Do males and females differ in how they perceive and elaborate on agent-based recommendations in Internet-based selling?

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A R T I C L E   I N F O

Article info

Article history:
Received 24 July 2009
Received in revised form 12 December 2010
Accepted 12 December 2010
Available online 21 December 2010

Keywords:
Advertising hierarchy of effects model
Perceived usefulness
Product involvement
Recommendation agents
Shopping task uncertainty

A B S T R A C T

Managers are eager to know whether they should use gender-specific strategies to communicate with male and female consumers differently to recommendation services in Internet-based selling, as both groups are worthwhile and profitable to target. This issue has been overlooked in the literature, despite its importance and the fact that recommendations have become a major online advertising tactic in recent years. This study is diverse from existing studies in three ways: testing recommendation agent acceptance in the information context, revealing gender effects and applying a new lens of cognition-conation. By proposing a theoretical model based on the advertising hierarchy of effects model, this study investigated consumers' elaboration processes towards recommendation agent advices. Based on 432 members randomly selected from a database of a well-known Internet-based sellers, the study finds that women consider perceived usefulness of recommendation agent advices to a greater extent than men while making decisions about the usefulness of recommendations. Further, consumers' perceived usefulness is more strongly influenced by their perceived shopping task uncertainty than by involvement, while more-involved consumers have lower levels of perceive shopping task uncertainty.

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1. Introduction

Recommender systems (sometimes also called recommender agents or RAs, for short) are an important facet of Internet-based sellers' advertising and promotion strategies due to their ability to deliver shopping advice, stimulate consumers' purchase desires and boost sales (Hung 2005). However, when managers introduce recommendation services, do they need to take into account that men and woman may react differently to the advice? This is important because advertising is the major way in which marketers communicate with different target segments in the traditional market, and recommendations have played a similar role in the e-commerce market. Moreover, for many years, gender has been considered to be the most useful basis for market segmentation because both segments are profitable and easy to target (Darley and Smith 1995). Consequently, managers must understand whether there are decision-processing differences between men and women in order to produce effective recommender system advice for each segment.

Gefen and Straub (1997) argued that the individual acceptance literature has ignored the effects of gender, and since then, a growing number of studies have revealed the impact of gender on users' acceptance of technology. Significant differences have been found between men and women in these studies. For example, Venkatesh and Morris (2000) revealed that men consider perceived usefulness to a higher extent than women when making decisions about using a new technology. Ahuja and Thatcher (2005), in a post-adoption study, also reported that gender moderates the associations between the perceptions toward work environment factors and trying to be innovative. However, Awad and Ragowsky (2008) contend that the literature regarding gender differences in e-commerce is still lacking. The current study also argues that past studies have mainly focused on technology acceptance at the system level, whilst individuals' technology acceptance at the information level, such as elaboration on recommender system advice, is being neglected. In support of this, Wixom and Todd (2005) also indicated that the acceptance of information should be treated differently from the acceptance of systems.

Consequently, to verify the effects of gender on consumers' acceptance of recommender system advice at the information level, this study has developed a model based on the advertising hierarchy of effects model (Lavidge and Steiner 1961), which proposed that consumers' advertising information processing can be delineated as a cognitive-conation process. Distinct from the existing literature in terms of testing recommender system acceptance in the information context, revealing gender effects, and applying the new lens of cognition-conation, this study's findings provide
interesting and fruitful insights for researchers and practitioners regarding the process of consumers’ information processing of recommendations. In the following sections, we propose theoretical model, its support from the literature, and a set of related research hypotheses. We also will discuss the research methodology, design, statistical analysis and results, and the conclusions and implications of our work.

2. Theory

Shopping advice supported by recommender systems is accepted to be able to assist consumers’ purchase decision-making. This study proposes that consumers’ cognitive processes can be tested via several perceptual constructs related to their existing knowledge. These include the current event, environmental stimuli in terms of product involvement, perceived shopping task uncertainty and perceived usefulness of recommender system advice. More specifically, we will test consumer intention to elaborate on recommender system advice from the perspective of cognition-conation based on the advertising hierarchy of effects model. Further, we will attempt to verify the effects of gender in decisions about elaborating on advice and consumers’ recommender system acceptance at the information level. The model is illustrated in Fig. 1.

2.1. Recommendation agents and consumer acceptance

Many online consumers are eager for the same assistance that is available in a conventional environment combined with the convenience of shopping online (Holzwarth et al. 2006). Recommender system advisory services, which involve software agents that collect the interests and product preferences of individual consumers, and offer shopping advice (Xiao and Benbasat 2007), have been developed. In practice, popular sellers such as Amazon.com and Lands’ End have embedded collaborative-filtering systems, which apply the opinions of like-minded people to produce recommendations. For example, immediately after introducing a product, Amazon.com provides shopping advice. It asks: “What do customers ultimately buy after viewing this item? 80% buy the item featured on this page...” The advice offered by Land’s End is in the form “You might also like...” Fig. 2 presents shows the kind of recommender advice offered at Amazon.com.

As recommender system advisory services are believed to stimulate consumers’ shopping desires and boost sales, research in this area has gained considerable attention in the past few years. The computing techniques used to develop recommender systems are among the most popular issues for research. For example, Liu and Shin (2005) proposed an approach integrating group decision-making and data mining techniques to evaluate consumer lifetime values and establish associated rules for giving shopping advice. Interface design is another central topic. Al-Natour et al. (2006), for instance, reported that the design of recommender systems can manifest personalities that attract consumers. Individual acceptance of recommender systems is also vital. Komiak and Benbasat (2009) used Amazon.com as an example. They demonstrate how the content of advice influences consumer trust in the recommender system and affects their willingness to use a recommender system to automate their shopping process or as a decision aid. Qiu and Benbasat (2009) employed a social relationship perspective to the interface design of recommender systems and investigated the effects of applying human forms and voices on users’ perceived relationship with a technology artifact. However, most of the existing research mainly examines acceptance at the system level. It explores how and why consumers adopt a recommender system as a technological system.

Knowledge of individual consumers’ acceptance of recommender systems at the information level – a form of elaboration

![Fig. 1. Research model for recommender system advice service (RA).](image1)

![Fig. 2. Recommender system agent (RA) advice service offered at Amazon.com.](image2)
on the recommender system's advice – is absent from the existing studies though. A small but growing number of studies have proposed and empirically verified that, while using technology-based systems, individuals' perceptions of the system and information are distinct constructs and should be validated separately (DeLone and Mclean 2003, Ahn et al. 2004, Wixom andTodd 2005, Roca et al. 2006). More importantly, Sussman and Siegal (2003) have demonstrated that its perceived usefulness will lead to adoption of this information. In the recommender systems field, the work of Wang and Benbasat (2005) is the first to shed light on this issue, and they have noted that their study focuses on "consumer intentions to adopt recommendation agents to get shopping advice." Even so, they still refer to the construct "consumers' intentions to adopt the agent," which does not differ from the studies investigating recommender system acceptance at the system level. To further clarify this issue, the current study formulates the construct as "intention to elaborate on recommender system advice," so as to address consumer intentions to consider recommendations in their online purchase decision-making process.

2.2. The advertising hierarchy of effects model

Lavidge and Steiner (1961) imitated consumers' responses to advertising in the marketplace and proposed that advertising may be thought of as a force that moves receivers up through a series of steps. (See Fig. 3.) The first two steps of "awareness and knowledge" are associated with information or ideas, followed by "liking and preference," which relate to favorable attitudes or feelings toward the product. The final two steps of "conviction and purchase" serve to generate purchase action. Lavidge and Steiner further link these six advertising functions directly to the classic psychological model, which splits behavior into three dimensions: (1) the cognitive dimension is the intellectual, mental, or "rational" states of consumers' minds; (2) the affective dimension refers to the "emotional" or "feeling" states; and (3) the conative dimension indicates the "striving" states, relating to the tendency to treat objects as positive or negative goals.

Although these authors proposed three psychological stages of behavior, researchers have contended that consumers may undergo only cognitive responses or only affective responses before reaching the conative stage (Vakratsas and Ambler 1999, Park et al. 2008). Further, as individuals actively process the environmental stimulus, the cognitive stage preceding the conative stage refers to the fact that individuals bring their past knowledge and prejudices to bear in working out how they perceive and identify with the present events (Shohov 2003). In this process, three perceptual attributes were identified: individual knowledge, the current event and the environmental stimulus. Ultimately, the results generated from the cognitive stage will shape the conative stage, which relates to intentions, behaviors and actions (Ray 1973).

To further explore the cognitive stage, this study frames the knowledge factor as "product involvement," because it previously has been shown that higher involvement precedes greater product information acquisition and improved product understanding (Hess et al. 2006). Baker et al. (2002) indicate that the involvement construct and consumer product knowledge are associated, such that consumers who are more involved with one particular product class also tend to have more knowledge about this product class. This is also in line with Lavidge and Steiner's (1961) proposition, which asserts that the stage of "knowledge" relates to consumers' understanding of a product's attributes or benefits, as well as the ways in which a firm's specific product or brand differs from its competitors' products or brands. Consistent with this, Bian and Moutinho (2009) pointed out that when consumers' product involvement is high, they are more able to distinguish between one specific brand and its competitors.

The current event factor was framed as "perceived shopping task uncertainty," to capture the degree of complexity of the ongoing shopping task. This is appropriate because Daft and McIntosh (1981) indicate that when the present event is unfamiliar, novel and unexpected, the task variability is high. In support of this, Chang et al. (2003) assert that task uncertainty is a contingency factor, and examine this uncertainty in the context of using an accounting information system. Similarly, Billi et al. (1998) also examined task uncertainty with the current event of end-user computing.

Finally, the environmental stimulus factor, which addresses consumers' responses to recommendations, was framed as "perceived usefulness of recommender system advice," since for consumers, perceptions of advice are only situational, and represent the response to the purchase environment offered by the Internet-based seller (Wang and Doong 2010). This is because the importance of the advice is only relevant to the consumer while shopping on site, and such relevance quickly disappears when the consumer leaves the seller's site. In support of this, Holzwarth et al. (2006) asserted that recommender systems services have been developed to meet consumers' demand for a shopping environment online, as they feel helpless when facing an array of complex product categories on an impersonal Web site and many want the assistance that is available in a conventional environment. More specifically, Komai et al. (2005) indicated that recommender systems advice services functions like a virtual salesperson, who communicates with consumers and stimulates their desire to make a purchase.

Together, these three perceptual factors will be able to delineate consumers' cognitive processes with respect to elaboration on recommender advice while shopping online. That is, to deal with the shopping task they are undertaking (current event), consumers may instantly use their existing knowledge frame (product involvement) to analyze the product to be purchased. As soon as they go online to shop, they will interact with the shopping advice offered by the recommender system (environmental stimulus). Finally, the interactions between these perceptions will lead to the intention to elaborate on recommender system advice (conative stage). The supporting literature for each factor is discussed below in order to build this study's hypotheses.

2.3. Perceived usefulness

Perceived usefulness has been an important construct in verifying IS adoption since the work of Davis (1989). For example, both Koufaris (2002) and Gefen et al. (2003) indicated that the more useful consumers perceived a particular Internet-based seller to be, the higher their intentions to make purchases from that seller. In the context of the IS services offered online, Lederer et al. (2000) revealed that perceived usefulness significantly influenced consumers' use intentions towards Internet newsgroups. More specifically, in the domain of recommender systems, Kamis and Davern (2005) reported that perceived usefulness increased consumers' online decision quality and confidence. Wang and Benbasat (2005) also indicated that perceived usefulness would enhance individuals' intentions to adopt recommender systems to get

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Table: Related Behavioral Dimension vs. Movement Toward Purchase

<table>
<thead>
<tr>
<th>Behavioral Dimension</th>
<th>Awareness, Knowledge</th>
<th>Liking, Preference</th>
<th>Conviction, Purchase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cognitive Stage</td>
<td></td>
<td></td>
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<tr>
<td>Affective Stage</td>
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<tr>
<td>Conative Stage</td>
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</tbody>
</table>

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Fig. 3. Advertising hierarchy of effects model (Lavidge and Steiner 1961).
shopping advice. However, the object of perceived usefulness investigated in past studies is primarily the “system” or the “technology.” Only recently have Sussman and Siegal (2003) proposed that this relationship should be examined at the information level and verified that users’ perceived information usefulness would lead to information adoption. As such, we hypothesize that:

Hypothesis 1. (The Usefulness of Advice Hypothesis). The perceived usefulness of recommender system advice will positively affect consumers’ intentions to elaborate on this advice.

2.4. Gender differences and information processing

For decades, researchers from different disciplines have attempted to delineate the fundamental similarities and differences between men and women. Bem (1981) argues that men and women use different socially cognitive attributes in information encoding and problem-solving: hence, their perceptions are also diverse. In other words, men and women may take unconscious or internalized actions due to their gender. These differences are particularly important for advertising and promotion strategies, and gender has long been utilized as a basis for market segmentation. This is because gender meets the requirements for successful implementation that not many other variables are able to meet: (1) men and women are simple to identify; (2) gender segments are easily accessible, given that they are included within the top few data that most retail channels collect; and (3) gender segments are large enough to be profitable (Darley and Smith 1995).

Gender effects are also becoming an increasing crucial topic in the IS field since the work of Gefen and Straub (1997), who asserted the importance of examining how men and women may differ in IS usage. (See Table 1 for a summary.) For example, compared to men, women were found to be more aware of non-verbal social cues in a computer-mediated environment (Dennis et al. 1999) and to perceive a greater social presence in electronic communication (Gefen and Straub 1997), and women’s decisions regarding technology acceptance are less influenced by their perceptions of its usefulness (Venkatesh and Morris 2000). Although these studies have found insightful diversity between men and women in their communication patterns and perceptions with regard to technology, there has been little investigation of gender-based differences in accepting information in terms of seller recommendations in the e-commerce environment.

A variety of studies indicate that while processing advertising information, men and women may use considerably different elaboration strategies to deal with its content. For example, compared to men, women may be more accurate in decoding non-verbal cues (Rosenthal and DePaulo 1979), engage in more detailed elaboration of message content and react to more subtle cues in messages (Meyers-Levy 1989). Men, in contrast, look for overall message schemata and tend to employ highly available and particularly salient cues for more detailed processing (Hess et al. 2006). As men are also more task-oriented (Minton and Schneider 1980), the goal of information processing is to use tactics that aim to maximize efficiency.

In the online shopping context, task orientation may refer to the accomplishment of shopping tasks. That is to say, men are more likely than women to apply recommender system advice without detailed consideration of its content because they inherently prefer to apply efficient tools to complete the task of shopping. In contrast, while making judgments, women are more comprehensive processors and exhibit superior information sensitivity (Meyers-Levy and Maheswaran 1991). Consequently, women are likely to consider more carefully whether the recommender advice is useful for the shopping task, as compared with men. In support of this, Holbrook (1986) also suggests that gender is a major factor in moderating consumers’ evaluative judgments. So we assert:

Hypothesis 2. (The Gender Moderation of Usefulness and Advice Elaboration Hypothesis). Gender will moderate the association between the perceived usefulness of recommender system advice and intentions to elaborate on the advice that is offered.

2.5. Personal involvement

Involvement is widely recognized as the lynchpin of the consumer decision-making process. Zaichkowsky (1986), one of the most well-cited scholars specializing in personal involvement, indicated that, since 1965, there have been three types of involvement research. Some have utilized involvement in studying the effectiveness of advertising. Some have examined involvement with consumer purchase decisions or actions such as time spent searching or number of stores visited. Still others have applied involvement to examine the link between an individual and a product: in this area, the research focus is how relevant or important the person perceives the product category to be. Zaichkowsky further asserted that although each is a different domain of research, the rule of

<table>
<thead>
<tr>
<th>Author</th>
<th>Topic</th>
<th>Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zhang et al. (2009)</td>
<td>The role of gender in bloggers’ switching behavior</td>
<td>Female bloggers, rather than males, are more sensitive to satisfaction and less responsive to attractive alternatives</td>
</tr>
<tr>
<td>Sanchez-Franco et al. (2009)</td>
<td>The moderating effect of gender on relationship quality and loyalty toward Internet service providers</td>
<td>The influence of trust on commitment and of commitment on loyalty was significantly stronger for females than for males, while the effects of satisfaction on commitment and of trust on loyalty were significantly stronger for males</td>
</tr>
<tr>
<td>Hess et al. (2006)</td>
<td>Explores how multimedia vividness and computer-based social cues can influence involvement with technology</td>
<td>Women report higher levels of involvement with the decision aid</td>
</tr>
<tr>
<td>Awad and Ragowsky (2008)</td>
<td>Cultural effect of gender on the relationship between online word-of-mouth and trust in e-commerce</td>
<td>The effect of trust on intention to shop online is stronger for women than for men. Further, men value their ability to post content online, whereas women value the responsive participation of other consumers to the content they have posted</td>
</tr>
<tr>
<td>Ahuja and Thatcher (2005)</td>
<td>The influence of the work environment and gender on trying to innovate with IT</td>
<td>The findings confirm that autonomy interacts with overload to determine trying to innovate with IT and that these relationships vary by gender</td>
</tr>
<tr>
<td>Venkatesh and Morris (2000)</td>
<td>Gender differences in the overlooked context of individual adoption and sustained usage of technology in the workplace</td>
<td>Men’s technology usage decisions were more strongly influenced by their perceptions of usefulness. In contrast, women were more strongly influenced by perceptions of ease of use and subjective norms</td>
</tr>
<tr>
<td>Gefen and Straub (1997)</td>
<td>Testing gender differences that might relate to beliefs and use of computer-based media</td>
<td>Women and men differ in their perceptions but not use of e-mail</td>
</tr>
</tbody>
</table>
thumb between these studies is the construct of involvement is defined as “personal relevance.” For example, in product class research, involvement refers to the “relevance” of the product to the consumer’s needs and values, and consequently there is continuing interest in product information (Zaichkowsky 1985).

In fact, little is known regarding the direct effects of product involvement on consumers’ conation processes regarding recommender system-based shopping advice. Zaichkowsky (1986) argues that involvement is more than just importance. Involvement affects consumers’ information processing at a primary level, as higher involvement can result in greater information acquisition, improved understanding, and increased effort (Hess et al. 2006). When individuals are involved, they pay attention, perceive the matter to be of importance and behave in a different manner than when they are not involved (Zaichkowsky 1985). More-involved consumers will have ongoing interests toward the specific product (Mittal and Lee 1988). Hence, they will be motivated to gather more product information and over time will become increasingly knowledgeable about the product (Zaichkowsky 1986). Given that more-involved consumers also purchase or use the product more frequently (Foxall and Bhat 1991), their product experience will be extensive, so they will not ignore the general shopping advice proposed by recommender systems. In support, Kramer (2007) indicated that more-involved consumers are able to evaluate a product better when shopping online because they continuously pay greater attention to the specific product. Thus, we propose:

**Hypothesis 3.** *The Product Involvement and Usefulness of Advice Hypothesis.* Consumers’ product involvement will negatively affect their perceived usefulness of recommender system advice.

### 2.6. Shopping task uncertainty

Task uncertainty is the “degree to which work to be performed is difficult to understand and complex” (Alexander and Randolph 1985). A particular task may be difficult because uncertainty constitutes the lack of sufficient information to describe a current state, predict a future situation or estimate the actions needed to achieve the task (Raiffa 1968). In other words, while shopping online, task uncertainty may refer to the “degree to which the shopping task to be undertaken is difficult to understand and complex.” Such uncertainty, however, may be a frequent occurrence for online buyers. Pavlou et al. (2007), for instance, proposed four antecedents of perceived uncertainty for buyers and verified how these factors may influence online purchase intention. In support, Bunn (1993) revealed that shopping task uncertainty was an important factor determining which purchase decision-making process consumers would use.

Bruner (1973) argued that uncertainty can be tolerated by using existing knowledge to predict, infer, estimate, or assume facts in place of missing information, with some resulting level of confidence and reliability. In other words, consumers who are able to use their existing information frame to proceed with the current purchase decision may feel more confident and experience less shopping task uncertainty (Cowley and Mitchell 2003). Further, more-involved consumers also will purchase and use the specific product more frequently. Hence, if compared with less-involved consumers, they will perceive less difficulty in performing the shopping task related to that specific product. So we offer:

**Hypothesis 4.** *The Product Involvement and Shopping Task Uncertainty Hypothesis.* Consumers’ product involvement will negatively affect their perceived shopping task uncertainty.

Zack (2007) asserted that uncertainty can be reduced by acquiring additional information. Thus, consumers who perceive higher shopping task uncertainty may look for more information to help them to make purchase decisions with confidence. In the context of online purchases, consumers who perceive high shopping task uncertainty may generally respond in two ways. They may look beyond the Internet-based seller to collect essential product, price or brand information for this shopping task (Mandel and Johnson 2002). Alternatively, they may browse the handy advice provided by the Web site (Swaminathan 2003; Kramer 2007). Considering that more uncertain consumers tend to regard purchase decisions as more difficult and recommender system services have been shown to improve the quality of purchase decisions (Wang and Benbasat 2007), consumers may therefore rely on online recommendations more and find recommender system advice more useful. Thus we hypothesize that:

**Hypothesis 5.** *The Shopping Task Uncertainty and Usefulness of Advice Hypothesis.* Consumers’ perceived shopping task uncertainty will positively affect the perceived usefulness of RA advice.

### 3. Methods

#### 3.1. Measurement

Four constructs were developed and investigated in this study: product involvement, perceived shopping task uncertainty, perceived usefulness of recommender system advice and elaboration intention toward recommender system advice. Constructs were measured via seven-point Likert scales ranging from “strongly disagree” to “strongly agree,” with the exception of product involvement and perceived shopping task uncertainty, which utilized seven-point semantic differential scales. Scale items were drawn from previously validated IS or marketing literature and appropriately reworded to fit the context of recommender systems and online shopping. For each construct, at least three items were measured, sufficient for adequate reliability.

Product involvement was defined as the perceived relevance of the products based on individuals’ inherent needs, values and interests. Involvement is usually measured using terms that express importance, concern or interest associated with the attribute, object, issue or action. The validity and reliability of Zaichkowsky’s Personal Involvement Inventory (PII) has also been confirmed by various studies across different product categories in past decades (Foxall and Pallister 1998). More recently, Olsen (2007) has adapted four items from the revised PII to evaluate consumers’ product involvement. These four items are important/unimportant, boring/interesting, insignificant/significant and irrelevant/concerning. Findings reported that the validity and reliability were acceptable. Specifically, Zaichkowsky (1985) indicated that “important,” “relevant” and “significant” were cognitive dimensions. “Interesting,” although it was proposed to be an affective dimension by Zaichkowsky, was argued to be a cognitive dimension in the service context by Stafford and Day (1995), Celuch and Taylor (1999), and Bienstock and Stafford (2006). This study thus employed Olsen’s (2007) four items to evaluate consumers’ product involvement.

Perceived shopping task uncertainty refers to the degree to which the shopping task to be performed lacks information, is difficult to understand and is complex. It has been measured using a scale adapted from Barki et al. (1993), and appropriately reworded to fit the context of online shopping.

The perceived usefulness of recommender system advice was measured using a four-item Likert scale that examined subjects’ perceptions of the performance, productivity, effectiveness and
overall usefulness of the advice. The original scale was developed by Bhattacharjee (2001) and was modified to fit the context of recommender systems. Finally, this study defined elaboration intention towards recommender system advice as the extent to which consumers are willing to use the recommendation as an aid to help with their decisions about which product to buy, and the measurement approach used was adapted from Wang and Benbasat (2005).

The initial version of the survey instrument was pre-tested by ten consumers and two professors who served as expert judges. The wording of each item was examined and ambiguous items were rephrased based on the responses and suggestions of these pilot testers. Table 2 provides the definitions of the various scaled responses for these constructs.

3.2. Sample

An international company with a well-known brand name in the retailing channel, operating an e-tailing Web site using the same brand name, was selected as the survey target. This brand's Web site primarily sells information technology-related equipment (e.g., personal computers, projectors, printers, scanners, monitors and digital cameras) and implements a recommender system. The recommender system advice service offered by this seller also applies an embedded collaborative-filtering approach, which is similar to what Amazon and Land's End do.

In this study, the sample frame included individuals from the seller's consumer database. Two thousand consumers who had made purchases from the seller within the past month were randomly invited to participate in an online survey. An e-mail invitation with a hyperlink was sent to each of them. The hyperlink enabled potential respondents to connect directly to the relevant questionnaire Web page set up on the brand's Web site. Respondents were asked to fill out the questionnaire according to their latest purchase experience on the brand's Web site. Respondents who completed the online questionnaire were awarded a coupon worth NT$100 (about US$3.00) that could be redeemed against their next purchase from the seller's Web site. To determine whether participants had the knowledge or experience necessary to participate in this study, the questionnaire’s introductory section illustrated the recommender system with screenshots from the brand’s Web site and contained one filter question: “I am aware of the recommendation mechanism built into the brand’s Web site to help me with decisions about which product to purchase.” The survey was completed in two weeks and 560 responses were collected. There were 72 respondents who failed to finish the questionnaire and 56 respondents who answered “no” to the filter question. They were removed from the valid sample. Thus, the effective response rate was 21.6% and 432 useful responses were harvested. Of the respondents, 69.7% were male and 30.3% were female; 12.7% were students and 87.3% were working people; 80.50% were at least university-educated. The average age of the respondents was 32.32 (with a standard deviation of 8.31) and the average length of Internet shopping experience was 4.57 years (with a standard deviation 0.76).

Non-response bias was examined by comparing the study constructs between early and late respondents (Armstrong and Overton 1977). No significant differences were found (t-test at \( p = 0.05 \) level), suggesting that non-response bias was not a problem in this study.

4. Results

4.1. Scale validation

Scale validation was assessed by applying confirmatory factor analysis (CFA) using the partial least squares (PLS) technique. The software package employed was SmartPLS. According to Fornell and Larcker (1981), three criteria must be met to conclude that construct validity is acceptable. First, all indicator factor loadings should exceed 0.7. Second, the composite reliability should not be less than 0.8. Third, the average variance extracted (AVE) should exceed 0.5. In this study, all item loadings exceeded 0.7. (See Table 3.) The composite reliabilities ranged from 0.91 to 0.96 and AVE ranged between 0.77 and 0.87. Hence, this study's results met all requirements of convergent validity. Moreover, Fornell and Larcker (1981) argued that the square root of AVE for each construct should exceed the correlation between that and any other construct. The factor correlation matrix shows that the lowest squared root of AVE was 0.88, while the highest correlation between any pair of constructs was 0.60 (perceived usefulness and elaboration intention). (See Table 4.) Therefore, discriminant validity was also demonstrated.

4.2. Hypothesis assessment

Next, the path significance of each association in the research model and the variance explained by each path were assessed

| Table 2: Summary of scale items. |

<table>
<thead>
<tr>
<th>Construct</th>
<th>Measure items</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Product involvement</strong></td>
<td><strong>PI1</strong> Important ... Unimportant&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td></td>
<td><strong>PI2</strong> Boring ... Interesting</td>
</tr>
<tr>
<td></td>
<td><strong>PI3</strong> Insignificant ... Significant</td>
</tr>
<tr>
<td></td>
<td><strong>PI4</strong> Irrelevant ... Relevant</td>
</tr>
<tr>
<td><strong>Perceived shopping task</strong></td>
<td><strong>TC1</strong> For me, it is ___ what product attributes I should be concerned with and the hierarchy of attributes in order to perform this shopping task successfully. Hard to identify ... Easy to identify&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td><strong>uncertainty</strong></td>
<td><strong>TC2</strong> When I feel that I need a well-defined body of information to execute the shopping task, I feel that this information ... Exists ... Does not exist</td>
</tr>
<tr>
<td></td>
<td><strong>TC3</strong> Overall, I feel that it is ___ to understand the shopping task. Simple ... Complex</td>
</tr>
<tr>
<td><strong>Perceived usefulness of RA</strong></td>
<td><strong>PU1</strong> The recommendation on the brand's Web site enhanced my effectiveness in finding suitable products</td>
</tr>
<tr>
<td><strong>advice</strong></td>
<td><strong>PU2</strong> The recommendation on the brand's Web site greatly enhanced the quality of my shopping judgments</td>
</tr>
<tr>
<td><strong>Elaboration intention</strong></td>
<td><strong>IA1</strong> I am willing to use the recommendation on the brand's Web site as an aid to help me with my decisions about which product to buy</td>
</tr>
<tr>
<td><strong>toward advice</strong></td>
<td><strong>IA2</strong> I am willing to let the recommendation on the brand's Web site assist me in deciding which product to buy</td>
</tr>
<tr>
<td></td>
<td><strong>IA3</strong> I am willing to use the recommendation on the brand's Web site as a tool to suggest a number of products from which I can choose</td>
</tr>
</tbody>
</table>

<sup>a</sup> Reverse coded.
using the PLS approach. First, a main effects model was used to assess the four associations between product involvement, perceived shopping task uncertainty, perceived usefulness of recommender system advice and elaboration intention towards recommender system advice as specified in Hypotheses 1, 3, 4 and 5. Then, multi-group PLS analysis was performed by comparing differences in the coefficients of the corresponding paths (the effect of perceived usefulness of recommender system advice on elaboration intention towards recommender system advice) for different genders (Chin 2000; Sia et al. 2009).

Fig. 4 shows the standardized path coefficient and path significance for the main effects model; all the hypothesized associations were found to be strongly significant at \( p < 0.01 \). Consumers’ perceived shopping task uncertainty was found to be the strongest predictor of their perceptions of the usefulness of recommender system advice (\( \beta = 0.39 \)), followed by their product involvement (\( \beta = -0.29 \)). These two constructs were able to explain 33% of the variance in the perceived usefulness of recommender system advice. In other words, consumers who are more product-involved would perceive recommender system advice to be less useful while shopping at the seller’s Web site. Hence, the Product Involvement and Usefulness of Advice Hypothesis (H3) was supported. Moreover, the higher the consumers’ perceived shopping task uncertainty is, the more useful they perceive recommender system advice to be. Thus, the Shopping Task Uncertainty and Usefulness of Advice Hypothesis (H5) was supported.

Table 3

<table>
<thead>
<tr>
<th>Construct</th>
<th>AVE</th>
<th>CR</th>
<th>Alpha</th>
<th>Item</th>
<th>Item mean</th>
<th>Standard deviation</th>
<th>Item loading</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product involvement</td>
<td>0.80</td>
<td>0.94</td>
<td>0.91</td>
<td>PI1</td>
<td>4.53</td>
<td>0.85</td>
<td>0.89</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>PI2</td>
<td>4.49</td>
<td>0.85</td>
<td>0.91</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>PI3</td>
<td>4.51</td>
<td>0.96</td>
<td>0.86</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>PI4</td>
<td>4.45</td>
<td>0.82</td>
<td>0.92</td>
</tr>
<tr>
<td>Perceived shopping task uncertainty</td>
<td>0.77</td>
<td>0.91</td>
<td>0.84</td>
<td>TC1</td>
<td>5.08</td>
<td>1.06</td>
<td>0.85</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>TC2</td>
<td>5.01</td>
<td>1.07</td>
<td>0.88</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>TC3</td>
<td>5.08</td>
<td>1.04</td>
<td>0.89</td>
</tr>
<tr>
<td>Perceived usefulness of recommender system advice</td>
<td>0.85</td>
<td>0.96</td>
<td>0.94</td>
<td>PU1</td>
<td>4.65</td>
<td>1.03</td>
<td>0.91</td>
</tr>
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<td></td>
<td></td>
<td>PU2</td>
<td>4.47</td>
<td>1.10</td>
<td>0.92</td>
</tr>
<tr>
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<td></td>
<td></td>
<td>PU3</td>
<td>4.54</td>
<td>1.05</td>
<td>0.92</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>PU4</td>
<td>4.51</td>
<td>1.06</td>
<td>0.94</td>
</tr>
<tr>
<td>Elaboration intention toward recommender system advice</td>
<td>0.87</td>
<td>0.95</td>
<td>0.93</td>
<td>IA1</td>
<td>4.77</td>
<td>1.11</td>
<td>0.94</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>IA2</td>
<td>4.58</td>
<td>1.07</td>
<td>0.93</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>IA3</td>
<td>4.81</td>
<td>1.08</td>
<td>0.93</td>
</tr>
</tbody>
</table>

Legend: AVE, average variance extracted; CR, composite reliability; Alpha, Cronbach’s alpha.

Table 4

<table>
<thead>
<tr>
<th>Construct</th>
<th>Mean</th>
<th>Standard deviation</th>
<th>Factor correlations *</th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product involvement (1)</td>
<td>4.50</td>
<td>0.77</td>
<td>0.89</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perceived shopping task uncertainty (2)</td>
<td>5.05</td>
<td>0.93</td>
<td>-0.41</td>
<td>-0.41</td>
<td>0.88</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perceived usefulness of recommender system advice (3)</td>
<td>4.54</td>
<td>0.98</td>
<td>-0.45</td>
<td>-0.45</td>
<td>0.51</td>
<td>0.92</td>
<td></td>
</tr>
<tr>
<td>Elaboration intention toward recommender system advice (4)</td>
<td>4.72</td>
<td>1.01</td>
<td>-0.59</td>
<td>-0.59</td>
<td>0.49</td>
<td>0.60</td>
<td>0.93</td>
</tr>
</tbody>
</table>

* Square root of AVE for each construct are show on the main diagonal.

**Fig. 4.** PLS analysis: main and moderating effects of recommender system (RA) advice.
variance. In other words, the higher the consumer involvement with the product, the less shopping task uncertainty they perceived while shopping online. Consequently, the Product Involvement and Shopping Task Uncertainty Hypothesis (H4) was supported. Last, consumers’ perceptions of the usefulness of recommender system advice significantly affected their elaboration intentions towards this advice (β = 0.60), and the former explained 37% of the variance of the latter. Thus, the more useful consumers perceive the recommender system advice to be, the higher their elaboration intention towards the recommender system advice. The Usefulness of Advice Hypothesis (H1) was ultimately confirmed.

The moderating effect described in the Gender Moderation of Usefulness and Advice Elaboration Hypothesis (H2) was evaluated using multi-group PLS analysis. This analysis was conducted by comparing the corresponding paths for each sub-group (male vs. female). The t-statistic with the pooled estimator for the variance was computed as follows (Chin 2000):

\[
S_{pooled} = \sqrt{\frac{[(N_1 - 1)^2/(N_1 + N_2 - 2)] \times SE_1^2 + [(N_2 - 1)^2/(N_1 + N_2 - 2)] \times SE_2^2}}
\]

\[
t_{pooled} = \frac{PC_1 - PC_2}{S_{pooled}} \times \sqrt{\frac{1}{N_1 + 1/N_2}}
\]

where \(S_{pooled}\) is the pooled estimator for the variance, \(t_{pooled}\) refers to the t-statistic with (\(N_1 + N_2 - 2\)) degrees of freedom, \(N_i\) is the sample size of the dataset for gender i, \(SE_i\) is the standard error of path in the structural model of gender i, and \(PC_i\) is the path coefficient in the structural model of gender i.

The results showed that the path coefficient from perceived usefulness of recommender system advice to elaboration intention towards recommender system advice for the female model (path coefficient = 0.77) is significantly stronger than that for the male model (path coefficient = 0.50). So, compared to men, women’s intentions to elaborate on recommender system advice are more strongly affected by their perceptions of the usefulness of this advice. Thus, the Gender Moderation of Usefulness and Advice Elaboration Hypothesis (H2) was supported (\(t_{pooled} = 3.66\), significant at \(p = 0.01\) level).

This is an interesting finding, since Venkatesh and Morris (2000) reported that men’s decisions regarding technology usage were more strongly influenced by perceived usefulness compared to those of women. Our study’s findings provide a different viewpoint on recommender system shopping advice. We found that women, rather than men, are more strongly influenced by perceived usefulness when deciding whether to consider recommender system advice as a shopping aid. This may result because recommender system acceptance occurs at the information level. This is different from recommender system acceptance at the new technology level discussed in past studies. Consequently, our study’s findings are more in line with studies examining men’s and women’s information adoption than men’s and women’s technology adoption. For example, Garbarino and Straub (2004) also report that women’s online purchase decisions are more strongly affected by a friend’s recommendation than are those of men. This finding supports the current study’s results: a friend’s recommendation is also a type of information.

5. Conclusion

For advertisers and managers of Internet-based sellers, the crucial facet of gender may be differences in how men and women process promotional information. The current research has revealed that the effect of perceived usefulness on intention to elaborate on recommender system advice while shopping online is stronger for women than for men. In the minds of men and women, the importance of perceiving recommender system advice as useful in aiding a particular online shopping task is different. Our findings also revealed that the psychological lens of cognitive and conative processing explains the process of consumers’ decision-making regarding elaboration on recommender system advice. Further, our argument that product involvement, perceived usefulness of recommender system advice and perceived shopping task uncertainty can be used to imitate the perceptual status of consumers’ existing knowledge, current event and environmental stimulus while the person shops online at the seller’s Web site. Specifically, perceived usefulness precedes consumers’ elaboration intentions toward online recommendations. Both involvement and perceived shopping task uncertainty significantly affect consumers’ perceptions of the usefulness of recommender system advice, and the latter demonstrates a stronger effect. Further, more-involved consumers tend to perceive less shopping task uncertainty than do less-involved consumers. Hess et al. (2006) have argued that past studies on involvement exploring computer-mediated technology have seldom utilized a decision-making viewpoint. Thus, our findings represent new knowledge.

The theoretical contributions of this research include the development of a theoretical model to address and verify two nascent issues: (1) the consumer decision-making process towards recommender system advice acceptance at the information level via the cognitive-conative approach, and (2) gender effects on the information processing of recommender system advice. The latter is important because Venkatesh and Morris (2000) have reported that in the context of system acceptance, men consider perceive usefulness to a greater extent than women in making their decisions about new technology use. However, the current study has empirically demonstrated that at the information acceptance level, women, rather than men, feel that it is more important to perceive recommender system advice to be useful before they are willing to consider this advice in their current shopping. The contrasting findings indicate that more research is essential to clarify whether the effects of perceived usefulness on adoption intention between men and women may also be different depending on whether the focus is on is a system or information to accept.

Practical implications of this study may be applied to marketing segmentation in terms of providing more involving recommender system designs to users based on gender. Today’s advanced technologies, such as cookies, make it easy for Internet-based sellers to recognize the identity of current visiting members. By identifying the gender of each consumer, sellers will be able to provide suitable shopping recommendations based on the gender preferences revealed by this study’s findings. For example, perceived usefulness has more influence on women’s intentions to elaborate on recommender system advice and their nature is to consider more comprehensive information than men. Consequently, shopping recommendations offered by recommender systems to female consumers should be carefully formulated to contain rich product information with supporting evidence so as to enhance their perceptions of argument quality. In support of this, Wang and Doong (2010) empirically revealed that designing recommender system advice with different argumentation forms and spokesperson types, consumer perceptions of argumentation quality and source credibility may increase and ultimately lead to stronger online purchase intentions. By following these recommendations, this recommender system advice strategy is likely to provide appropriate shopping assistance based on gender characteristics.
This research is not without its limitations. Only one Internet-based seller case is examined in this study. Future research should compare multiple online sellers, product categories and other cultural factors to confirm and extend our understanding of the issue addressed in this study. To verify the effects of these various factors on the perceived usefulness of recommender system advice, an experiment could be designed to manipulate the level of product involvement and task uncertainty to demonstrate their influence on perceived usefulness.

Acknowledgements

An earlier version of this paper was presented at the 2009 International Conference on Electronic Commerce, where it was initially discussed and developed. The authors are grateful to chairs, discussants and participants at ICEC 2009, the Editor in Chief of Electronic Commerce Research and Applications, Rob Kauffman, the Area Editor, and the three anonymous reviewers for offering constructive comments. This research was supported by the National Science Council in Taiwan under grant numbers NSC98-2410-H-419-005-MY3 and NSC96-2416-H-194-005-MY2.

References

Ahn, T., Ryu, S., and Han, I. The impact of the online and offline features on the user acceptance of Internet shopping malls. Electronic Commerce Research and Application, 3, 4, 2004, 405–540.


Bettencourt, L., and Larker, D. Structural equation models with unobservable variables and measurement error. Journal of Marketing Research, 18, 1, 1981, 39–50.


Koufaris, M. Applying the technology acceptance model and flow theory to online consumer behavior. Information Systems Research, 13, 2, 2002, 205–223.


Venkatesh, V., and Morris, M. G. Why don’t men ever stop to ask for directions? Gender, social influence, and their role in technology acceptance and usage behavior. MIS Quarterly, 24, 1, 2000, 115–139.


