Do males and females think in the same way? An empirical investigation on the gender differences in Web advertising evaluation

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Informativeness and entertainment are regarded as two types of advertising value that can influence consumers’ attitudes toward Web advertising. Despite of many studies on these two factors, there are two research gaps in extant literature. First, the effects of informativeness and entertainment on attitude are considered separately, yet their interaction effect is neglected. Second, the role of individual characteristics (e.g., gender) in the advertising evaluation process is far from clear. To address these two issues, a laboratory experiment was conducted to investigate the interaction effect between informativeness and entertainment, and also the moderating role of gender. The results indicate that informativeness can help form a more positive attitude for males than for females, and entertainment can lead to a more positive attitude for females than for males. It is also found that there is a three-way interaction among informativeness, entertainment, and gender. More specifically, the interaction effect between informativeness and entertainment is significant for females, but insignificant for males. Results, research contributions, and limitations are discussed, and implications for future studies are suggested.

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1. Introduction

Web advertising has become an important ad type since 1994 when the first banner ad appeared on HotWired for AT&T (Brackett & Carr, 2001; Choi & Rifon, 2002). Both researchers and practitioners treat it as a revolutionary change of marketing after television. Many resources and efforts have been spent on the Web advertising practice and theoretical investigations (Brackett & Carr, 2001; Eighmey, 1997; McDonald, 1997). According to the report of Interactive Advertising Bureau (IAB) and the New Media Group of PriceWaterhouseCoopers (PWC), the first 6-month revenue of Web advertising in 2008 was nearly $11.5 billion, an increase of 15.2% from the same period in 2007.

The ultimate goal of advertising is to persuade consumers to purchase the advertised products. Prior studies on advertising have found that attitudes toward ads (\(A_{Ad}\)) affect brand attitudes (\(A_{B}\)) and purchase intentions (\(PI\)) through a hierarchy of effects, i.e., \(A_{Ad} \rightarrow A_{B} \rightarrow PI\) (MacKenzie & Lutz, 1989; Mitchell & Olson, 1981; Shimp, 1981). Thus attitude becomes an important factor that can predict ads effectiveness in the field of Web advertising (Brackett & Carr, 2001; Bruner & Kumar, 2000; Ducoffe, 1996; Moore, Stammerjohan, & Coulter, 2005; Singh & Dalal, 1999; Wang, Zhang, Choi, & Daeredita, 2002).

Among many research models that aim to explain the formation of attitudes towards Web advertising, Ducoffe’s (1996) advertising value model is a widely accepted one. In the model, informativeness, entertainment, and irritation are considered as three antecedents of advertising value which in turn influences attitudes towards Web advertising. Following Ducoffe’s model, researchers consider the role of several other factors such as credibility (Brackett & Carr, 2001), interactivity (Zhang & Wang, 2005), and personalization (Xu, Liao, & Li, 2008), in predicting attitudes towards Web advertising. However, all of these studies assume that the impacts of various factors are independent, and the interaction effects among them are not considered. Prior studies in the fields of economics and management provide this research with a meaningful insight by proposing synergy effect which describes that the combined value of complementary resources can be greater than the sum of their individual value (Admir, 2005; Tanriverdi, 2006; Topkis, 1998; Wade & Hulland, 2004). The synergy effect can be presented as an interaction effect between complementary resources. In this study, it is argued that there may be a synergy effect between the two kinds of advertising value (i.e., informativeness and entertainment). This leads to the first research question:

\begin{itemize}
  \item \textbf{Research Question 1:} Do males and females have different attitudes toward Web advertising?
\end{itemize}
Research question 1: Can informativeness and entertainment interact with each other so as to influence attitude toward Web advertising?

Another aim of this study is to understand the role of gender in the advertising evaluation process. Gender has been considered as a basic strategy of market segmentation because of its identifiability and accessibility (Meyers-Levy & Maheswaran, 1991; Simon, 2001). In prior studies, it is argued that there are gender differences in biology, cognition, behavior and social orientation (Bakan, 1966; Bem, 1981; Hofestede, 1980; Knox & Kimura, 1970; Meyers-Levy, 1988). These differences indicate that males and females tend to think and behave in different ways. Despite of so many studies examining the role of gender in advertising, Brackett and Carr (2001) propose that gender has a direct impact on attitude. However, according to the research on decision making, there are two mechanisms to explain the role of gender: one is the direct role, i.e., gender has main effect on decision outcome (e.g., Gefen & Straub, 1997); the other is the moderator role, i.e., gender influences the process of decision making, or moderates the relationships between other independent variables and decision making outcome (e.g., Morris, Venkatesh, & Ackerman, 2005; Venkatesh & Morris, 2000, 2003). Despite of the direct role of gender, understanding the moderating role of gender in the advertising evaluation process can make further research contributions. In this study, since the decision outcome refers to consumers’ overall attitudes towards Web advertising, and the decision process refers to the way in which consumers form their attitudes based on various beliefs, the two mechanisms can potentially contribute to the understanding of the role of gender in ads evaluation. Specifically, the first mechanism indicates the direct effect of gender on attitudes, while the second mechanism explicates its moderating effect. Testing the direct and moderating effect of gender can make great research significance. Thus, our second research question is:

Research question 2: Are there any gender differences in Web advertising evaluation outcome and process? If so, what are they?

The rest of the paper is organized as follows. In the next section, a research model is proposed according to related literature on Web advertising and gender difference. To empirically test the proposed research model, a laboratory experiment is conducted. Then, data analysis and results are presented. Major findings are discussed. And this paper ends with the implications for research and practice.

2. Literature review

2.1. Attitude toward Web ads and advertising

Attitude toward the ad is defined as the predisposition to respond in a favorable or unfavorable manner to a particular advertising stimulus during a particular exposure occasion (Lutz, 1985). It is consistent with Fishbein and Ajzen’s (1975) definition of attitude in the theory of reasoned action (TRA), according to which attitude is determined by beliefs related to it. Prior studies on Web advertising have indicated that informativeness, entertainment, and irritation are three main beliefs associated with the value of and attitude toward Web advertising (Brackett & Carr, 2001; Ducoffe, 1996; Tsang, Ho, & Liang, 2004; Xu et al., 2008).

Informativeness refers to the extent to which the Web ads satisfy consumers’ needs of acquiring product information; while entertainment refers to the extent to which Web ads fulfill audience’s needs of escapism, diversion, aesthetic enjoyment, or emotional release (Ducoffe, 1996). These two factors respectively represent utilitarian and hedonic value (Edwards, Li, & Lee, 2002), as well as cognitive and affective value of Web ads (Brown & Stayman, 1992; Szymanski, 1981). Different from informativeness and entertainment, which are evaluated from the positive aspect of Web ads and based on the characteristics of ad per se, irritation describes consumers’ negative reactions to the improperly delivered Web ads (Bauer, Greysen, Kanter, & Weilbacher, 1968; Ducoffe, 1996; Li, Edwards, & Lee, 2002). In some sense, irritation has nothing to do with advertising value per se but consumers’ emotional reactions to the advertising value. Edwards et al. (2002) figure out this distinction by proposing informativeness and entertainment values of ads as antecedents of irritation. According to Edwards et al. (2002), only informativeness and entertainment are treated as advertising value in this study. Irritation is considered as a control variable so as to keep consistent with Ducoffe’s (1996) model.

Based on Ducoffe’s (1996) model, Brackett and Carr (2001) add demographic factors into the advertising value model. They find that gender, one of the demographic factors, directly influences attitudes towards Web ads. However, this direct effect of gender shows only gender-based perceptual (outcome) differences but not gender-based differences in decision making processes (Venkatesh & Morris, 2000). In some research models on technology acceptance (TAM), demographic variables (e.g., gender, age, and experience) are treated as moderators rather than direct antecedents. For example, Venkatesh and colleagues find that gender moderates the impacts of perceived usefulness, perceived ease of use, subjective norm, and facilitating conditions on behavioral intention (Venkatesh & Davis, 2000; Venkatesh & Morris, 2000, 2003). Psychological research also indicates that women and men process information using different socially-constructed cognitive structures and in different schema (Bem & Allen, 1974). Therefore, in this study, we try to investigate whether there are differences between men and women in the Web ads evaluation process, i.e., whether gender moderates the relationships between informativeness/entertainment and attitude.

2.2. Gender difference

Gender difference has been studied in many disciplines, such as biology, psychology, marketing and management (Bakan, 1966; Bem, 1981; Kalleberg & Leicht, 1991; Meyers-Levy, 1988; Ohlott, Ruderman, & McCauley, 1994; Putrevu, 2001; Spence & Helmreich, 1978; Stevens, 1905). In recent years, the importance of gender difference in IS domain is also emphasized. For instance, Gefen and Straub (1997) first investigate gender differences in perceptions of usefulness and ease of use of e-mail, and intentions to use it. Later, Venkatesh, Morris and their colleagues conduct a series of studies on the moderating effect of gender on various relationships between constructs in technology acceptance model (TAM) and TAM2, such as relationships between perceived usefulness and intention, perceived ease of use and intention, subjective norm and intention, perceived ease of use and perceived usefulness, attitude and intention, and perceived behavior control or facilitating conditions and intention (Morris et al., 2005; Venkatesh, Brown, Maruping, & Bala, 2008; Venkatesh & Morris, 2000, 2003; Venkatesh, Morris, & Ackerman, 2000). Before identifying the role of gender in Web advertising evaluation, a literature review on gender difference is conducted. Generally, gender differences exist at three different levels: biological level, cognitive level, and behavioral and social level (see Table 1).

Gender difference at the biological level includes difference in chromosomes, hormonal, and brain lateralization (Putrevu, 2001). In other words, gender difference at this level is objectively determined by human physical structure. Further, biological difference is regarded as the basis of cognitive, behavioral and social difference (Costa, Terracciano, & McCrae, 2001; Putrevu, 2001). Knox
Gender difference at the behavioral and social level is relevant to people’s social orientation and behavioral motivation. Social orientation refers to how people view the social relations and role or identity of themselves in the society. Bem’s (1981) gender schema theory, Eagly’s (1987) social role theory, Hofstede’s (1980) culture theory, and Sidanius and Pratto’s (1999) social dominance orientation theory generally elucidate gender difference in social orientation under the umbrella of the masculine-feminine framework: men concern more of themselves, are independent, competitive, and assertive; in contrast, women concern more of both self and others, pursue harmonic interrelationships, and are warm and nurturing (Deaux, 1984; Gfen & Straub, 1997). This orientation difference is also reflected by the different communication patterns of women and men. Women communicate to create rapport and affinity, while men communicate to establish social standing, control the conversation, and establish a hierarchy of domination (Gfen & Ridings, 2005; Gfen & Straub, 1997).

Similar with social orientation difference, males and females are motivated by different motives for conducting a behavior. Hoffman (1972) points out men are motivated by achievement needs while women are motivated by affiliation needs in terms of McClelland’s (1975) achievement motivation theory. Prior studies also find that men pursue instrumental and agentic goals (e.g., task performance and power), while women are driven by expressive and communal goals, such as enjoyment and interpersonal harmony (Bakan, 1966; Spence & Helmreich, 1978). Hofstede’s (1980) seminal work on culture also indicates that men rate extrinsic motivators (e.g., potential for advancement and earning power) as more important than women.

In summary, males and females are biologically different, think in different patterns, and behave for different goals. These differences may influence the outcome and process of Web advertising evaluation. To further investigate this issue, we suggest gender as both direct antecedent of value beliefs and attitude, and moderator of the relationships between beliefs and attitude in our research model (see Fig. 1). Since the direct effect of gender difference has been studied in previous research (Brackett & Carr, 2001), this study focuses on its moderating effect. However, to confirm the research findings in prior research, the direct effect of gender is considered in the baseline model.

and Kimura (1970) suggest that the timing of brain lateralization (females precede males) explains females’ superiority in verbal skills and males’ superiority in spatial skills (cognitive level). Bergenbaum (1999) suggest that sex difference in androgens during the early development induces that men are more aggressive than women (behavioral and social level).

Gender difference at the cognitive level refers to the different information processing modes used by males and females. Meyers-Levy (1988, 1989) proposes the selectivity hypothesis which theorizes men are “selective processors” who often rely on a subset of highly available and salient cues in place of detailed message elaboration, while women are “comprehensive processors” who attempt to assimilate all available information before rendering judgment. One explanation for this difference is that women have a lower threshold for elaborative processing than that of men. It is indicated that women will process the information cues as long as they feel they are of certain importance, whereas men will process the information cues only when they are of high importance.

Based on Einstein and Hunt’s (1980) elaboration type model which suggests two types of elaboration (i.e., relational processing that emphasizes on similarities or shared themes among disparate pieces of information, and item-specific processing that stresses on attributes that are unique or distinctive to a particular message), Putrevu (2001) proposes that men prefer item-specific processing while women engage in relational processing. In other words, men pay attention to independent impacts of different attributes while women attempt to decipher the intricate interrelationships between different attributes.

Similarly, Epstein, Pacini, Denes-Raj, and Heier (1996) propose another dual process model named cognitive-experiential self-theory (CEST). CEST suggests that people process information by two parallel but interactive systems: a rational system that “operates primarily at the conscious level and is intentional, analytic, primarily verbal, and relatively affect free”, and an experiential system “assumed to be automatic, preconscious, holistic, associationistic, primarily nonverbal, and intimately associated with affect” (p. 391). They further point out that men often use rational and logical thinking (rational system), while women prefer intuitive and feeling-based thinking (experiential system).

### Table 1
Gender difference: a three-level architecture.

<table>
<thead>
<tr>
<th>Biological level</th>
<th>Males</th>
<th>Females</th>
<th>Sources</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chromosomes</td>
<td>XY</td>
<td>XX</td>
<td>(Stevens, 1905)</td>
</tr>
<tr>
<td>Hormonal differences</td>
<td>High androgen</td>
<td>Low androgen</td>
<td>(Putrevu, 2001)</td>
</tr>
<tr>
<td>Brain lateralization</td>
<td>Symmetrical</td>
<td>Asymmetrical</td>
<td>(Knox &amp; Kimura, 1970; Saucier &amp; Elias, 2001)</td>
</tr>
<tr>
<td>Cognitive level</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Information processing mode</td>
<td>Selective</td>
<td>Comprehensive</td>
<td>(Meiers-Levy, 1988, 1989)</td>
</tr>
<tr>
<td></td>
<td>High elaboration threshold</td>
<td>Low elaboration threshold</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Item specific</td>
<td>Relational</td>
<td>(Einstein &amp; Hunt, 1980; Putrevu, 2001)</td>
</tr>
<tr>
<td></td>
<td>Rational</td>
<td>Intuitive</td>
<td>(Epstein et al., 1996)</td>
</tr>
<tr>
<td></td>
<td>Analytical</td>
<td>Experiential</td>
<td></td>
</tr>
<tr>
<td>Behavioral and social level</td>
<td>Independent</td>
<td>Dependent</td>
<td>(Deaux, 1984; Gfen &amp; Straub, 1997)</td>
</tr>
<tr>
<td>Social orientation</td>
<td>Competitive</td>
<td>Cooperative</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Self-oriented</td>
<td>Relationship-oriented</td>
<td>(Bem, 1981; Eagly, 1987; Hofstede, 1980)</td>
</tr>
<tr>
<td></td>
<td>Masculine</td>
<td>Feminine</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Assertive</td>
<td>Nurturing</td>
<td></td>
</tr>
<tr>
<td>Behavioral motivation</td>
<td>High social dominance orientation</td>
<td>Low social dominance orientation</td>
<td>(Sidanius &amp; Pratto, 1999)</td>
</tr>
<tr>
<td></td>
<td>Extrinsic motivation</td>
<td>Intrinsic motivation</td>
<td>(Hofstede, 1980)</td>
</tr>
<tr>
<td></td>
<td>Instrumental</td>
<td>Expressive</td>
<td>(Spence &amp; Helmreich, 1978)</td>
</tr>
<tr>
<td></td>
<td>Achievement</td>
<td>Affiliation</td>
<td>(Huffman, 1972; McClelland, 1975)</td>
</tr>
<tr>
<td></td>
<td>Agentic goals</td>
<td>Communal goals</td>
<td>(Bakan, 1966)</td>
</tr>
</tbody>
</table>

In summary, males and females are biologically different, think in different patterns, and behave for different goals. These differences may influence the outcome and process of Web advertising evaluation. To further investigate this issue, we suggest gender as both direct antecedent of value beliefs and attitude, and moderator of the relationships between beliefs and attitude in our research model (see Fig. 1). Since the direct effect of gender difference has been studied in previous research (Brackett & Carr, 2001), this study focuses on its moderating effect. However, to confirm the research findings in prior research, the direct effect of gender is considered in the baseline model.
3. Research model and hypotheses development

3.1. Baseline model

In order to compare two models used to explain the role of gender (direct antecedent vs. moderator), in the baseline model, we postulate that gender can directly influence beliefs (informativeness, entertainment, and irritation) and attitude.

Advertising is defined as a type of “non-personal communication” between consumers and advertisers who try to persuade consumers to buy certain products or services (Arens & Bovee, 1994). As discussed above, men and women communicate with others in different patterns. It is believed that this conclusion is also applicable when communication style changes from personal communication to non-personal communication.

In the communication process, men and women react to others’ information in different ways. Because men focus on hierarchy, independence and competition, they tend to neglect others’ opinion in order to keep their dominance status and seek respect (Coates, 1986; Gefen & Ridings, 2005; Gefen & Straub, 1997). Thus, men will perceive relatively low informativeness and entertainment. Further, men tend to control the conversation (Coates, 1986), so when their Webpage reading activity is disturbed by Web ads, men will feel relatively high irritation. In contrast, women focus on intimacy and solidarity in the communication process (Coates, 1986; Gefen & Straub, 1997), so they tend to pursue harmony and rapport, and give positive evaluation to others’ opinion. Women are relationship-oriented, in order to keep good relationship with other communication parties, they tend to tolerate others’ intrusiveness (Deaux, 1984; Gefen & Straub, 1997). Therefore, for the same ad, women, different from men, will perceive higher informativeness and entertainment, but lower irritation, and finally have more favorable attitude toward Web ads.

- **H0a:** Women perceive higher informativeness of Web ads than men.
- **H0b:** Women perceive higher entertainment of Web ads than men.
- **H0c:** Women perceive lower irritation of Web ads than men.
- **H0d:** Women have more favorable attitude toward Web ads than men.

3.2. Informativeness and entertainment

According to TRA, attitude toward a behavior is determined through an assessment of one’s salient beliefs \(b_i\) regarding consequences of performing the behavior and evaluation \(e_i\) of those consequences:

\[ A = \sum b_i e_i. \]

Similarly, attitude toward an object also can be expressed as the product of salient beliefs about the characteristics of the object and evaluation or perceived importance of those characteristics. Informativeness and entertainment are two salient beliefs relevant to Web ads evaluation (Ducoffe, 1996). They reflect two different kinds of Web advertising value: informativeness describes its utilitarian value, i.e., whether Web ads can help consumers to acquire adequate product information so as to better complete shopping tasks; while entertainment indicates its hedonic value, i.e., whether Web ads can bring enjoyment to consumers’ online shopping process (Edwards et al., 2002). For the same value \(b_i\), men and women may set different weights for its importance \(e_i\), thus informativeness and entertainment may influence attitude in different patterns across gender.

To distinguish utilitarian from hedonic shopping value, Babin, Darden, and Griffin (1994) argue that utilitarian value reflects shopping with a work mentality (Holbrook & Hirschman, 1982), where shopping is regarded as ergic, task-related, and rational. In contrast, hedonic value is more subjective and personal, reflecting potential entertainment and emotional value of shopping (Babin et al., 1994; Holbrook & Hirschman, 1982). The impacts of utilitarian and hedonic value on attitudes are contingent on the information processing modes and behavioral motivations. Because men make judgment based on rational reasoning (Epstein et al., 1996), pursue instrumental and agentic goals (Bakan, 1966; Spence & Helmreich, 1978), and are motivated by extrinsic motivators, such as task fulfillment (Hofstede, 1980), they will consider informativeness as more important than women. In contrast, women prefer intuitive judgment and expressive value (Epstein et al., 1996; Spence & Helmreich, 1978), thus they tend to consider entertainment as more important than men.

- **H1:** The relationship between informativeness and attitude toward Web ads is stronger for men than for women.
- **H2:** The relationship between entertainment and attitude toward Web ads is stronger for women than for men.

3.3. Synergy effect of informativeness and entertainment

Prior studies regard the impacts of informativeness and entertainment on attitude as independent, but neglect their interaction...
effects (Brackett & Carr, 2001; Ducoffe, 1996; Xu et al., 2008; Zhang & Wang, 2005). In this study, we propose that these two kinds of value can complement each other so as to create additive value. This complementary effect is called synergy effect in economics and management research. It is believed that combined value of complementary resources is greater than the sum of their individual value. In other words, the marginal returns to one variable are increasing with the existence of the other variable (Admir, 2005; Tanriverdi, 2006; Topkis, 1998; Wade & Hulland, 2004). At the methodological level, the synergy effect can be represented as the positive interaction effect between complementary resources (Tanriverdi, 2006).

As to the two kinds of advertising value (informativeness and entertainment), it is expected that the increase of one value (e.g., informativeness) can enhance the effect of the other value (e.g., entertainment) on attitude. This argument can be traced back to the motivation crowding theory (Deci, 1971; Frey & Jegen, 2001) which depicts two possible crowding effects of extrinsic and intrinsic motivations, i.e., crowding-out and crowding-in effect. Crowding-out effect describes the situation that introducing an extrinsic motivator diminishes the effect of intrinsic motivation on tasks; while crowding-in effect, conversely, reflects that when introducing an extrinsic motivator the effect of intrinsic motivation will be enhanced (Frey & Jegen, 2001). Whether crowding-out or crowding-in effect occurs depends on how individuals perceive extrinsic motivators (Frey & Jegen, 2001). If individuals perceive extrinsic motivators as something that controls or constrains their behavior, the crowding-out effect will occur. In contrast, when individuals perceive extrinsic motivators as supportive, the crowding-in effect will occur.

In this study, informativeness can be viewed as extrinsic motivation which is determined by external task-related outcome, while entertainment as intrinsic motivation which is determined by inherent interest and enjoyment (Deci & Ryan, 1985). Meanwhile, different from rewards which may bring work pressure to individuals, informativeness is generally perceived as supportive, so we expect the crowding-in effect of entertainment and informativeness. An example of the crowding-in effect in IS research is Davis, Bagozzi, and Warshaw’s (1992) work on investigating extrinsic and intrinsic motivation to use computers in the workplace. In the study, they find a significant crowding-in effect of extrinsic and intrinsic motivation, i.e., perceived usefulness positively moderates the relationship between perceived enjoyment and intentions to use computer in the workplace. Similarly, we hypothesize that there will be a positive interaction effect of informativeness and entertainment on attitude.

H3: The interaction effect of informativeness and entertainment is positively associated with the attitude toward Web ads.

The interaction effect of informativeness and entertainment may be different across gender due to gender difference in information processing mode. Men prefer item-specific processing that treats different attributes as unique, distinctive and independent, while women tend to use relational processing that stresses on the intricate interrelationships between various attributes (Einstein & Hunt, 1980; Putrevu, 2001). When synthesizing evaluations on informativeness and entertainment into an overall attitude, men tend to consider independent impacts of the two kinds of advertising value on attitude, while women consider not only how these two kinds of advertising value influence attitude, but also how one value (e.g., informativeness) influences the relationship between attitude and the other value (e.g., entertainment). In other words, different from men who treat the effects of informativeness and entertainment independently, women prefer the trade-off between these two kinds of advertising value. Prior studies have proved that women prefer to balance different aspects of an object or behavior before making a judgment or decision. Ahuja and Thatcher (2005) find that women balance autonomy and overload in their innovation behavior. Igbaria, Zinatelli, Cragg, and Cavaye (1997) show evidence that women are more likely to care about the balance between work and personal life in the IT profession. Senatra (1988) also find that women are more likely than men to report work–family conflict. Thus, we expect that the interaction effect of informativeness and entertainment is more likely to occur for women than for men.

H4: The interaction effect of informativeness and entertainment on attitude is stronger for women than for men.

4. Research methods

In order to test the proposed research model, a laboratory experiment was conducted by using a simulated e-commerce website with banner ads. Survey questions were administered to collect participants’ perceptions and attitudes toward the pop-up ads. There are three advantages of conducting the survey in simulated e-commerce websites: (1) the simulated e-commerce website is novel for all the respondents whose prior knowledge about website will not influence their evaluations on Web ads; (2) in the simulated context, respondents can make their evaluations on the specific individual ads rather than Web advertising in general; (3) respondents’ beliefs on and attitude toward Web ads are based on their first-hand experience in the simulated context, thus they can more precisely express their perceptions about Web ads in contrast to asking them to recall their prior experience.

4.1. Stimuli

The simulated context was designed as an e-commerce website, since e-commerce website is a typical context in which Web ads appear. An e-commerce Webpage generally constitutes of two parts: A product description area where alternative products are listed in the central part of the Webpage, and a web ads area where advertisers promote their products in the peripheral zone of the Webpage. Our simulated Website context follows this normal Web site design principle (see Fig. 2). Banner ads were posted at the top of Webpage, and under the banner ads, several product items were listed.

4.2. Subjects and procedures

Student volunteers at a university in Hong Kong participated in the study. Because students continue to be the dominant Internet users as well as major participants of e-commerce (Brackett & Carr, 2001; Lim, Sia, Lee, & Benbasat, 2006), use of college students in research related to Internet and e-commerce is appropriate. HK$50 was provided to every subject as an incentive. A total of 134 subjects participated in the study and all of them completely answer the questionnaire.

Before the experiment, subjects were told that they would enter an online store for digital products, and they were asked to choose a product as the gift to one of his/her best friends according to their own preference. They were instructed to browse the Webpage just like their usual online shopping process. During the experiment, subjects browsed the designed Webpage to search for an appropriate product. At the same time, some Web ads (e.g., banners) appeared on the peripheral parts of the Webpage. After the simulated online shopping process, subjects were asked to answer several questions relevant to their perceptions of or attitude toward the Web ads that they had just seen.

4.3. Measurement

All the survey questions were adapted from prior studies. Items on informativeness, entertainment, and irritation were adapted
from Ducoffe (1996), and they were also used in Brackett and Carr (2001), Tsang et al. (2004), Xu et al. (2008), and Zhang and Wang (2005). Ducoffe (1996) measured attitude with a single item: “How would you describe your overall attitude toward advertising on the World Wide Web?” In this study, we adopted two items frequently used to describe individual attitude: good–bad and favorable–unfavorable (Bruner & Kumar, 2000; Mitchell & Olson, 1981). All the constructs were measured using a 7-point Likert scale anchored from strongly disagree to strongly agree, or from one extremity to the other one (e.g., from 1 = bad to 7 = good for attitude), see Appendix A for details.

5. Data analysis and results

Statistical Program for Social Sciences (SPSS) and Partial Least Squares (PLS) were used to analyze the data. Specifically, SPSS was used to do some preliminary analysis (e.g., descriptive statistics), validate the measurement model (e.g., scale reliability and collinearity analysis), and test the baseline model. PLS was used to test the measurement and structural model. There were several advantages to use PLS. First, when compared to a 1st generation, tradition statistical method, such as regression, a second-generation causal modeling technique, such as PLS, can estimate the loadings of indicators on constructs and the causal relationships among constructs (Fornell & Larcker, 1981). Second, PLS, in contrast to LISREL (another SEM technique), is more suitable for exploratory research and requires fewer data points (Fornell & Bookstein, 1982; Lim et al., 2006). Chin (1998) suggested 10 times the largest number of independent constructs affecting a dependent construct or the largest number of formative indicators as the threshold. In this study, there were four predictors (informativeness, entertainment, irritation, and informativeness × entertainment) of attitude, so 40 was the acceptable sample size for PLS analysis. Third, prior studies have developed a mature method based on PLS to compare path coefficients across different groups (Ahuja & Thatcher, 2005; Keil et al., 2000). It is easy for us to analyze the moderating role of gender by following this method. For these reasons, we adopted PLS as the tool to analyze our research model. However, we also used LISREL to analyze the measurement model, specifically, to detect common-method bias.

5.1. Demographics

Among the 134 participants, about 65% of them were females and most of them were majoring in business (53%). Over 80% were undergraduate students, the rest were with Master or higher education level. All had some experience in using the Internet: over 80% had more than 6 years of Internet experience, and 73% used the Internet for at least 20 h a week.

5.2. Measurement model

The measurement model was assessed by the full sample and each subgroup separately. Reliability, convergent validity, and discriminant validity were three indicators of the goodness of the measurement model. Reliability can be assessed by using Cronbach’s alpha, composite reliability, and average variance extracted (AVE) (Fornell & Larcker, 1981). Nunally (1978) suggested that a value of at least 0.70 of Cronbach’s alpha indicated adequate reliability. Fornell and Larcker (1981) proposed 0.7 and 0.5 as the threshold value of composite reliability and AVE, respectively. As shown in Table 3, all the constructs were of good reliabilities. Convergent validity was assessed by checking the loadings to see if items within the same construct have high loading values. Loadings of all the items on their respective latent construct were all higher than 0.7 in this study (see Table 2), indicating good convergent validities (Comrey, 1973).

Discriminant validity can be assessed by comparing the square root of AVE of a construct and correlations of that construct with the other constructs: if the square root of AVE is higher than any correlations related to this construct, acceptable discriminant validity is indicated (Fornell & Larcker, 1981). The results show that all the constructs have good discriminant validity.

Furthermore, because all the questions were answered by the same respondents, there might be a threat of common-method bias. To justify whether this issue is a problem for this study, a test
was conducted by using the hierarchically nested covariance structure model in LISREL8.70 (Cote & Buckley, 1987; Zhou, Brown, Dev, & Agarwal, 2007). Following the steps proposed by Zhou et al. (2007), we estimated three models:

1. M1 was a method-only model in which all items were loaded on one factor ($\chi^2(20) = 230.51$, $CFI = .52$, $NNFI = .33$, $RMSEA = .281$).
2. M2 was a trait-only model in which each item was loaded on its respective scale ($\chi^2(14) = 25.88$, $CFI = .98$, $NNFI = .95$, $RMSEA = .080$).
3. M3 was a trait and method model in which a common factor linking to all the measurement items was added into M2 ($\chi^2(6) = 8.27$, $CFI = .99$, $NNFI = .97$, $RMSEA = .053$).

Because M2 is highly better than M1, while M3 is only slightly better than M2, the trait rather than the common-method factor explains most of the variance. Common-method bias does not pose a major threat to the study. In addition to validity assessment, we also checked for multicollinearity due to the relatively high correlations among some variables (e.g., a correlation of .596 between informativeness and entertainment in male group). The resultant variance inflation factors (VIF) values for all the constructs between 1.001 and 1.606, far less than the suggested threshold value 10 (Hair, Anderson, Tatham, & Black, 1998).

5.3. Structural model

The baseline model about the direct effect of gender was tested by using one-way ANOVA (see Table 4). No gender differences in perceptions of informativeness ($p > .1$), entertainment ($p > .1$), and irritation ($p > .1$), and attitude toward advertising ($p > .1$) were found. Thus, all the hypotheses in the baseline model (H0a–d) were unsupported.

Moderating effect of gender and interaction effect of informativeness and entertainment were tested via two models (I and II) in three groups (combined group, male subgroup, and female subgroup). In Model I, only main effects of informativeness and entertainment were considered. In Model II, an interaction effect was added into Model I. For each model, PLS analysis was conducted for three times based on different samples, thus totally six ($2 \times 3$) PLS models were executed.

Following Keil et al. (2000), the moderating effect of gender was tested by comparing path coefficients of the same relationship for male and female subgroups based on the PLS analysis (details of the analysis, see Appendix B). The results indicated that informativeness had significant effect on attitude in both Model I ($t = 3.25$, $p < .01$) and Model II ($t = 3.09$, $p < .01$) for male group, but insignificant for female group (Model I: $t = 1.43$; Model II: $t = 1.66$). In contrast, entertainment was significant for female group (Model I: $t = 2.84$; Model II: $t = 2.65$) but insignificant for male group (Model I: $t = 1.73$; Model II: $t = 1.29$). Further, Table 5 listed the path coefficients comparison results according to Keil et al.’s (2000) method. Results showed that the path loadings of informativeness–attitude (Model I: $t = 10.95$; Model II: $t = 9.32$) and entertainment–attitude (Models I and II: $t = 3.54$) were significantly different for male and female subgroup. So H1 and H2 were supported.

The synergy effect was represented as the positive interaction effect (Davis et al., 1992; Tanriverdi, 2006). According to Chin, Marcolin, and Newsted (2003), the interaction effect of informativeness and entertainment, which were continuous variables, was considered as the product of two interacting variables. Thus the interaction effect can be tested by checking whether the path from interaction variable to dependent variable was significant or not. As suggested by Chin et al. (2003), standardizing approach was more appropriate than centering approach for reflective measures. When conducting the PLS product-indicator approach, the standardized value of every indicator was used to generate the interaction variable. According to the PLS results of Model II, the synergy effect was not significant for the combined group ($\beta = .175$, $t = 1.50$), thus H3 was not supported. However, the significance of interaction effect was different for male and female subgroup. Specifically, there was a significant interaction effect for females ($\beta = .249$, $t = 2.40$), but an insignificant interaction effect for males ($\beta = .129$, $t = 0.81$). When comparing the path loadings...
of interaction-attitude for male and female subgroups (Ahuja & Thatcher, 2005), a significant difference was found too ($t = 5.26, p < .01$). Thus, H4 was supported. Further, following Cohen and Cohen (1988) and Chin et al. (2003), the effect size was tested by using the $f^2$-statistic. The result showed an effect size of .074 for the female group, indicating a between small and medium effect and was larger than those found in most prior IS studies (Chin et al., 2003).

6. Discussions, implications, and limitations

6.1. Discussions of the results

The objective of this study is to identify the role of gender in Web advertising evaluation, as well as the synergy effect of informativeness and entertainment on attitude toward advertising. In order to solve the long-term debate on what the exact role that gender plays in individual behavior, we compared two roles of gender: direct antecedent (Brackett & Carr, 2001; Gefen & Ridings, 2005; Gefen & Straub, 1997; Okazaki, 2007) and moderator (Morris et al., 2005; Venkatesh & Morris, 2000, 2003). The results showed that all four hypotheses on the direct role of gender on attitude (H0a–d) were not supported in this study. In contrast, three hypotheses on the moderating effect of gender (H1, H2, and H4) were significantly supported. Therefore, gender-based difference in decision making process rather than gender-based perceptual (outcome) difference might better capture the mechanism about how gender works (Venkatesh & Morris, 2000). In future research, the moderating effect of gender should be taken into considered.

The synergy effect of informativeness and entertainment (H3) was not found for the combined sample. It was not surprising to find the insignificance of this two-way interaction effect after the three-way interaction effect was confirmed (H4). Men and women process information in different modes: men prefer the item-specific information processing, while women tend to adopt relational processing (Putrevu, 2001). Thus, the interaction effect was not significant for males, but significant for females. As a result, when pooling male and female sample together, the synergy effect was mixed and became insignificant.

Another interesting finding was that the dependent variable, i.e., attitude, was explained with different $R^2$ by informativeness, entertainment, and irritation for male and female subgroups. For the male subgroup, 45% of variance was explained by these three predictors; while only 26% was explained for female subgroup. One explanation for this result can be explained by the gender difference in information processing. Meyers-Levy (1988, 1989) proposed a selectivity hypothesis which argues that men are “selective processors” who often rely on a subset of highly available and salient cues, while women are “comprehensive processors” who attempt to assimilate all available information before rendering judgment. Because more other factors (e.g., credibility) might be considered by women than men when forming their attitudes, the three available antecedents explained relatively lower variance of attitude for women.

6.2. Theoretical implications

This study has several theoretical implications. First, gender moderates the relationships between informativeness, entertainment and attitude; this extends our understanding on the role of gender in Web advertising evaluation. Prior studies pay little attention to gender difference in the Web advertising evaluation process, apart from some studies on its direct effect. In this study, it is found that men and women think in different ways in the process of forming an attitude toward Web ads. For males who stress on the achievement and are task-oriented, informativeness is more important. For females who prefer intrinsic motivation and pursue the internal enjoyment, entertainment is more important.

Second, prior studies consider that informativeness and entertainment exert their impacts on attitude independently and few attentions are paid to the interaction effect of these two variables.
In this study, according to the theories discussing the crowding-in effect of extrinsic and intrinsic motivation, we identify a synergy effect exists between informativeness and entertainment. Although no significant interaction effect has been found with the combined sample, it is found that the strength of interaction effects are different for male and female subgroups. This leads to the third implication of this study, i.e., the interaction effect is stronger for females than for males due to gender difference in information processing. This finding also provides a possible explanation for why no interaction effect is found in prior studies. That is, when pooling the subjects (males and females) who think in different patterns together, the mixed samples may make the results insignificant. When considering a two-way interaction effect, we should also pay attention to possible factors that moderate this two-way interaction effect, i.e., a three-way interaction may exist. If not, an objectively significant two-way interaction effect for certain sample (e.g., females) may be concealed by the mixed results.

6.3. Practical implications

In terms of the gender differences found in this study, advertisers can make different strategies for male and female consumers. Especially for Web advertising, with the development of personalization technology, delivering different styles of ads to males and females has become true (Xu et al., 2008). It is found that informativeness is more important for males than for females, and entertainment is more important for females than for males. Further, for males, informativeness is more important comparing with entertainment. Conversely, for females, entertainment is more important comparing with informativeness. Thus the first principle for Web advertising design is providing males with informative ads and females with entertaining ads (Principle I).

Further, the interaction effects of informativeness and entertainment for males and females are different. Since no significant interaction effect is found for males, the optimal strategy of ad design is maximizing the value of greatest importance for them, i.e., simply focusing on improving the informativeness value (Principle II). Considering the significant interaction effect for females, maximizing the value of greatest importance is not the optimal strategy, because this strategy eliminates the synergy effect of informativeness and entertainment on attitude. Thus, the balance between informativeness and entertainment should be considered in the strategy planning process (Principle III). A mathematical discussion of these two strategies is shown in Appendix C.

However, another un-discussed issue in this study is about the threshold value of informativeness and entertainment. Although it is unexamined, we believe there should be a minimum value of informativeness and entertainment that men and women can tolerate. That is to say, although informativeness for females and entertainment for males are not as important as its counterpart, too small values of them may dissatisfy people. Thus, we list the threshold principle in Table 6 too.

6.4. Limitations and future research

Notwithstanding rich implications are suggested, there are several limitations in this study. The first limitation is about the sample size. Chin (1998) suggested that 10 times the largest number of independent constructs affecting a dependent construct is enough for conducting PLS analysis. Although the numbers of sample size of all the groups (the least number is 47 for male group) exceed this criterion (10 × 4 = 40), they were still a little small. Thus, we expect the same conclusion of this study to appear in the future studies with larger sample.

Second, the participants in the study all are fairly homogeneous students from the same university. The extent to which the results can be generalized across different sectors of the Internet shopping population could be limited. Nevertheless, the subjects should be representative of the Internet shopping population (Lim et al., 2006). In the future, a cross section study can be conducted to examine whether the results hold true for other sectors.

Third, in this study, we used the biological characteristics of gender (e.g., males vs. females) rather than the cultural characteristics of gender (e.g., masculine vs. feminine) as the moderator. Some researchers have argued that although the biological characteristics and cultural characteristics are generally consistent with each other, sometimes they are inconsistent (Bem, 1981; Eagly, 1987; Hofstede, 1980). Thus, it will be very interesting to examine the effects of biological characteristics and cultural characteristics of gender to see which can outperform their counterparts in predicting the hypothesized relationships in this study.

7. Conclusion

Informativeness and entertainment are two salient beliefs determining consumers’ attitudes toward Web advertising. Although their direct impacts on attitudes have been repeatedly proven in prior studies, potential moderators influencing their relationships have been neglected. This study engages in filling this research gap by considering the role of gender.

Before making a conclusion, it is necessary to return to the research questions mentioned at the introduction of this paper. They are: (1) Can informativeness and entertainment interact with each other so as to influence attitude toward Web advertising? (2) Are there any gender differences in Web advertising evaluation outcome and process? If so, what are they?

For the first question, our answer is “Partially Yes”. The interaction effect of informativeness and entertainment only exists for females. For the second question, we found that there was no significant gender differences in advertising evaluation outcome (i.e., direct effects on informativeness, entertainment, irritation, and attitude), but significant gender differences in advertising evaluation process. Specifically, they are: (1) informativeness is more important for males than for females; (2) entertainment is more important for females than for males; (3) the interaction effect of informativeness and entertainment is stronger for females than for males. Thus, in future practice, Web advertisers should consider gender difference in their ads design process, and deliver personalized ads to consumers, so as to make consumers happy and gain more benefits from the Web advertising.

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Appendix A. Measures

Informativeness (Ducoffe, 1996)
1. Banner is a good source of product information.
2. Banner makes product information immediately accessible.

Entertainment (Ducoffe, 1996)
1. Banner is entertaining.
2. Banner is fun to use.

Irritation (Ducoffe, 1996)
1. Banner is annoying.
2. Banner is irritating.

Appendix B. Path coefficients comparison method (Keil et al., 2000)

\[
S_{\text{pooled}} = \sqrt{\frac{\left(\frac{1}{N_1} + \frac{1}{N_2} - 2\right)}{S_{\text{error}}} + \frac{\left(\frac{1}{N_1} + \frac{1}{N_2} - 2\right)}{S_{\text{error}}}}
\]

\[
t = \frac{(PC_1 - PC_2)}{S_{\text{pooled}}} \times \sqrt{\frac{1}{N_1} + \frac{1}{N_2}}
\]

where \(S_{\text{pooled}}\) is the pooled estimator for the variance; \(t\) is the t-statistic with \(N_1 + N_2\) 2 degrees of freedom; \(N_i\) is the sample size of dataset for group \(i\); \(SE\) is the standard error of path in structural model of group \(i\); \(PC_i\) is the path coefficient in structural model of group \(i\).

Appendix C. Advertising strategies for males and females

Considering the question that there is an investment to improve advertising value, we should make decision on the allocation of the investment to improve informativeness and entertainment value. Supposing that the investment can bring an increment of informativeness value with \(k_1\) units or entertainment value with \(k_2\) units, the ratios of investment on these two parts are \(k\) and \(1 - k\), where \(0 < k < 1\). We also suppose that the initial values of informativeness and entertainment before the investment are \(v_{10}\) and \(v_{20}\). Let us think about the strategy selection in the two conditions below.

**Condition 1**: There is no interaction effect between informativeness and entertainment.

Attitude toward advertising is a function of informativeness \((v_1)\) and entertainment \((v_2)\), where irritation is not considered to simplify the discussion, i.e.,

\[
A = \beta_0 + \beta_1 v_1 + \beta_2 v_2 + \epsilon, \quad \text{where } \beta_1, \beta_2 > 0.
\]

Thus, initial attitude is

\[
A_0 = \beta_0 + \beta_1 v_{10} + \beta_2 v_{20}.
\]

Attitude after the investment is

\[
A_1 = \beta_0 + \beta_1 (v_{10} + k_1 x) + \beta_2 (v_{20} + k_2 (1 - x)).
\]

The increase of attitude is

\[
\Delta A = A_1 - A_0 = \beta_2 k_2 + (\beta_1 k_1 - \beta_2 k_2 x).
\]

**Condition 2**: There is a positive interaction effect of informativeness and entertainment.

Attitude is predicted by both main effect and interaction effect between informativeness and entertainment, i.e.,

\[
A = \beta_0 + \beta_1 v_1 + \beta_2 v_2 + \beta_3 v_1 v_2 + \epsilon, \quad \text{where } \beta_1, \beta_2, \beta_3 > 0.
\]

The increase of attitude can be expressed as

\[
\Delta A = A_1 - A_0 = -\beta_3 k_1 k_2 x^2 + (\beta_1 k_1 - \beta_2 k_2) v_{10} - \beta_3 k_1 k_2 x + \beta_2 k_2 + \beta_3 k_2 v_{10}.
\]

To simplify the discussion, we set \(k_1 = k_2 = 1\), \(v_{10} = v_{20} = 0\), then we get

\[
\Delta A_{\text{constant}} = f_1(x) = A_1 - A_0 = -\beta_3 k_1 k_2 x^2 + (\beta_1 - \beta_2) x + \beta_2.
\]

The first condition is applicable for males. Because \(\beta_1\) is greater than \(\beta_2\) for male subgroup, the optimal strategy for advertisers is \(\alpha_{\text{optimal}} = 1\), i.e., spending all the investment on improving informativeness value.

The second condition is applicable for females. Further, we expect the maximum value of \(f_1(x)\) can be achieved when \(x\) is between 0 and 1, then the path coefficients should satisfy

\[
0 < \frac{\beta_1 - \beta_2}{2\beta_2} < 1.
\]

That is \(\beta_1 > |\beta_1 - \beta_2|\). The optimal value of \(x\) is:

\[
\alpha_{\text{optimal}} = \frac{\beta_1 + \beta_2 - \beta_3}{2\beta_3} = 1 + \frac{\beta_1 - \beta_2}{2\beta_3}.
\]

For our study, \(\beta_1 = 0.97\); \(\beta_2 = 0.255\); \(\beta_2 = 0.249\), so the optimal choice of \(x\) is .38. That is also to say, although entertainment is more important than informativeness for females, the best strategy is not spending all the money on improving entertainment. There should be a trade-off between these two kinds of advertising value.

References
