The effects of information overload on consumers' subjective state towards buying decision in the internet shopping environment

Yu-Chen Chen*, Rong-An Shang, Chen-Yu Kao

Department of Business Administration, Soochow University, 56 Kuei-Yang St., Sec. 1, Taipei, Taiwan, ROC

1. Introduction

The rates of diffusion and projection about internet shopping are stunning, and its attractive scenarios are worth noting. If consumers feel satisfied with their purchase decisions and shopping experiences, this attractive scenario of internet shopping is highly likely fulfilled. How to enhance the quality of consumer's on-line shopping experience, this attractive scenario of internet shopping is highly likely fulfilled. How to enhance the quality of consumer's on-line shopping experience, and improve their subjective states towards shopping decisions, hence, has attracted some researchers' attention (Lee and Lee, 2004).

Abundant information plays a critical role in improving consumers shopping decisions (Alba et al., 1997). Previous studies indicated that, in brick-and-mortar settings, more information may lead to better decision (e.g., Russo, 1974; Wilkie, 1974; Malhotra et al., 1982). One of the advantages of the internet retailers is the capacity to convey large amount of information to people in very low cost, which can reduce the cost and effort of searching information, enlarge consideration set, and improve consumers' welfare (Alba et al., 1997; Evans and Wurster, 1999).

According to the theory of information overload, however, while the information load increases beyond a threshold, consumers might need to take more effort to process the information and may make poorer decision (Jacoby et al., 1974a,b). 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,b; Russo, 1974; Summers, 1974; Wilkie, 1974; Malhotra et al., 1982; Malhotra, 1982; Keller and Staelin, 1987; Meyer and Johnson, 1989; Hahn et al., 1992; Lee and Lee, 2004; Lurie, 2004).

However, consumers are different with their information processing ability (Henry, 1980); hence, the threshold to overload could be varied from person to person. The same can be said to on-line shopping experience, an internal mechanism for filtering irrelevant information which may vary across individuals (McGuire, 1976). Furthermore, many e-storefronts provide information filtering mechanisms to help consumers abate the burden of product information screening and processing. Effects of the above internal and external information filtering mechanisms, however, are seldom addressed by previous studies.

An understanding of how consumers utilize the information provided by internet retailers would help e-business managers devise marketing strategies regarding the most effective and efficient ways to provide information to their customers (Wu and Lin, 2006; Alba et al., 1997). This study explores the phenomenon of information overload in the internet shopping environment, hoping to know that whether or not, and why the information-richness advantage of e-retailers bring opposite consequences to consumers. The effects of information load and information filtering tools on the decision outcomes of novice and experienced consumers will be examined.

* Corresponding author. Tel.: +886 2 2311 1531x3451; fax: +886 2 2382 2326. E-mail address: cyc@scu.edu.tw (Y.-C. Chen).
2. Theoretical background

2.1. Theory of decision making

The decision theories care about two things: the independent variable – outside variable, and the dependent variable – decision quality. At first, perfect information and complete rationality were recognized as the ways to obtain an optimal decision (Edwards, 1954). The school of complete rationality view decision makers as well informed economic men rationally seeking “maximum utility” based on their permanent preference functions (Edwards, 1954; Simon, 1956).

The complexity and limitation of individuals’ information processing capacity and the difficulty to gather perfect information were noticed later on (Simon, 1956). It is worth noting that Henry (Henry, 1980) observed evidence about a wide range of information processing ability among people. It also seems not possible that everyone holds a permanent preference and seeks the “best choice”. Due to these limitations, individuals in reality usually adapt well enough to “satisfied” but not “optimized” decisions (Simon, 1956).

Psychologists argued that, though outside information is necessary for decision making, the individual factors in relation to processing information seem more important. Many factors influence the comprehension and solicitation of external information. According to McGuire (McGuire, 1976), the structural characteristics of one’s personality may influence one’s information processing greatly. For example, one’s belief influences decisions on what portion of the information to be accepted as a valid and appropriate basis for determining his/her attitudes and actions (McGuire, 1976).

While making decisions, consumers also use a variety of information processing strategies, some kinds of “mental information filtering mechanism”, to trim down those complex tasks of assessment processing strategies, some kinds of “mental information filtering mechanism”, to trim down those complex tasks of assessment processing system with limited information processing capacity and the difficulty to gather perfect information (Alba and Marmorstein, 1987). The frequency heuristic, for example, indicates that frequency knowledge plays an important role in consumers’ decision making. Frequency knowledge refers to 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 while information load inhibited the comprehension of alternatives’ semantic details. The frequency heuristic, however, often leads to erroneous decisions (Alba and Marmorstein, 1987).

Prospect theory describes some other heuristics that are economical and reasonably effective but usually introduce systematic errors under certain conditions. People, in situation involving uncertainty, relies more on heuristics than rationality to reach a decision (Tversky and Kahnman, 1974). The availability heuristic proposed that people frequently incline to overvalue the information which is around him/her and is easier to recall. In addition, the “anchoring” heuristic posits that people make estimate by starting from an initial value that is to be adjusted to yield final answer. This theory also indicates that the reactions toward gains are often lower than the reactions toward possible losses. So the negative emotion induced by loss situation is much stronger than the positive emotion induced by gain situation (Kahneman and Tversky, 1983). In context of information overload, therefore, the emotions aroused from foregone alternatives may be greater than the emotions aroused from chosen alternative. It is empirically supported that, even when information on the foregone alternative is not available to customers, people can still experience regret if they counterfactually think that foregone brands outperform chosen brand; this experienced regret may lead to brand switching (Tsivros and Mittal, 2000).

Hence, people are different in their information processing ability and often make systematic mistakes due to the application of heuristics. If one perceives potential errors from his/her tasks of shopping decision, coping strategy would be applied to actively deal with an error and learn from it. Situational factors may induce passive coping attitudes and prevent one from learning from errors (Rybowiak et al., 1999). Conversely, people with active coping attitude may apply resources such as self efficacy in work skill to overcome errors (Rybowiak et al., 1999; Bandura, 1977). However, there is also evidence that self-percepts of high efficacy would escalate the commitment of losing courses of action, and vice versa (Whyte et al., 1997).

Situational factors also affect consumers’ information processing capability and decision outcomes (Summers, 1974; Wilkie, 1974; Malhotra, 1982). Characteristics of stimulus manipulated by e-store to communicate product information to consumers may impact the ways people deal with information. For example, Mittelstaedt et al. (1976) argued that individuals strive to maintain an optimal level of stimulation, which possesses intra-individual stability but varies across individuals. People with higher optimal stimulation level will incline to present an attitude of novelty seeking, and are more familiar with innovative products and retail facilities.

Adaptive structuration theory proposed by DeSanctis and Poole (1994), though primarily focused on organizational or group decision making through aids from information systems, might provide hints to situational factors that impact individual’s shopping decision through the facilitation of e-store. Ast posit that information systems are designed to impose structure, including procedures (e.g., shopping process), sets of rules (e.g., terms and contract) and resources (e.g., data structure, personalized information and services) on the users and their tasks of decision making. The structure will change dynamically as users interact with the technology. For example, e-store may tailor their services and information provided to customers after many transactions. During the process of human–computer interaction, technology and user behavior coevolve, producing new structure. An ideal appropriation of the technology structure produces better decisional process and outcomes (Limayem et al., 2006). There are, however, different modes of appropriation of technology structure (DeSanctis and Poole, 1994). For example, people, while appropriating technology, may make judgment to negate the usefulness of the systems, and display attitudes of unfavorable valuation of this system; then try to adopt the system for other instrumental purposes.

Finally, Schwartz (2004) also asserted that although the objective decision quality is important, the subjective experience is probably more influencing to the utility of the objective quality. Kahneman et al. (1999) pointed that one may not always know a priori of his/her goal. When deciding one’s goal, an individual is deeply affected by the “experienced utility,” the feelings he/she got during the process of experience, and “remembered utility”, the feelings about the experience one remembered. But, according to the “peak theory,” memories about the experience are depending on the peak feelings (best or worst feeling) of the experience. As a result, we may assume that consumers’ “subjective states of mind” is probably more important because they influence consumers’ feelings toward the purchasing and the e-retailers, and may determine consumers’ intention to shop on-line.

2.2. Information overload in consumer buying

In the domains of decision science and information systems, computing machinery is described as a system with limited capacity to process information. The phenomenon of information overload is defined as the drop-off of response rates due to the input surpassing the limits of capacity. Drawing from the above concepts, decision scientists described human being as a human information processing system with limited information processing
capacity. When the given information load increased, the decision maker will also increase his/her effort to process it. Once the input surpasses the processing capacity, people should be overloaded by the processing of product information, the response rate will drop-off (Schroder et al., 1967; Grisé and Gallupe, 2000).

The theory of information overload has been borrowed by consumer psychologists as a framework to explain consumers’ buying decision. Jacoby et al. (1974a) might be the first researchers who tried to observe the information overload phenomenon in consumer shopping context. Jacoby (1977) defined information in consumer buying context as the “externally objective stimulus” rather than a personal perception of the external stimulus. Consequently, the loading of product information has been measured in terms of the number of product alternatives (i.e. brands) times the number of product attributes (e.g., calories). By varying the amount of product information via the number of alternatives and the number of attributes in a choice set, the effects of information load on decision quality were examined (Jacoby et al., 1974a,b).

Several researchers later critiqued Jacoby et al. (1974a) definition of information load, re-appraised their original data to derive an opposite conclusion that “more information is better”. To remedy the arguments about the definition of information load and the divergent data-explanation results, some researchers incorporated other factors, including information quality, variability of attributes, similarity of alternatives, and distribution of attribute levels across alternatives, 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 and Staelin, 1987; Lurie, 2004; Lee and Lee, 2004).

2.3. Outcomes of consumers’ decision making

Jacoby et al. (1974a) defined the drop-off of response rate in consumer decision context as the “drop-off of decision quality”. Jacoby (Jacoby, 1977) acknowledged that previous studies did not provide a clear definition about the concept of “decision quality” in consumer decision context. Drawing from the thoughts of complete rationality (Edwards, 1954). Jacoby et al. (1974a) defined “decision quality” as “best choice,” and sought to account for each consumer’s “best choice” by an idiographic approach in which each consumer determined which combination of attributes was the best for him/her according to one’s own utility function, and then consumers’ “actual choice” in a specific information load context was measured to see how far it was deviated from the best choice. The closer the distance is, the better the “decision quality” is.

However, several researchers criticize Jacoby’s definition and operationalization of “decision quality” and “best choice” from both conceptual and methodological perspectives. Conceptually, for example, some argued that an individual may have no consistent preference during the procedure; different cognitive processes might be used to generate different types of preference judgment, and it would never be clear which set of measures reflected most accurately consumers’ true normative preferences. It is also methodologically difficult to measure both idiographic ideal brand and dysfunctional consequence (Summers, 1974; Wilkie, 1974; Jacoby, 1977; Keller and Staelin, 1987; Meyer and Johnson, 1989; Lee and Lee, 2004). Some researchers challenged the choice of “decision quality” as the dependent variable, and indicated that there should be other “dysfunctional consequences” of information overload (Summers, 1974; Keller and Staelin, 1987; Meyer and Johnson, 1989). Hence, just as Malhotra (1984) suggested, “choose the best brand” should not be the only outcome variable.

To gain a deeper understanding about the effects of information load, Jacoby et al. (1974a,b) designed a subjective state scale as another dependent variable to assess the impact of information load on consumers’ psychological states. This scale includes the consumer’s satisfaction, certainty, confusion, and regret about one’s buying decision, and the degree of desire for more product information. In the era of experiential economics, consumption has been regarded as a subjective state towards shopping experience which may have greater influences on the utilities of objective results (Schwartz, 2004). Superior subjective experiences can lead to preference and satisfaction toward the e-store. Negative emotional reactions such as regret after decision, in contrast, may influence choice preference, lead people to switch away from previous chosen option even consumers were satisfied with that option, and may have a negative influence on satisfaction (Tsiros and Mittal, 2000).

Hence, 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. The effect of information overload on the subjective state towards decision, however, is still uncertain. As the amount of information increased, Jacoby et al. asserted that consumers would feel better even though they actually made poorer purchase decisions. Malhotra (1982), (Keller and Staelin, 1987), and Lee and Lee (2004) have found opposite results. Generally, their findings refuted the assertion of Jacoby et al. (1974a,b).

2.4. Perceived information overload and internal information filtering

A consumer’s process of decision making involves his/her cognitive system to process product information (McGuire, 1976). Previous researchers aimed to find a universal threshold of information load to make consumers’ decisions worse (Jacoby et al., 1974a,b; Malhotra et al., 1982; Malhotra, 1982, 1984; Muller, 1984; Keller and Staelin, 1987; Lurie, 2004; Lee and Lee, 2004). Each consumer, however, may differ from their information processing capability and shopping experience. Even people are exposed to the same amount of external “objective” stimuli, their cognitive process can influence the decision on the part of information to be perceived and comprehended (Grisé and Gallupe, 2000). A perception of information overload results from the interaction of high information load and limits of one’s cognitive process (Grisé and Gallupe, 2000).

Henry (1980) had observed that information processing ability varies across people. People try to minimize the effect of information overload by applying different information processing strategies (Grisé and Gallupe, 2000). A person’s past experiences can be a type of “internal filtering mechanisms”, which can affect which piece of information will be exposed to and selectively perceived by this person (McGuire, 1976). Human decision making actually is a complex dynamic process which is deeply influenced by a person’s past experiences (Tversky, 1972; Tversky and Kahneman, 1974; Kahneman and Tversky, 1983).

Hence, it seems impossible to find a universal threshold of information to make everyone overloaded. Formal, prescriptive models of decision making seldom account for cognitive factors, and it is argued to consider the perceived information overload as the intervening variable between the predicted variable and decision outcomes (Buchanan et al., 2000). Considering the individual differences, and adapting from Grisé and Gallupe (2000), this study defines perceived information overload as “a perception of having too much product information to deal with while making a buying decision,” and proposes the concept of perceived information overload intervening between the objective information load and the outcomes of decision. This study also considers past on-line shopping experience as an internal filtering mechanism, a factor moderate the relations between external stimulus and internal cognition results. In this way, different perceptions regarding the information load offered by current e-stores between experienced and novice consumers can be examined.
2.5. External information filtering mechanism

One of the most important functions of brick-and-mortar retailers is to help consumers abate the burden of product information screening and processing. Many e-stores instead provide information filtering mechanisms to help customers to alleviate the problem of information searching and processing. Practically, the main information filtering mechanisms that e-stores currently offer to consumers can be classified into three types: (1) search engine, (2) merchandise catalog, and (3) shopping basket.

Allowing consumers to put first-round candidate products in it to make further consideration, shopping basket is usually used as supplement of the first two types. Search engine requires consumers to key in specific information that is related to their wanted products. Unless consumers already know what products they want and are familiar with keyword searching, the resulting products are usually more than what is needed, not highly related with, or even irrelevant to consumers’ needs.

Merchandise catalog, based on the concept of “query tree”, offers another information extraction method that can more clearly express the sequence and relation between different information (Aggarwal et al., 1998). The most important part of query tree is to logically classify information. Practically, most of the e-stores in Taiwan usually use a merchandise catalogue that classified products by “brands, attributes, and popularities” to help customers screening information. This study chooses merchandise catalog rather than search engine as the information filtering tools available to customer in the e-storefront. The effectiveness of external filtering mechanism to help decrease consumers’ perception of information overload between experienced and inexperienced consumers will be examined.

3. Research method

3.1. Research model and hypotheses

Our research model is illustrated in Fig. 1. While interacting with customers, the e-tailers, conveying an amount of information richer than that from brick-and-mortar stores, may easily require their customers to bear a burden in processing this information. Richer information may require a higher information processing capacity, which may make it easier for consumers to exceed the limits of his/her capacity, hence producing a stronger perception of overload. Hence, this study proposed:

H1: The higher the amount of information load, the higher the degree of perceived information overload.

To help their customers to alleviate barriers of abundant information, many e-retailers provide information filtering mechanisms for selecting relevant information. One may intentionally or unintentionally filter out irrelevant information to conquer such burden. Without such filtering tools, one may perceive a higher degree of information overload. Hence, this study proposed that:

H2: Perceived information overload is lower in the situation that the e-storefront provides information filtering mechanism than in the situation that the e-storefront does not.

One’s past experiences can influence which piece of information be perceived and recognized by the decision maker and can influence his/her decision strategies. Similarly, consumers’ on-line shopping experiences can also influence the efficiency of using information filtering mechanisms offered by e-stores. Therefore, offering the same amount of external information to consumers will not necessarily cause the same cognitive response. Offering the same information filtering mechanism to consumers also will not lead to the same effectiveness. Therefore, this study hypothesizes that:

H3a: Consumers’ on-line shopping experiences will moderate the relationship between information load and perceived information overload; giving the same external information load, consumers with more on-line shopping experiences will perceive lower degree of information overload.

H3b: Consumers’ on-line shopping experiences will moderate the relationship between information filtering mechanism and perceived information overload; giving the same external information filtering mechanism, consumers with more on-line shopping experiences will perceive lower degree of information overload.

While accessing the same external information condition, consumers with more on-line shopping experience will operate their heuristics well to efficiently select what information they want to perceive. They will feel more confident about what they know and what they want (Park and Lessing, 1981). Moreover, experienced consumers may have got used to the information-richness environment on the internet and are familiar with on-line information processing tasks. Therefore, this study hypothesizes that:

H4: Consumers’ on-line shopping experience is negatively related with the perceived information overload.

The subjective state towards buying decision is a consumers’ emotional reaction to their decisions to buy something in the storefront. Jacoby et al. (1974a) argued that, making a good decision will lead an individual to a better psychological state; he/she will subjectively feel more satisfied and certain with the decision, less confused and regret about the decision, and need no more information. While individuals perceive a phenomenon of information overload, they may get a feeling of losing control (Edmunds
and Morris, 2000; Huang, 2003). The negative emotions caused by “losing something” are much stronger than the positive emotions caused by “gathering something” (Kahneman and Tversky, 1983). In other words, a good psychological state generated by buying one product is possibly weak than the worse psychological state induced by foregone products. Hence, information intensive websites are more likely to elicit unpleasant feeling (Huang, 2003). Applying a strategy of information personalization (Guttman et al., 1998; Sakagami et al., 1998) to simplify the information environment, on the other hand, was found to induce a pleasant emotion (Huang, 2003). Therefore, we hypothesized that:

H5: The higher the degree of information overload one perceived, the poorer the subjective state one might feel.

3.2. Experimental design and treatments

An experiment was conducted to test the research model. A simulated e-storefront was developed. A 2 (high or low information load) × 2 (with or without information filtering mechanisms) between subjects design was used. Mobile phone was chosen to be the stimuli for they are one of the major products sold through internet in Taiwan (FIND, 2004).

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. This study believes that mimicking a real e-storefront, is one of the simplest, most precise and most straightforward ways to reflect consumers’ perception of information load in internet shopping environment.

The high information load store sells mobile phones of the five best-sold brands in Taiwan (E-ICP et al., 2005), and each brand is distributed with 20 alternatives. The chosen of 100 mobile phones was referred to our pilot test in which the subjects reported a perception of overload under a time limit of 15 min that was designed to impose the information overload effects (Lee and Lee, 2004; Hahn et al., 1992; Malhotra et al., 1982). Compared with previous studies, the information load of 100 alternatives with full descriptions of product attributes seems high enough for inducing a perception of overload. For example, Malhotra (1982) provided respondents with at most 25 alternatives, or information on at most 25 attributes. 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. Information filtering mechanism was designed as a merchandise catalogue that classified products by “brands, attributes, and popularities” (Fig. 2).

3.3. Measurement

To ensure content validity, items selected for the constructs, shown in 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. (Table 1) summarizes the operational definition, variable type, source of measurement items, and number of items of the three constructs in this study, including past on-line shopping experience, perceived information overload, and subjective state towards buying decision.

Fig. 2. E-store with merchandise catalogue:
1. The information can be filtered via the merchandise catalogue in the left-hand side of the e-store.
2. The merchandise catalogue mechanisms from the top to the bottom are: 20 top sales; brands; attributes.
3. E-store without merchandise catalogue is the same with this one except for the buttons displayed in the left-hand side.
Butcher (Butcher, 1998) argues that the phenomenon of information overload may come from too abundant relevant information to be dealt with (having too much information relevant to one’s need than one can assimilate); or too much worse quality information (being burdened with a large amount of information, where some of these information is relevant to one’s need, some are irrelevant, he/she couldn’t tell where to find relevant information). A five-item scale by Lu et al. (2002) to measure perception of information overload towards e-newspaper was borrowed and adjusted to the on-line shopping context. We added two more items to measure participants’ perception of the quality of information.

The original scale of subjective state toward buying decision was designed by Jacoby et al. (1974a,b) to assess the impact of information load on consumers’ psychological states. Though many criticisms has been raised regarding the effects of information load on subjective state, this scale is still widely accepted and deployed (e.g., Malhotra, 1982; Keller and Staelin, 1987; Lee and Lee, 2004. This study, hence, employed this scale too and adjusted it to the context of this study. It contains eight items reflecting four concepts, including satisfaction, certainty, confusion, regret, and need for additional information. Finally, subjects’ demographic variables, including age, internet using experience, and internet familiarity were also taken as control variables.

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 item of the measurement scales was thought to be unrelated to internet purchase context and was deleted.

3.4. Pilot test and procedure

A pilot test with 22 undergraduate students was conducted. The authors discussed with them for their feedback. The designs of e-storefront, experimental procedures, and questionnaire had been revised greatly. The experiment was conducted in a computer room during 2 weeks (5/9/2005–5/20/2005). Totally 224 graduate and undergraduate students were recruited from the university by campus advertisements and voluntarily participated in this experiment for 100 NT Dollars payment. They came to the computer room at appointed time and were randomly assigned to one of the four treatment groups (n = 56 per group).

![Fig. 3. The “see detail” window:](Image)

1. Each mobile phone is displayed with five basic attributes (in the right hand side of mobile phone picture) and a “see detail” button (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 descriptions of the phone.
Once the subjects arrived at the Lab and checked in, the experimental instructor gave them a notice requesting the participant 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 system began to record each subject’s searching behaviour.

In the first page, the subjects were asked to pretend that they were in a real e-storefront and must seriously consider buying a mobile phone within 15 min. Then, the subjects entered the experimental mobile phone e-storefront. Each mobile phone is displayed with five basic attributes that mobile phone sellers usually provided to their customers at the time of this study. The subjects can freely surf in the e-store and use the merchandise catalogue to solicit preferred candidates. A “See Detail” button enables participants to see detail illustrations about an alternative (Fig. 3). The participants could close the detail description window to keep surfing, or they can click the “buy-now” button of the chosen mobile phone to finish the buying decision. But, beyond 15 min, they will be forced to make a decision, and leave the e-storefront. The coming web-page would show to the subjects the items of perceived information overload, subjective state scales, and on-line shopping experiences. After the questionnaire was filled in completely, the experiment was finished.

4. Results

4.1. Measurement model

The valid samples in groups 1, 2, 3, and 4 were 54, 51, 53, and 46, respectively. A chi-square test revealed that the samples of each group were homogeneous. Since the value of KMO was greater than 0.5 (0.694) and the Bartlett’s test of sphericity was significant (0.000), an exploratory factor analysis (EFA) used principal components analysis with orthogonal rotation by varimax method was conducted. (Table 2) presented the factor structure of the constructs and showed that most of the items were loaded in the predicted constructs.

Perceived information overload was divided into two constructs; we named IO-2, IO-3, and IO-4 as “perceived too much information”, and IO-1 and IO-5 as “adequacy of information”. Furthermore, subjective state towards decision was also divided into two constructs; we named SS-1, SS-2, and SS-4 as “feeling of obtaining best decision”, and SS-6, SS-7, and SS-8 as “need for additional information”. SS-5 was dropped because its largest score of factor loading was less than 0.5. Besides, SS-3 was excluded because it was not loaded in the predicted construct.

A confirmatory factor analysis (CFA) was conducted to examine the convergent validity and discriminant validity of the measurement model. Results showed that the fit between the data and the measurement model was acceptable (chi-square/df = 1.86; RMSEA = 0.061; NFI = 0.88; NNFI = 0.91; CFI = 0.94; SRMR = 0.071; GFI = 0.94; AGFI = 0.90). The average variance extracted (AVE) of all the constructs were beyond 0.5 except the “adequacy of information (AVE = 0.25)” and “need for additional information (AVE = 0.46)” constructs (Fornell and Larcker, 1981). Factor of “adequacy of information” was dropped out for further analysis. However, we still held “need for additional information” construct since the T-values of its item loadings were all significant (T-value > 1.96) Espinoza, 1999. Additionally, the results of an examination of discriminant validity indicated that the confidence intervals of correlation coefficient between any two constructs all did not include 1. Hence, the three constructs left had all met the criterion suggested by Anderson and Gerbing (1988).

The reliabilities of the three constructs were all larger than 0.7, except for the reliability of “need for additional information” which, though not good enough, was still larger than 0.5 and in the acceptable range for an exploratory research (Nunnally, 1978). In the following article, to ease understanding, we named “perceived too many quantities of information” construct as “perceived information overload”.

4.2. Hypotheses testing

Univariate analysis of variance (ANOVA) was applied to test the main and interaction effects on perceived information overload. Since a requirement of ANOVA is the homogeneity of the variance of dependent variable between groups, the appropriateness of the univariate technique is tested by Levene statistics. The test (F = 1.937, p = 0.066 > 0.05) indicated that the samples of this study did not violate this assumption (Hair et al., 1995). The results of a two-way ANOVA revealed that both of the direct effects of “information load” (F = 5.267, p = 0.023) and “information filtering mechanisms” (F = 5.935, p = 0.016) treatments were significant, and the interaction between these two factors was insignificant (F = 0.186, p = 0.666) (see Fig. 4). Fig. 4 shows that the level of perceived information overload is higher when information load is

<table>
<thead>
<tr>
<th>Items</th>
<th>Variable</th>
<th>EFA</th>
<th>CFA</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Too many information</td>
<td>Feeling of obtaining best decision</td>
</tr>
<tr>
<td>IO-2</td>
<td>Too many information</td>
<td>0.821</td>
<td>0.161</td>
</tr>
<tr>
<td>IO-4</td>
<td>0.812</td>
<td>–0.285</td>
<td>0.365</td>
</tr>
<tr>
<td>IO-3</td>
<td>0.640</td>
<td>0.826</td>
<td>0.154</td>
</tr>
<tr>
<td>SS-1</td>
<td>SS-2*</td>
<td>Feeling of obtaining best decision</td>
<td>0.755</td>
</tr>
<tr>
<td>SS-7</td>
<td>SS-5</td>
<td>Need for additional information</td>
<td>–0.174</td>
</tr>
<tr>
<td>SS-6</td>
<td>0.166</td>
<td>0.694</td>
<td>–0.316</td>
</tr>
<tr>
<td>SS-8</td>
<td>0.304</td>
<td>0.100</td>
<td>–</td>
</tr>
</tbody>
</table>

a. Extraction method: principal component analysis.
b. Rotation method: Varimax with Kaiser normalization.
c. (*) Dropped by EFA. (***) Dropped by CFA.

Abbreviation: IO: perceived information overload; SS: subjective state toward decision.
high, no matter whether information filtering tools were provided or not; on the other hand, the level of perceived information overload would be higher without information filtering tools, no matter what the information load is. The directions of the effects of information load are similar in situations with or without information filtering tools, indicating that the influences of these two experimental treatments on perceived information overload are mutually independent. Hence, no interaction between these two treatments was found to exist. The overall main effects, hence, will be interpreted directly.

We converted information load into one dummy variable that the high information load group was set as “1”, and the low information load group should be “0”. On the other hand, the group with information filtering mechanism was set as “1”, and the group without filtering mechanism was then set as “0”. Some control variables were also included into the model.

Table 3 shows the results of the ANOVA. A significant main effect was found for information load ($F = 5.412, p = 0.021 < 0.05$). This study further conducted a t-test to compare the level of perceived information overload between high and low information load situation. The result ($t = 2.203, p = 0.029 < 0.05$) indicated that richer information load leads to perception of higher information overload. Therefore, H1 can be accepted. The main effect of information filtering tools was also significant ($F = 5.542, p = 0.020 < 0.05$). The t-test analysis ($t = 2.358, p = 0.019 < 0.05$) indicated that information filtering may be useful in relieving consumers’ burden in information processing, since the perception of information overload is lower with information filtering mechanisms. Hence, H2 was supported.

H3a and H3b, on the other hand, were rejected since the interaction effect between information load and on-line shopping experience was found not significant ($F = 0.018, p = 0.894$), and interaction effect between information filtering and on-line shopping experience was found not significant ($F = 0.389, p = 0.533$). A significant effect for on-line shopping experience was found ($F = 7.731, p = 0.006 < 0.05$). The t-test analysis ($t = 2.355, p = 0.021 < 0.05$) indicated that subjects with more on-line shopping experience tended to perceive lower degree of information overload. Hence, H4 can be accepted. Finally, the effects of control variables, including sex ($F = 0.57, p = 0.811$), www experience ($F = 0.029, p = 0.865$), and www familiarity ($F = 0.014, p = 0.907$) were all not significant.

The effects of perceived information overload on feelings of obtaining best decision, and needs for additional information were tested separately by using bivariate linear regression. The results showed that perceived information overload was negatively related with needs for additional information ($\beta = -0.16, t = -2.302, p < 0.05$), but it had no significant effect on feelings of obtaining best decision (see Table 4). Therefore, H5 was only partially supported.

5. Conclusions and discussions

Based on the theory of information overload, this study examined whether consumers’ subjective states towards their buying decision would be worse while accessing abundant information in an e-store. The effectiveness of external filtering mechanism on alleviating the perception of information overload was also examined. Finally, this study also examined whether these relations would be different between novice and experienced consumers.

There are three main results that may contribute to our knowledge regarding the phenomena of information overload in the con-
text of e-commerce. First of all, consumers incline to perceive higher information overload while accessing larger amount of information in an e-storefront (H1). The effect of information filtering mechanisms was also supported (H2), indicating that consumers may alleviate the perception of information overload through the facilitation of information filtering tools.

Secondly, considering individual differences is necessary. As expected, individual with different information processing abilities and internal information filtering mechanisms may perceive different degree of perceived information overload. It seems that consumers with more on-line shopping experience may process product information more effectively and efficiently, hence perceive lower degree of information overload (H4). The results suggest that experienced consumers and novice customers may have significant different perception regarding the abundant information offered by current e-stores. This "personal difference" may partly explain the inconsistency of previous researches.

Thirdly, once consumers were strongly overloaded by abundant information, they incline to need no more information (H5). Opposite to previous assertion, more product information may not be beneficial to e-retailers and customers. It seems that consumers, inexperienced consumers in particular, can not effectively handle too much information. Giving them large amount of information might not be able to enlarge their consideration sets; people may feel needing no more information, even if it is easier, cheaper and faster than past to get more information. Though information filtering mechanisms filter part of product information, they still do not need so much information.

Perceived information overload, as expected, negatively affect feeling of obtaining best decisions, though the effect is not significant ($-0.104$, $t = -1.486$) (H5). Two possible reasons might be able to explain this finding. The first explanation is due to the experimental design. The mental processes perceiving information overload involves an overall experience towards information dimensions of an e-storefront. On the other hand, the emergence of cognition of best decisions is related with "product" chosen. One's cognition of bad or good decision might be affected by various factors such as reference price, product preference, etc., but not just information. For example, consumers' attitudes towards their decisions may be influenced by their a priori preferences towards the products in the real world. This is evident by the fact that part of the participants of this study chooses a mobile phone the same as the one they used in real life. Future research could take the effects of individual's characteristics such as product preferences, product knowledge, personal involvement, etc., into account.

A second explanation is related with the emotion aroused during the shopping process. It is argued that a certain level of information overload may induce consumers a sense of pleasure and challenge, encouraging exploration and promoting shopping; a simplified informational environment, conversely, imposes no challenges to customers, may induce customers a sense of boredom and avoidance (Huang, 2003). It is not clear what the influences of emotion aroused on subjective states towards decision will be, since this issue is not a subject of Huang (2003) research. Arguments proposed by Hoffman and Novak (1996) may provide some cues to that answers. They argued that, while surfing on a website, a sense of control and pleasure will lead people to a positive subjective experience of the website. The negative effect of perceived information overload on feeling of best decision may be lessened by such positive experience and emotion. Researchers are advised to take the emotional and informational dimensions into account (Huber et al., 2004).

Surprisingly, the moderating effects from on-line shopping experience were all found insignificant (H3). The explanation of this unexpected finding is related with the psychological structure of human decision making. During the process of buying decisions, consumption relevant knowledge is represented in memory and is applied to evaluate product attributes. These cognitive structures, referred to as Mean-End chains, are results of learning and experience process (Huber et al., 2004). On-line shopping experience was used to capture the above concept, and it included but not limited to product knowledge, since consumers may learn many aspects of experience such as skills for using information mechanisms during repeated purchasing behavior. What is more matter with filtering and processing product information, however, may be the product knowledge. Experts are better than novice in the quantity and quality of, and the effectiveness and efficiency of deploying product knowledge (Wu and Lin, 2006). Feeling more confident about product knowledge may reduce search of product alternatives (Park and Lessing, 1981). Hence, experts make much better decisions than novice in a high information load environment, and vice versa (Wu and Lin, 2006). On-line shopping experience may not be adequate for conceptualizing consumers' knowledge structure.

To summarize, information overload phenomenon possibly exist in E-commerce environment, especially for inexperienced or novice consumers. Information filtering tools and shopping experience may have influences on relieving but are not the panacea to the phenomenon of information overload. The effects are not so powerful that could turn a bad situation into a good one, since people must rely on themselves to learn and experience, and the filtering technologies outside their control to abate the burden of information. The results suggest that deciding what information to provide or not to provide, may partly determine e-retailers success in the marketplace.

Theoretically, some implications may be proposed. The variance explained (R square) is not high enough, indicating that some important variables are omitted in the research model. Future research may consider the role of individual factors, emotion in particular, to more precisely measure the cognition aspect of consumers' decision making in the internet shopping environment. This study stretches previously used scales to measure perceived information overload and subjective states. However, these scales are not mature, and need to be further clarified in the future. Further research may be able to consider other concepts or theories to examine consumers' responses to informational dimensions on the internet, such as Means-End analysis, or theories related with affective states incurred during buying decisions.

Our findings indicate that large amount of information may not be e-customers' benefits; rather, they, confronting abundant information, probably derive poorer subjective states towards their decisions. Thus, e-retailer should pay more attentions on screening appropriate information to consumers. It is suggested to maintain information load at a level to stimulate an emotion of pleasure. Simplification of information environment may be a key to create a pleasant e-storefront. Information personalization has been suggested to be a suitable technique to filter irrelevant information (Huang, 2003).

Specifically, the barrier of information overload is much worse for novice consumers in the internet shopping environment. Current information filtering mechanisms on the internet still mainly emphasize the informational aspect of shopping (offering more alternatives and more powerful search engines). Though on-line one-to-one direct marketing is theoretically beneficial to customers, e-stores may have no ways to learn the preferences of inexperienced customers, since these customers interact with them very rarely. To overcome the barrier of information overload for these consumers, easy and user-friendly interfaces, interaction with store personnel, and personally feel products may be useful among others.
Acknowledgement

This Research is supported by the National Science Council, Executive Yuan, Taiwan, under Grant number NSC 94-2416-H-031-007.

Appendix A. Measurement items for the constructs

A.1. Subjective state

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

A.2. Perceived information overload

IO-1 I carefully read every piece of information about mobile phone on this e-store.
IO-2 There was too much information about mobile phone on this e-store so that I was burdened in handling it.
IO-3 I could effectively handle all of the mobile phone information on this e-store.
IO-4 Because of the plenty mobile phone information on this e-store, I felt difficult in acquiring all of this information.
IO-5 I found that only a small part of the mobile phone information on this e-store was relevant to my need.
IO-6 I was certain that the mobile phone information on this e-store fitted to my need for making a buying decision.
IO-7 I had no idea where to find the information I needed on this e-store.

References


Lu HP, Liu SU, Hsu CL. Do people really need personalization? In: International conference on information management, Taiwan; May 2002.