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# **The Effects of Information Load and Individual Differences on Consumers' Subjective State towards On-line Buying Decisions**

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## **Abstract**

It is claimed that e-retailers can reduce consumers' search cost and enlarge the amount of product alternatives offered. This is an advantage of e-retailers which will bring welfare to consumers. The aim of this study is to provide an insight into the effects of individual characteristics on the processing of abundant information obtained from e-retailers and the subjective states toward the buying decisions. Theory of information overload was deployed and extended, hoping to understand why the information-richness advantage of e-retailers would bring opposite consequences to consumers. This study focuses on empirically testing the effects of three individual factors, including subjective product knowledge, product involvement, and self-efficacy, that are, at least, conceptually important in theory of heuristic decision making and strategy, but are seldom addressed by information overload paradigm. An experiment was conducted, where a simulated e-storefront selling mobile phone was constructed. Two information load groups were set up with 224 subjects randomly assigned to each of the groups. The results indicate that comprehensive information may not necessarily lead consumers to a perception of reaching a good decision, and may not alleviate the perception of needing more information; cognitive involvement and self-efficacy, however, moderate the relation between information load and subjective state. In addition, product knowledge was found to directly influence the subjective state towards online purchase decisions.

**Keywords:** Internet Shopping, Information Overload, Subjective States towards Buying Decision, Individual Differences

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# 資訊量、個體差異與消費者對網路購物決策的主觀心理狀態

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## 摘要

網路商店據信可以減少消費者搜尋成本並給消費者帶來更豐富的產品選擇，這是網路商店的優勢之一，可以提昇消費者福祉。本研究希望理解，當消費者處理從網路商店獲得的豐富資訊時，其對購物決策之主觀心理感受如何受到個體差異影響。本研究以資訊超載理論為基礎，將主觀產品知識、產品涉入與自我效能這三個在經驗法則決策理論中非常重要，卻被資訊超載理論忽略的個體差異變數整合進來，希望理解是否、為何豐富的資訊反而給消費者帶來負面的後果。本研究建置一個模擬的手機消費網站，設定兩個資訊量水準，並將 224 個受測者隨機分配到兩個實驗網站中，要求他們在限定時間內決定購買那一隻手機。研究結果發現過多的資訊不見得會使消費者感受到做了好決定，或者能緩和其需要更多資訊的感受。知覺涉入與自我效能會干擾資訊量與主觀心理狀態的關係，產品知識則直接影響主觀心理狀態。

**關鍵詞：**網路購物、資訊超載、對購物決策的主觀心理狀態、個體差異

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## 1. Introduction

Internet has become one of the most revolutionary retail channels for people to purchase products or services. Finding ways to make use of the advantages of Internet to enhance consumer's on-line shopping intention and satisfaction has attracted significant attention (Chen & Tan 2004; Cheung et al. 2005). It is believed that the Internet allows formation of centralized intermediaries, which enable consumers to search product information across different e-stores simultaneously without physical limitation and with the lowest search cost (Choi et al. 1997). Shopping online, hence, has been regarded as the acceptance of, and the processing of information obtained from information systems (Castañeda et al. 2007).

Consumers now are possible to gather unprecedented rich information. For example, there are some 175,000 books stored in the largest bookstore in the USA, Barnes & Nobel. However, the number of books offered in its Internet bookstore amount to more than three millions (Brynjolfsson & Smith 2000). "Information-richness" has been recognized as one of the most important advantages of Internet (Alba et al. 1997; Evans & Wurster 1999; Lynch & Ariely 2000). The hypotheses of "non-friction" and "no-boundary" connote the probability, for firms, of offering unlimited amount of product information to various consumers and the likelihood, for consumers, of making extensive search, reducing information searching cost, and improving their welfare (Evans & Wurster 1999; Lynch & Ariely 2000).

Satisfaction with information obtained from the Internet may affect the satisfaction with product selected (Castañeda et al. 2007). An understanding of how consumers deal with information obtained, then, would help e-business managers devise marketing strategies regarding the most effective and efficient ways to provide information to their customers. However, locating and processing relevant product information may now adversely become difficult and a burden to consumers because of its abundance (Xu & Chen 2006). Consumers may have to pay more efforts to make buying decisions. Thus, the attraction of products and/ or storefronts may decrease (Beattie et al. 1994). People might make a poorer decision in a context of e-commerce environment, and may feel unsatisfied and uncertain in regards to their decisions (Wu & Lin 2006). Only a few literatures, however, investigated the effect of abundant information on consumers' buying decisions, their subjective states toward decisions in particular (e.g., see Lee & Lee 2004; Chen et al. 2009).

Based on the theory of information overload, this study examines consumers' subjective states towards buying decisions after accessing plentiful information in the Internet shopping environment. According to the theory of information overload, while the information load increases beyond a threshold, consumers might need to take more efforts to process the information and may make poorer decisions (Jacoby et al. 1974a; 1974b). Previous researches stressed for a consensus in the operationalization of information load and decision quality, hoping to find a universal threshold of information load that make decisions worse (Jacoby et al. 1974a; 1974b; Russo 1974; Summers 1974; Wilkie 1974; Malhotra et al. 1982; Malhotra 1982; Keller & Staelin 1987; Meyer & Johnson 1989; Hahn et al. 1992; Lee & Lee 2004; Lurie 2004).

However, consumers are different with their information processing ability (Henry 1980). People always try their best to minimize the effects of information overload by applying different information processing strategies and heuristics (Grisé & Gallupe 2000; Park et al. 2006). Many personal factors will influence the decision making process (Kahneman & Tversky 1983; Tversky 1972; Tversky & Kahneman 1974). The roles of these individual factors, however, are seldom addressed by previous studies. This study, considering the effects of individual's difference, examines whether the information-richness advantage of Internet would become its own threat reversely. The concept of heuristic decision strategy was taken as a basic assumption, and individuals' factors were incorporated into the theoretical model to extend and enhance traditional framework from information overload.

## 2. Literature Review

### 2.1 Consumers' Information Search: Offline Versus Online

Before making a purchase decision, consumers are likely to search for and process product information relevant to ones' need. Retail channels always provide various alternatives for consumers to consider. To satisfy customers, they must provide product information to facilitate consumers to screen alternatives to form consideration set. Consumers can search and access the information from many sources like advertisement, newspapers, magazines, books, or even driving from store to store, etc. (Browne et al. 2007).

Brick-and-mortar economics are governed by a basic law in the provision of information: firms must make a trade-off between the *reach* and *richness* of information delivery (Evans & Wurster 1999). The former means the number of people who could

receive and/or exchange information. The latter is defined as the quality, content and prosperity of information, which mostly depends on the characteristics of bandwidth, customization, and interactivity of the media.

Traditionally, as a result of the limitations of mass media, the message is always monologue when firms communicate with millions of people. To communicate richer information to customers may require dedicated channels but whose costs or physical constraints might limit the reach of customers. Hence, firms can deliver information to a large amount of customers only when information richness is depressed. In front of poor information, consumers have to pay expensive cost in searching information owing to limited time and efforts to visit many retail stores or access different information sources. Hence, a problem of information scarcity always exists in traditional retail situation.

Online shopping decisions will depend more heavily on the product information since people can't touch or smell products, as would be possible in traditional retail stores (Park et al. 2007). Luckily, through the Internet, e-storefronts can probably relieve this trade-off to get reach and richness at the same time (Evans & Wurster 1999). First of all, the bandwidth of Internet is much wider than traditional media. Because of the Internet's ability to transmit and search through a huge amount of information, it can unbundle information from its physical carriers (Evans & Wurster 1999). Without the limitation of retail space, online stores can offer more options and information than brick-and-mortar stores (Shang et al. in press).

Secondly, interactivity is one of the most distinctive characteristics of the Internet (Hoffman & Novak 1996). Traditional retailers use one-way communication and the push model of information provision. E-retailers, on the other hand, now provide two-way communication such that consumers gain control over information search (Wu & Ling 2006). Furthermore, e-retailers now can provide abundant amount of individually customized information, with superior quality, at minimal effort and cost (Para & Ruiz 2009).

Consumers now can search various products information everywhere at very low costs. Both the speed and reach of searching online are different. Speed is much faster, and reach is almost infinite (Browne et al. 2007). Searching product information across various e-storefronts to acquire information became an easy and cheap task (Lynch & Ariely 2000). While the problem of information scarcity is diminishing, "information overload" during the process of information processing in decision making may arise in the information-rich Internet environment.

## 2.2 Consumer Decision Making and Information Overload

The decision theories care about two things: outside information stimuli and decision quality. At first, perfect information and complete rationality were recognized as the ways to obtain best decision—a decision that maximizes decision maker's utility (Edmunds & Morris 2000). Based on assertions in decision science and information system disciplines, the theory of information overload has been borrowed by consumer psychologists as a framework to explain consumers' buying decision (Jacoby et al. 1974a; 1974b). Consumers are presumed as an “input-process-output” system with limited information processing capacity. Once the inputted information surpasses the limitation, a decision-maker's decision quality should drop off (Grisé & Gallupe 2000), consumers' buying decisions should become dysfunctional. Previous researchers aimed to find a universal threshold of product information load to make consumers' buying decisions worse (Jacoby et al. 1974a; 1974b; Malhotra et al. 1982; Malhotra 1982; 1984; Muller 1984; Keller & Staelin 1987; Lurie 2004; Lee & Lee 2004).

Jacoby, Speller and Kohn (1974a) measured the loading of product information in terms of the number of product alternatives (i.e. brands) times the number of product attributes (for example, calories). By varying the amount of product information load in a choice set, the effects of information load on consumer's decision-making quality were examined (Jacoby et al. 1974a; 1974b). Several researchers later critiqued the definition of information load proposed by Jacoby et al. (1974a; 1974b), re-appraised their original data to derive an opposite conclusion that “more information leads to better decision” (Malhotra et al. 1982; Malhotra 1982; Muller 1984).

To remedy the arguments about the definition of information load and the divergent data-explanation results, some researchers incorporated other factors, including information quality (Keller & Staelin 1987), variability of attributes (Russo 1974; Summers 1974; Wilkie 1974), similarity of alternatives (Keller & Staelin 1987), and distribution of attribute levels across alternatives (Lee & Lee 2004; Lurie 2004), or adapted different methodologies to test the information overload effects, but still produced inconsistent results (Malhotra et al. 1982; Malhotra 1982; 1984; Muller 1984; Keller & Staelin 1987; Lurie 2004; Lee & Lee 2004). Unfortunately, recent information overload studies still produce inconsistent results (Sicilia & Ruiz 2010). For example, Castañeda, Frías and Rodríguez (2007) concluded that more information is better, which leads to the enjoyment of tourism and satisfaction of traveler; while Chen, Shang and Kao (2009) concluded that there are dysfunctional consequences.

It is worth noting that Henry (1980) observed evidence indicating that information processing ability varied across people. Even consumers are exposed to the same level of “objective” stimuli, information selectively solicited, comprehended, and perceived by consumers might be influenced by one’s cognitive process (Grisé & Gallupe 2000) and many individual and situational factors such as structural characteristics of one’s personality, information processing strategies, mental information filtering mechanism, coping strategy, characteristics of stimulus manipulated by e-store and individual optimal level of stimulation. Effects of the above factors have been explored by school of human decision behavior (Chen et al. 2009).

Drawing from the arguments and thoughts from human decision making, there are at least three approaches in extant literature trying to extend and improve the theoretical framework of information overload. The first approach inquires and elaborates the effects of one’s cognitive process and information processing strategies. For example, Sicilia and Ruiz (2010), considering one’s cognitive responses to the stimuli exposed, found empirical evidence of the ‘inverted U-shape’ relating consumer’s cognitive responses and the information load. Cognitive fit theory and elaboration likelihood model (ELM) was deployed by Park and Kim (2008) and Park, Lee and Han (2007) to discover the strategies consumers’ used to deal with external information. Chen et al. (2009) argued that a new concept- perceived information overload mediates the relationship between information stimuli and the subjective state towards decision.

The second avenue considers the roles played by individual characteristics. For example, consumers’ expertise and capabilities in processing product information has been investigated (Wu & Lin 2006); evidence indicated that novice consumers may face a more serious information overload problems than experienced consumers (Chen et al. 2009). Park and Kim (2008) also found experience played the same role in the context of e-word-of-mouth (e-WOM). Park and his colleagues found that the strategies consumers used to against the information overload from e-WOM might depend on their levels of involvement (Park et al. 2006; 2007; Park & Lee 2008).

The third approach investigates the role of situational factors such as the design of web site. For example, Para and Ruiz (2009) and Chen et al. (2009) found that the provision of search or information filtering tools results in smaller, more stable, and more homogenous consideration sets, hence may relieve the perception of information overload.

These three approaches are not mutual exclusive in a single study; instead, researchers may at the same time deploy more than one approach in their studies. For

example, Shang, Chen and Chen (in press), considered framing effects from prospect theory, and individual characteristics including tendency towards maximization and regret, found an inverted U-shape relating consumer's subjective state towards decision and the amount of information.

### **2.3 Outcomes of Consumers' Decision Making**

Jacoby et al. (1974a) believed that the drop-off of response rate, analogizing the information overload theory in disciplines of computer system and decision science, should occur too in consumer decision context and defined it as "drop-off of decision quality". Drawing from the thoughts of complete rationality (Edwards 1954), this theory assumes decision makers are "economic men" seeking "optimal solutions" based on their preferences (Jacoby et al. 1974a; 1974b; Russo 1974; Wilkie 1974; Summers 1974; Malhotra et al. 1982; Malhotra 1982; Keller & Staelin 1987; Meyer & Johnson 1989; Hahn et al. 1992; Lurie 2004; Lee & Lee 2004). Jacoby et al. (1974a) defined decision quality as "the best choice," and accounted for best choice by an idiographic approach in which each consumer determined which combination of attributes was best for him/her, and then the "actual choice" in a specific information-load context was measured. The closer the deviation from the best choice is, the better the "decision quality" is.

However, several researchers criticized Jacoby's definition and operationalization of decision quality and best choice from both conceptual and methodological perspectives. Conceptually, some argued that an individual may have no consistent preferences during the procedure; and it would never be clear which set of measures reflected most accurately one's true normative preferences. It is also methodologically difficult to measure both idiographic ideal brand and dysfunctional consequence (Summers 1974; Wilkie 1974; Jacoby 1977; Keller & Staelin 1987; Meyer & Johnson 1989; Lee & Lee 2004). Some researchers challenged the choice of decision quality as the dependent variable of information overload phenomena (Summers 1974; Keller & Staelin 1987; Meyer & Johnson 1989; Malhotra 1984; Russo 1974), and indicated that there should be other possibilities of the dysfunctional consequences (Summers 1974; Keller & Staelin 1987; Meyer & Johnson 1989).

Schools of thoughts other than complete rationality recognized the limitation of complexity and capacity of individuals and the difficulty to gather perfect information in the real world (Simon 1956). Due to the limitation on the information processing,



individuals usually adapt well enough to “satisfied” but not “optimized” decisions (Simon 1956). People in reality tend to use heuristics decision making mechanisms that are highly economical and reasonably effective but usually introduce systematic errors under certain conditions (Tversky & Kahnman 1974). Hence, just as Malhotra (1984) suggested, “choose the best brand” should not be the only one outcome variable.

To gain a deeper understanding about the effects of information loading, Jacoby et al. (1974a; 1974b) designed a subjective state scale as another dependent variable to assess the impact of information load on consumers' feelings of buying decision. This scale includes satisfaction, certainty, confusion and regret about one's buying decision, and the degree of desire for more information. In the era of experiential economics, consumption has been regarded as a subjective state of consciousness with shopping experience. Though objective decision results are important, subjective experiences can have greater influences on the utilities of objective results (Schwartz 2004). A consumer may have made a best choice but felt exhausted and frustrated by the time and efforts spent in buying a product. Negative emotional reactions may decrease the utility of the best choice, and lead people to switch away from the options that are successful overall in the past. Superior subjective experiences, in contrast, can lead to a preference for and satisfaction with the e-store (Ratner & Herbst 2005). For example, a non user-friendly interface and an irresponsible intermediary may lead to an unhappy shopping experience such that consumers may never return. Ample evidence indicates that decisions may cause regret, and anticipation of regret will impact decision making outcomes (Zeelenberg & Pieters 2004). Thus, consumers' “subjective state towards buying decision,” even though they had made good decisions in the past, should still play an important role on consumers' intention to shop on-line on the next occasions, and is chosen as the dependent variable of this study.

As the amount of information increased, Jacoby et al. (1974a; 1974b) asserted that consumers would feel better towards their decisions even though they actually made poorer decisions. This assertion soon incurred criticisms. Malhotra (1982) indicated that consumers tended to feel less satisfied and more confused with their decisions as the amount of alternatives and attributes increased. Keller and Staelin (1987) concluded that consumers tended to feel less confident as the amount of attributes increased. Lee and Lee (2004) also indicated that consumers in on-line shopping environment tended to feel less satisfied, less confident, and more confused with their purchase decisions. Generally, arguments of Jacoby et al. (1974a; 1974b) were refuted by these researches.

## 2.4 Individual Differences

People try to minimize the effect of information overload by applying different information processing strategies (Grisé & Gallupe 2000; Park et al. 2006). Among which, heuristic decision strategies are usually used by people in daily life; but their effects received relatively little attention from information overload researches. This strategy is accomplished by different information processing modes based on personal experience and knowledge, self-assessing of the ability to handle the information, and the desired goal (Tversky & Kahnman 1974). For example, while deploying frequency heuristic to make purchase decision, people may rely on the mere number of positive or negative attributes of a product; or the mere number of attributes on which one product outperforms another, which is learned and accumulated from experiences (Chen et al. 2009).

Several crucial individual factors regarding the deployment of heuristic information processing strategies may be derived from Tversky and Kahnman (1974). First, a person's **past relevant experience** should affect one's selective exposure, selective perception, and the relevant information retained in one's long term-memory. The more abundant the past relevant experience is, the easier the perception of familiar information and the retrieval of the information retained are. Second, **personal proclivities**, including need states, interesting, persistent values, and motives etc., should also affect one's selective perception, comprehension, agreement, and retention of the information. Finally, **personal ability** should affect one's ability to comprehension, retention, and retrieval of information. Specifically, three variables: subjective product knowledge, product involvement, and self-efficacy, are chosen to represent these three factors that should affect consumers' information-processing strategies.

### 2.4.1 *Subjective product knowledge*

Though consumers' product knowledge can be classified into subjective and objective ones (Brucks 1985), subjective product knowledge is adapted here to represent consumer's perception of past relevant experience. Unlike the objective one, which measures what's actually remembered by consumers, the subjective product knowledge reflects consumers' perception of how much they know. In this regard, Park and Lessing (1981) claimed that subjective knowledge provides a better understanding of decision makers' self-confidence about their product knowledge levels. According to McGuire's (1976) decision process model, consumers feeling more confident about what they

know will more selectively perceive information presented to them. Their product-related experiences become information filtering mechanisms, and the use of heuristics will increase (Tversky 1972). This will reduce the amount of unnecessary information processing and increase the opportunity of choosing a satisfactory product.

#### *2.4.2 Product involvement*

Product involvement, which is defined as “a person’s perceived relevance of an object based on one’s inherent needs, values, and interests”, may be an appropriate variable to reflect one’s personal proclivities toward a product (Zaichkowsky 1985). Product involvement can be divided into two dimensions: affective and cognitive involvement. The former is used to describe the emotions, moods, and feelings evoked by a product. The latter reflects the degree of personal relevance of message contents based on the product’s functional performance (Zaichkowsky 1994). Consumers who highly involved with a product may actively seek product information, compare product attributes and perceive the differences among different brands more thoroughly, and have special preferences for a particular brand; and vice versa (Assael 2004; Zaichkowsky 1985). During the process of decision making, hence, they will try to perceive and comprehend information presented more completely (McGuire 1976), and may use less heuristic reasoning (Tversky 1972). They will increase the amount of information processed, and will feel better about their decisions only when they have made comprehensive comparison among products.

#### *2.4.3 Self-efficacy*

Self-efficacy, which is defined as individual’s belief that he/she has the capability to perform a particular behavior (Bandura 1977), is used here to measure a consumer’s self-confidence about his/her ability to process product information and make purchase decision. Consumers with higher self-efficacy may perceive themselves as being capable of processing information and achieving satisfactory decision outcomes, so they may be more willing to spent more efforts to process information (Tversky 1972). As a result, consumers with higher self-efficacy may use less heuristic reasoning and feel more confident about their decisions when they feel situations are controllable. Consumers who believe that he/she is highly capable of processing such information might be able to achieve these information-processing tasks whatever their actual inherent abilities are.

### 3. Research Model and Hypotheses

Based on the theoretical background reviewed in the previous section, a research model (Fig. 1) and a set of hypotheses were derived. The subjective state towards buying decision is a consumers' emotional reaction to their purchase decisions. Jacoby et al. (1974a) argued that, more information will lead an individual to a better psychological state. Abundant information, however, may easily require individuals to bear a burden in processing information; hence producing a stronger perception of overload (Chen et al. 2009). Evidence from other researches indicated that a worse subjective state could result from the uncontrollable feeling of overwhelming information (Russo 1974; Malhotra 1982; Keller & Staelin 1987; Edmunds & Morris 2000; Schwartz 2004; Lee & Lee 2004; Chen et al. 2009). The inconsistent findings revealed the difficulty and complexity of concluding the effects of information load on subjective state towards buying decision. Since the relations between information load and the subjective state may be moderated by personal factors, hence:

H1: More information load will not necessarily lead to better subjective states towards decision.

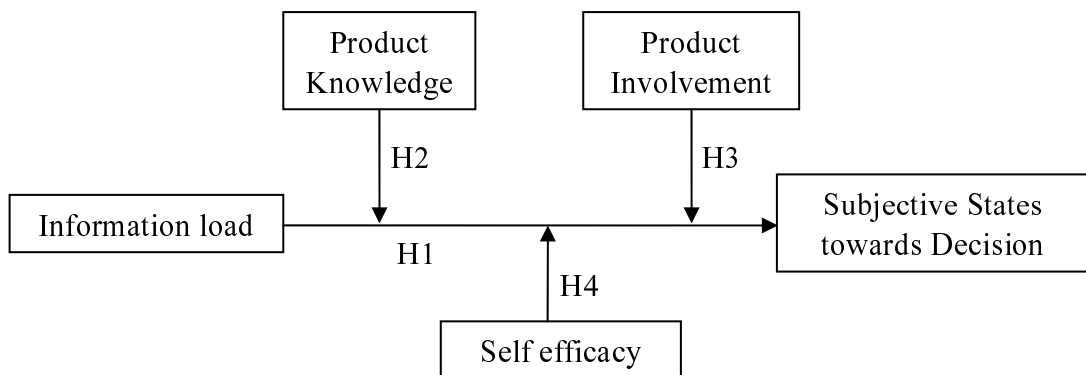


Figure 1 : Research model of this study

Product knowledge can influence which piece of information be perceived and recognized, and the decision strategies deployed by the decision maker. Experts are better than novices in the quantity and quality of product knowledge, and the

effectiveness and efficiency of deploying knowledge (Wu & Lin 2006). During the process of buying decisions, consumption relevant knowledge is represented in memory and is applied to evaluate product attributes (Huber et al. 2004). Giving the same information load, experts may be more confident about what they want, and may filter irrelevant information more efficiently; hence may reduce one's needs and efforts in searching of product alternatives (Park & Lessing 1981). Therefore, experts are more likely to produce a perception of information overload lower than novice consumer (Chen et al. 2009); and vice versa. Since a higher perception of information overload may lead to a worse subjective state towards decision (Chen et al. 2009), hence, we hypothesize that, facing the same amount of information:

H2: Subjects' product knowledge may moderate the relationship between information load and subjective states towards decision.

Giving the same amount of information, highly involved consumers may deploy filtering mechanisms and heuristics fewer than low-involved consumers; they are more likely to seek information for alternatives more actively and try to comprehend every pieces of information (McGuire 1976; Tversky 1972; Zaichkowsky 1985). Thus, they are likely to process more information; and may produce a better subjective state towards their decisions only when they have made comprehensive comparison among products. On the other hand, low-involved consumers may be more likely satisfied with suboptimal solution, hence, may have no need to process every pieces of information. Hence, low involved consumers may have a lower perception of information overloading. Since a higher perception of information overload may lead to a worse subjective state towards decision (Chen et al. 2009), hence, we hypothesize that, facing the same amount of information:

H3: Subjects' product involvement may moderate the relationship between information load and subjective states towards decision.

Consumers with higher self-efficacy are more likely to believe that they can deal with the large amount of information to purchase an optimal product (Bandura 1977). They may be more likely feeling confident about their processing of information and purchase decisions. On the other hand, giving the same amount of information, people with lower perception of self efficacy may perceive a heavier burden in processing

information; under such a context, people may get a feeling of losing control (Edmunds & Morris 2000). Missing part of alternatives may lead consumer to feel that one of the missed choices may be better than the chosen one (Gilovich & Medvec 1995). The negative emotions caused by losing something are much stronger than the positive emotions caused by gathering something (Kahneman & Tversky 1983). Hence, we hypothesize that, facing the same amount of information:

H4: Subjects' perceptions of self-efficacy will moderate the relationship between information load and subjective states towards decision.

## 4. Method

### 4.1 Experimental Design and Treatments

An experimental design is employed to test the research model, where a simulated e-storefront which includes two information-load groups is developed. *Mobile phones* are chosen to be the stimuli, for they are one of the major products sold through the Internet in Taiwan (E-ICP 2005). According to the survey of E-ICP (2005), the five most popular brands of mobile phone in Taiwan were Motorola, Nokia, Panasonic, Samsung, and Sony Ericsson in 2004. Together, they occupied 95.5% of market share in Taiwan's market. In this way, the participants would have no a priori preference of cell phone other than these five brands; hence, bias from pre-existed brand preference may not present.

There are many ways to operationalize the concept of information load. As can be seen in the literature review, there is, however, little agreement as to the measurement scales regarding this concept. Mimicking a real e-storefront, this study believes, may be one of the simplest and most straight forward ways to reflect consumers' perception of information load in e-retailing situation. Each mobile phone, hence, is displayed with five basic attributes that mobile phone e-sellers usually provided to their customers at the time of this study. A "See Detail" button enables participants to see detail illustrations about an alternative (fig. 2). Each detail illustration contained the same manner of functional explanation with that of the real e-store.

In such way, the operationalization of information load may be simplified to a problem of the amount of alternative cell phone. We designed two levels for the amount of alternatives. A hundred cell phones were provided in the high information-load store,

with 20 alternatives for each of the five best-sold brands in Taiwan (E-ICP 2005). The chosen of 100 mobile phones was referred to the pilot tests of Chen et al. (2009) and Shang et al. (in press), where the subjects of these two studies reported a perception of overload under duration of 15 – 20 minutes (Lee & Lee 2004; Hahn et al. 1992; Malhotra et al. 1982) with 100 cell phones. Compared with previous studies (Wilkie 1974, Malhotra 1982), the information load of 100 alternatives seems high enough for inducing a perception of overload. Only 40 mobile phones were displayed in the low information-load group, where each brand is distributed with 8 alternatives that are randomly chosen from the 20 alternatives.



1. Each mobile phone is displayed with five basic attributes (in the right hand side of mobile phone picture) and a “See-detail” button (the words under the five attributes).
2. A “Buy-now” button is displayed under the picture of the chosen mobile phone in the window that provide detail description of the phone.

Figure 2 : The “See detail” window

## 4.2 Measurements

To ensure content validity, items selected for the constructs, shown in the appendix, were primarily revised from prior studies for the context of on-line shopping. All the constructs, except for the demographic variables of the subjects, were measured on a five-point Likert-type scale. The original scale developed by Jacoby et al. (1974a) was used to measure the subjective state towards decision outcome. The scale proposed by Smith and Park (1992) was used to measure subjective product knowledge because of its high reliability ( $\alpha = .80$ ), and some revision was made after the pilot test. Zaichkowsky's (1994) personal involvement inventory scale (PII) was used to measure consumers' product involvement rather than Kapferer and Laurent's consumer involvement profile (CIP) (Kapferer & Laurent 1986). What CIP measures is a stable trait that is the antecedents of involvement (Zaichkowsky 1994). However, PII measures state of involvement as a changeable concept in terms of characteristics of people, stimuli, and situations, and this is what we want to measure in this study. Thus the PII scale was used here on a five-point semantic differential scale.

The personal efficacy belief scale developed by Riggs et al. (1994) was used to measure self-efficacy but was revised to fit the on-line shopping context. There are various self-efficacy scales specifying special contexts. We used Riggs's (1994) scale as it's widely used in many empirical research and shows good reliability ( $\alpha = .86$ ). The measurement items revised after the pilot test and used in the experiment are presented in the appendix.

To evaluate and revise the content and wording of the questionnaires, the author of this study discussed with three experts, two of them are professors major in e-commerce and MIS, and the last one is an academic expert in field of marketing and e-commerce. Except for some minor revisions, one measurement item was thought to be unrelated to Internet shopping context and was deleted.

## 4.3 Pilot Test and Procedure

22 undergraduate students enrolled in a course of e-commerce lectured by one of the authors were invited to participate in a pilot test. The authors discussed with them for their feedback. The designs of e-storefront, experimental procedure, and questionnaire had been revised greatly. The experiment was conducted in a computer room for two weeks. Totally 224 graduate and undergraduate students were recruited from the university by campus advertisements and voluntarily participated in this



experiment for NT \$ 100 payment. They came to the computer room at appointed time and were randomly assigned to one of the treatment groups.

Once the subjects arrived at the Lab and checked in, the experimental instructor gave them a notice requesting the participants not browsing other web pages; and no talking, or discussing with others, and asked them to obey the experimental rules and procedure. Then, the instructor randomly drew an ID and password card from a bag and assigned to the participant. After the subject logged in to the web system, the subjects must first answer the product knowledge, product involvement, and self-efficacy questionnaires. Then, the subjects entered the experimental mobile phone e-storefront and were asked to pretend that they were in a real e-storefront and had at most 15 minutes to seriously consider buying a mobile phone without budget limit. This time limit was designed to impose the information overload effects (Hahn et al. 1992; Malhotra et al. 1982). During this time period, the subjects can freely surf in the e-store to solicit preferred candidates. They can click the "See Detail" button to see detail illustrations about an alternative (fig. 2), and then close this window to keep surfing, or click the "buy now" button to finish the buying process. But, beyond 15 minutes, they will be forced to make a decision, and leave the e-storefront. Then, the coming web-page would show to the subjects the items of subjective state. After the questionnaire was filled in completely, the experiment was finished.

## **5. Analysis and Results**

### **5.1 Validity and Reliability**

There are 204 valid samples used to analyze in this study because the system failed to record 20 subjects' answers. Hence, the valid samples in high (group 1) and low (group 2) information load groups are 105 and 99 respectively. The Chi-Square test and independent sample t test revealed that the samples of both groups were homogeneous in the control variables and the three moderation variables.

Jacoby et al. (1974a) operationalized "subjective state towards decision" by using a 8-items scale. Since then, following the convention from Jacoby et al. (1974a), the effects of information load on subjective state are almost analyzed separately. For example, Lee and Lee (2004) found that consumer tended to feel "less satisfied, less confident, and more confused with their purchase decisions" in rich information e-stores. Since data analysis is complex, even if it was used, it was mainly measured by many

single-items, which were part of Jacoby's original items. Single-item measures usually have low reliability, and the scale used before has not been tested for reliability and validity. An exploratory factor analysis, hence, was used to reduce the number of dimensions and improve the quality of this measurement scale, hoping to simplify the complexity and improve the quality of data analysis. The result of Kaiser-Meyer-Olkin value (0.835), and the result of Bartlett's test of sphericity indicated that the samples are meritorious to conduct an factor analysis (Kaiser 1974). An exploratory factor analysis (EFA) used principal components analysis and orthogonal rotation by varimax method was conducted.

The results of EFA reveal that most of the items of product knowledge and self-efficacy were loaded into the predicted constructs (Table 1). The sixth item of self-efficacy, SE-6, is dropped because its largest score of factor loading is less than 0.5. Besides, the product involvement concept is divided into two constructs, which agree with Zaichkowsky's definition (Zaichkowsky 1994): InVo-1, InVo-3, InVo-8, and InVo-10 are loaded into the *cognitive involvement* construct, and InVo-2, InVo-4, InVo-6, InVo-7, and InVo-9 are loaded into the *affective involvement construct*. However, InVo-5 is dropped because of its uncorrected loading.

The "subjective state toward decision outcomes" concept is divided into two factors. SS-1 (satisfaction), SS-2 (best decision), and SS-4 (certainty of decision) are loaded into factor 5. This factor (certain about and satisfied with best decision) should be a reasonable substitution for decision quality. The only difference is that decision quality reflects an objective best decision that no one knows whether it exists or not; while factor 5 reflects consumer's immediate subjective feeling about arriving at a best decision.

This scale's last three items, SS-6 (like more inf.), SS-7 (more information on new brand), and SS-8, which represent the feeling of needing more information, should be the opposite concept to factor 5 because one made a best choice should need no more information. Therefore, this article divided the original concept proposed by Jacoby et al. (1974a) into two constructs: the better the subjective state is, the better the (a) *feeling of obtaining a best decision* is and the less the (b) *desire for more information* is. However, SS-3 is dropped because its largest score of factor loading is less than 0.5. SS-5 is also dropped because it did not load into the predicted construct.

Table 1 : Validities and reliabilities analysis results

	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	AVE	$\alpha$
PK-1	0.763							
PK-3	0.754							
PK-5	0.735						0.53	0.85
PK-4	0.729							
PK-2	0.696							
SE-4		0.845						
SE-9		0.791						
SE-7		0.773						
SE-1		0.745					0.51	0.89
SE-5		0.739						
SE-2		0.719						
SE-8		0.717						
SE-3		0.562						
InVo10			0.803					
InVo-3			0.779				0.53	0.81
InVo-1			0.769					
InVo-8			0.655					
InVo-7				0.839				
InVo-4				0.796				
InVo-6				0.731			0.51	0.86
InVo-2				0.589				
InVo-9				0.569				
SS-2					0.831			
SS-1					0.772		0.53	0.76
SS-4					0.770			
SS-6						0.823		
SS-7						0.772	0.46	0.69
SS-8						0.601		

a. Extraction Method : Principal Component Analysis.

b. Rotation Method: Varimax with Kaiser Normalization.

c. Dropped items are omitted.

Since the subjective state towards decision was divided into two constructs, the hypotheses of this study were further decomposed into:

- H1a: More information load will not necessarily lead to a better feeling of obtaining a best decision.
- H1b: More information load will not necessarily lead to a lower degree of desire for more information.
- H2a: Subjective product knowledge will moderate the relationship between information load and feeling of obtaining a best decision.
- H2b: Subjective product knowledge will moderate the relationship between information load and desire for additional information.
- H3a: Product involvement will moderate the relationship between information load and feeling of obtaining a best decision.
- H3b: Product involvement will moderate the relationship between information load and desire for more information.
- H4a: Self-efficacy will moderate the relationship between information load and feeling of obtaining a best decision.
- H4b: Self-efficacy will moderate the relationship between information load and desire for more information.

A confirmatory factor analysis (CFA) was then conducted to examine the convergent validity and discriminant validity of the measurement model. The average variance extracted (AVE) values of all the constructs are beyond 0.5 except the feeling of needing more information construct (AVE = 0.46) (Fornell & Larcker 1981). However, the T-values of its factor loadings are significant (T-value > 1.96), so we still hold this construct (Fornell & Larcker 1981).

Furthermore, we adapted the criterion suggested by Anderson and Gerbing (1988) to examine the discriminant validity of the constructs. This criterion is to examine the confidence interval of correlation coefficient between any two constructs. If the number "1" is not included in the confidence interval, the two factors are two separate variables and can be claimed to hold discriminant validity. Results of the analysis, shown in table 2, indicate that all of the constructs have passed the examination of discriminant validity. Generally, the measurement model holds an acceptable convergent validity and discriminant validity.

The value of Cronbach's  $\alpha$  of all the variables are all met the criteria of high

reliability ( $\alpha > 0.7$ ), except for desire for more information (0.69), which is only marginally satisfactory. Since this historical scale proposed by Jacoby et al. (1974a) is still conceptually and statistically immature, this study adapts Nunnally's (1978) criterion for an exploratory research ( $\alpha > 0.5$ ) to accept the reliabilities of this construct.

Table 2 : Discriminant Validity of the Constructs

Construct	1	2	3	4	5
2	(0.08, 0.22)				
3	(0.06, 0.19)	(-0.01, 0.13)			
4	(0.07, 0.18)	(0.00, 0.10)	(0.14, 0.28)		
5	(0.02, 0.10)	(0.02, 0.11)	(-0.00, 0.09)	(-0.01, 0.05)	
6	(0.08, 0.21)	(-0.04, 0.08)	(0.03, 0.16)	(0.05, 0.16)	(0.01, 0.09)

Abbreviation: 1- product knowledge; 2- Self-efficacy; 3- Cognitive Involvement; 4- Affective involvement; 5- feeling of best decision; 6- Desire for more information

## 5.2 Hypotheses Testing

A hierarchical regression was used to test the hypotheses. As illustrated in Table 3, model 1 and model 4 expressed the main effects of information loads on the two dependent variables. Three individual factors were added into model 2 and model 5 as the basis for examining moderating effects. The interaction effects were added into model 3 and model 6 to examine the moderating effects. To reduce the effects of multicollinearity, all variables were mean-centered (Cronbach 1987). Because the independent variable is categorical variable, we converted it into a dummy variable. The high information-load level was set as "1", and the other level was than set as "0".

According to model 1, 2, and 3, the effects of information load on feeling of obtaining a best decision were all insignificant. H1a, hence, was supported. Furthermore, the direct effect of product knowledge on the feeling of obtaining a best decision was positive ( $\beta = .219, p < .05$ ), and so was the direct effect of cognitive involvement on the feeling of obtaining a best decision ( $\beta = .309, p < .05$ ). Moreover, the moderating effect of cognitive involvement on the relation between information load and the feeling of obtaining a best decision was negative ( $\beta = -1.51, p < .05$ ). Hence, H3a are supported, but H2a and H4a are refuted.

Table 3 : Hierarchical regression models

	Feeling of obtaining a best decision						Desire for more information					
	Model1		Model2		Model3		Model4		Model5		Model6	
	$\beta$	t	$\beta$	t	$\beta$	t	$\beta$	t	$\beta$	t	$\beta$	t
IL	.036	.513	.024	.346	.994	1.753	-.038	-.535	-.005	-.069	-.621	-1.148
PK			.219**	2.811	.100	.844			.345**	4.635	.374**	3.299
CI			.090	1.131	.309**	2.728			.017	.226	.011	.098
AI			-.078	-.922	-.069	-.553			.141	1.752	.194	1.629
SE			.130	1.799	.135	1.323			-.087	-1.262	-.301**	-3.089
IL*PK					.488	1.237					-.184	-.488
IL*CI					-1.51**	-2.692					-.051	-.095
IL*AI					.010	.027					-.191	-.514
IL*SE					.034	.090					1.10**	3.080
R <sup>2</sup>	.001		.088		.131		.001		.169		.210	
F	.264		3.84**		3.26**		.286		8.06**		5.72**	
$\Delta R^2$			.087		0.043				.168		.040	
F			4.73**		2.392*				9.99**		2.480*	

a. IL: information load, PK: product knowledge, CI: cognitive involvement, AI: affective involvement, SE: self-efficacy

b. \* $p < .05$ , \*\* $p < .01$

According to model 4, 5, and 6, the effects of information load on desire for more information were all insignificant. H1b, hence, was supported. Additionally, in model 5 and 6, the direct effects of product knowledge on the desire for more information were positive ( $\beta = .345$ ,  $p < .05$ ;  $\beta = .374$ ,  $p < .05$ ). The direct effect of self-efficacy on the desire for more information was negative ( $\beta = -.301$ ,  $p < .05$ ). In addition, the moderating effect of self-efficacy was positive ( $\beta = 1.10$ ,  $p < .05$ ). Therefore, H4b are supported, but H2b and H3b are refuted.

To gain deeper and clearer insights into the relationships among the variables, this study, following the suggestion by Baron and Kenny (1986), regressed the dependent variables on individual differences separately for each information-load level. The effects of these individual differences are observed under different information-load levels. The results of regression analysis are shown in table 4.

The results in table 4 reveal that product knowledge is positively related to the feeling of obtaining a best decision in the high information-load group ( $\beta = .298$ ,  $p = .007$ ) but is not significant in the low one. Cognitive involvement is positively related to the feeling of obtaining a best decision in the low information-load group ( $\beta = .322$ ,  $p = .005$ ) but is not significant in the high one. Furthermore, product knowledge is positively related to the desire for more information in both high and low information-load groups ( $\beta = .340$ ,  $p = .001$ ;  $\beta = .329$ ,  $p = .003$ ). Self-efficacy is negatively related to the desire for more information in the low information-load group ( $\beta = -2.90$ ,  $p = .002$ ) only.

Table 4 : Regression models in different information load levels

	The feeling of obtaining a best decision				Desire for more information			
	High IL		Low IL		High IL		Low IL	
	$\beta$	Sig.	$\beta$	Sig.	$\beta$	Sig.	$\beta$	Sig.
PK	<b>.298</b>	<b>.007</b>	.098	.377	<b>.340</b>	<b>.001</b>	<b>.329</b>	<b>.003</b>
CI	-.111	.316	<b>.322</b>	<b>.005</b>	-.004	.970	.010	.927
AI	-.064	.579	-.069	.562	.124	.260	.175	.131
SE	.124	.163	.140	.167	.128	.182	<b>-2.90</b>	<b>.005</b>
R <sup>2</sup>	<b>.125</b>	<b>.009</b>	<b>.136</b>	<b>.008</b>	<b>.214</b>	<b>.000</b>	<b>.204</b>	<b>.000</b>

a. IL: information load, PK: product knowledge, CI: cognitive involvement, AI: affective involvement, SE: self-efficacy

b. The boldface numbers are significant results.

## 6. Discussions and Conclusions

Based on the theory of information overload, this study examines consumers' subjective states towards decision while accessing abundant information in the Internet shopping environment. In addition, based on the concept of heuristic decision strategy, this study incorporates individual factors to revise traditional theoretical framework.

There are some findings that may contribute to our knowledge regarding the phenomenon of information overload in the Internet environment. First of all, the direct effects of information load on subjective state are insignificant (H1). This result indicates that comprehensive information may not necessarily lead consumers to a perception of reaching a good decision, and may not alleviate the perception of needing more information to a certain degree. Conveying large amount of information, therefore,

is not necessary the advantage of e-store.

Secondly, considering individual differences may be necessary. Some of the moderating effects (H3a, H4b) from individual factors are significant; besides, product knowledge directly affect the dependent variables (refer to model 2 and model 5 in table 3). Hence, consumers' perception of decision making outcomes may be significantly influenced by personal factors, product knowledge in particular. Human decision making is a complex dynamic process involves one's cognitive system to process product information which is deeply influenced by the interactions of individual characteristics and information environments. The difference between individual characteristics may partly explain previous inconsistency.

Unexpectedly, the moderating effects of product knowledge are all insignificant (H2a, H2b were rejected); instead, it directly influences subjective state. In other words, expert and novice customers responses differently to the abundant information; they may have different perceptions to the outcomes of buying decision. Chen et al. (2009) found that experienced consumers may perceive lighter information overload than novice consumers, and they concluded that experience may play the role of inner information filtering mechanism. Finding of this study is similar and consistent with their conclusion. Hence, product knowledge may also be a strong inner information filtering mechanism which may directly alleviates the negative effects of abundant information; consumers with comprehensive product knowledge indeed know much better what they want and are more likely to find ideal products with less effort.

A further analysis regarding the effects of product knowledge can be found from table 4. Product knowledge positively affect the feelings of obtaining a best decision in high information load situation only; however, its direct effects on desire for more information are positively significant in both high and low information load groups. In the high information load situation, products alternatives are more comprehensive. Consumers are, hence, more likely to find their ideal products. On the other hand, since some products are not offered in low information load situation, the possibility for consumers' to obtain a best decision does not increase as product knowledge increases. Contradictorily, consumers feeling about reaching a best decision may still feel a need of additional information. This contradiction may due to these people perceive themselves as fresh-information seekers; their satisfaction about obtaining a best decision is immediate but may disappear after acquiring additionally new information. Besides, consumers with abundant product knowledge may represent a group of people highly interested in the products so that they would like to know new information about



the products.

Cognitive involvement moderates the relationship between information load and the feeling of obtaining a best decision (H3a). Highly cognitive involved consumers tend to feel more about obtaining a best decision in the low information-load situation. This effect, however, is insignificant in the high information-load situation (see table 4). Before arriving at a decision, highly cognitive involved consumers usually need to compare and evaluate among products and product attributes completely. In the high information load situation, this task may not be finished within the time limit since the amount of product information is too plentiful. Thus, they tend to have a poorer feeling about obtaining a best decision.

In addition, self-efficacy moderates the relationship between information load and the desire for more information (H4b). Consumers with high self-efficacy tend to feel less about needing more information in low information-load situation (see table 4). This effect, however, is insignificant in high information-load situation (see table 4). Consumers with high self-efficacy may perceive themselves as having excellent ability to make purchase decision and shop on-line. Even they actually do not choose the best "product", they may still be confident about their "decisions". Their responses to further information, hence, tend to be negative to avoid the likelihood that additional information shows the imperfection of and denies their confidence about the decision. Conversely, in high information load situation, the information may not be processed completely within the time limit; hence, they may not be confident about their decisions, and hope for further information to improve the decision just made.

Finally, self-efficacy and cognitive involvement also have direct impacts on desire for more information and feeling of obtaining best decision, respectively (Table 3). Sharma et al. (1981) referred to this situation as quasi moderation, where a variable has interaction effects with independent variables and direct influences on dependent variables at the same time, and argued that this variable should be viewed as a complex of moderator and independent variable. Conceptually, moderator and independent variable play the same role of antecedent or exogenous to dependent variables (Baron & Kenny 1986). Hence, significant main effects on dependent variables may be found for moderator (Sharma et al. 1981; Baron & Kenny 1986); however, this situation is not relevant conceptually to testing moderation effects (Baron & Kenny 1986). But, Sharma et al. (1981) raised a model specification problem that in quasi moderation situation, the role of independent variable could actually be moderator and vice versa (p. 294). They suggested readers to examine independent variables' roles from theoretical views to

validate that they can't be moderator at all; then we can have greater confidence that the quasi moderator is mainly a moderator. Since information load has been viewed as primary independent variable by information overload paradigm for many decades, it can't be moderator in this study. Hence, self-efficacy and involvement can still be viewed as moderators.

The academic implication from the above findings is clear: researchers are encouraged to incorporate more individual factors to conduct information overload research. This study found that abundant information may not lead to a better subjective state towards decision; which is consistent with previous literature such as Malhotra (1982), Keller and Staelin (1987), Lee and Lee(2004), and Chen et al. (2009), but is contradictory to Jacoby et al. (1974a; 1974b). The evidence of recent studies, including this research, indicates that incorporating other factors, individual factors in particular, may be an avenue to resolve this conflict.

Product knowledge as an important information filtering mechanism is evident not only in this study, but also in other studies (Wu & Lin 2006; Park & Kim 2008; Chen et al. 2009). Product involvement is also proved by this and other studies (Park et al. 2006; 2007; Park & Lee 2008), to be an important factor that influence the way consumers respond to product information and how they perceive the results of purchase decisions. This study further found that self efficacy may play a role in this issue. In addition, incorporating process of cognition and other individual factors, Sicilia and Ruiz (2010) and Shang et al. (in press) found an inverted-U shape relation between levels of information load and responses to decisions. Hence, an explanation of the conflict findings may due to that the amounts of information employed by previous researches are actually located in the two extremes of the continuum of information load.

To sum up, results of recent studies together are gradually uncover the black box of causal links between information load and decision results; Different factors that operate during different information processing stages may have different influences on the subjective decision outcome. However, studies related with information overload phenomenon are relatively few and the effects of many other factors are still unknown. The whole and precise description of the causal links between information stimuli and decision outcomes is yet to be found. The approach deployed by this and other studies may be a promising way to such objective.

There are also some hypotheses that were rejected. Rationales for these unexpected findings are elaborated below. First of all, H3b predicted that, under the same level of information load, consumers with higher cognitive involvement will desire for more

information than lowly involved consumers. This hypothesis was rejected. Highly involved consumers may care more about the product, and may access and learn product knowledge more aggressively; hence, they may possess much more product knowledge (correlation between product involvement and product knowledge is 0.389,  $p < 0.01$ ). Due to the effect of product knowledge, they may deal with product information efficiently and effectively, and feel that they already processed enough information and need no more information.

The moderating effects of affective involvement are all insignificant (H3a, H3b). Affective involvement reflects the emotions, moods, and feelings associative with a product. Cell phone is now gradually becoming a must have communication tool for every young adult. Owning a cell phone may not necessarily bring people a sense of good emotion, or proud among peers. Instead, the specification of cell phone is complex, and its price is not cheap for young adult (note that correlation between income/per month and product involvement is 0.215,  $p < 0.01$ ). Therefore, cost/benefit may be an important index for the selection of cell phones. To get such an index, cognitive process of cell phone information may be more critical.

The moderating effect of self efficacy on feeling of obtaining a best decision is not significant (H4a was rejected). According to hypothesis 4, subjects with low self efficacy will bear a high burden in information processing, leading to a sense of losing control and missing some options. Since experience is one of the sources of self efficacy (Bandura 1977), and the correlations between on line shopping experiences and information searching time and amount are -0.163 ( $p < 0.05$ ) and -0.167 ( $p < 0.05$ ), indicated that the relation between self efficacy and burden in information processing may consist with the hypothesis, but its effects is insignificant. This may due to that all the subjects own a cell phone belong to one the five brands in the e-store; They have already made a choice and get a feeling of choosing the right brand in real life. This a priori feeling may distort the subjects' feeling during experiment. Future researches should re-examine this hypothesis with another product.

This study has some implications for practitioners. Offering more information to consumers on the Internet, contrary to the common belief, is not necessary e-retailers' benefit. Consumers may not feel good while information-load is high. Thus, a more personalized e-storefront might be more important than just offering rich information to consumers. To this end, this study suggests the importance of "portal segmentation". An important role of intermediaries is to facilitate consumers' buying decisions rather than exhaust them. Internet intermediaries should break up the myth that the bigger, the

better; instead, they should set up different hyperlinks designed for different customer segmentations.

According to the results of this study, there are at least four segmented hyperlinks on an Internet intermediary's web site. The first segmentation of consumers is people with comprehensive product knowledge. For them, a hyperlink named "I know what products I want, and I would like efficient searching" could be provided. To help find what they want efficiently and effectively, after clicking the hyperlink, a precise search engine is provided to set up various criteria for searching products within a large and comprehensive product database.

For consumers with high cognitive involvement, a hyperlink named "I hope to compare different products carefully before buying" could appear. To meet their needs to process more information efficiently, tables displaying product attributes, such as brands, functions, and prices etc., may be helpful for them to compare products. Shopping baskets might be useful for them to make a second round comparison. Regarding consumers with higher self-efficacy, a hyperlink named "I would like a comfortable and self-determined shopping space" could be provided. The interface should keep clean and refreshing and should avoid crows and advertisements.

The final segmentation of consumer is composed of novice customers who are lowly-involved with poor product knowledge and self-efficacy. They usually do not know what they want, and have no idea about brands and product functions, lack the motivation for active information searching and comparison, and lack of confidence or experience of on-line shopping. The only thing they know is that they need a certain product (i.e. mobile phone). The interface must play the role of sale assistants in physical stores. An easy introduction of product brands, functional differences, and arrangements of price may be helpful. Products offered may be introduced in the forms of top sales, expert or famous spokesmen recommendations. Post-purchase services should be emphasized.

Finally, readers should be cautious in interpreting the results of this study since the sampling procedure is not random. The variance explained ( $R^2$ ) is not high enough, indicating that some important variables are omitted in the research model. This study stretches previously used scales to measure subjective states which is not mature and need to be further clarified in the future research. The determination of the amount of mobile phones in the two experiment groups (100 vs. 40) is a little arbitrary. Researchers could mimic real situation of e-shopping where the amount of mobile phone is more comprehensive, and the shopping time is not limited. Further research

may also consider other concepts or theories to examine consumers' responses to informational dimensions on the Internet, such as theories related with affective states incurred during buying decisions.

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## Appendix: Measurement items for the variables

### *Subjective state measure*

1. How satisfied are you with your decision?
2. How certain are you that you made the best decision?
3. How confused did you feel while performing this task?
4. How likely is it that you did not get the best buy for your money?
5. How like it is that one of the other brands you did not choose would be equal to or better than your choice in satisfying your desires and expectations?
6. How much would you like to receive more information about the various brands?
7. If a new brand were to be introduced on the market, how much would you like to receive information about it?
8. How likely is it that this new brand would be equal to or better than any of the brands you are now already familiar with in satisfying your desires and expectations?

### *Subjective product knowledge measure*

1. I know a lot about mobile phones.
2. I would like to understand mobile phones actively.
3. I remember a lot of product information about mobile phones.
4. I can tell the differences between different mobile phones.
5. I have had abundant information about mobile phones after buying or using the product.

### *Product involvement measure*

- |                  |                             |             |
|------------------|-----------------------------|-------------|
| 1. important     | ___ : ___ : ___ : ___ : ___ | unimportant |
| 2. boring        | ___ : ___ : ___ : ___ : ___ | interesting |
| 3. relevant      | ___ : ___ : ___ : ___ : ___ | irrelevant  |
| 4. exciting      | ___ : ___ : ___ : ___ : ___ | unexciting  |
| 5. means nothing | ___ : ___ : ___ : ___ : ___ | means a lot |
| 6. appealing     | ___ : ___ : ___ : ___ : ___ | unappealing |
| 7. fascinating   | ___ : ___ : ___ : ___ : ___ | mundane     |
| 8. worthless     | ___ : ___ : ___ : ___ : ___ | valuable    |
| 9. involving     | ___ : ___ : ___ : ___ : ___ | uninvolving |
| 10. not needed   | ___ : ___ : ___ : ___ : ___ | needed      |

*Self-efficacy measure*

1. I have confidence in my ability to search and evaluate product information and to purchase on-line.
2. There are some tasks required by searching and evaluating product information on-line that I cannot do well.
3. When I cannot buy an ideal product, it is due to my lack of ability.
4. I doubt my ability to shop on-line.
5. I have all the skills needed to pick up a good product on-line.
6. Most people shopping on-line can do this task better than I can.
7. I am expert at shopping on-line.
8. My performance in shopping on-line is limited because of my lack of skills.
9. I am very proud of my on-line shopping skills and abilities.