepresence felt by the online customer.

System Stimuli and Emotional States

Prior research has also demonstrated that interactivity and vividness are related to positive affective responses (Fortin and Dholakia 2003). For online consumers, interactivity is an empowering and desired system characteristic (Zillmann and Vorderer 2000). A highly interactive website stimulates the sense of fun and satisfaction (Rafaeli 1989). Even though online customers may not explore all interactive features, the possibility of enhancing interactivity may augment the perceptions of greater navigational ease and elicit more pleasure (Childers et al. 2001). Thus, we hypothesize that:

H_{6a}: the more interactive the online stimuli, the stronger is the pleasure felt by the online customer.

One of the integral components of interactivity is playfulness (Ha and James 1998). As the website becomes more interactive, customers have more control over the navigation and are more likely to engage in the interaction, actively selecting or modifying the objects if their interested (Ghose and Dou 1998). With high interactivity, online shopping is more like a play, elevating arousal for the individual (Lieberman 1977). Therefore, we hypothesize that:

H_{6b}: the more interactive the online stimuli, the higher is the arousal felt by the online customer.

Vividness, as another dimension of system stimuli, also induces the feeling of pleasure experienced in online stores. The work of Mischel and Moor (1973) has demonstrated that presenting with a real product, rather than with photographs or symbolic presentation, enhances the intensity of positive affect experienced by respondents. Similarly, Loewenstein (1996) posits that a vivid presentation makes it easier to sense the gratification than a less vivid presentation. The rationale is that the vivid presentation hinders the individual's allocation of processing resources in making decisions, increasing positive affective responses (Shiv and Fedorikhin 1999). Miller and Marks (1997) compare the vividness of different imagery-evoking strategies in the radio ads, i.e., sound effects, vivid verbal message, and instructions to imagine. Their empirical results confirm the positive relationship between vividness and pleasant feelings.

H_{6c}: the more vivid the online stimuli, the stronger is the pleasure felt by the online customer.

A vivid message is emotionally interesting, concrete, imagery provoking, and proximate in a sensory, temporal, or spatial way (Nisbett and Ross 1980). Usually, information with animation, flash, audio, video or presented with colorful language is more vivid than that without additional sensory stimuli (Miller and Marks 1997; Steuer 1992). Empirical evidence shows that animated web advertising elicits stronger orienting responses (Lang et al. 2002), faster click-through (Li and Bukovac 1999), and higher arousal (Heo and Sundar 2000) than the static ads. Similar findings in audio-visual stimuli also show that moving images, in contrast to static images, induce greater arousal (e.g., Detenber and Reeves 1996).

H_{6d}: the more vivid the online stimuli, the higher is the arousal felt by the online customer.

Methodology

In order to control for the other types of stimuli for impulse buying and to establish the causal relationship, we validated the research model with a lab experiment with a 2×2 full factorial design. A fictitious VCD online movie store was created with four storefronts representing each combination of treatments. Undergraduate students were used in the empirical study since young people have constituted a large proportion of online shoppers (Dutta et al. 2003). A total of HK$100 was used as the incentive for participating in the experiment. The final participants consisted of 34 students for the pilot test and 151 students for the main study. Most participants were below 25 years old and with over 3 years of Internet experience.

Subjects were grouped based on gender. Each group was then randomly assigned to four experimental groups representing each combination of treatments to ensure equal representation of males and females. Individuals in each group were compared on a number of variables, including product involvement, attitudes towards online shopping, information processing styles, online shopping experience, and impulsivity. The results of ANOVA using

manipulations as a grouping variable found no significant difference for all variables, implying no individual difference across treatments.

Manipulation and Website Design

The system stimuli, i.e., interactivity and vividness, were manipulated, setting them at two levels, i.e., high and low (See Table 1). Based on the classification of interactivity level provided by Kristof and Satran (1995), the incremental method was used for the operationalization of interactivity (Burgoon et al. 2000). With this design, the difference between two levels of interactivity could be attributed to the increasing levels of interactivity (Teo et al. 2003). As for vividness, the same method was used and the manipulation was derived from the conceptualization in Steuer (1992), where vividness is defined in terms of sensory breadth and sensory depth. Higher level of vividness presents more simultaneous sensory dimensions and higher resolutions within each sensory channel. In prior studies, multi-media is usually considered as more vivid than pure text (Coyle and Thorson 2001). To avoid the confounding between the operationalization of interactivity and vividness, the manipulation of interactivity did not include the control over the media and subjects could only passively watch the trailers no matter the levels of interactivity.

Table 1. Manipulation and Implementation

Variables	Level	Manipulation	Features
Interactivity (Burgoon et al. 2000; Schaffer and Hannafin 1986; Teo et al. 2003)	High	Control over pace Control over sequence Control over variables Control over objects	Sequential browsing Choose specific movie Customize the database search Move posters or titles around the screen
	Low	Control over pace	Sequential browsing
Vividness (Keller and Block 1997; Kisielius and Sternthal 1984)	High	Multiple sensory channels with pictorial presentation	Text, images (movie posters) and multi-media (movie trailers)
	Low	Single sensory channel without pictorial presentation	Text only

Tasks and Procedure

The experiment consisted of two phases, spanning two weeks. In the first week, the subjects were told that their task was to evaluate an online movie store before it became operational. All functions related to transaction processing were disabled. The minimum time for browsing was 10 minutes and there was no maximum time limit. In this stage, we measured control variables and the organismic factors. To separate the measures at different time points reduces the common method bias. Furthermore, the first week also serves as learning process for participants to get familiar with the online store and subsequently to reduce the cognitive efforts in the shopping stage. In the second week, the subjects were told that they were going to revisit the same store website after it became operational[1]. They could make a real online purchase but online shopping was totally voluntary. Same promotion was used for all groups, i.e., 50% discount for all products (HK$15) as a special reward for their assessing the website. In this stage, buying impulse was measured right after the subject clicked "Buy" or "Exit". The question for those choosing "Buy" was "Please rate the extent to which you agree or disagree with the following statements"; while for those choosing "Exit" was "Think about the VCD movie that attracted you most during the browsing and indicate the extent of agreement/disagreement with the following statements." After finishing the survey, those who chose "Buy" entered the one-click transaction page where two options were provided, i.e., abandon the shopping cart or confirm the transaction. In case they wanted to buy through this store, the payment method was only in cash upon the receipt of the order. The subjects did not need provide personal information for shipping or payment to alleviate privacy concerns.

[1] It is necessary to note that, although the same website was used across different stages, the sequence of movies was reshuffled to reduce the possibility of recall effects.

Measures

Consistent with prior studies, we rely on self-reported measures for buying impulse, as impulse buying episodes are memorable with reasonable accuracy (Rook and Gardner 1993). Moreover, we shorten the recall time by measuring it right after the subject click "Buy", capturing the felt urge at the moment. A reflective scale consisting of four items was adapted from Beatty and Ferrell (1998)'s study. One sample question is "When I saw the VCD movie, I wanted to buy it although initially it was not in my plan". To further verify whether the subject's response is a buying impulse, an open question was added to ask the subject to describe the reasons for his/her decision. The enactment of buying impulse is operationalized with a binary indicator for the actual purchasing behavior and indicated by the subject clicking "confirm" in the transaction page. The measurement of actual behavior in this study enhances its real-world relevance. The perceived value is measured with five items developed in Adelaar et al. (2003). The measures for pleasure and arousal are adapted from the polar-scale developed by (Mehrabian and Russell 1974) and well validated by numerous studies (e.g., Holbrook et al. 1984; Rook and Gardner 1993). For social presence, we adapt the instrument developed by Short et al. (1976) and validated by several studies (e.g. Venkatesh and Johnson 2002). The instrument consists of bipolar items such as social - unsocial, sensitive - insensitive and warm - cold. As for the measurement of telepresence, we rely on the widely used "arrival" and "departure" instrument developed by Kim and Biocca (1997). As for the manipulations check, three items measuring interactivity level were adapted from Liu (2003) and McMillan and Huang (2002). Vividness was measured with the scales developed by Marks (1973).

Data Analysis

The method of multiple analyses of variance (MANOVA) was used with averaged responses for manipulation check items and the dependent variables to test the validity of the experimental design. Then the data analysis was done in a holistic manner using Partial Least Squares procedure (PLS), because it is able to model latent constructs under conditions of non-normality and small to medium sample sizes, and to test the interaction effects easily (Chin et al. 2003).

Results

Manipulation Check

The results of MANOVA (see Table 2) showed no interaction between the treatments for interactivity and vividness, implying no confounding in the treatment. Furthermore, the manipulation for interactivity had significant effects for all variables except for perceived vividness; while the manipulation for vividness had significant effects for all variables except for perceived interactivity. The results of MANOVA demonstrated the validity of the experimental design.

Table 2. Manipulation Check

Dependent Variables	Interactivity		Vividness		Interaction Term	
	F-Value	***Sig.***	***F-Value***	***Sig.***	***F-Value***	***Sig.***
Perceived Interactivity	2499.03	0.000	0.036	0.850	0.009	0.923
Perceived Vividness	0.018	0.894	1380.03	0.000	0.438	0.509
Telepresence	23.772	0.000	82.44	0.000	0.037	0.847
Social Presence	55.631	0.000	43.882	0.000	2.430	0.121
Pleasure	196.73	0.000	179.535	0.000	2.426	0.122
Arousal	11.789	0.000	59.478	0.000	0.471	0.494

Measurement Model

The reliability and validity of the measurement model was determined by examining internal consistency and convergent and discriminant validities (Hulland 1999). The composite reliability measures (ρ) (Fornell and Larcker 1987) were used to check internal consistency of the reflective measures. In this study, the ρ values for all variables

were higher than the recommended value of 0.80, indicating internal consistency (Nunnally and Bernstein 1994).

The convergent validity was verified by examining the average variance extracted (AVE) (Fornell and Larcker (1987), i.e., the amount of variance that a latent variable component captures from its indicators relative to the amount due to measurement error. The AVE scores for all constructs were much higher than the generally recognized cutoff value of 0.50. In addition, all reflective items were significant at the 99% level with high loadings (all above 0.70 and most above 0.80), demonstrating the convergent validity.

We tested the discriminant validity by comparing the square root of the AVE for a particular construct to its correlations with the other constructs (Fornell and Larcker 1987) and by examining cross-loadings of the constructs. The square roots of the AVE scores were all higher than the correlations among the constructs, demonstrating discriminant validity. Furthermore, all items loaded higher on their respective constructs than on others, providing additional evidence for discriminant validity.

Structural Model

Figure 2 presents the results of the PLS analysis of the structural model. All path coefficients were significant at the 99% level, except for the link between arousal and buying impulse, which was significant at the 95% level. The model indicated a good explanatory power for impulse buying formation (R^2=58.7%) and its enactment (R^2=64.9%), as well as for organismic variables resulting from the system stimuli, i.e., pleasure (R^2=68.5%), arousal (R^2=35.2%), telepresence (R^2=46.3%) and social presence (R^2=39.1%). These results provided strong support for the research model and verified all hypotheses.

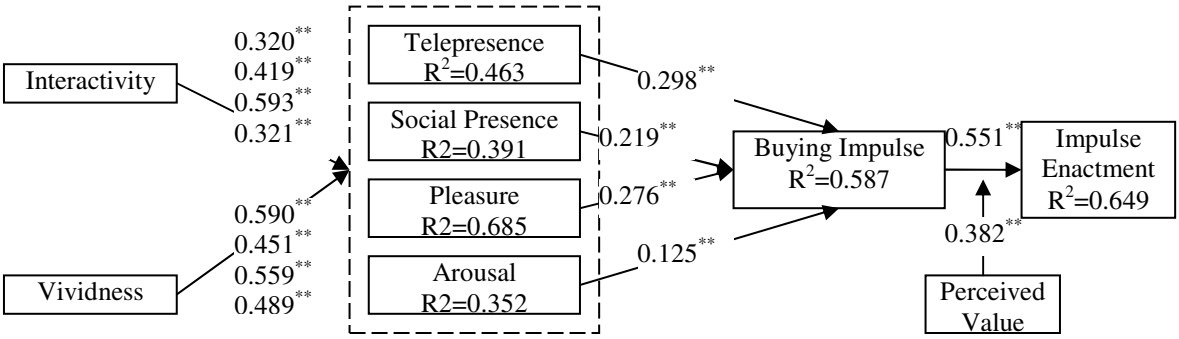

Figure 2. Structural Model

The results demonstrated a very good performance in terms of internal validity and explanatory power, providing a strong support for the theoretical model. Prior studies state that buying impulse precedes actual purchase behavior and serves as an imminent motivation. This proposition was also validated in the online context (H_1: β=0.551, p<.01). Moreover, consistent with Rook and Fisher (1995) and Dholakia (2000), the significant moderating effect of value perception (H_2: β=0.382, p<.01) demonstrates that even the rapidity of one-click transaction did not preclude the likelihood that consumers were still thinking and evaluating. Furthermore, this result implied that the positive value perception would catalyze the enactment of buying impulse by removing the dissonance between cognition and impulse. Together with the moderating effect of value perception, buying impulse explained over 64% of the variance of actual impulse buying behavior, implying the important role of buying impulse in driving purchasing behavior.

Consistent with prior studies, the emotional reactions, i.e., pleasure (H_{3a}: β=0.276, p<.01) and arousal (H_{3b}: β=0.125, p<.05), were significant determinants of buying impulse. These results empirically demonstrate that emotions had a strong implication for action tendency. Moreover, under pleasant conditions, arousal was also a significant predictor for buying impulse. In a recent study by Zhang and Li (Forthcoming), the importance of affective quality of information systems is demonstrated with the significant effects of pleasure and arousal on perceived usefulness and ease of use. While their study investigates the role of affect in cognitive behavior, the result of this research provides additional empirical evidence for the positive effects of affective quality of commercial websites in triggering impulsive behavior.

In addition to emotional responses, both telepresence (H_{4a}: β=0.298, p<.01) and social presence (H_{4b}: β=0.219, p<.01) were found to play important roles in the formation of buying impulse by shortening physical proximity. The

effect of social presence on the formation of buying impulse could be explained by augmented sociability. When shopping in a warm, friendly and social environment, customers tend to extend their exploration, increasing the likelihood for generating buying impulses. The discriminant validity check verified the independence among these organismic factors.

In this study, the system stimuli are conceptualized as interactivity and vividness. The results verified the hypothesized positive effects of interactivity and vividness on both presence and emotional responses. The model explains 39.1% of the variance of social presence and 46.3% of the variance of telepresence. Consistent with prior studies (Khalifa and Shen 2004; Novak et al. 2000), both vividness and interactivity were found to be effective in arousing the sense of presence, implying the important role of system stimuli in creating a compelling online experience. More specifically, vividness seemed more important for both telepresence (H_{5c}: β=0.590, p<.01) and social presence (H_{5d}: β=0.451, p<.01) than interactivity (H_{5a}: β=0.320, p<.01, telepresence; H_{5b}: β=0.419, p<.01, social presence). Such difference may arise from the specific manipulations used in the experiment and the nature of the online store. For an online movie store, using trailers and posters, may be more effective to get the customers engaged in browsing.

The system stimuli were also significant in stimulating positive emotions. The model explained 68.5% of the variance of pleasure and 35.2% of the variance of arousal. Both vividness (H_{6c}: β=0.559, p<.01) and interactivity (H_{6a}: β=0.593, p<.01) were significant for pleasure. The usage of trailers and posters significantly increased the virtual attractiveness and brought a more direct experience to the customer. The effect of interactivity on pleasure may arise from the convenience, playfulness and satisfaction of navigation (Teo et al. 2003). With searching functions and multiple ways for browsing, the subject could easily personalize their online shopping experiences; and the control over the objects made the browsing more playful. As for arousal, the effects of vividness (H_{6d}: β=0.489, p<.01) and interactivity (H_{6b}: β=0.321, p<.01) were significant too. The effect of vividness was consistent with prior findings that relative to still images, moving images elevated subjective ratings of emotional intensity or arousal. Interactivity, on the other hand, empowered the subject to control over the browsing, and the resulting active participation enhanced arousal.

Conclusions and Implications

Impulse buying is usually described as a sudden, compelling, hedonically complex purchasing behavior without deliberate consideration of all information and choice alternatives. With the proliferation of electronic commerce, stimulating impulse has become a focal phenomenon in online consumer behavior. Most prior research on online shopping relied on attitude-behavior models with a focus on intentional behavior. Impulse buying, however, is characterized by the lack of planning and the dominance of emotions, precluding the formation of intention. Drawing upon the widely accepted M-R theory, we develop a model explaining the relationship between system design and online impulse buying. Two theoretical extensions are proposed, e.g., including presence to capture the organism associated with the computer-mediated communication, and examining the effects of system design stimuli on online impulse buying. The research model is validated by an experiment with a 2×2 full factorial design involving 151 undergraduate students. The results strongly supported the research model.

Prior to discussing the implications of our findings however, it is important to acknowledge the limitations of this research. This research has the traditional limitations associated with experimental design. In this experiment, marketing stimuli and product stimuli were controlled with a fixed value (constant discount price and single product), which may limit the generalizability of the results. It is important and interesting to examine the interaction among different stimuli in affecting online impulse buying. The relative effectiveness of system design may vary for different marketing techniques and product categories. Additionally, the focus on main effects of system design does not exclude the possible interactions, e.g., interaction between interactivity and vividness. Integrated in a single website, different design features may interfere with each other, which, in fact, may be more interesting than the main effects. However, our reasoning at this point is to establish a good base model from which important main effects could be assessed first (cf. Aiken and West 1991; Beatty and Ferrell 1998).

Theoretical Implications

IS research in general and online shopping in particular have been dominant with belief-attitude-behavior model with the cognitive assumption of users (customers), while the influence of impulsive variants, e.g., affect or

emotion, is traditionally neglected. Yet, the recent development in social psychology has confirmed the existence of the dual-system, i.e., elaborative and impulsive systems, in determining social behavior, and more specifically, the fundamental role of impulsive system. Indeed, some researchers in IS and HCI have turned the attention to the affective aspect, one component in the impulsive system (e.g., Zhang and Li Forthcoming), however, such studies have been scattered and less systematic. By investigating online impulse buying, a theoretically different type of online consumer behavior from planned behavior, our study highlights the influences of impulsive variants, representing a great theoretical extension. Furthermore, online impulse buying represents a typical IT-related behavior which is experiential, hedonic and affective-laden. Other examples include online game, online chatting and blogging. Thus our study also sheds the light to those phenomena that may beyond the explanatory power of traditional cognitive models. Finally, the dual-system perspective may inspire the reconsideration of IT use behavior in general. The inclusion of impulsive factors (e.g., emotions and motivational orientation) and their interaction with cognitive factors may generate more intriguing and comprehensive understanding towards the phenomena that have been taken for granted. Recently various product presentation and/or website design techniques have been explored. It would be interesting to examine their impacts on online impulse buying as well.

With a focus on the role of IT artifacts, we extend the existing knowledge developed in traditional retailing environments to the online setting. The resulting theoretical model provides an explanation for the distinctiveness of the online environment through inclusion of organismic variables that are associated with computer mediation, i.e., telepresence and social presence. It also clarifies the system effects on emotional states leading to impulse formation. The theoretical implications are multiple. Firstly, explanation of online impulse behavior in general and online impulse buying in particular should not be restricted to emotional states, i.e., pleasure and arousal. It should also include organismic variables that reflect the system design efforts to reduce the physical distance and increase sociability. As demonstrated in this study, such design efforts can be properly captured by telepresence and social presence. Secondly, this study reveals that system design plays an important role in stimulating online buying impulse. Thus in addition to stimuli identified in traditional settings, i.e., marketing stimuli, product stimuli and atmospheric cues, system design should be incorporated as a new type of stimuli. Furthermore, the conceptualization developed in this study, i.e., interactivity and vividness, provides an effective framework to investigate the role of system design in stimulating online impulse behavior.

Practical Implications

In addition to the theoretical implications, this study also presents significant practical implications. With the popularity of online shopping, impulse buying has constituted a large portion for the online sales, esp. the holiday online shopping. Practitioners are striving to enhance the possibility of impulse buying and system design has been recognized as a main factor in online marketing. The findings of this study, therefore, justify the general beliefs of using design features to stimulate the online impulse buying. More importantly, Features manipulated in this study provide a guideline for designers. Certain design features that make the website more interactive and vivid, are found to effective in triggering online impulse buying. For example, videos and pictures are important design elements in enhancing vividness. Flexible navigation and various searching functions can be used to make websites more interactive. In addition to system design, successful stimulation of online impulse buying also contingent upon the cognitive thinking involved in the process of impulse enactment. As demonstrated in this study, the consonance between cognition and impulse will further increase the likelihood of impulse enactment. Practitioners need to further enhance the value perception of products in the transaction process.

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