UNDERSTANDING CONSUMER DECISION MAKING FOR COMPLEX CHOICES: THE EFFECTS OF INDIVIDUAL AND CONTEXTUAL FACTORS

Research-in-Progress

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Abstract

E-commerce consumers are facing increasingly complex purchasing decisions. Due to their cognitive capacity, however, consumers may not always achieve their goal of optimal product choice. Existing research has focused on providing aids to consumers to help them make rational and conscious information choices for complex purchasing decisions. Recently, a dual-process Unconscious Thought Theory (UTT) has suggested otherwise. It shows that due to the limited cognitive resources, unconscious information processing may outperform conscious information processing for complex decisions. Drawing on the UTT, the study proposes that strategically designed interventions would interact with other contextual and individual factors in consumer information processing, and ultimately lead to superior consumer choice under certain choice environment. An experiment was conducted to test the research model. Focusing on the unconscious information processing in online shopping, this study has important implications for Web-specific human-computer interaction research and e-commerce practitioners.

Keywords: Web design, Human-computer interaction, Electronic commerce, Online Shopping

Introduction

E-commerce has attracted an increasing share of overall retail sales revenues (US Census Bureau 2013). Consumers shop for a larger number of and a wider range of goods online, and are frequently making purchase decisions online. Consequently, e-commerce has become an essential axis in understanding consumer behavior (Chung and Park 2009), especially consumer decision making.

E-commerce consumers are facing increasingly complex purchasing decisions. It is now widely acknowledged from research that consumer behavior is largely goal-directed (Bettman et al. 1998). Nevertheless, several researchers have also noted that consumers may not achieve their goal of optimal consumer choice due to a variety of factors such as limited information processing capacity (Gao et al. 2012). Moreover, the design features of e-commerce sites can also either facilitate or impede consumers' information processing (Ivory and Megraw 2005). E-commerce vendors are able to provide much information to their customers, thanks largely to the advances of information technology. Customers often can see information with regard to alternative products, other people's evaluations and purchase behavior, and recommendations from the vendor (e.g., Amazon's Gold Box). In short, cognitively limited customers have to face a large amount of information, which makes the decision-making particularly difficult.

Therefore, it is important to study how to help customers make sound decisions in the face of the increasing complexity of purchase decisions. This study is different from existing research that would focus on providing decision aids and recommendation systems to facilitate consumers' *conscious* information processing; we approach this topic from the perspective of *unconscious* information processing. A growing body of recent research has suggested the value of studying consumer information processing capacity under unconscious modes of deliberation (Dijksterhuis and Nordgren 2006). This stream of research challenges the traditional view that conscious deliberation during pre-purchase evaluation always leads to optimal purchase decisions. The Unconscious Thought Theory (UTT; Dijksterhuis and Nordgren 2006) posits that strategically distracting users from the decision process may lead to superior outcome for complex products in certain contexts because it evokes unconscious modes of deliberation. This effect is named Deliberation-without-Attention (DWA) effect (Dijksterhuis et al. 2006).

Focusing on the *unconscious* information processing in online shopping, this study has important implications for Web-specific human-computer interaction (HCI) research. Existing research has emphasized how to facilitate consumers' information processing. For example, prior research has studied how various decision aids or recommendation systems facilitate conscious decision making (Komiak and Benbasat 2006; Wang and Benbasat 2009). This research, however, takes a different perspective by arguing that conscious information processing may not always result in the best decision. Sometimes unconscious information processing is beneficial. So it is necessary to start studying how to employ strategically designed interventions in e-commerce websites to induce unconscious information processing modes for customers.

This research attempts to understand how e-commerce customers apply unconscious modes of deliberation when making purchase decisions. Although more work on the underlying mechanisms of DWA effect is needed, we believe that DWA effect interacts with *environmental factors* given prior empirical evidence supporting such interaction effects. It is worth noting that among the ongoing experimental effort to investigate possible influences of the DWA effect, researchers have underscored the interaction of conscious/unconscious mode with the cognitive demand requested by the choice environment (Payne et al. 2008). For example, the propositions of the UTT are more likely to apply in a choice environment where the decision maker adopts a configural mindset (i.e., to hold coherent product representation in the memory rather than focus on the specific features of the product) (Lerouge 2009), the time for decision is constrained (Payne et al. 2008), the quality of product information provided is high (Gao et al. 2012), and the decision attributes have small differences in magnitude (and thus require more cognitive efforts to differentiate them) (Payne et al. 2008) and are presented simultaneously (Acker 2008). We also aim to contribute to the ongoing experimental effort to empirically manifest the DWA effect by manipulating the individual and cognitive components of the choice environment and to explore possible boundaries of thought mode. Specially, the paper addresses two research questions:

1) What is the effect of unconscious information processing on purchase decision quality for complex

products in e-commerce settings? 2) What is the interacting effect of distracting website features and individual factors (i.e., need for cognition and circadian preference) and contextual factors (i.e., time of decision) on consumer decision making for complex choices?

Literature Review

When a consumer encounters a complex product, the consumer automatically exerts a cognition process, which is subject to the influence of various contextual and individual factors (Petty and Cacioppo 1986; Petty and Wegener 1999). This study underscores the importance of contextual and individual factors, and their literature relevant to conscious and unconscious information processing are reviewed.

Information Processing Theories

A widely accepted model of decision making, the weighted additive strategy (WADD; Edwards et al. 1982), suggests that consumers need to carefully consider every attribute for each alternative before selecting one of the alternatives. The underlying assumption is that a conscious and thorough deliberation process is desired for decision-making. Similarly, contemporary studies of decision-making have shown that intuitive thinking process may result in lower quality decisions unless the process is controlled by deliberate and systematic reasoning (Kahneman 2003).

Moreover, human beings can process only a limited amount of information at a time, which could be problematic for complex decisions. To make decisions, we need to hold information in our working memory, which is quite limited compared to the much bigger long-term memory (Baddeley 1999). Information processing literature generally acknowledges that consumers have limited information processing capacity which affects their ability to hold product attitudes (Gao et al. 2012). Research has shown that the span of information processing for a human being is limited to a temporary 'store' of about seven items (Miller 1956), at 10-60 bits per second, much slower than the 11,200,000 bits per second processing speed of the entire human system (Dijksterhuis and Nordgren 2006). Thus, complex tasks cause confusion and restrain consumers' ability to process, respond, and perceive information (Schick et al. 1990), resulting in a suboptimal purchasing decision (Turetken and Sharda 2004).

The information processing theories have several implications for website design. First, distracting website features, such as pop-ups, animated banners and floating advertisements (Burns and Lutz 2006; Hong et al. 2007) tend to disrupt information processing (Petty and Cacioppo 1986; Petty and Wegener 1999). Second, the distraction would interrupt the process of product information gathering and evaluation by distracting consumers' attention away from the primary purchasing task, and lead to greater processing and cognitive workload (Tan et al. 2008). If the cognitive workload exceeds an individual's limited information processing capacity, an information overload occurs (Speier et al. 1999), which causes him to focus narrowly on a subset of information while dropping relevant information, likely resulting in an unfavorable decision outcome (Turetken and Sharda 2004). Third, it leads to the belief that a conscious and deliberate pre-purchase evaluation supported by distraction-free websites would lead to improved understanding of product specifications and thus results in better purchase decision quality (Blackwell et al. 2006).

Thus, it is generally accepted among researchers in web-specific Human-Computer Interaction (HCI) that such distracting website features should be applied with caution. Website design should be focused on reducing distracting features and/or providing decision support (Wang and Benbasat 2009). Accordingly, contemporary research focuses mainly on how to facilitate customers' cognitive information processing.

Unconscious Thought Theory

Recently, a dual-process Unconscious Thought Theory (Dijksterhuis et al. 2006; Dijksterhuis and Nordgren 2006) has emerged to provide a solution to the limited cognitive capacity problem. The motif of UTT is that unconscious thinking is not constrained by low cognitive capacity and consequently may lead to more satisfying or better decision in the context of complex decisions. This phenomenon has come to be known as the Deliberation-Without-Attention Effect (Dijksterhuis et al. 2006; Lassiter et al. 2009).

Researchers in cognitive and social psychology acknowledge two distinct modes of information processing, namely, conscious thought and unconscious thought (Evans 2008). Under conscious thought, an

individual is "consciously aware of the cognitive and/or affective task-relevant processes" while attending to a task, whereas unconscious thought refers to "cognitive and/or affective task-relevant processing that takes place outside conscious awareness" (Dijksterhuis 2004, p.586).

UTT suggests that when the decision is complex, unconscious thought leads to better decision performance than conscious deliberation because unconscious thought is associated with a high capacity, distributed and bottom-up information processing process which can weight numerous pieces of information and integrate them into decisions automatically (Dijksterhuis 2004; Dijksterhuis and Nordgren 2006). As mentioned above, information processing theories assume that individuals are systematic information processors constrained by the low capacity of consciousness and are unable to deal with complex tasks (Allert 2001; Keller and Staelin 1987). In contrast, UTT asserts that unconscious thought is not constrained by low processing capacity and thus can deal better with complex tasks (Dijksterhuis and Nordgren 2006).

The results of empirical studies on the specific propositions of the UTT are mixed (Acker 2008; Strick et al. 2010), probably due to the fact that UTT is still new and our understanding of it is not yet sufficient. Some studies provide support for the superiority of unconscious deliberation (e.g., de Vries et al. 2010; Dijksterhuis et al. 2006). Some experiments replicate the DWA effect under certain boundary conditions (e.g., Lerouge 2009; Payne et al. 2008). Other researchers, however, acknowledge little evidence of the DWA effect (e.g., Lassiter et al. 2009; Smith et al. 2008).

Despite the mixed empirical support for the DWA effect (e.g.,Lassiter et al. 2009), the DWA effect is an interesting phenomenon which has important implications for web-specific HCI research. First, rather than focusing on reducing distraction on the website to facilitate conscious deliberation, what the UTT suggests is that distracting features that direct consumers' attention away from the primary task of online shopping, if properly employed, may not necessarily result in inferior purchasing decisions. Consequently, the strategic use of some pop-ups, animated banners, floating advertisements or other interactive features may result in better purchase decision and minimal disturbance (Tan et al. 2008). In other words, rather than forcing the customers to go through a linear process of online shopping, some interventions which are strategically triggered to the right consumers at the right time may help consumers develop unconscious modes of elaboration and thus may result in optimal purchase decisions. Second, the choice environment in favor of unconscious thought can be created in an e-commerce setting, where the task demand is susceptible to the interaction of individual factors and contextual factors, which can be manipulated by marketers, e.g., by organizing product choices by brands to induce a configural mindset (Lerouge 2009), imposing a time limit for transactions (Payne et al. 2008), describing high quality product information (Gao et al. 2012) in proper units to minimize the contrast in attribute magnitude (Payne et al. 2008), and presenting product attributes simultaneously (Acker 2008). Therefore, we argue that it is crucial to take into account the interaction of the presence of distractions with individual and contextual dimensions of the choice environment when considering how to approach complex consumer choices.

Need for Cognition

Need for Cognition (NC) refers to the extent to which people engage in and enjoy effortful thinking (Cacioppo and Petty 1982). Consumer researchers often use Need for Cognition (NC) as an operationalization of cognitive resources demanded by the choice environment (Inman et al. 1990; Kim and Kramer 2006; Meyers-Levy and Sternthal 1993). However, fundamentally, NC is a motivational variable to account for individual differences in the amount and nature of product-relevant elaboration (Petty and Wegener 1999). It relates to cognitive demand of the choice indirectly through its effect on consumers' motivation to engage in different kinds of deliberation, in particular effortful and complex decision making (Drolet et al. 2009). The Need for Cognition Scale (NCS; Cacioppo and Petty 1982) was designed to distinguish between high NC and low NC individuals. Early studies of NC reveal that high NC individuals are more likely to organize, elaborate on and evaluate received information (Cohen 1957), to expend more cognitive effort in evaluating messages (Cacioppo et al. 1986; Cacioppo et al. 1983), and to be more motivated to process complex information (See et al. 2009). Thus, NC would interact with perceived task complexity to influence information processing preceding a consumer choice. Notably, higher NC does not necessarily lead to better decisions (Carnevale et al. 2011). NC leads to increased thinking. If thoughts are biased to begin with, increased NC does not guarantee better decisions (Lerner

and Tetlock 1999). In fact, biases caused by effortful thinking, such as explicit priming, can be exacerbated by higher NC (Petty et al. 1996). In the context of e-commerce, consumer individual factors, specifically NC, would interact with other contextual factors of retail websites (e.g., distracting features) and influence consumer product evaluation processes.

Circadian Rhythms and Time of Decision

In the quest to understand how consumers make purchase decisions, there has been an emerging interest in studying the direct and moderating effects of time-related contextual variables on consumer behavior (Hornik and Miniero 2009; Hornik et al. 2010). For example, circadian rhythm is found to be a fundamental construct of human behavior (Cavallera and Giudici 2008; Kruglanski and Pierro 2008). Consumers differ in their circadian orientation, which reflect 24-hour cycles of increases and decreases in a range of biological and physiological functions, including body temperature, heart rate and hormone secretion (Hasher et al. 2002; Hrushesky 1994; Moore-Ede et al. 1982).. Prior research demonstrates that most individuals have a certain time of day (TOD) when they are most alert and able to perform at their best in various tasks, such as proactive interference (Hasher et al. 2002), long term memory access (Anderson et al. 1991), reaction time and concentration (Buela Casal et al. 1990), recall and recognition (Intons-Peterson et al. 1999; Petros et al. 1990), visual search (Natale et al. 2003), and certain complex reasoning tasks (Bodenhausen 1990). It is believed that circadian orientation affects the energy dimensions of activation and alertness (Tankova et al. 1994), which is an antecedent to attention and cognitive resource availability (Matthews and Davies 2001), and subsequently to information processing (Hornik et al. 2010).

The concept of circadian rhythms could be a crucial dimension of understanding consumer behavior in e-commerce settings. The synchrony between consumer peak circadian periods and time of decision may influence consumer product information processing and purchasing decision-making. For instance, the synchrony is shown to strongly influence consumers' waiting time and service evaluation and consumers are able to recall and recognize ads when tests are performed during their peak circadian time (Hornik and Miniero 2009). Also, there is an interaction effect between consumers' circadian arousal and their ability to evaluate information (Yoon et al. 2000).

Research Model and Hypotheses

The theoretical model is presented in Figure 1. Drawing upon the UTT, this research model includes both individual and contextual factors as constitutes of the task demand, which determines decision quality for complex choices.

The Dependent Variable: Quality of Purchase Decision

Quality of purchase decision refers to the optimality of product choice based on pre-defined decision making criteria (Tan et al. 2008). Following the UTT paradigm (Dijksterhuis 2004; Dijksterhuis and Nordgren 2006), the quality of actual choice is used as the outcome variable when concerning the benefits of a particular decision strategy. Optimal purchase decision increases the possibility that consumers' pre-purchase expectations of the product are well confirmed, and thus may lead to greater consumer satisfaction (Churchill Jr and Surprenant 1982; Wang and Benbasat 2008). Although distracting website features give rise to disruption and annoyance, prior literature suggests that the benefits of better decision quality resulting from using distracting features is likely to alleviate the negative side effect of annoyance perceived by consumers (Tan et al. 2008).

There are two dominant schools of thought on good decision making: one emphasizes the process, the other mainly considers the outcome (Oz et al. 1993). Both are addressed in this research. Specifically, decision quality is operationalized as choosing the options with more positive features (Dijksterhuis and Nordgren 2006), representing the decision-making outcome. The amount of deliberation is also studied to represent the decision-making process.

Deliberation Mode and Quality of Purchase Decision: The DWA Hypothesis

According to the DWA hypothesis (Dijksterhuis et al. 2006), unconscious deliberation will lead to better

identification of optimal choices when the decision complexity is high. By contrast, conscious deliberation may require excessive information processing beyond consumers' cognitive capacity (Wilson et al. 1993), leading to relevant pieces of information being dropped (Rey et al. 2009) or suboptimal weighting of product attributes subject to cognitive rules or biases (Dijksterhuis and Nordgren 2006).

We expect that the presence of distracting features will trigger the unconscious mode of thought described in the unconscious thought principle of the UTT, resulting in better purchase decisions for complex products. In this study, we focus on purchase decisions for complex products. Hence, we expect that:

H1: Unconscious deliberation will lead to higher quality of complex purchase decision as compared with conscious deliberation.

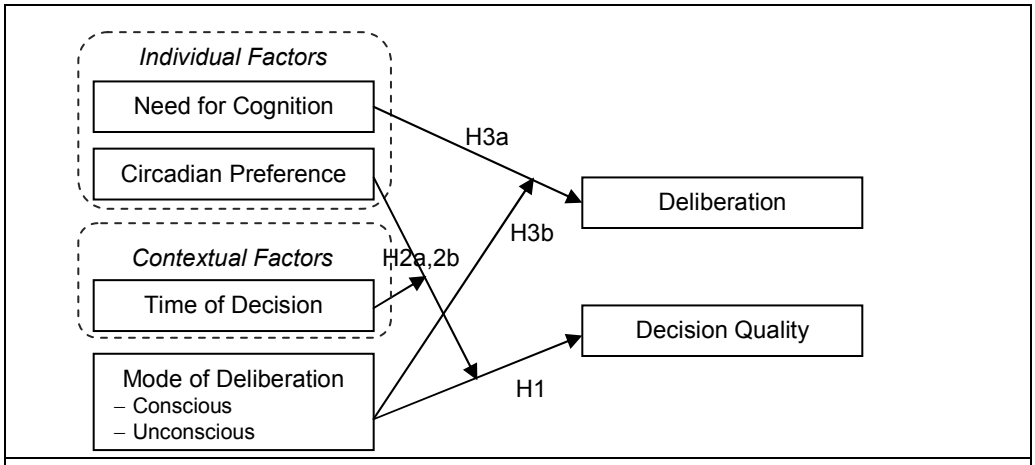

Figure 1. Research Model

Deliberation Mode, Circadian Preference and Time of Decision

Processing of product information requires individuals to rapidly access information (e.g., individual preference and previous purchasing experience) from long-term memory as well as simultaneously manipulate earlier portions of the text from working memory (Perfetti and Lesgold 1979). Prior research reveals that consumers reach optimal performance of information processing when there is a synchrony between peak circadian periods and time of testing, because the synchrony facilitates efficient retrieval of consolidated information in memory (Hornik and Miniero 2009; Hornik et al. 2010). This synchrony effect may result in better information processing under conscious deliberation, making the relative advantage of unconscious deliberation less significant. By contrast, a mismatch between circadian preference and time of decision reflects low level of arousal, and consequently deterioration of information processing (Hornik 1988). Such mismatch would lead to poorer performance of conscious deliberation, which is constrained by ones' cognitive efficiency, compared with that of unconscious deliberation. Therefore, we expect that:

H2a: When there is a match between consumer circadian preference and time of decision (i.e., morning type makes purchase in the morning and evening type makes purchase in the evening), unconscious deliberation will not lead to higher quality of complex purchase decision as compared with conscious deliberation.

H2b: When there is a mismatch between consumer circadian preference and time of decision (i.e., morning type makes purchase in the evening and evening type makes purchase in the morning), unconscious deliberation will lead to higher quality of complex purchase decision as compared with conscious deliberation.

Deliberation Mode and Need for Cognition

Effective consumer decision-making requires individual consumers to have an inclination to actively and continuously engage in thinking about the product alternatives. Prior studies have found positive

correlations between scores on tests of cognitive ability and resistance to decision-making biases, including overconfidence (Stanovich and West 2000; Wolfe and Grosch 1990), hindsight bias (Stanovich and West 2000), and inefficient use of decision rules (Bröder 2003). Furthermore, high NC individuals are more likely to think about a complex problem and deliberately evaluate alternatives before a purchase decision (Cacioppo and Petty 1982), recall greater amounts of information to which they have been exposed (Cacioppo et al. 1983; Heslin and Johnson 1992; Lassiter et al. 1991), generate a higher number or proportion of task-relevant thoughts (Axsom et al. 1987; Verplanken 1993; Verplanken et al. 1992), and make thoughtful judgments (Verplanken 1989). Thus, we expect:

H3a: With increase in need for cognition, individuals will deliberate more on the information.

Furthermore, Lassiter et al. (2009) argue that NC theoretically effects only conscious thought processes. Hence, for the conscious deliberation condition, we propose that:

H3b: With increase in need for cognition, individuals will deliberate more on the information particularly under conscious deliberation.

Research Methodology

The experiment was set in the context of an online auction site since we want to manifest the DWA effect under time constraint, which has been shown as a boundary condition of DWA effect (Payne et al. 2008). The auction closure mechanism in auction websites is a natural time constraint without compromising the realism of experimental settings, as compared to, for instance, introducing an artificial time limit for subjects to make a purchase decision (Tan et al. 2008). A program was developed to simulate two identical online auction websites representing two treatment groups, namely Conscious Deliberation (CD) and Unconscious Deliberation (UD).

Participants and Design

185 university student subjects (Mean age = 18.66 years, SD = 1.05, range = 17-23) were randomly assigned to one of the two treatment groups. 95 of them were assigned to Conscious Deliberation (CD) group, and the other 90 participants were assigned to Unconscious Deliberation (UD) group. The participants (CD or UD) were then randomly assigned to one of seven experiment timeslots (i.e., hourly from 9am to 15pm). Students are often online consumers and thus are suitable for this study on time and individual factors. Participants were paid $5 to participate in the study. There is no significant difference in age or gender across conditions.

The mode of deliberation and time of decision were manipulated as between-subjects factors. Participants in the CD group were given two minutes to think about the product information before their choice making. Participants in the UD condition were distracted by a pop-up for two minutes before their choice making. Informed by the UTT paradigm (Dijksterhuis 2004; Dijksterhuis et al. 2006), the US condition was manipulated so as to take the mind of the participants off conscious product evaluation, and the pop-up was set to be irrelevant to the primary task of consumer purchase. Pretests were performed for both CD and UD conditions to ensure that the distraction is intensive enough to make conscious product evaluation impossible.

Based on the principle that a conscious information processing capacity is limited to a temporary "store" of seven items (Miller 1956) and the manipulation of product complexity in the UTT paradigm (e.g., Dijksterhuis 2004), a complex product is manipulated as a product with 12 attributes. The attributes were either positive or negative. The best product was characterized by 75% positive attributes, two median products by 60% and 40% positive attributes respectively, and the least attractive one by 25% positive attributes.

Procedure and Material

Prior to the experiment, participants' were required to complete Home and Ostberg's (1976) Morningness-Eveningness Questionnaire (MEQ). The experiment was described as an experiment on decision-making. Participants were told that they would be presented with information about four hypothetical mobile phones from an auction website and had to make a purchase decision before the

auction closed. Participants were told that they should make product judgment based on the percentage of desirable attributes possessed by the product. To further motivate participants to pick the optimal product, they were informed that they would be paid $6 bonus (besides $5 participation reimbursement) if they selected the best product, $4 if they selected a mediocre product and $2 if they selected the worst product or do not indicate their preference.

Information was then presented about the four mobile phones; each mobile phone was described by 12 attributes (i.e., complex tasks). The sequence in which the four product pages are presented and accessed was randomized to minimize possible order effects. Each product was presented for 15 seconds which was verified in pilot tests as adequate for absorbing all relevant information but insufficient for systematic deliberation. The timing was controlled by the program which simulates an auction site. Subjects were automatically directed to the next product specification page after 15-second intervals.

After the product presentation, participants in the CD group were asked to think very carefully about the products and deliberate for 2 minutes. The distraction for the UD group was by a pop-up in the form of an n-back task (Jonides et al. 1997) which aimed at preventing conscious thought. The pop-up presented a serious of images and asked participants to decide whether an image matches the image that preceded it by n-places. As the task demanded considerable cognitive resource, it could be expected to eliminate conscious thought (Dijksterhuis 2004). All the participants completed the n-back task with satisfactory scores. Subsequently, subjects were redirected to the auction site and asked to indicate their purchase choices before the auction closed in the next 15 seconds.

Subsequently, participants were asked to complete the questionnaire examining their level of deliberation and need for cognition. All items on the above mentioned questionnaires were measured on 7-point Likert scales. Finally, participants were required to fill out their demographic and academic background information. The development of construct measurement was based on a survey of prior literature. The Need for Cognition Scale was adapted from Cacioppo and Petty (1982). In all statistical analysis, we used the continuous measure of NC. Individual differences in circadian preference was measured by the MEQ developed by Home and Ostberg's (1976); participants were categorized into eveningness (i.e., MEQ<59) and non-eveningness (i.e., morningness or intermediate) circadian preference according to their MEQ score. Deliberation was assessed based on questions taken from Tan et al. (2008). Demographic information, such as age and gender, were included as control variables in our analysis.

Preliminary Results and Discussion

Scale Reliability and Factor Analysis

Reliability was assessed by Cronbachs alpha and Composite Reliability (CR). Cronbachs alphas were greater than 0.7 and CRs exceeded 0.7, verifying reliability (Chin 1998b; Nunnally 1978). *Convergent validity* was assessed by item loadings, t-values of loadings, and AVE (Hair et al. 1998). AVEs were above the threshold of 0.5, indicating that the constructs can account for at least 50% of variance in the items. Additionally, all item loadings were higher than 0.7 and their t-values indicate that they were significant at the level of 0.01. Moreover, *discriminant validity* was verified by comparing the square root of AVEs with inter-construct correlations and comparing loadings with cross-loadings. The result revealed that the square root of AVE for each construct was greater than the correlations involving the construct (Chin 1998a). Also, item-factor loadings were all greater than item-unintended factor loadings (Cook et al. 1979). Thus, the discriminant validity was acceptable.

Hypotheses Testing

The Effect of Deliberation Mode on Purchase Decision Quality

The percentages of participants choosing the best alternative were compared. As expected, a greater proportion of participants in UD condition than those in CD condition made the right choice (27.8% and 13.7% identified the best alternative, respectively), and the difference was significant ($\chi^2(1, N=185) = 5.436$, $p<0.05$). Therefore, H1 is supported.

The Effects of Individual and Contextual Factors

A logistic regression on decision quality revealed a non-significant interaction effect of circadian preference and time of day ($\chi^2(1, N=185) = 0.243$, NS), and also a non-significant three-way interaction effect ($\chi^2(1, N=185) = 1.615$, NS), and therefore, H2a and H2b are not supported. It is possible that consumers with different circadian preference did not experience much variation in arousal within the restricted experiment time from 9am to 3pm. Indeed, diurnal studies on circadian rhythm reveal that evening-type individuals may consistently experience lower level of arousal and cognitive concentration compared with their morning- or intermediate- counterparts throughout the day time from about 10 am to 3pm (Natale et al. 2003; Natale and Cicogna 1996).

A closer examination of the interaction between mode of deliberation and circadian preference showed that evening-type individuals (who may experience lower level of arousal) were more likely to benefit from unconscious mode of deliberation as a higher proportion of evening-type made the optimal choice for complex decision ($\chi^2(1, N=88) =4.146$, $p<0.05$). By contrast, morning- and intermediate-type individuals did not experience significant benefit of strategically developed distraction ($\chi^2(1, N=83) =0.153$, NS). This finding, although not predicted by our research model, provides evidence of superiority of unconscious deliberation under low cognitive efficiency and suggests that further study is necessary to investigate how the circadian dimension contributes to the cognitive demand of choice.

Supporting H3a, a regression on deliberation revealed a significant main effect of NC on deliberation ($\beta=0.0.298$, $t=3.488$, $p<0.01$). The interaction between NC and mode of deliberation, however, did not have a significant effect on deliberation ($\beta=0.187$, $t=1.062$, NS). Thus, H3b is not supported.

Table 1. Results of Regression Analysis

Paths	Hypotheses
Mode of Deliberation → Decision Quality	H1 supported
Circadian Preference × Time of Decision × Mode of Deliberation → Decision Quality	H2a, 2b not supported
NC → Deliberation	H3a supported
NC × Mode of Deliberation → Deliberation	H3b not supported

Conclusion

This paper fills current literature gaps by conducting a theoretical conceptualization of how distracting website features would be strategically used to interact with both individual and contextual factors of choice environment in complex decision making in e-commerce. Theoretically, this study has challenged the long-held assumption in existing web design literature that conscious deliberation during pre-purchase evaluation leads to optimal choices. This research brings in the new perspectives arguing that unconscious information process can sometimes lead to favorable purchase decisions. Also, this research contributes to the ongoing empirical effort to manifest the DWA effect in a novel choice environment, and provides partial evidence of poor performance of constrained conscious thought under low level of arousal. More importantly, the findings suggest that time related factors and individual factors should be investigated for further research on unconscious decision-making. Practically, the study suggests that distracting website features may be beneficial to e-commerce retailers if they could tactically manipulate various contextual factors of consumer choice environment. For example, distractions features may be invoked during the day time for evening-type consumers who usually perform online activities in the evening. This research suggests to e-commerce practitioners that strategically employed interventions can help customers leverage the power of unconscious information processing to make optimal purchasing decisions to enhance customer satisfaction and to avoid costs associated with product refunds.

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