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The influence of web aesthetics on customers' PAD

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ABSTRACT

One key focus of an online retail website is to enhance the consumers' online shopping behavior. Based on the Stimulus-Organism-Response (S-O-R) framework and pleasure, arousal, and dominance (PAD) emotional model, we investigated the relationship between consumers' emotional model and purchase behavior from the perspective of web aesthetics, and how web aesthetics affect their purchase behaviors through the emotional model. Using 441 questionnaire responses and structural equation modeling, we verified that both aesthetic formality and aesthetic appeal influence purchase behaviors through the emotional model. In the emotional model, web aesthetics have significant and positive influences on control, which is composed of behavior control, cognitive control, and decisional control. Control indirectly influences pleasure through the mediations of energetic arousal and tense arousal. Additionally, pleasure and searching on other websites positively influences purchasing behavior. The aim of this study was to provide practical recommendations in the establishment of a pattern of web aesthetics that influence consumers' emotions.

1. Introduction

The recent global financial turmoil and economic recession has resulted in consumers searching for lower-priced commodities online, leading to a global boom for online shopping platforms. As physical retail stores experienced a reduction in consumer expenditure, e-commerce sales soared. According to a report by the Organization for Economic Co-operation and Development (OECD), commodities and services purchased over the Internet have increased annually in OECD countries (OECD, 2011). Therefore, it considers e-commerce a tool for sustaining enterprises because it facilitates the exploration of new business opportunities.

According to the OECD report (2011), approximately 30% of people in OECD countries purchase goods or services over the Internet. The online shopping market has experienced substantial growth, with the population of consumers who participate in online trading increasing (Forrester, 2011). From the perspective of online retail websites, analyzing consumers' shopping patterns and modes are essential to encourage them to spend more. This study was based on the environmental psychology theory presented by Mehrabian and Russell (1974), and deployed the Stimulus-Organism-Response (S-O-R) framework. The S-O-R framework has been widely used to examine environmental influences on consumers' responses. Previous studies have verified that attractive web designs can enhance consumers' online shopping experience (Wolfinbarger & Gilly, 2003). A number of studies have also examined the shopping environment elements that consumers' care about, how the store atmosphere significantly affects their purchasing decisions (Bitner, 1992; Donovan, Rossiter, Marcoolyn, & Nesdale, 1994; Spies, Hesse, & Loesch, 1997).

However, the results of previous studies were inadequate. Grewal and Levy (2007) highlighted that in the field of web design, few extensive studies have been conducted on consumer behavior. Thus, this research direction has significant potential. Recent empirical studies regarding human–computer interactions have confirmed the importance of generic aesthetics, and the particular importance of web aesthetics (Schenkman & Jonsson, 2000; Van der Heijden, 2003). Wang, Minor, and Wei (2011) highlighted that the development of a website with aesthetic values that provide consumers with an enjoyable shopping experience is an important research topic. The shopping atmosphere of retail websites affects

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consumers' emotions (Koo & Lee, 2011). A website with a good atmosphere provides consumers with a feeling of control, which enhances their enjoyment. Consequently, for this study, we adopted the two dimensions of web aesthetics: aesthetic formality and aesthetic appeal (Wang et al., 2011). By adopting this two-dimensional model, we examined how the design of online retail Web sites affects consumers' emotions from an aesthetic perspective.

Mehrabian and Russell (1974) developed the pleasure, arousal, and dominance (PAD) emotional categorization model. Koo and Lee (2011) argued that pleasure, arousal, and dominance can appropriately express consumers' preferences for website atmospheres. However, as highlighted by Kulviwat, Bruner, Kumar, Nasco, and Clark (2007), most marketing-related studies have extensively examined the pleasure and arousal and ignored the dominance aspect (e.g., Sherman, Mathur, & Smith, 1997). We contend that the layout, readability, and navigation design of a website can improve consumers' dominance and stimulate their purchase responses (Dailey, 2004). Because of the risks associated with the inability to touch or trial products before making online purchases, consumers' sense of dominance is particularly significant. Therefore, in this study, we applied extensive control to consumers' sense of dominance to enhance the information provided by existing studies in related literature.

Based on the S-O-R theory, we incorporated webpage aesthetics and an elaborate PAD emotional model to verify the structural equation of the model. Additionally, we aimed to construct an organic mode regarding the influence of web aesthetics on consumers' emotions to obtain a deeper understanding of consumers' search operations and purchasing behaviors.

2. Theoretical background and hypotheses

2.1. S-O-R framework theory

The S-O-R framework is based on the assumption that environmental cues influence people's cognitive or emotional responses, which subsequently influence their consumption behaviors (Mehrabian & Russell, 1974). Under this theoretical framework, the stimulus can be the store atmosphere, which stimulates consumers' emotions. The organism aspect refers to the internal processes that occur between the perception of the stimulus and the resulting behaviors, including various perceptual, psychological, emotional, and cognitive activities. The premise of the S-O-R framework is to stimulate consumers' emotions to obtain the desired responses from consumers, which may foster in-store purchasing behaviors, such as customer revisits, product searching, or other in-store behaviors (responses) (Thang & Tan, 2003). Previous studies of website consumption investigated a wide range of topics. These included consumer responses to the characteristics of online stores (Eroglu, Machleit, & Davis, 2001), customer responses to the atmosphere of online stores (Eroglu, Machleit, & Davis, 2003), the influence that Internet-based store designs have on consumers' purchase intentions (Chang & Chen, 2008), and the interactive effect between website atmosphere and consumer curiosity (Koo & Ju, 2010).

We adopted the study framework to explore consumers' responses to web aesthetics at various levels. We attempted to examine how the two dimensions of web aesthetics affect online consumers' emotional changes (dominance, arousal, and pleasure), as well as how these psychological changes influence consumers' online behaviors, such as searching on other websites and purchasing. Thus, we adopted the S-O-R framework to understand the relationships among web aesthetics, the emotional model, searching on other websites, and purchasing behavior.

2.2. Web aesthetics

The visual appearance of an online store is extremely important. An artistically designed website is visually appealing to visitors, and website designs with aesthetic value are typically superior to less attractive designs. Research on web aesthetics contributes to understand consumers' demands for entertainment. Previous studies have shown that the overall impression of a website significantly affects consumers' purchase behaviors (Donovan et al., 1994; Eroglu et al., 2001; Hui, Dube, & Chebat, 1997).

In literature and art, the concept of aesthetics also refers to a "philosophy of beauty" (Dickie, 1997). In the content of webpages, web aesthetics represent a beautiful impression created by the combination of various elements and attributes. Web aesthetics is a two-dimensional construct. Schenkman and Jonsson (2000) noted that websites with visual beauty comprise of two dimensions: aesthetic formality and aesthetic appeal. Lavie and Tractinsky (2004) found two similar aspects regarding webpage aesthetics, that is, classical aesthetics and performance aesthetics, which accords with the results reported by Schenkman and Jonsson (2000). These results were as follows:

(1) *Aesthetic formality*: aesthetic formality refers to the website layout, readability, and simplistic style. Lavie and Tractinsky (2004) noted that classical aesthetics means a website is well organized, clear, clean, and symmetrical, echoing the aesthetic formality introduced by Schenkman and Jonsson (2000). Aesthetic formality in webpages involves design utility, economy, and practicality.
(2) *Aesthetic appeal*: aesthetic appeal refers to the degree of pleasure and enjoyment that users obtain from the Web site. Lavie and Tractinsky (2004) introduced the concept of performance aesthetics to refer to the creative, fascinating, and sophisticated aspects of a website, which, when combined with the concept of aesthetic appeal presented by Schenkman and Jonsson (2000), emphasizes the significance of beauty and importance of the overall impression. Aesthetic appeal reflects the enjoyment, attraction, and entertaining properties of website design.

As the atmospheric stimulus of an online store comprises various page elements, identifying how combinations of these elements affect consumers' emotional and behavioral responses are crucial. Web aesthetics provides an overall impression of an online shopping environment. Previous studies of human–machine interfaces have focused on the consistency and fidelity of web aesthetics, with substantial results having been achieved (Schenkman & Jonsson, 2000; Tractinsky, 2004; Tractinsky, Avivit, Moti, & Tal, 2006). However, the influence of web aesthetics on consumer emotions, purchase behavior, and website service choices remains unclear. The primary objective of this study is to address this area.

2.3. PAD theory

A person's emotions affect his or her personal response and evaluation of the surroundings. The affective and perceptive responses of a consumer in a store are considered important (Koo & Lee, 2011). Most studies have followed PAD theory established by Mehrabian and Russell (1974), who proposed that the emotional model comprises three emotional responses: pleasure, arousal, and dominance. Most investigations considered each of the three emotional responses as independent (Donovan et al., 1994; Massara, Liu, & Melara, 2010).

However, a few studies have challenged this proposition, arguing that these emotional responses are interdependent. For example, Kuppens (2008) pointed out that arousal and pleasure have

close relationship, and two other studies (Hui & Bateson, 1991; Ward & Barnes, 2001) reported that dominance has a positive and direct influence on arousal and pleasure. Koo and Lee (2011) argued that dominance and control are the same, and Averill (1973) divided control into three variables, namely behavioral control, cognitive control, and decisional control. Rafaeli and Revelle (2006) divided arousal into energetic arousal and tense arousal. We contend that the three dominances (behavioral control, cognitive control, and decisional control) (Averill, 1973) affect the two arousals (energetic arousal and tense arousal) (Rafaeli & Revelle, 2006). In other words, the sense of dominance obtained by customers after entering an online shopping website triggers either an energetic arousal or tense arousal, which ultimately affects their pleasure. The purpose of this study is to verify whether control indirectly influences pleasure through the mediations of energetic arousal and tense arousal.

In addition, energetic arousal and tense arousal have a respectively positive and negative effect on pleasure. However, pleasure has a positive effect on purchasing behavior. These statements are elaborated below.

2.3.1. Dominance

Dominance refers to the degree with which a person is influenced or controlled by the environment (Mehrabian & Russell, 1974; Wu, Cheng, & Yen, 2008; Yani-de-Soriano & Foxall, 2006). In service environments, dominance refers to the degree at which actual behavior and implementation results are regulated (Van Raaij & Pruyn, 1998). Service providers may influence consumers' perceptive dominance in environments. On the Internet, consumers themselves can control consumer behaviors (Menon & Kahn, 2002), such as navigating a website and locating the required information. Therefore, dominance plays an important role in this research topic.

For this study, we adopted the concepts of behavioral control, cognitive control, and decisional control introduced by Averill (1973) as the measurements of dominance. Behavioral control refers to responses that may directly affect or modify the details of events (Averill, 1973), cognitive control refers to predictability and cognitive reinterpretation, and decisional control refers to the determination of results or the objective of decisions (Averill, 1973). Hui and Bateson (1991) indicated that in service contact environments, any situational or interpersonal characteristics might increase consumers' cognitive control, which influences their emotions positively. Eroglu et al. (2001) noted that when online shoppers experience a slow webpage download speed, they might develop a low dominance level, which can then discourage them from revisiting because of the navigational difficulty. However, a good navigational design can enhance consumers' dominance and arouse their purchase responses: from this, dominance is more essential to online shopping environments (Dailey, 2004). According to the definition provided by Dailey (2004), navigational cues are links associated with text and icons, including next and previous page links, navigational toolbars, and site indices combined with navigational toolbars. These tools are used for browsing convenience, enabling consumers to retain various levels of control. Dailey (2004) identified the restrictive navigation cues that may lead to negative emotional responses (frustration, anger, and hostility), attitudes, and behaviors among consumers. In summation, we contend that the better the website's aesthetic design, the more it allows consumers to gain a sense of control. Thus, we propose the following hypotheses:

H1. Aesthetic formality has a significant and positive influence on control.

H2. Aesthetic appeal has a significant and positive influence on control.

2.3.2. Arousal

Arousal refers to the degree of sensory stimulation, energy, or excitement (Eroglu et al., 2003; Menon & Kahn, 2002). Complex, fast, and surprising stimulus may excite consumers, making them happy and inducing approach behaviors (Babin & Darden, 1995; Holbrook & Gardner, 1993; Sherman et al., 1997). However, the results of a number of studies have indicated the opposite. For example, Menon and Kahn (2002), Donovan et al. (1994), and Massara et al. (2010) pointed out that excessive arousal may lead to negative behaviors. Previous studies have identified the relationship between an inverted U-shaped arousal (where the peak is central) and service scenarios (Holbrook & Gardner, 1993). Some studies have attributed these inconsistencies to specific factors of arousal, such as an unpleasant shopping environment (Donovan et al., 1994), personality traits (Babin & Darden, 1995), and shopping preferences (Kaltcheva & Weitz, 2006).

In this study, the two-dimensional arousal model of Thayer (1987) was adopted to explain these inconsistent emotions and behaviors. Thayer (1987) noted that from a psychological perspective, arousal could be regarded as a multi-dimensional construct that describes at least two types of arousal, that is, energetic arousal and tense arousal. Energetic arousal refers to the feelings of being invigorated, energetic, refreshed, or full of energy; this is the opposite of drowsiness and fatigue (Matthews, Davies, & Holley, 1990). Tense arousal refers to feeling of anxiety, nervousness, and restlessness (Matthews et al., 1990). Koo and Lee (2011) argued that the field of consumer psychology and behavior has never examined tense arousal as a psychological dimension, suggesting that among the complex processes of consumer arousal, tense arousal has been the most often ignored in previous studies. Rafaeli and Revelle (2006) also mentioned that previous studies primarily focused on energetic arousal, ignoring tense arousal.

Ward and Barnes (2001) reported that control significantly and positively affects on arousal. Koo and Lee (2011) confirmed that dominance has a significant and positive effect on energetic arousal. Dailey (2004) also concluded that restrictive navigation is hazardous to websites because it arouses the negative effects of Internet marketing, such as negative emotions and negative attitudes. However, effective website navigation arouses positive emotions and reduces negative emotions in users. Therefore, we propose the following hypothesis:

H3. Users' control has (a) a significant and positive influence on energetic arousal and (b) a significant and negative influence on tense arousal.

2.3.3. Pleasure

The definition of pleasure is "the degree to which a person feels good, happy, blessed, or satisfied" (Eroglu et al., 2003). Previous studies on consumer behavior indicated that the perceived control of consumers affects the emotional outcomes (Hui & Bateson, 1991). Perceived control has a positive effect on the feelings of pleasure. On the interaction of consumers and environment, there is a positive relationship between the sense of control and mood (Ward & Barnes, 2001), which can provide consumers a positive emotional response and increase pleasure (Massara et al., 2010).

Thus, we propose the following hypothesis:

H4. Control has a significant and positive influence on pleasure.

Previous studies have found that a causal relationship exists between arousal and pleasure, which can explain consumers' behavioral changes (Darden & Babin, 1994; Donovan & Rossiter, 1982; Hui & Bateson, 1991). In an environment with music congruency, Demoulin (2011) confirmed that arousal has a significant and positive effect on pleasure. Kuppens (2008) showed that high arousal has a significant and positive effect on pleasure, and low arousal has a significant and positive effect on displeasure. Koo and Lee (2011) reported that energetic arousal has a significant and positive effect on pleasure, whereas tense arousal has a significant and negative effect on pleasure. Therefore, we propose the following hypotheses:

H5. Energetic arousal has a significant and positive influence on pleasure.

H6. Tense arousal has a significant and negative influence on pleasure.

The graphics, colors and links of webpages can affect the pleasure of users (Koo & Ju, 2010). Previous studies have confirmed that website aesthetics positively affect consumers' shopping enjoyment (Cai & Xu, 2011), and that web store designs will affect the consumers' emotions (Porat & Tractinsky, 2012).

Eroglu et al. (2003) demonstrated that atmospherics of an online store has a positive impact on pleasure. Expressive aesthetics, which relates to the fascinating and decorative features of a Web site, such as rich graphics and intriguing images, enhances the perceived hedonic quality of a website (Cai & Xu, 2011). Aesthetics of computer interfaces is a strong determinant of users' pleasure (Lavie & Tractinsky, 2004). Therefore, we propose the following hypotheses:

H7. Aesthetic formality has a significant and positive influence on pleasure.

H8. Aesthetic appeal has a significant and positive influence on pleasure.

Additionally, viewers may simply wish to browse pages on the Internet for enjoyment, such as joining an information center to participate in conversations regarding leisure topics with friends, rather than for a specific purpose (Hoffman & Novak, 1996). Psychological studies have shown that the stimulation of consumer pleasure may increase their purchasing behaviors and desires. For example, Isen (1987) found that positive emotions enabled consumers to manage information that is more complex, have more optimistic expectations of possible outcomes, and exhibit greater willingness to participate in experiments or undertake more risks. In the settings of a physical store and an online retail website, emotions influence consumers' behaviors, including their communication with other consumers, browsing of relevant Web sites, and participation in promotional activities (Menon & Kahn, 2002; Ridgway, Dawson, & Bloch, 1989). Therefore, we propose the following hypothesis:

H9. Pleasure has a significant and positive influence on search on other websites.

Numerous empirical studies have supported the proposition that positive emotions have positive effect on online purchasing behaviors (Donovan et al., 1994; Menon & Kahn, 2002; Sherman et al., 1997; Spies et al., 1997). According to Donovan and Rossiter (1982), unlike unpleasant stores, delightful stores encourage customers to spend more money spontaneously. Physical stores with an experience-oriented marketing strategy should carefully decorate to create a pleasant atmosphere, thereby fulfilling the target of profitability. This is extremely important for customers strolling around the store (Spies et al., 1997). Unlike arousal, previous studies have consistently shown that pleasure positively influences behavior: the lower the consumer enjoyment, the less likely they are to purchase products. Therefore, we propose the following hypothesis:

H10. Pleasure has a significant and positive influence on purchase behavior.

Consumers engaged in complex purchasing behavior typically need to manage risks and identify the information relevant to high-involvement purchases (Grant, Clarke, & Kyriazis, 2010). The more a consumer wants to search for information from other websites, the greater the probability the consumer will perform purchase actions. Thus, searching for information from other websites has a significant and positive influence on purchase behavior (Grant et al., 2010; Payne, Storbacka, & Frow, 2008). Therefore, we propose the following hypothesis:

H11. Search on other websites has a significant and positive influence on purchasing behavior.

3. Methodology

3.1. Sample and data collection

This study is divided into three parts based on the S-O-R (Stimulus-Organism-Response) framework. The first part of

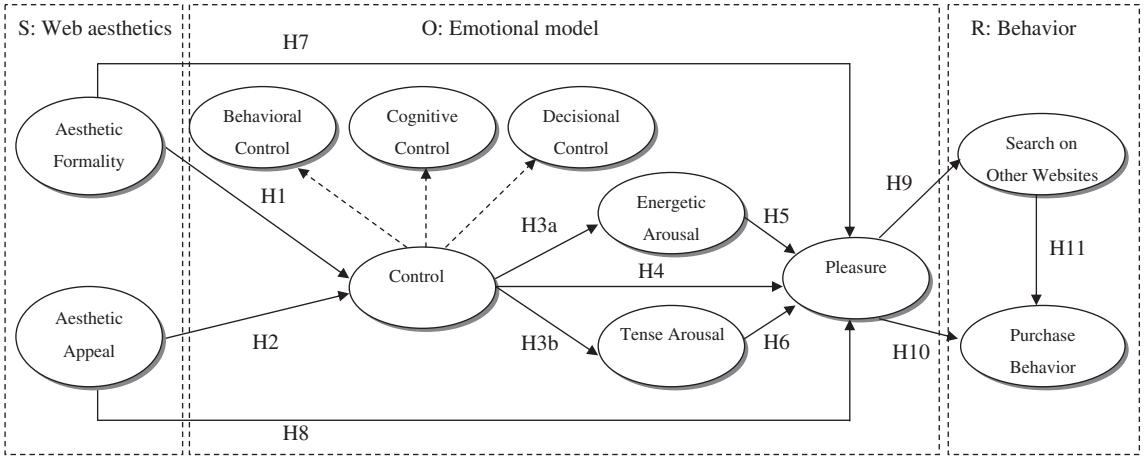

Fig. 1. Proposed model.

stimulus, web aesthetics, includes aesthetic formality and aesthetic appeal. The second part of organism is the emotion model, including control (a latent factor with three sub-dimensions: behavior control, cognitive control, and decisional control), energetic arousal, tense arousal, and pleasure. The third part of response includes searching on other websites and purchase behavior. This research investigated the relationship(s) among these variables in the context of an online shopping website, as well as the impact of these variables on consumer emotion and purchase behavior. Fig. 1 shows the research framework.

The survey was conducted online, placed on heavily-used networks of such as: MySurvey, the Internet questionnaires services, Facebook, NTU PTT online shopping board, questionnaires board, etc., from November 15th, 2011 to January 20th, 2012. This study used an online questionnaire and asked for participants who have shopped online in the past to fill out the questionnaire. Using this kind of research strategy may be restricted due to issues such as memory loss, however, the use of website shopping interfaces is to diverse and may not be able to provide specific samples for reference. As the purpose of this study is to obtain results of a general website environment, external validity is, therefore, very crucial. Accordingly, this research did not apply the experimental research methodology; the formal questionnaire adopted closed-ended questions to meet the research purpose. Although previous research indicated that the manipulation of experimental design has a high degree of internal validity, the external validity is relatively weak (Dillon, Madden, & Firtle, 1994). Furthermore, in order to ensure the respondents understanding the true meaning of each question, this study conducted seven rounds of pre-testing to make sure of wording. The first phase of the twenty-one pre-tests with the questionnaire was conducted in seven rounds; the respondents answered the questionnaire in one-on-one mode in order to modify the questionnaire. The second phase of the pre-test was with a small-scale questionnaire to analyze and confirm the convergent validity, discriminant validity, and reliability.

All samples came from Taiwanese residents, and the samples were those who had experience of online shopping in the past three months in Taiwan. This study collected eight hundred and thirty-two valid samples, not including the respondents of the sample who refused to answer, never used shopping sites, missed or incomplete samples, and invalid samples. The analysis used four hundred and forty-one valid samples, resulting in a valid response rate of 53.00%. Table 1 shows the frequency distribution of demographics for respondents.

Table 1
Demographics of the respondents.

Demographics	Frequency	Percentage	Accumulated percentage
Gender			
Male	210	47.62	47.62
Female	231	52.38	100.00
Age			
Under 19 years old	44	9.63	9.63
20–29 years old	225	49.23	58.86
30–39 years old	140	30.64	89.50
Over 40 years old	48	10.50	100.00
Education			
Under junior high school	18	4.08	4.08
Senior high school	20	4.54	8.62
Junior college/college	249	56.46	65.08
Graduate	154	34.92	100.00
Monthly income			
Under NTD 10,000	163	36.96	36.96
NTD 10,001–30,000	93	21.09	58.05
NTD 30,001–50,000	100	22.68	80.73
NTD 50,001–70,000	55	12.47	93.20
NTD 70,001–90,000	11	2.49	95.69
Over NTD 90,000元	19	4.31	100.00

3.2. Measures

This study adopted questionnaires from previous studies and validated it with a pilot test. The original questionnaire's constructs, measurement items of each construct and references are shown in Appendix A. From the constructs, aesthetic formality, aesthetic appeal, search on other websites, and purchase behavior were adopted from Wang et al. (2011); behavioral control, cognitive control, and decisional control were from Liu, Doucette, and Farris (2007), Faranda (2001) and Bishop, Enkelmann, Tong, Why, and Diong (2003); and energetic arousal, tense arousal, and pleasure adopted from Koo and Lee (2011).

4. Analysis and results

4.1. Measurement model

Following procedures recommended by Anderson and Gerbing (1988), this research conducted two analysis phases. First, the measurement model estimated reliabilities and validities of the research constructs by confirmatory factor analysis (CFA). Then, the structural model verified the strength and direction of the proposed relationships among research constructs.

We evaluated the psychometric properties of our measures using a CFA that combined each factor measured by reflective scales (Anderson & Gerbing, 1988; Bagozzi & Yi, 1988). The measure of the convergent and discriminant validity is described as follows: Convergent validity was checked by using composite reliability (CR) (above the recommended value of 0.70), and average variances extracted (AVE) (above the recommended value of 0.50) (Hair Jr., Black, Babin, & Anderson, 2010). As shown in Table 2, all composite reliabilities (CR) for the constructs are above 0.70, which indicates acceptable levels of reliability for each construct (Hulland, 1999) and average variances extracted (AVE) are all over 0.50. The results showed each construct with good convergent validity.

Evidence of discriminant validity exists when the square root of the average of variance extracted in each construct exceeds the correlation coefficients of this particular construct with other constructs (Fornell & Larcker, 1981). Gaski and Nevin (1985) suggested checking the correlation coefficient between any two dimensions is less than 1, and by checking the correlation coefficient of any two dimensions less than the Cronbach α coefficient for each dimension. As presented in Table 3, the results indicate adequate discriminant validity.

Recommended fit criteria for reliability adopted by previous studies are as follows. When the squared multiple correlations (SMC) is greater than 0.20 (Bentler & Wu, 1993; Jöreskog & Sörbom, 1993) and each of the Cronbach α coefficient exceeds the threshold value of 0.70 recommended by Nunnally (1978), there is a reasonable degree of internal consistency between the corresponding indicators for each of the constructs. The results of this research indicate SMC is between 0.340 to 0.831 and Cronbach α coefficient are over 0.707. This indicates that there is sufficient reliability.

4.2. Structural model

The overall fit statistics ($\chi 2 = 1639.427$, df = 511, $p < 0.001$, $\chi 2/df = 3.208$, GFI = 0.813, TLI = 0.849, CFI = 0.863, and RMSEA = 0.071)

Table 2
Analysis of measurement model.

Constructs	MLE estimates		Squared multiple correlation (SMC)	Composite reliability (CR)	Average of variance extracted (AVE)	Cronbach's α
	Factor loading (λ_x/λ_y)	Measurement error (δ/ε)				
Aesthetic formality				0.749	0.500	0.808
AF1	0.743***	0.353	0.552			
AF2	0.704***	0.410	0.496			
AF3	0.843***	0.202	0.711			
Aesthetic appeal				0.836	0.631	0.811
AA1	0.691***	0.400	0.478			
AA2	0.781***	0.393	0.611			
AA3	0.856***	0.273	0.732			
Behavior control				0.823	0.701	0.801
BC1	0.860***	0.187	0.740			
BC2	0.792***	0.398	0.627			
Cognitive control				0.897	0.556	0.888
CC1	0.677***	0.424	0.459			
CC2	0.677***	0.471	0.458			
CC3	0.754***	0.395	0.568			
CC4	0.616***	0.608	0.380			
CC5	0.750***	0.450	0.563			
CC6	0.830***	0.312	0.689			
CC7	0.793***	0.336	0.630			
Decisional control				0.922	0.856	0.707
DC1	0.746***	0.086	0.557			
DC2	0.734***	0.098	0.539			
Control				0.746	0.500	0.884
BC	0.807***	0.186	0.651			
CC	0.811***	0.160	0.657			
DC	0.583***	0.076	0.340			
Energetic arousal				0.921	0.747	0.824
EA1	0.717***	0.189	0.514			
EA2	0.843***	0.124	0.710			
EA3	0.787***	0.144	0.619			
EA4	0.604***	0.289	0.364			
Tense arousal				0.954	0.873	0.899
TA1	0.853***	0.121	0.727			
TA2	0.912***	0.072	0.831			
TA3	0.831***	0.134	0.691			
Pleasure				0.924	0.754	0.848
P1	0.800***	0.159	0.639			
P2	0.738***	0.208	0.544			
P3	0.794***	0.168	0.631			
P4	0.722***	0.229	0.521			
Search on other websites				0.888	0.726	0.893
SOW1	0.854***	0.271	0.730			
SOW2	0.845***	0.311	0.713			
SOW3	0.874***	0.251	0.763			
Purchase behavior				0.833	0.625	0.760
PB1	0.724***	0.303	0.524			
PB2	0.660***	0.337	0.436			
PB3	0.767***	0.287	0.588			
$\chi 2 = 1491.895$, df = 496, $p < 0.001$, $\chi 2/df = 3.008$, GFI = 0.830, TLI = 0.863, CFI = 0.879, RMSEA = 0.068						

Note: AF: aesthetic formality; AA: aesthetic appeal; BC: behavior control; CC: cognitive control; DC: decisional control; EA: energetic arousal; TA: tense arousal; P: pleasure; SOW: search on other websites; PB: purchase behavior.
*** All factor loading are significant at the $p < 0.001$ level.

indicate an acceptable level of fit. Table 4 presents the results of the hypotheses tests and Fig. 2 provides a graphic representation of the estimates in the path diagram. Our findings suggest that both aesthetic formality and aesthetic appeal have significant and positive influences on control ($\gamma_{11} = 0.390$, $t = 6.239$, $p < 0.001$; $\gamma_{12} = 0.466$, $t = 7.327$, $p < 0.001$), supporting H1 and H2.

In addition, control has a significant and positive influence on energetic arousal ($\beta_{21} = 0.587$, $t = 9.080$, $p < 0.001$), but control has a significant and negative influence on tense arousal ($\beta_{31} = -0.487$, $t = -8.403$), supporting H3a and H3b. However, control does not have a significant and positive influence on pleasure ($\beta_{41} = 0.017$, $t = 0.169$, $p > 0.05$). It does not support H4. On the other hand, energetic arousal ($\beta_{42} = 0.590$, $t = 8.759$, $p < 0.001$) has a significant and positive influence on pleasure, but tense arousal negatively influences pleasure ($\beta_{43} = -0.107$, $t = -2.156$, $p < 0.05$), supporting H5 and H6. Furthermore, both aesthetic formality and aesthetic appeal does not have significant and positive influences on pleasure ($\gamma_{41} = 0.108$, $t = 1.722$, $p > 0.05$; $\gamma_{42} = 0.112$, $t = 1.688$, $p > 0.05$). The results do not support H7 and H8. Finally, pleasure has a positive and significant influence on both search on other websites ($\beta_{54} = 0.211$, $t = 3.921$, $p < 0.001$) and purchase behavior ($\beta_{64} = 0.336$, $t = 5.564$, $p < 0.001$), and search on other

Table 3
Correlation matrix for measurement scales.

Constructs	AVE	Alpha	AF	AA	BC	CC	DC	EA	TA	P	SOW	PB
AF	0.500	0.808	0.707									
AA	0.631	0.811	0.427**	0.794								
BC	0.701	0.801	0.408**	0.376**	0.837							
CC	0.556	0.888	0.438**	0.586**	0.540**	0.746						
DC	0.856	0.707	0.290**	0.282**	0.440**	0.293**	0.925					
EA	0.747	0.824	0.317**	0.403**	0.290**	0.421**	0.293**	0.864				
TA	0.873	0.899	−0.210**	−0.117*	−0.436**	−0.377**	−0.322**	−0.183**	0.934			
P	0.754	0.848	0.343**	0.383**	0.412**	0.376**	0.128**	0.606**	−0.282**	0.868		
SOW	0.726	0.893	0.079	0.116*	0.395**	0.265**	0.194**	0.096*	−0.141**	0.187**	0.852	
PB	0.625	0.760	0.241**	0.327**	0.215**	0.266**	0.150**	0.252**	−0.033	0.272**	0.198**	0.791

Note: AF: aesthetic formality; AA: aesthetic appeal; BC: behavior control; CC: cognitive control; DC: decisional control; EA: energetic arousal; TA: tense arousal; P: pleasure; SOW: search on other websites; PB: purchase behavior; diagonal elements are the square root of the average variance extracted of each construct; Pearson correlations are shown below the diagonal.
*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.

Table 4
Results of proposed model.

	Paths			Path coefficients	Hypotheses	Test results
γ_{11}	Aesthetic formality	→	Control	0.390***	H1	Supported
γ_{12}	Aesthetic appeal	→	Control	0.466***	H2	Supported
β_{21}	Control	→	Energetic arousal	0.587***	H3a	Supported
β_{31}	Control	→	Tense arousal	−0.487***	H3b	Supported
β_{41}	Control	→	Pleasure	0.017	H4	Not supported
β_{42}	Energetic arousal	→	Pleasure	0.590***	H5	Supported
β_{43}	Tense arousal	→	Pleasure	−0.107*	H6	Supported
γ_{41}	Aesthetic formality	→	Pleasure	0.108	H7	Not supported
γ_{42}	Aesthetic appeal	→	Pleasure	0.112	H8	Not supported
β_{54}	Pleasure	→	Search on other websites	0.211***	H9	Supported
β_{64}	Pleasure	→	Purchase behavior	0.336***	H10	Supported
β_{65}	Search on other websites	→	Purchase behavior	0.165**	H11	Supported

* $p < 0.05$.
** $p < 0.01$.
*** $p < 0.001$.

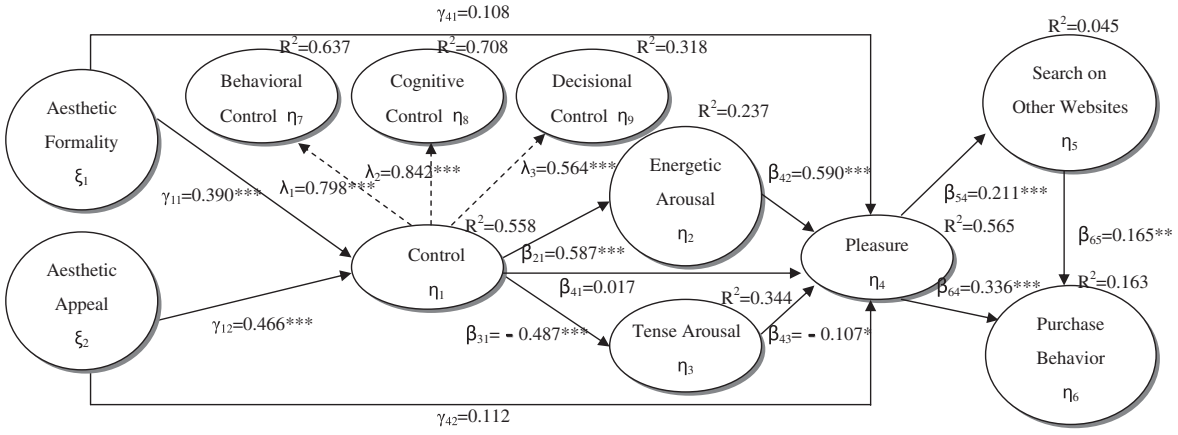

Fig. 2. Hypothesized model. * p<0.05, ** p<0.01, *** p<0.001.

websites has a significant and positive influence on purchase behavior ($\beta_{65} = 0.165$, $t = 2.903$, $p < 0.01$), supporting H9, H10, and H11, respectively.

4.3. Post analysis: tests of mediation effects

This study further investigated the mediation effects of energetic arousal and tense arousal between control and pleasure. Table 5 shows that the values of Sobel test statistics of energetic arousal and tense arousal were greater than 1.96, and are significant. In addition, the 95% confidence intervals of the 2000 simulations of Bootstrapping do not include zero. This indicates both energetic arousal and tense arousal are the mediators between control and pleasure (Efron & Tibshirani, 1993; Sobel, 1982). The regression analysis results of Table 6 show that both energetic arousal and tense arousal have partial mediations between control and pleasure (Baron & Kenny, 1986).

Table 5
Sobel test and bootstrapping of mediation analysis for energetic arousal and tense arousal.

IV	M	DV	Sobel test	Bootstrapping 95% CI	
				Percentile method	Bias-corrected
C	EA	P	8.225***	[0.163, 0.270]	[0.166, 0.274]
C	TA	P	5.275***	[0.003, 0.102]	[0.004, 0.102]

Note: IV: independent variable; M: mediator variable; DV: dependent variable; C: control; EA: energetic arousal; TA: tense arousal; P: pleasure.
* $p < 0.05$.
** $p < 0.01$.
*** $p < 0.001$.

5. General discussion

Referencing the S-O-R model, and using web aesthetics and the emotional model, we investigated the factors that influence consumers' online purchase behaviors. Aesthetic formality and aesthetic appeal are exogenous variables, and behavior control, cognitive control, decisional control, energetic arousal, tense arousal, and pleasure are emotional model to construct the model. Regarding the research process, we developed the research framework and a number of hypotheses by synthesizing the results of previous studies. Structural equation modeling verified the constructs, paths, and hypotheses. The major findings of this study are as follows:

Schenkman and Jonsson (2000) introduced web aesthetic principles and Mehrabian and Russell (1974) presented the emotional model. The results of this study confirm that both aesthetic formality and aesthetic appeal have significant and positive influences on control, as proposed by a number of previous studies (Dailey, 2004; Eroglu et al., 2001; Hui & Bateson, 1991). However, aesthetic formality and aesthetic appeal do not directly affect pleasure, which may be due to the mediation of the emotional model affecting pleasure. Therefore, enhancing the layout, readability, and visual style of websites enhance the consumers' sense of control over the website.

With respect to the emotional model, the empirical results of this study indicate that control has a significant and positive influence on energetic arousal and a significant and negative influence on tense arousal. Hence, the higher the degree of control perceived by users, the greater their energetic arousal (Dailey, 2004; Koo & Lee, 2011; Ward & Barnes, 2001), and lower tense arousal. Furthermore, the factor loading of cognitive control is the highest in the composition of control. This indicates that if a consumer perceives an online retail website to be competent with memory-evoking experiences, this can significantly increase the sense of control of consumers in the website.

Additionally, the results of this study also confirm that energetic arousal has a significant and positive influence on pleasure, and tense arousal has a significant and negative influence on pleasure. This suggests that the tense arousal caused by negative emotions has an undesirable influence on pleasure. When consumers browse the website of an online store, their energetic arousal by the content of the website creates a sense of happiness, which increases the pleasure they experience when browsing the online retail website.

In the verification of mediation effect, control is not significant on the direct and positive influence on pleasure; the result corresponds to the study of Koo and Lee (2011). Although the direct and positive influence of control on pleasure is not significant, the influence of control on pleasure is significant through both energetic arousal and tense arousal. This indicates that users have a sense of control, but if the site is unable to inspire arousal emotions, this does not affect pleasure. This study further tests the mediation effects of energetic arousal and tense arousal between control and pleasure.

Pleasure and search on other websites have significant and positive influences on purchase behavior (Donovan & Rossiter, 1982; Spies et al., 1997). However, pleasure has a greater influence on purchase behavior, indicating that the level of pleasure perceived by consumers is a critical factor that influences their purchase behaviors when browsing online retail websites. Consumers' purchase behaviors are subject to their emotions at that particular moment. Therefore, owners of online stores should strive to maintain consumers' happy mood, because pleasant emotions enhance consumers' online purchasing behaviors.

Furthermore, in a theoretical contribution, this study has extended an existing research model and framework. Additionally, we further developed the PAD theory by elaborating the dominance and arousal aspects to understand consumers' emotional responses better and thereby increase the understanding of the role of emotions in online shopping. Web aesthetics indirectly affect consumers' purchase behaviors. The empirical results of this study show that the aesthetic value provided by online retail Websites has significant and positive influence on the level of control among consumers' emotions. Therefore, in future studies investigating consumers' emotional control, both aesthetic formality and aesthetic appeal should be important factors and not be neglected.

6. Strategic implications

From the above analysis, we can infer that in practice, web aesthetics and the design of websites significantly affect consumers' sense of control. Therefore, the owners of online stores should enhance the attractiveness of their websites, and create a greater sense of control by providing auditory and visual guidance and feature specifications that contain detailed product descriptions. They should also provide audio, video, and picture-based information to strengthen customers' sensory stimulation and boost their energetic arousal. This can be conducted using a number of methods, such as promptly updating webpages with commodities for

Table 6
Regression analysis of mediation analysis for energetic arousal and tense arousal.

IV	M	DV	IV → DV		IV → M		IV + M → DV			
							IV		M	
			β	S.E.	β	S.E.	β	S.E.	β	S.E.
C	EA	P	0.390***	0.040	0.381***	0.037	0.175***	0.039	0.565***	0.045
C	TA	P	0.390***	0.040	−0.447***	0.043	−0.111*	0.045	0.340***	0.045

Note: IV: independent variable; M: mediator variable; DV: dependent variable; C: control; EA: energetic arousal; TA: tense arousal; P: pleasure.
** $p < 0.01$.
* $p < 0.05$.
*** $p < 0.001$.

different seasons, offering the most fashionable and widely discussed commodities of public interest, listing a diverse range of well-organized commodities, and providing a customer feedback mechanism to collect customers' responses. Thus, it can obtain and stimulate consumers' emotions. Meanwhile, consumers elevate their pleasures when enhance the browse of online retail websites, eventually increase their purchase behaviors.

The emergence of the Internet has accelerated our connection with the rest of the world. The rising trend in online shopping has attracted a growing number of participants. Commodities in physical store cannot be assessed using sensory perception. Thus, stimulating consumers' desire to engage in online shopping is a major challenge for online store managers. Studies have increased the attention that the research community has given the design of online stores. Grewal and Levy (2007) reported that webpage design could affect consumers' online behaviors. However, more in-depth investigations have not yet verified such statements. Through this study, we confirmed that both web aesthetics and consumer emotions influence consumers' behaviors. Current online retailers are applying numerous advanced network technologies, such as customized solutions and computer-aided analytical tools, to provide superior online services. However, from a marketing perspective, the functionalities provided to date are insufficient for establishing a customer-oriented online shopping environment. Therefore, the incorporation of aesthetic elements can enhance consumers' shopping experience and purchase intentions.

7. Limitations and future research directions

First, because of time constraints, we could only employ cross-sectional empirical data to measure customers' perceptions and behaviors. The consumers' internal changes remain unknown. Considering the constant evolution of webpage design, functionality, and services, as well as the rapid social developments under the time and space context, the measurement bias caused by time gap may have increased. Therefore, we recommend those future researchers, under the premise of sufficient funding and time, collect longitudinal empirical data to examine the interactions between variables at different times to obtain more effective and reasonable verification results. Additionally, because we used an online questionnaire to collect data, despite all consumers of online stores being Internet users, online questionnaire remain subject to the limitations of the distribution channel and response time. Thus, the questionnaire was not accessible for all types of Internet users, and measurement biases resulted. Third, this study – based on the S-O-R perspective – investigated the casual model of Stimulus-Organism-Response. Whether the reverse causal model can explain the purchasing behavior on a website is unclear. For example, is it possible for one's purchase behavior to bring more pleasure, increase arousal and thus enhance feelings of control that in turn makes a page look more aesthetically pleasing?

Although the S-O-R model can explain the situation of purchase reactions, created by consumers when consumers are inspired by external stimuli, it does not account in detail websites that provide explanations for visual stimulation when consumers are restricted by external force or get used to a particular website. This part is an interesting area for scholars to do further research.

Finally, we recommend that future research incorporate other relevant variables or theoretical models. Besides web aesthetics, emotional model, and behaviors, other considerations such as product engagement, privacy and security, personality, and website responsiveness can be included to increase the model's comprehensiveness and predictability.

Appendix A. Scale items

Construct/item

Aesthetic formality (Wang et al., 2011)
In my eyes, the website is:
1. Poorly organized/well organized
2. Ordered/chaotic
3. Illegible/legible

Aesthetic appeal (Wang et al., 2011)
In my eyes, the website is:
1. Fascinating/monotonous
2. Conventional/creative
3. Impressive/unremarkable

Behavioral control (Liu et al., 2007)
1. During the next six weeks, it is entirely up to me whether or not I try to get more information about a medication for an advertised anti-arthritic prescription medicine from each of the following sources?
2. How much personal control do you feel you have over trying to get more information about a medication for an advertised anti-arthritic prescription medicine from each of the following sources during the next six weeks

Cognitive control (Faranda, 2001)
The cognitive of browsing my favorite shopping store is:
1. Aware/unaware
2. Knowledgeable/ignorant
3. Mindful/unknowing
4. Educated/uninformed
5. Capable/helpless
6. Competent/incapable
7. Mighty/weak

Decisional control (Bishop et al., 2003)
1. They could choose to do something different now if they wanted to
2. They could choose to do what they are doing now at a different time

Energetic arousal (Koo & Lee, 2011)
When I was shopping in my favorite store (online store), I felt (acted):
1. Active
2. Energetic
3. Vigorous
4. Sleepy (R)
5. Excited

Tense arousal (Koo & Lee, 2011)
When I was shopping recently in my favorite store, I was (felt):
1. Anxious
2. Jittery
3. Nervous
4. Relaxed (R)

Pleasure (Koo & Lee, 2011)
When I was shopping in my favorite store online store), I was (felt):
1. Pleased
2. Contented
3. Happy
4. Cheerful

Search on other websites (Wang et al., 2011)

Scale items (*continued*)

Construct/item
After browsing the website, my inclinations are:
1. I intend to search other websites for more information
After browsing the website, the likelihood of taking each action for me is:
2. Search other websites for more information
I rate my chances of taking each action as:
3. Search other websites for more information
Purchase behavior (Wang et al., 2011)
After browsing the website, my inclinations are
1. I intend to purchase from the website immediately
After browsing the website, the likelihood of taking each action for me is
2. Purchase from the website immediately
I rate my chances of taking each action as
3. Purchase from the website immediately

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