

It's a Pleasure Buying Here: The Effects of Web-Store Design on Consumers' Emotions and Attitudes

Talya Porat¹ and Noam Tractinsky¹

¹Ben-Gurion University of the Negev, Israel

We draw on research in human-computer interaction, information systems, environmental psychology, and marketing to develop and to test a model, which suggests that salient design characteristics of the web store (aesthetics and usability) influence the emotions of visitors to the store's site, which in turn affect their attitudes toward the store. A study examined the proposed model in two e-commerce domains—bookstores and apparel stores. The results, based on data collected from 327 participants, suggest that the effect of the design aspects on attitudes toward the store was partially mediated by affect. In addition, certain design aspects also affected attitudes directly. Specifically, effects of perceived aesthetic aspects of the online store were mainly mediated by affect. The influence of perceived usability was mainly direct and less mediated by affect. Both pleasure and arousal were associated with attitudes toward the store, with pleasure being the main mediator between store design and attitudes toward the store.

1. INTRODUCTION¹

The introduction of e-commerce is the most wide-ranging and significant area of current development in marketing (Barwise, Elberse, & Hammond, 2002). The estimate of U.S. retail e-commerce sales for 2009 was \$134.9 billion. This figure represents a 3.7% share of all retail sales in the United States, a fivefold increase over 9 years (U.S. Department of Commerce, 2010). In addition to the virtual nature of

Talya Porat is a researcher with interest in human-computer interaction and cognitive performance; she is a postdoctoral fellow in Human factors at the Department of Industrial Engineering and Management and the head of the usability lab at the Deutsche Telekom Laboratories at Ben-Gurion University. **Noam Tractinsky** studies human-computer interaction with special interest in visual aesthetics; he is an Associate Professor of Information Systems Engineering at Ben-Gurion University.

¹Portions of the theoretical development of this article follow Porat and Tractinsky (2008a, 2008b).

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the new retail environment, marketing on the Web has become heavily dependent on design and implementation of information technology. Because of the ease by which potential consumers can switch between competing stores, design features of the stores play a major role in consumers' perceptions of the stores and in their willingness to interact with these stores (Everard & Galletta, 2005-6; Jiang & Benbasat, 2007; Nadkarni & Gupta, 2007). Thus, in addition to traditional marketing concepts and practices, the realm of store design should also rely on knowledge from the areas

of information systems and human–computer interaction (HCI). One of the most intriguing challenges in this marriage of the marketing and the information technology (IT) disciplines is the apparent tension between accommodating traditional marketing principles, on one hand, and adhering to HCI goals and guidelines, on the other hand.

Thus, for example, the field of marketing has been intensively involved in attempts to influence consumers' emotions through advertisements and through product and store design (e.g., Bloch, 1995; Kotler & Rath, 1984; Whitney, 1988). Information technology, on the other hand, had traditionally been about efficiency and accuracy (Card, Thomas, & Newell, 1983; Davis & Olson, 1984). This tendency was also reflected in the emphasis on accurate and fast task execution as the main success criteria of the HCI field, until quite recently (Norman, 2002; Tractinsky, 2004). These IT-related criteria are not shared by marketing. In fact, some marketing techniques attempt to make the information processing or the shopping process even less efficient for various reasons (e.g., Hoyer & MacInnis, 2001; Levy & Weitz, 1998; Russo, 1977; Schroeder, 2002). Hence, the coupling of these contrasting disciplines in a new business model, in which marketing's success hinges on vendors' and consumers' use of IT, is challenging for both research and practice. Currently, research on the merger of marketing and HCI is scarce (Barwise et al., 2002; Vergo, Noronha, Kramer, Lechner, & Cofino, 2003). Studies and design recommendations of online retail have mainly concentrated on the usability aspects of the web store (cf. Nah & Davis, 2002; Nielsen, 2000; Venkatesh & Agarwal, 2006). Consequently, we still lack robust conceptual frameworks to explain how website design affect consumers' emotions and attitudes toward a particular vendor.

To address the gaps between traditional and online retail research, we integrated theoretical concepts and frameworks from the fields of environmental psychology, HCI and marketing to form a model of consumers' response to web stores. We then conducted a study to examine the proposed model in different domains of e-commerce.

2. BACKGROUND

In this section, we examine the design of retail environments and online experience as a background to the study's model.

2.1. Designing Retail Environments

Retailers have long recognized the importance of the shopping environment and product design in influencing consumers' affective states (Donovan & Rossiter, 1982; Kotler, 1973; Martineau, 1958). Affect, in turn, influences consumers' behavior (Bagozzi, Gopinath, & Nyer, 1999; Isen, 2001). For example, emotions influence cognitive processes, and evaluation and decision making; positive emotions are positively correlated with customers' satisfaction, which in turn increases the probability of repeat purchase.

Indeed, retailers invest considerable resources in the design of their physical space in order to create an environment that induces desirable emotions in consumers. The term “atmospherics” is used in marketing to denote the design of shopping environments to produce desired emotional effects in consumers that will enhance purchase probability (Kotler, 1973). Atmospheric cues may include store layout and design, employee appearance, and musical and olfactory stimuli (Baker, Grewal, & Levy, 1992; Bitner, 1992; Darden & Babin, 1994; Spangenberg, Grohmann, & Sprott, 2005). The value of store atmospherics was demonstrated repeatedly in traditional store environments. Thus, emotions induced by store atmospherics influence perceptions of both hedonic and utilitarian value (Babin & Attaway, 2000). Studies demonstrated that emotions experienced in the store environment trigger buying responses (e.g., Baker et al., 1992; Donovan, Rossiter, Marcoolyn, & Nesdale, 1994; Gardner, 1985; Gardner & Hill, 1987); influence price and value perceptions (Babin & Attaway, 2000; Grewal & Baker, 1994); sway shoppers’ satisfaction and future shopping intentions (Dawson, Bloch, & Ridgway, 1990; Swinyard, 1993; Yoo, Jonghee, & MacInnis, 1998), and, in general, affect the quality of the transaction between the service providers and the customers (Kluger & Rafaeli, 2000).

However, whereas the means for shaping the experience of shopping are readily available to physical store designers, creating store atmospherics in a virtual world is much more difficult (Levin, Levin, & Heath, 2003). A main concern related to online shopping is that consumers cannot feel, touch, and try products (Jiang & Benbasat, 2007). Tractinsky and Rao (2001) suggested that visual design is a key factor in molding the experience of online shopping. E-retailers have to invest more in visual design to compensate for the medium’s shortcomings: lack of olfactory and tactile information, limited auditory channel, and the lack of opportunity to use physical space to affect atmospherics. Recently, researchers have begun to explore various aspects of the affective qualities of e-retail environments (e.g., Eroglu, Machleit, & Davis, 2001; Kim, Lee, Han, & Lee, 2002; Kim & Yoo, 2000; Menon & Kahn, 2002; Zhang & von Dran, 2001). Studies demonstrated the relations between perceptions of various design elements of virtual stores, emotional states, and consumers’ behavior (Mummalaneni, 2005). For example, entertainment cues (escapism, diversion, aesthetic enjoyment, and emotional release) affected consumers’ involvement and attitudes (Richard, 2005), and stimulating experience predicted consumers’ arousal and pleasure, which enhanced willingness to purchase in the online store (Fiore, Jin, & Kim, 2005).

2.2. Designing the Experience of Online Shopping

HCI researchers and practitioners have traditionally emphasized objective performance criteria, such as time to learn, error rate, and time to complete a task (Butler, 1996). Consequently, the HCI literature expressed only passing interest in the noncognitive aspects of the interaction (Norman, 2002). However, evidence in support of the importance of those nontraditional aspects of HCI has emerged during the last

decade. For example, practical changes in the approach toward product design (e.g., Apple's iMac) indicated that not only performance but also visual appearance has become a major factor in buyers' considerations of IT purchase decisions (Postrel, 2001). Recent product development (e.g., Apple's iPhone and MacBook Air) and empirical studies in the field of HCI confirm the notion that the aesthetic aspects of various computing products serve an important role in shaping users' attitudes in general, and in particular in the context of the web (e.g. Kim et al., 2002). The beauty of IT products is perceived as a hedonic attribute of the product, which leads to pleasurable user experience (Coates, 2003; Hassenzahl, 2003; Norman, 2004; Postrel, 2003) and to increased satisfaction in users (Lindgaard & Dudek, 2003; Tractinsky, Shoval-Katz, & Ikar, 2000).

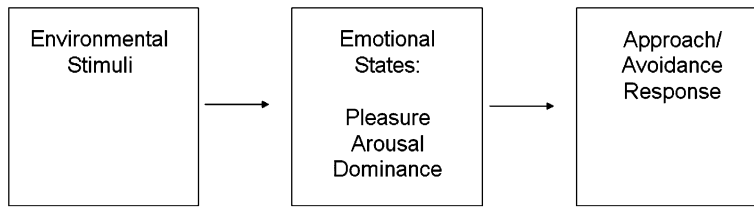
Retailers of electronic stores rely on their websites to attract customers, present products, provide services, and complete transactions. However, unlike traditional marketing approaches to the design of retail spaces, website design rationale and guidelines mirrored the general design approach practiced in the fields of IT and HCI. In the formative years of website design, the emphasis had clearly been on the aspects of functionality and usability rather than on aesthetics or affect (e.g., Li & Zhang, 2005; Nah & Davis, 2002; Nielsen, 2000). Empirical studies, however, showed the inadequacy of this approach. Thus, for Internet users, beauty was an influential aspect of websites (Schenkman & Jonsson, 2000; van der Heijden, 2003). Consequently, recent studies have concentrated on understanding the relationships of website design with aesthetic perceptions (Lavie & Tractinsky, 2004) and affective reactions (Gorn, Chattopadhyay, Sengupta, & Tripathi, 2004; Jiang & Benbasat, 2007; Kim, Lee, & Choi, 2003; Sun & Zhang, 2006).

3. MODEL DEVELOPMENT

To study how perceived design qualities of a Web store affect online consumers' emotions and attitudes toward the store, we propose a model that is based on two areas of research. The first area is based on an environmental psychology model of affective states (Mehrabian & Russell, 1974; Russell & Mehrabian, 1977), which suggests that the affective reaction to environments influences diverse behaviors (Russell & Pratt, 1980). The second area is research on web design. Within this area we focus on two major design attributes: (a) usability, which has been the focus of research on web site design (Nielsen, 2000), and (b) the aesthetics qualities of websites, which is a growing area of interest among HCI researchers (Lavie & Tractinsky, 2004).

3.1. The Environmental Psychology Model

The basic environmental psychology model of Mehrabian and Russell (M-R model) is depicted in Figure 1. It posits that our perceptions of the environment affect the emotional state of a particular individual. Those emotional states can be captured

FIGURE 1. The Mehrabian-Russell model of environmental influence.

by a set of basic underlying dimensions. Mehrabian and Russell (1974) proposed three such bipolar dimensions, abbreviated PAD: (1) *pleasure*—the degree to which a person feels happy or satisfied in a place, (2) *arousal*—the degree of stimulation caused by an atmosphere, and (3) *dominance*—the degree to which a person feels that she has influence over her surroundings and is in control of a situation. Subsequently, the person's emotional state influences her behavior within the environment, framed as “approach–avoidance” response. In past research, approach–avoidance response was operationalized by measuring people's attitudes toward the environment or preferences for specific situations (e.g., Richard, 2005; Yalch & Spangenberg, 1988). For example, Mehrabian and Russell used items such as “How much would you dislike having to work in this situation” (p. 221).

This model and its derivatives have been used extensively in the study of physical retail environments (Babin & Attaway, 2000; Bellizzi & Hite, 1992; Chebat, Gelinass-Chebat, Vaninski, & Filiatrault, 1995; Donovan & Rossiter, 1982; Donovan et al., 1994; Sherman, Mathur, & Smith, 1997; Turley & Milliman, 2000). Recently, researchers have begun to study virtual online environments using the M-R model (Fiore et al., 2005; Huang, 2003; Menon & Kahn, 2002). These studies have demonstrated the general applicability of the model to the online environment. Yet the relations between design attributes of online stores and consumers' emotions remain largely unexplored. Only a few studies have concentrated on empirical examination of design elements as antecedents to consumers' emotions. Eroglu, Machleit, and Davis (2003) distinguished between environmental elements that included information relevant to the shopping task (e.g., price and pictures of the merchandise) and environments that included irrelevant information (such as colors and font styles). Richard (2005) employed similar distinctions, but her use of stimuli was more abstract (e.g., navigational and informativeness characteristics of the environment vs. its entertainment potential). Mummalaneni (2005) studied an online retail environment with various descriptors denoting the environment's design and ambience.

Our model augments the aforementioned studies by offering a systematic and theory-driven treatment of major HCI-design variables that affect store atmospherics and emotions. In particular, it contributes to knowledge by introducing perceived aesthetics as a major aspect of online retail environments. Finally, our model incorporates the emotional dimension of dominance, which was a part of the original M-R model, as opposed to tendency in past research to ignore that dimension.

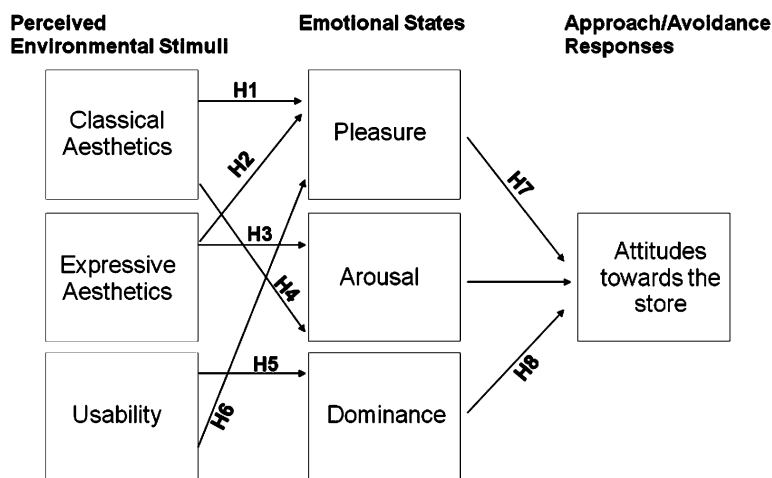
3.2. The Research Model

In line with the environmental psychology model, we suggest that perceptions of the e-retail environment induce certain emotional states in consumers, which in turn affect their attitudes toward the store (see Figure 2). In this model, the environment (i.e., the Internet store) is perceived in terms of two central design concepts: usability and aesthetics. The induced emotional responses are the same three primary dimensions described by Mehrabian and Russell, and the approach–avoidance response of the M-R model is reflected in our model by users' attitudes toward the store. Next we break down the model's components.

The Environment—Web-Site Design Characteristics

Online stores can be designed along various dimensions, each comprised of numerous design elements. Studying each of these elements is impractical due to the sheer quantity of such elements, the many ways in which they interact with each other, and the context-dependent nature of HCI design, which makes the influence of those elements difficult to isolate. Thus, studying higher order, more abstract design dimensions is likely to yield better insights (e.g., Park, Choi, & Kim, 2005). In this work, we concentrate on two high-level design dimensions: usability and aesthetics. We chose these dimensions for three reasons. First, they are central to the design of HCI. Consequently, they are likely to be two of the most salient to the consumers when they interact with the e-store (e.g., Kim et al., 2002) and hence the most likely to influence the perceived atmosphere of the retail outlet and consumers' emotions. Finally, both attributes provide a relatively abstract view of the design space; by subsuming a large number of other low-level design features, they provide a conceptually parsimonious view of the e-retail environment (Kim et al., 2002).

FIGURE 2. The proposed research model and hypothesized relations between constructs.



Usability. Usability has been the most influential concept of HCI for the last two decades (Butler, 1996). Usability work focuses the design and evaluation activities around users' ability to accomplish their tasks efficiently. Store layouts that facilitate a consumer's way-finding are critical for retail success, even more so for online retailers as a consumer's exit from an online store is but a click away (Griffith, 2005). Ease of navigation is a major component of website usability (e.g., Nielsen, 2000) and is analogous to ease of navigation in physical stores. The process of navigation and search on a website should require minimal effort, and the website should be designed in such a way that it facilitates product search within a short amount of time, minimize disorientation, and provide users with a good sense of control over the interaction (Nah & Davis, 2002). The concept of usability is broad, containing several aspects (Hornbæk, 2006). In this study, we refer to one of usability's main aspects—the subjective assessment of ease of use (e.g., Shackel, 1991)—which can be viewed as similar to the ease-of-use constructs in the technology acceptance model (cf. Davis, 1989). We chose to concentrate on this usability aspect because we are interested in how users perceive the environment, whereas past research has shown relatively low correlations between subjective and objective measures of usability (e.g., Hornbæk & Law, 2007).

Aesthetics. Recent HCI research suggests that in addition to usability, aesthetics also serves a major role in affecting users' attitudes toward websites. This argument goes hand in hand with a research tradition that regards aesthetics as a key factor in how people perceive their environment (cf. Tractinsky, 2004). Lavie and Tractinsky (2004) found that users perceive the aesthetic of web pages along two dimensions: classical aesthetics and expressive aesthetics. The empirical emergence of two aesthetic dimensions in websites is consistent with other scholars' and designers' conceptualizations and with empirical findings from the field of environmental aesthetics. Classical aesthetics represents the degree to which the design is clean and balanced. It represents qualities embraced by classical notions of what constitutes aesthetic design (Johnson, 1994; Krufft, 1994) and thus increases understanding, aids in "making sense," and reduces ambiguity. To a large extent, it represents how the design of the online store corresponds to environmental qualities such as "visual clarity" (Nasar, 1988), "order" (Arnheim, 1964/1966), and "legibility" (S. Kaplan, 1988). Expressive aesthetics relate to the creativity and innovativeness of the design. It corresponds to the "visual richness" dimension (Nasar, 1988) of the site, which includes ornamentation and expressions of the designers' character, originality, and creativity (Lavie & Tractinsky, 2004). It also relates to Arnheim's (1966) "complexity" to S. Kaplan's (1988) "stimulating" factor, and to Coates's (2003) "novelty"—all of which are hypothesized to increase arousal or involvement (Lavie & Tractinsky, 2004).

The advantage of this componential view of aesthetics is that, relative to viewing aesthetics as a unidimensional construct, it allows researchers to tease out finer details about how aesthetics relate to users' perceptions of other attributes of the website, how website design relates to users' emotions, and how it influences their attitudes toward the site. Thus, research suggests that classical aesthetics is strongly

correlated with evaluations of usability, that both aesthetic dimensions contributed to user satisfaction (Lavie & Tractinsky, 2004), and that expressive aesthetics is a better determinant of immediate attractiveness impressions of websites (Tractinsky, Cokhavi, Kirschenbaum, & Sharfi, 2006). At the same time, the level of abstraction of the chosen dimensions is high enough to allow the generalization of the results regardless of the designers' choice of specific, lower level design elements (e.g., font type and color, line width, etc.).

In our model, we are especially interested in the effects of the e-store's perceived aesthetics on consumers' emotions (e.g., Desmet, 2002; Norman, 2004; Rafaeli & Vilnai-Yavetz, 2003). There are several reasons for such effects to take place, but perhaps the most obvious is that first aesthetic impressions are formed immediately (e.g., Berlyne, 1971; Lindgaard, Fernandes, Dudek, & Brown, 2006; Norman, 2004; Tractinsky et al., 2006; Zajonc & Markus, 1982). Those first impressions may linger and color subsequent evaluations of objects. Thus, to a large extent, aesthetics sets the tone for the rest of the interaction.

Emotional States

The major premise behind the M-R model is that environmental stimuli are perceived in terms of their affective qualities. Those emotional states can be reduced into a set of basic underlying dimensions. Originally, Mehrabian and Russell (1974) proposed three such bipolar dimensions: pleasure, arousal, and dominance (PAD). The original conceptualization underwent several modifications. Modern interpretations suggest the existence of only two basic emotional dimensions: pleasure (also termed *valence* or *evaluation*) and arousal (also termed *activation*, *energy*, or *engagement*) that together constitute "core affect" (Russell, 2003). The affective quality of an object (e.g., a website) can be estimated by the dimensions of the core affect (Russell, 2003). Studies have confirmed the bipolarity nature of these dimensions and their independence of each other (e.g., Feldman-Barrett & Russell, 1998; Green, Goldman, & Salo, 1993; Mehrabian, 1995; Reisenzein, 1994; Yik, Russell, & Barrett, 1999).

Over the years, researchers have lost some interest in the third PAD dimension, dominance (or perceived control). The loss of interest stemmed from arguments that it represents a more cognitive reaction and less of an affective state (Feldman Barrett & Russell, 1999) and from the difficulties of empirical studies to establish its independence from the other two dimensions (Brenngman & Geuens, 2004) or its effects on approach/avoidance variables (Babin & Attaway, 2000). Still, dominance is included in our model for two reasons. First, its lack of independence from the other two affective states in the M-R model may have been merely an artifact of limited stimulus sets in many studies (cf. Brenngman & Geuens, 2004). Thus, the independence of the dominance dimension was demonstrated in a study featuring a more representative and comprehensive stimulus set (Mehrabian, 1995). Second, dominance appears particularly relevant to HCI in general and in particular to situations such as e-retail where the consumer's interaction with the system is not as intuitive as in the physical world but rather mediated by a computerized system.

In such environments, perceptions of control (or lack thereof) are very important (Brown, 1986; Huang, 2003; Sautter, Hyman, & Lukosius, 2004; Shneiderman, 1998).

In a study of representative everyday situations, Mehrabian, Wihardja, & Ljunggren (1997) found that people most preferred situations that elicited positive pleasure and positive dominance. People least preferred situations that elicited negative pleasure and negative dominance (i.e., being controlled) coupled with high arousal. The study also demonstrated one of the interesting features of the PAD model—its contingent nature. For example, in unpleasant situations, people preferred situations engendering feelings of low arousal rather than high arousal; unpleasant situations can also be mitigated if users have more control over the situation.

Response: Approach or Avoidance

The M-R model relates the emotional response variables to a diversity of behaviors, such as physical approach, performance, affiliation, and verbally or nonverbally expressed preference. These behaviors are more generally subsumed under the concept of approach–avoidance. Thus, environmental stimuli (e.g., a landscape, a store's atmospherics) influence a person's affective states, which in turn will influence his or her response in terms of choosing to approach or to avoid the environment. In a retail context, approach responses may include the desire to stay longer in the store, to explore it, to be willing to return, and to communicate with salespeople. Examples of avoidance responses are a desire to leave the store, to be inactive within it, and to avoid interaction with salespeople (Bitner, 1992; Donovan & Rossiter, 1982). In the context of e-retail, an approach response would mean greater tendency to browse, search, and interact with a store site for a longer period; greater willingness to buy from the store; and a better chance of actual purchase and loyalty. An avoidance response would mean just the opposite.

4. HYPOTHESES

Based on our review of the literature, we propose a set of relationships between the model variables. These relationships are depicted in Figure 2 and are further explained and formulated next.

4.1. Relationships Between Environment and Emotions

In the proposed model, the perceived environment comprises two salient design aspects of the online store: its usability and aesthetics. The aesthetic aspect is further divided into two subdimensions: classical aesthetics and expressive aesthetics (Lavie & Tractinsky, 2004). The classical aesthetics subdimension emphasizes orderly and clear design; expressive aesthetics is manifested by the designers' creativity and originality and represent qualities that go beyond the classical principles and that stress the designer's expressive power. In general, we expect both aesthetic dimensions to correlate

positively with the emotional state of pleasure, as pleasure is regarded as a prominent emotion accompanying the aesthetic experience (e.g., Coates, 2003; Sheppard, 1987). The new wave of research on the visual aesthetics of computer interfaces suggests that product aesthetics is a strong determinant of pleasure experienced by the user during the interaction (Coates, 2003; Hassenzahl, 2003; Jordan, 1998; Norman, 2004; Postrel, 2003). This premise is based not only on philosophical, linguistic, or theoretical grounds, but also on empirical evidence (e.g., Gannon, 2005; Lavie & Tractinsky, 2004). Thus, we hypothesize:

- H1: Sites perceived by users as having higher levels of classical aesthetics induce higher levels of pleasure.
- H2: Sites perceived by users as having higher levels of expressive aesthetics induce higher levels of pleasure.

Whereas we expected the two aesthetic dimensions to be positively associated with pleasure, their effects on arousal are expected to differ. Due to its emphasis on novel and creative stimuli, expressive aesthetics is expected to correlate positively with arousal (e.g., Berlyne, 1971; Coates, 2003; Gait, 1985; Gilboa & Rafaeli, 2003; Mehrabian & Russell, 1974). Classical aesthetics, on the other hand, adhere to familiar and accepted notions of design. As such, it is familiar; it increases understanding and sense making and reduces ambiguity (S. Kaplan, 1988; Lavie & Tractinsky, 2004) and is expected to have a calming effect on the senses. However, there is no evidence or theoretical argument to suggest that it will reduce arousal to below average levels. Hence, we do not expect classical aesthetics to affect arousal.

Consequently, we derive the following hypotheses:

- H3: Sites perceived by users as having higher levels of expressive aesthetics induce higher levels of arousal.
- H4: Sites perceived by users as having higher levels of classical aesthetics will not influence the level of arousal.

Perceptions of the web store's usability are expected to correlate positively with the feeling of dominance. The IT literature has long emphasized the importance of allowing the user to be in control of the technological environment (e.g., Brown, 1986; Compeau & Higgins, 1995; Shneiderman, 1998) and the role of usability in achieving such control. In retail environments, settings that restrict consumers' ability to browse for items or limit their choice reduce feelings of control (Yani-de-Soriano & Foxall, 2006). Similarly, the process of navigation and search in online stores should minimize occurrences of being "lost in space" and provide users with a good sense of control over the interaction (Nah & Davis, 2002). We expect that users' perceptions of having control over the interaction, and hence of higher likelihood of achieving their goals, will increase their feeling of dominance in the e-store's environment. In addition, smoother interactions facilitated by better usability are likely to increase pleasure, whereas lower levels of usability increase frustration (Brave & Nass, 2003) and thus

reduce pleasure. Hence, we hypothesize that usability effects on emotions will be as follows:

- H5: Sites perceived by users as more usable will increase feelings of dominance.
- H6: Sites perceived by users as more usable will induce higher levels of pleasure.

4.2. Relationships Between Emotions and Approach–Avoidance

We expect that consumers who are more pleased and who feel more in control of their environment will exhibit greater approach, rather than avoidance, tendencies. For example, in the traditional retail environment, pleasure was a significant predictor of extra time spent in the store and actual incremental spending (Donovan et al., 1994). In e-retail context, Koufaris, Kambil, and LaBarbera (2002) showed that perceived control and shopping enjoyment can increase the intention of new customers to return. The relations between arousal and approach/avoidance may be more complicated. Although the overall pattern of results suggests that pleasantness has a consistently positive effect on approach behaviors, arousal effects are less consistent and have varied across studies (Kaltcheva & Weitz, 2006). This may stem from two reasons. First, these relations may reflect the inverted U-shaped relations often observed between arousal and other attitudinal or behavioral measures (e.g., Berlyne, 1971). Second, these relations may be contingent upon the nature of the shopping sites and products (Kaltcheva & Weitz, 2006). Thus, our hypotheses relate only to the effects of pleasure and dominance on users' response.

- H7: Higher levels of pleasure will increase users' approach response.
- H8: Higher levels of dominance will increase users' approach response.

5. METHOD

We conducted a series of studies, including focus groups and preliminary studies before embarking on the main study. During these preliminary studies, we have also dealt with certain methodological issues as discussed next.

5.1. Focus Groups

Two focus groups (each consisting of eight Master of Design students) were conducted to examine the adequacy of the proposed model constructs and the relations among them. In particular, we were interested to learn whether important variables or relationships are missing from the model. Members of each group were presented with a sample of eight websites in different domains. They were asked to define and to classify the sites according to their aesthetic and usability dimensions. Participants were also encouraged to describe their emotional reactions to each site.

Overall, participants' responses and the order of responses were consistent with our model. Mostly, the participants first raised issues related to design aspects, then they teased out emotions, and they concluded with attitude statements. Without being prompted to discuss a specific topic, most of the participants commented first on the aesthetic and usability aspects of the sites. These included comments such as "very organized," "minimal," "everything stands on the pixel," "retro," "too sophisticated," "avant-garde," "seems very efficient," "in a second you know what to do and where to go," "big mess, small fonts," and "I like the menu, seems convenient." Then, they continued to discuss their emotions regarding the sites (e.g., "very boring," "not exciting," "heavy feeling," "stressed," "aggressive," "feeling clam," and "sensual"). They concluded with comments that reflected their overall attitude, or approach/avoidance response (e.g., "I wouldn't even enter this site," "It's not for me, but maybe for someone who is really goal oriented," "It's not appetizing," and "I feel I can buy here everything").

5.2. Operationalization Issues and Preliminary Studies

E-commerce Domains

To increase the generalizability of the study's results we decided to study two e-commerce domains. Retail domains can be distinguished according to various perspectives. One such distinction has been made by Nelson (1970, 1974), who suggested two categories of products: search and experience. "Search goods" are those for which full information on dominant attributes can be known prior to purchase (e.g., books). "Experience goods" are those for which qualities a consumer cannot determine prior to purchase and direct experience is necessary (e.g., perfume; Klein, 1998; Nelson, 1974).

Another distinction, which is particularly relevant to e-retail involves "high-touch" versus "low-touch" products. It relates to the degree to which consumers feel the need to physically inspect the product before buying (Levin et al., 2003; Lynch, Kent, & Srinivasan, 2001). High-touch products are those that the consumer desires to touch or experience before buying. Fashion products are a good example, where the feel of a fabric has to be experienced prior to purchase (Bhatnagar, Misra, & Rao, 2000). High-touch products that are sold successfully online include cloths, food, wine, and flowers. In contrast, the consumer can normally evaluate the quality of low-touch products without inspecting them (Levin et al., 2003). For such products as computer hardware and software, books, and financial services, gathering information is more important than direct experience. Other products may fall at different points on the continuum.

In general, low-touch and high-touch domains are likely to differ along the environment (design) dimensions, and consequently along the emotions that the environment produces. Website design of high-touch domains is more likely to emphasize aesthetics, and especially expressive aesthetics, in order to enhance the shopping experience that is inherent in this kind of product and that had been lost in the

transition from physical to virtual shopping (Tractinsky & Rao, 2001). In low-touch domains, usability would play a greater role in order to facilitate information-seeking activities. This would result in users feeling more in control and thus in higher ratings along the dominance dimension.

It is important to note that although differences between the domains are expected in terms of the design dimensions and the resulting emotions, it is not expected that the nature of the relationships between the model's variables will differ as a function of the domain. That is, the research hypotheses should hold across store domains.

Bipolar Versus Unipolar Scales

There is an ongoing debate in the literature regarding the type of items that should be used to measure emotions (Gannon & Ostrom, 1996). Some researchers advocate the use of bipolar rating scales, which explicitly label one category at either endpoint of the response scale (e.g., participants indicate in response to a single item whether their feeling is closer to happy or to sad). Other researchers have used unipolar scales, which ask about one emotion at a time (e.g., the participants indicate how happy they are). Bipolar items were used in the original study of the environmental psychology model (Mehrabian & Russell, 1974), as well as in many of the studies that followed (e.g., Bellizzi & Hite, 1992; Brengman & Geuens, 2004; Donovan & Rossiter, 1982; Donovan et al., 1994; Fiore et al., 2005; Michon, Chebat, & Turley, 2005; Mummalaeni, 2005; Spangenberg et al., 2005). In those studies, the PAD scales exhibited good psychometric properties. However, opponents have pointed out several limitations of the bipolar scales. They have argued that the scales may not distinguish between neutrality and ambivalence (K. J. Kaplan, 1972), that they may artificially impose bipolarity on the data (Watson & Tellegen, 1999), or that the two concepts measured by the same item may not vary inversely (Solomon, 1978).

Still, practical considerations favor the use of bipolar scales in that they may reduce the questionnaire's length and save time for both respondents and researchers (e.g., Babin & Darden, 1995). In addition, recent studies have verified the adequacy of bipolar items for measuring emotions under the PAD paradigm (Mehrabian, 1995; Russell & Carroll, 1999). To examine the practical adequacy of using the bipolar and the unipolar scales, we conducted two preliminary studies, as described next.

Preliminary Studies

In addition to the goal of examining the two scale types, the two preliminary studies also gauged the overall adequacy of the proposed model to the e-retail environment, and pilot-tested the study's measures (questionnaire items). The first study (Porat & Tractinsky, 2006), examined the proposed model across five different store domains, using unipolar items for the emotions scale. The second study (Porat, Liss, & Tractinsky, 2007), examined the proposed model across three different store domains (bookstores, museum stores, and luxury goods). In that study, emotions were measured using bipolar items.

In general, the results of both studies supported the relationships posited by the model; high levels of expressive aesthetics were translated to higher levels of arousal and pleasure, and higher levels of usability produced higher levels of dominance. In addition, all three emotional states affected attitudes toward the store, whereas pleasure had the strongest overall effect on attitudes, a finding that was consistent across domains. Finally, although both measurement techniques proved reliable, using the bipolar items provided the practical benefit of using fewer items. Hence, we chose to use this technique in our main study.

The preliminary studies provided evidence for the general plausibility of the model and in support for the reliability of our measures. The main study, described next, employed a larger sample size, which enabled us to use confirmatory factor analysis to test the model in two different domains. Such a comparison is important given the different design requirements of sites from various domains (Kempf, 1999; Zhang & von Dran, 2001).

5.3. Main Study

To select the web store domains and sites for the main study, we conducted two pretests. We used the first pretest to select two store domains and the second pretest to select two sites in each domain.

Domain Selection. We conducted a small study to identify and select ecommerce domains for the main study. Seventy-one people (who did not participate in the main study that followed) rated 13 product domains according to three aspects: (a) whether the domain sells high-touch products (i.e., consumers feel the need to inspect the product before buying) versus low-touch products (i.e., consumers can normally evaluate the product without inspecting it), (b) the perceived cost of the products sold in each domain, and (c) the likelihood of buying products that belong to that domain in online stores.

For the study, we selected two retail domains that differed mostly on all three aspects. Bookstores were rated as a low-touch domain that holds relatively low-price merchandise, with high probability for online purchases. Apparel was selected as a domain holding high-touch and relatively highly priced products, in which online purchasing is quite unlikely.

Site Selection. We selected domains and sites in order to create variance in the design aspects (i.e., the atmospherics) of the sites (rather than to test for differences between sites or domains). For practical reasons (length of the study) we chose only two existing sites from each domain. We preferred real-world sites over simulated sites mainly because of their ecological validity and their full functionality. We also realized that it would be quite impractical to insist on finding real-world sites that will support an independent manipulation of the three design variables (classical aesthetics,

expressive aesthetics and usability).² Thus, we pretested the sites only to verify that they differ in terms of overall aesthetics. Note that this decision does not specify in advance whether and how the sites differ in terms of classical aesthetics, expressive aesthetics, or usability. It only provides some indication that the stores communicate different atmospherics.

To select a set of online stores for the books and the apparel domains, we asked 70 people (who did not participate in the previous pretest or in the main study that followed) to rate the overall aesthetics of four online stores from each domain, on a 0 (*not beautiful at all*) to 10 (*very beautiful*) scale. Some of the stores in this set were selected according to recommendations of the participants in the focus groups, and the rest were selected by the authors.

Based on the aesthetics scores of the eight stores we selected two sites from each domain for inclusion in the main study: one store that received relatively high aesthetic evaluations and one that was evaluated as relatively low on aesthetics. The selected bookstores were Angus Robertson (M aesthetic score = 6.45) and Collins Books (M aesthetic = 4.63). The apparel stores were Guess (M aesthetics = 7.41) and Blair (M aesthetics = 4.87). The stores' designs were not changed during the study. Screen shots of the e-stores' home pages at the time of the study are presented in Appendix A.

Sample. Three hundred twenty-seven students participated in this study. About half of the respondents (49.5%) were women. The average age was 24.5 years ($SD = 2.61$) and ranged between 18 and 30. The participants were recruited by calls that were posted on physical message boards and on an online students' forum. Participants received a monetary compensation of 50 NIS (about €10) for their participation. All participants reported to be experienced web users. Sixty-two percent of the participants reported to have purchased at least one item in an online store; thirty-one percent of them indicated that they have purchased at least three items online.

Conditions. Participants were assigned randomly to one of four conditions. Each condition included two stores—one from each domain. The four conditions included all the possible combinations of stores from the two domains (e.g., high-aesthetics bookstore and low-aesthetics apparel store; high-aesthetics bookstore and high-aesthetics apparel store, etc.). The order of the stores was counterbalanced within each group to control for potential order effects.

Procedure and Task. The study took place in a computer lab, in groups of up to 16 participants, supervised by two instructors. A computer program was developed to administer the study. An instructor briefed the participants about the study and they then signed a consent form. Before commencing the session, participants received a page of written instructions. The instructions included a brief description of the

²The study uses correlational analysis, which does not require that the independent variables will be orthogonal.

study's stages and of the computer program. In addition, the instructor also read aloud the instructions.

During the session, the participants first filled out a short background questionnaire (indicating their age, gender, and number of products they bought online in the past). These variables did not have significant effects on the dependent variable (attitudes toward the store) and thus were not used further as control variables in this study. The participants then evaluated the two online stores (one from the books domain and one from the apparel domain). They were instructed to ostensibly purchase a few items via each of the two e-stores (see Appendix B for the instructions). The instructions did not specify which items to purchase but encouraged the participants to browse the e-stores, form some impression, and simulate a true process of e-purchasing. After visiting each site, the participants completed a questionnaire, based upon their impression of that site. This questionnaire included items measuring the model's constructs: emotions (pleasure, arousal, and dominance), aesthetics (classical and expressive), usability, and approach/avoidance response. The study lasted about 45 min.

Measures. The questionnaire included the following scales:

1. Aesthetics: Four items for each of the classical aesthetics and expressive aesthetics scales were adopted from Lavie and Tractinsky (2004).
2. Usability: Four items for the usability scale were the same as in Porat and Tractinsky (2006) and Porat et al. (2007). These items stressed the site's ease of navigation and ease of use.
3. Emotions: Bipolar items for the three emotion scales were taken from Porat et al. (2007). These scales were based on the original items of Mehrabian and Russell (1974) with slight modifications to fit the e-retail context. There were five items in the pleasure scale and six items in the arousal and dominance scales.
4. Approach–Avoidance: We used the same five items from Porat and Tractinsky (2006) and Porat et al. (2007), which reflected attitudes toward the store. The scales and their items are listed in Appendix C.

The items for the classical aesthetics, expressive aesthetics, usability, and approach/avoidance response scales were presented as 7-point statements, with the endpoints marked as “fully agree” and “fully disagree.” For the pleasure, arousal, and dominance items, we used bipolar statements of emotions in which opposing emotions were displayed as the endpoints of a continuum (e.g. happy – unhappy). The participants marked one out of nine slots that spanned between the two opposing emotions.

6. RESULTS

6.1. Perceived Design Dimensions

In this subsection, we examine whether the selected stores differed from each other in terms of their design variables. Figure 3 shows means and standard de-

FIGURE 3. Ratings of classical aesthetics, expressive aesthetics, and usability by domains, sites, and combined

Variable	Domain						All ^g
	Books			Apparel			
	LA ^a	HA ^b	Total ^c	LA ^d	HA ^e	Total ^f	
Classical aesthetics							
<i>M</i>	4.26	4.71	4.50	4.65	5.39	4.99	4.74
<i>SD</i>	1.49	1.27	1.40	1.24	1.09	1.23	1.34
Expressive aesthetics							
<i>M</i>	2.85	3.02	2.94	2.99	3.98	3.44	3.19
<i>SD</i>	1.19	1.1	1.14	1.27	1.18	1.32	1.26
Usability							
<i>M</i>	4.59	5.06	4.83	5.17	5.35	5.25	5.04
<i>SD</i>	1.49	1.31	1.42	1.32	1.26	1.29	1.37

Note. Attributes are rated on a 1-to-7 scale (average = 4). LA = Low Aesthetic site; HA = High Aesthetic site.

^a*n* = 157. ^b*n* = 170. ^c*N* = 327. ^d*n* = 178. ^e*n* = 149. ^f*N* = 327. ^g*N* = 654.

variation for the perceived design dimensions (aesthetics and usability) of the four stores. Overall, the participants rated the sites as above average in terms of their classical aesthetics and usability and below average in terms of their expressive aesthetics. The results indicate that, within each domain, stores that were pretested as more aesthetic were rated in the main study higher on the classical aesthetics and expressive aesthetics scales. These differences were statistically significant for classical aesthetics in both domains: in the books domain, $F(1, 326) = 8.9, p < .01$; in the apparel domain: $F(1, 326) = 32.3, p < .001$. For expressive aesthetics the difference was statistically significant only in the apparel domain, $F(1, 326) = 52.6, p < .001$, whereas the difference in perceived usability was statistically significant only in the books domain, $F(1, 326) = 9.51, p < .01$. These results indicate that the selection of stores was effective in introducing some variability in the online environment. Recall that our objective in this study is not to test differences between ratings of stores or domains. Rather, it is to show that the *relationships* specified in the model hold across different domains. We test this objective in Sections 6.2 and 6.3.

6.2. Confirmatory Factor Analysis

The data were analyzed in two stages, following the conventional practice of confirmatory factor analysis of latent variables modeling (Anderson & Gerbing, 1988). First the measurement model was assessed to determine how observed items load on the constructs in the model. Next, the study's hypotheses were tested by assessing the relationships among the variables in the structural model. The measurement and the structural model were assessed using AMOS Version 17.

Assessing the Measurement Model

A measurement model was specified for the factors and their corresponding items. Because we wanted to compare the model in two different domains, we used a multigroup invariance testing, in which domains served as groups. Because domain was a within-subjects factor (each participant evaluated one site from the Books domain and one site from the Apparel domain), there was a concern that the response sets of the two sites are related. We tested this possibility by calculating the correlations between the corresponding questionnaire items of the two sets (a total of 32 such correlations). The analysis revealed low correlations between the items. The individual correlations ranged from $-.09$ to $.25$, and the average absolute value of correlations within scales was 0.2 or less, suggesting that these responses were independent. Therefore, we could perform ordinary multigroup analysis with the bookstores' data set as one group and the apparel stores' data set as the other group.

It is customary to start the testing of multigroup invariance by establishing the measurement model for each group separately (Byrne, 2001). Thus, we started the analysis testing the model for each domain (books and apparel) separately. The analysis revealed adequate fit in each of the domains.

We then tested the measurement model using the combined data set (i.e., the data from the two domains). We decided to drop two of the 34 original items based on their low loadings on their respective factors. One of these items had a very low factor loading ($.31$) on its respective factor (arousal). The other item had a relatively low loading ($.67$) on the dominance factor. Because this item was introduced for the first time in this study, we decided that its relatively low loadings (below the recommended threshold of 0.7) does not justify its inclusion in further analyses. The fit statistics of the modified measurement model (selected based on recommendation of Marsh, Hau, & Grayson, 2005) indicated good fit across the two domains. Figure 4 presents fit statistics for each of the two domains and for the combined model.

Examining the items' loadings of the model after dropping the two problematic items indicated that most of the model's items (27 of 32) loaded above the recommended threshold of 0.7 on their respective latent constructs. We retained the five indicators with loadings below 0.7 to maintain continuity with previous research, which used the same scales (see Appendix C for final set of items and their loadings on their respective factors).

In addition, the study's constructs were internally consistent and distinct from each other. The Cronbach's alpha coefficient of reliability for variables ranged between 0.81 and 0.95 , indicating good internal consistency (see Figure 5). The correlations between the study's indicators show that items were correlated higher with other items from the same constructs than with items from other constructs (see Appendix D). A slight exception is the relatively high correlations between some indicators of the pleasure scale and some items of the attitude scale. Still, the items for both constructs are based on scales that have been validated in previous studies. Thus, it seems that the correlations reflect an association between the scales given the causal nature of the

FIGURE 4. Fit indices for the three measurement models

Fit index	Recommended cut-off ^a	Books	Apparel	Combined
χ^2	Nonsignificant χ^{2b}	1036.8 (443); $p < .001$	902.5 (443); $p < .001$	1939.36 (886); $p < .001$
χ^2/df	**	2.34	2.04	2.19
GFI ^a	$\geq .9$.95	.96	.92
CFI	$\geq .9$.914	.94	.93
TLI	$\geq .9$.904	.933	.92
RMSEA	$< .05$ good fit $< .08$ acceptable fit	.064	.056	.043
Intervals		.059–.069	.051–.062	.040–.045
PCLOSE		.000	.023	1

Note. GFI = goodness of fit index; CFI = comparative fit index; TLI = Tucker-Lewis index; RMSEA = root mean square error of approximation.

^aAccording to Marsh et al. (2005).

^bChi-square-based indices are not particularly useful as GOF indices because of their sensitivity to sample size. An exception may be using χ^2/df as a basis for comparing between alternative, competing models of the same data in that it corrects for model complexity (Marsh et al., 2005).

two constructs (cf. Straub, Boudreau, & Gefen, 2004) and the naturalistic context of the study rather than due to lack of conceptual and operational distinction between them.

Assessing the Structural Model

Next, we examined the structural model (i.e., the relationships between variables). In testing the model, we allowed the three independent variables (classical aesthetics, expressive aesthetics, and usability) to covary, because in “real-world” environments they are likely to be correlated (cf. Lavie & Tractinsky, 2004). In addition, the tested model included a path between arousal and attitudes toward the store because, despite not having a theory to support such a relationship, we could not rule out the possibility that it exists.

FIGURE 5. Zero-order correlations between the model's scales and Cronbach's alpha coefficient of reliability (on the diagonal)

Variable	Correlations						
	1	2	3	4	5	6	7
1. Classical aesthetics	.86						
2. Expressive aesthetics	0.41*	.89					
3. Usability	0.48*	0.26*	.90				
4. Pleasure	0.41*	0.42*	0.43*	.84			
5. Arousal	0.32*	0.41*	0.31*	0.68*	.87		
6. Dominance	0.27*	0.16*	0.41*	0.53*	0.46*	.81	
7. Attitudes	0.49*	0.55*	0.52*	0.74*	0.62*	0.40*	.95

* $p < .001$.

FIGURE 6. FIT measures of comparative models

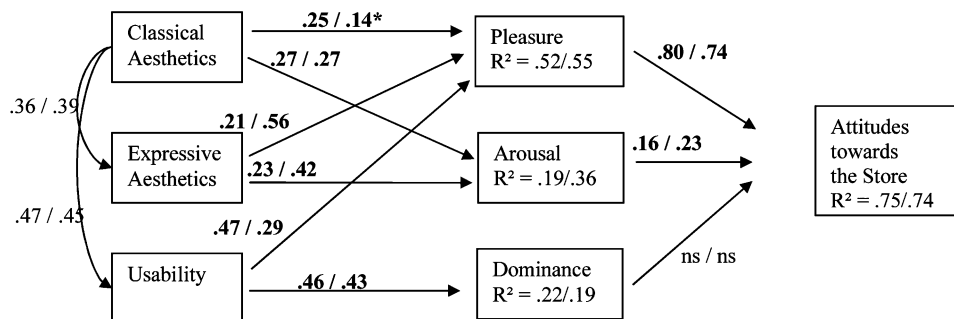
Fit index	Research model	Mediation analysis model
χ^2	2472.36 (906); $p < .001$	2376.8 (900); $p < .001$
χ^2/df	2.73	2.64
GFI*	.90	.90
CFI	.89	.90
TLI	.88	.89
RMSEA	.051	.05
Intervals	.049–.054	.048–.053
PCLOSE	.154	.451

Note. *GFI = unbiased goodness of fit index; CFI = comparative fit index; TLI = Tucker-Lewis index; RMSEA = root mean square error of approximation.

The fit statistics (see research model in Figure 6) indicate that the structural model had acceptable fit. Figure 7 displays the standardized path coefficients for the books and the apparel domains.

The results indicate an association between classical aesthetics and feeling of pleasure, supporting Hypothesis 1; expressive aesthetics was associated with higher levels of both pleasure and arousal, supporting Hypotheses 2 and 3; and usability was associated with feeling of dominance and pleasure, supporting Hypotheses 5 and 6. Consistent with Hypothesis 7, pleasure contributed significantly to attitudes toward the store.

Two of the hypotheses were not supported. Higher levels of classical aesthetics were associated with higher arousal levels, thus not supporting Hypothesis 4. Dominance was not associated with attitudes toward the site, thus not supporting Hypothesis 8. Overall, these results were consistent within both the books and the apparel domains. However, the two domains differed to some extent in terms of the strengths of the associations between the model's variables.

FIGURE 7. Research model—standardized path coefficients for books/apparel online stores.

Note. All numbered regression paths are significant ($p < .001$) except * ($p < .05$)

6.3. Mediation Analysis

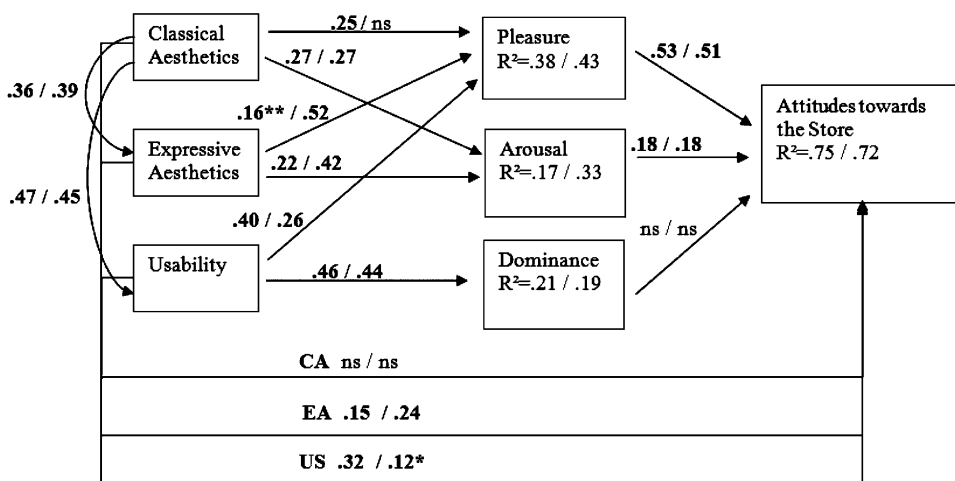
Although the results support our proposed model, it may be argued that online store characteristics (operationalized as design variables) influence attitudes toward the online store directly, without any mediation by affect. To examine this possibility we tested a second model that included direct links between the design factors and attitudes, in addition to the paths specified in our original model. Two conditions have to be satisfied to support the direct influence argument: (a) the direct links between design factors and attitudes have to be significant, and (b) the indirect links between design factors and attitudes, which were found to be significant in our original model, should turn insignificant.

The fit indices of the mediation analysis model are presented in the rightmost column of Figure 6. They indicate acceptable fit, with slight improvement over the original model. A chi-square difference test between the two models was statistically significant, $\Delta\chi^2(6) = 95.6, p = .001$, suggesting that the second model is preferred (Byrne, 2001; Kline, 1998).

Figure 8 shows the standardized path coefficients for the revised model. Statistical significance of mediation effects were computed using the bias-corrected bootstrap confidence intervals (MacKinnon, Lockwood, Hoffman, West, & Sheets, 2002), computed from 2,000 samples. The effects (direct, indirect, and total) and their associated p values are presented in Figure 9.

The analysis indicates significant direct links between attitudes and two of the design variables: usability and expressive aesthetics. The indirect links remained quite similar to those in the original model, with the exception of the reduced coefficients

FIGURE 8. Mediation analysis model—standardized path coefficients for books/apparel online stores.



Note. All numbered regression paths are significant ($p < .001$) except ** ($p < .01$) and * ($p < .05$).

FIGURE 9. Mediation testing model—standardized total, direct, and indirect effect estimates, bootstrap standard error, and two-tailed significance level

Effect	Books			Apparel		
	Total	Direct	Indirect	Total	Direct	Indirect
CA → attitudes	.23** (.09)	<i>ns</i>	.18** (.07)	.19* (.08)	<i>ns</i>	.11* (.06)
EA → attitudes	.27*** (.06)	.15*** (.05)	.13** (.05)	.58*** (.06)	.24*** (.06)	.34*** (.06)
US → attitudes	.51*** (.07)	.32*** (.06)	.19*** (.06)	.23*** (.06)	.12* (.05)	.11** (.05)

Note. CA = classical aesthetics; EA = expressive aesthetics; US = usability.

*** $p < .001$. ** $p < .01$. * $p < .05$.

between pleasure and attitudes. Thus, overall, it appears that affect partially mediates design effects on attitudes.

As can be seen in Figure 9, perceived usability had the most prominent influence on attitudes in the books domain (.51), whereas perceived expressive aesthetics had the main influence on attitudes in the apparel domain (.58). Combined, the magnitude of the two aesthetic dimensions' effects on attitude was equal to that of usability in the books domain and was considerably higher in the apparel domain.

Figure 9 indicates that perceived classical aesthetics influenced attitudes only indirectly, through pleasure and arousal. Usability influenced attitudes mainly directly, and especially in the books domain, whereas expressive aesthetics influenced attitudes mainly indirectly (through pleasure and arousal) in the apparel domain (.34).

7. DISCUSSION

The explosive growth of online shopping during the past decade calls for the convergence of two distinct and seemingly incompatible disciplines—marketing and HCI. This work offers a perspective that merges the two disciplines by suggesting that important design aspects of the online store are part of the store's atmospheric, which influences consumers' emotional states and, in turn, their attitudes toward the store. The design aspects used in this study— aesthetics and usability—can be perceived as instantiations of broader design concepts such as the hedonic and pragmatic attributes of environments or products. A process similar to the one entailed by the M-R model (Mehrabian & Russell, 1974), which was studied extensively in various environments, is proposed by Hassenzahl (2003) regarding products. It suggests that people construct the apparent product character based on its perceived hedonic and pragmatic qualities. These constructions have emotional and behavioral consequences, which depend on the context of using the product. In Hassenzahl's model, a product that elicit positive emotions is appealing and thus is more likely to promote future buying or use. Similarly, in M-R's model, an environment that elicits positive emotions will attract people or prolong their stay. Whereas M-R's model has been used extensively in the area of marketing, Hassenzahl's model appeal more to the HCI community (e.g.,

Hassenzahl & Tractinsky, 2006). Taken together, the two models can point the way in the quest for a synergistic model of marketing and HCI. The results of this study can be seen in light of the similarities between the two models. Thus, whether the online store is viewed as a product or as an environment, its pragmatic and hedonic qualities are likely to affect the emotions of “consumers” or “users” and, consequently, their behavior.

7.1. Main Findings and Insights

The results lend support to the idea that emotions mediate the relationships between perceptions of the online shopping environment—as manifested by hedonic attributes such as aesthetics and pragmatic attributes such as usability—and approach/avoidance tendencies toward the e-store. Thus, all three design dimensions, which constitute store atmospherics—classical aesthetics, expressive aesthetics, and usability—contributed to consumers’ pleasure. In addition, the two aesthetic dimensions influenced the feeling of arousal. Approach/avoidance tendencies were associated mainly with the emotional state of pleasure, and to lesser extent with arousal. Pleasant activation (i.e., positive degrees of pleasure and arousal) is generally associated with positive feelings such as excitement (e.g., Russell & Pratt, 1980; Yik et al., 1999). This affective state is considered desirable for shopping activities and certainly can be valued from the online retailer’s perspective (Babin & Attaway, 2000; Donovan & Rossiter, 1982; Holbrook & Gardner, 1993; Yoo et al., 1998).

Although emotions play an important role in mediating the effects of design attributes on attitudes, usability, and expressive aesthetics influenced attitudes also directly. The direct significant path between usability and attitudes is in line with the technology acceptance model (Davis, 1989), according to which perceived ease of use influences attitudes both directly and indirectly (via perceived usefulness). It is less straightforward to explain the direct link between expressive aesthetics and attitudes. One possible explanation is that this relationship is mediated by other variable, which was not included in our model—for example, cognitive evaluation of the design’s goodness (e.g., Hassenzahl & Monk, *in press*).

The finding that of the three affect dimensions pleasure plays a pivotal role (relative to arousal and dominance) in influencing consumers attitudes was a recurrent finding in research on traditional retail environment (Baker et al., 1992; Bellizzi & Hite, 1992; Donovan & Rossiter, 1982; Donovan et al., 1994). Keeping with Mehrabian and Russell’s model, Donovan and Rossiter (1982) found that although the influence of pleasure on all of the approach–avoidance behaviors was statistically significant, arousal had significant influence only on affiliation measures and dominance on none of the measures. They concluded that store-induced pleasure is a major predictor and a very powerful determinant of approach–avoidance behaviors within the store. Donovan et al. (1994) also found that pleasure experienced within a retail store environment has a major and significant influence on purchase. This study provides support to the idea that pleasure plays a similarly central role in online retail environments as well.

The main reason for the central role of pleasure might be that although pleasure plays a consistent role in approach–avoidance tendencies in the environment, the roles of arousal and dominance are more contingent on the nature of the environment, on people’s motivation, and on the interaction between them (Huang, 2003; Mehrabian et al., 1997). Given the relative inferiority of online environments in creating attractive shopping atmospherics (Tractinsky & Rao, 2001), the prime role of pleasure in mediating store atmospherics’ effects on consumers’ attitudes stresses the need to identify those aspects in the virtual environments that bring about a pleasurable shopping experience. Our study demonstrates that people’s perceptions of two major design aspects—usability and aesthetics—contribute significantly toward this goal.

From a HCI perspective, usability has been considered for many years the most important aspect of interactive systems (Nielsen, 1993, 2000; Venkatesh & Agarwal, 2006). Our study demonstrated its importance to the pleasurable interaction and to the users’ feelings of being in control of their virtual environment. However, we also found that being in control in itself had no significant impact on attitudes toward the store. Thus, the role of dominance in relation to approach–avoidance behaviors remains unclear. Various researchers did find that dominance influenced approach–avoidance response across different consumption environments (e.g., Biggers & Rankis, 1983; Foxall & Greenley, 1999; Gilboa & Rafaeli, 2003). However, others failed to find such effects (e.g., Babin & Attaway, 2000; Kamis, Koufaris, & Ster, 2008). These conflicting results suggest that contingent forces moderate this relationship. As Kamis et al. (2008) suggested, it is possible that feelings of dominance (or lack thereof) do become more significant when online customers are engaged in real-life shopping tasks, which involve multiple decisions on multiple products and vendors, and which entail “real” consequences, such as actual purchase and monetary expenses. We cannot rule out this idea, as our study was not conducted in such a context. Foxall (1997) proposed that the role of dominance may depend on the type of consumer setting investigated. In the same vein, Turley and Milliman (2000) noted that the importance of dominance may depend on the context and on the variables used by the researchers to represent the store’s environment.

The mediated relations with consumers’ attitudes differed for the three design dimensions. Whereas perceived usability influenced consumers’ attitudes by the mediating effect of pleasure, especially in the domain of books, perceived aesthetic aspects of the e-store design influenced attitudes toward the store via their ability to both induce pleasure and to arouse potential consumers. This role was especially salient in the effects of expressive aesthetics on pleasure and arousal in the apparel domain. These findings stress the importance of aesthetic design. Aesthetics is considered a salient design aspect on the web (Tractinsky & Rao, 2001; Zhang, 2007), one that can serve as a major differentiator in the virtual retail environments (Tractinsky & Lowengart, 2007). This study reinforces the idea that people take pleasure in the way things look (Fenner, 1996; Norman, 2004; Postrel, 2003; Sheppard, 1987). Thus, by stressing aesthetic design and thereby increasing consumers’ pleasure during the interactions, e-retailers can differentiate their sites and improve consumers’ attitudes

in a way that may translate to better sales (Tractinsky & Lowengart, 2007). Increasingly, then, economic value is tied to aesthetic considerations (Postrel, 2003).

Consistent with expectations, the need to provide aesthetic-based atmospherics was less pronounced in low-touch domains such as books relative to high-touch domains such as apparel. Whereas in the high-touch online stores, the aesthetic dimensions had much stronger influence on attitudes relative to the influence of usability, here, the effects were balanced. Consequently, both the direct and indirect association between usability and attitudes were stronger in the books domain than in the apparel domain.

7.2. Implications: Theoretical and Practical

The findings of this research suggest several implications for researchers, e-retailers, and web designers. Theoretically, it contributes to our understanding of the associations between design, emotion, and attitudes in virtual retail environments. Research has shown that first aesthetic impressions are fast and consistent (Lindgaard et al., 2006; Tractinsky et al., 2006) and are likely to leave lasting impressions and influence later evaluations of interactive systems (see, however, van Schaik & Ling, 2009).

The mechanisms through which aesthetics affect subsequent attitudes are not entirely clear, but one potential mediating route is pleasurable experience created by aesthetic design (Lavie & Tractinsky, 2004). Our results lend partial support to this idea. Conceptually, we have expanded on the conventional treatment of website design aspects by including two subdimensions of aesthetics alongside the ubiquitous usability construct. We have also examined and validated three different affective states as mediators between e-store design and consumer attitudes toward the store. Operationally, we have validated a set of measures that would enable researchers to incorporate characteristics of e-store atmospherics and consumers' affective states in future studies of e-retail environments. We then demonstrated the differential relations between the various dimensions of virtual store design and emotions.

Clearly, not all design aspects contribute equally to the affective constructs, and not all emotional states contribute equally to approach–avoidance responses. The robustness of the structural model was demonstrated by the fact that it held equally well across different shopping domains. Still, the study demonstrated that the strength of associations between some of the model's variables may change given the retail domain. Thus, not only did the study's results support the need for designing sites differently for various domains (Kempf, 1999; Zhang & von Dran, 2001), it also demonstrated that the perceptions of design aspects used in this study matter differentially to two specific and distinct domains.

The study demonstrated the importance of design attributes and emotions (particularly pleasure) in virtual environments. In a crowded marketplace, design and ensuing emotions can potentially differentiate between sites and between competing firms. We hope that our findings will encourage future attempts to continue exploring the nature of the relationships between design, emotion, and behavior in virtual places (Jiang & Benbasat, 2007; McKinney, Yoon, & Zahedi, 2002).

The findings of this study could provide practical guidelines for online retailers. One of the important findings of our study is that pleasurable interactions are a key determinant of positive consumer' attitudes toward a web store. In our study, aesthetics contributed to attitudes toward the store equally, if not more than usability. This finding stands in contrast to previously widely held beliefs in the information systems and HCI community. Furthermore, the distinction between different dimensions of aesthetics allows a more focused analysis of the aesthetic aspects of the design and their differential effects on emotions in various online retail domains. Thus, expressive aesthetics might be more important when designing stores that sell high-touch, relatively expensive products (such as apparel and luxury stores), whereas usability and classical aesthetics might be more important in designing stores that sell low-touch and relatively inexpensive products (such as books, CD's, electronic appliances). Based on this, developers of websites can employ different strategies according to the intended effect of the design (cf. Tractinsky & Lowengart, 2007). The two aesthetic dimensions used in this study were based on previous research, and are likely to reflect general tendencies in how people capture aesthetic stimuli (cf. Lavie & Tractinsky, 2004).

7.3. Limitations and Future Research

Our results are obviously limited by various characteristics of the study and inevitable tradeoffs that we made during its execution. First, the participants in the study were all students, mainly 20 to 30 years old. The generalizability of the results is thus limited to this age group to the extent that its shopping decision making processes differ than those of other age groups. However, a recent study (Horrigan, 2008) suggests that people aged 18 to 29 (at about the same age of the participants in our study) do not differ much from people aged 30 to 64 with regards to their attitudes toward Internet shopping. Therefore, it is reasonable to assume that the model presented here can be generalized to other age groups as well.

Second, we used real-world e-commerce sites in the study. This conscious decision traded-off control and internal validity for ecological and external validity. One consequence of this decision is that our results cannot serve as evidence in support of the causal chain implied by our model. Rather, causal inference can only rely on the theoretical strength of the model itself. Although we have argued extensively for the soundness of the model, it could be further strengthened in the future if more controlled studies are carried in order to test its implied causality. For example, researchers may build artificial online stores in which parameters of the design environment will be manipulated independently. This would allow researchers to isolate the effects of various design properties of the environment. Yet it is clear that increasing our knowledge of socio-technical domains such as HCI depends on applying multiple research methods and approaches (Mason, 1989). Thus, although our work supports the plausibility of the environmental model in online shopping environments, it should not be viewed as an ultimate evidence for the model's correctness.

The present study investigated participants' emotions and attitudes only in two domains (books and apparel) and in only two sites in each domain. Thus, our ability to generalize about the two domains and about the differences between them is limited (Hassenzahl & Monk, *in press*). The main reason for using a small number of sites and domains was practical: Participants spend relatively long time on browsing and evaluating each site. Future research examining other domains and sites may add to our ability to generalize the findings of this study. In addition, classifying domains according to the ability to touch or feel the product is but one of a number of possible classifications of the online retail environment. Thus, other classifications of retail environments should be used in future studies in order to further test the robustness of our model.

Our study has concentrated on two salient design attributes—*aesthetics* and *usability*. However, other aspects of store design (e.g., Jiang & Benbasat, 2007; Kim et al., 2003) can serve as antecedents to affective states and decision processes in the e-retail context. It also remains to be seen whether studying design aspects that are more detailed than the relatively high-level constructs used in this study (e.g., Kim et al., 2003; Park et al., 2005) can produce a more accurate model or lead to new insights about the relationships between design, emotions, and attitudes in the area of online retailing. Similarly, conceptualizations of aesthetic dimensionality that differ from ours may also prove to be useful in affecting online consumers' emotions and attitudes (e.g., Moshagen & Thielsch, 2010).

The current study used attitudes to examine approach–avoidance response. Although attitudes may serve as a good predictor of response, future studies can improve the predictive power of the model by examining constructs that are more closely related to actual response. For example, in the traditional retail environment behavioral intentions were examined (e.g., Bellizzi & Hite, 1992; Donovan & Rossiter, 1982), as well as actual behaviors such as purchase (e.g., Milliman, 1986), unplanned purchases (e.g., Donovan et al., 1994), impulse purchases (e.g., Yalch & Spangenberg, 1990) and time spent in the store (e.g., Yalch & Spangenberg, 1988, 1990). In e-retail context, studies have similarly examined behavioral intentions (e.g., Richard, 2005) and actual behaviors such as purchase and amount of time spent in the store (e.g., Mummalaeni, 2005).

Finally, the direct associations between design dimensions and attitudes deserve a closer look in future research. Although some of these effects can be explained in terms of established theories such as technology acceptance model, residual effects are likely to exist that call for additional explanation. For example, Hassenzahl and Monk (*in press*) suggested that goodness mediate aesthetic impressions on other constructs. Thus, the direct effect of expressive aesthetics on attitudes may be explained by similar processes.

7.4. Conclusion

Despite the phenomenal growth of the Internet over the past few years, the vast potential of conducting business over the Internet remains largely untapped

(Lim, Sia, Lee, & Benbasat, 2006). Therefore, there is still much room for online retailers to grow, and as such, research that contributes to our understanding of online environments in general and in the e-retail domain in particular has value to both theory development and practice. The overarching goal of this article was to enrich our understanding of how e-store atmospherics, as manifested by salient design aspects, affect consumers' attitudes toward the store. We found that people's perceptions of the aesthetics and the usability of the online store are key factors that influence their emotions. In turn, emotions—especially pleasure—partially mediate the relations between the design attributes and whether users tend to approach or avoid the store.

Our findings are in line with recent calls for broadening the scope of HCI research (e.g., Forlizzi & Battarbee, 2004; Hassenzahl & Tractinsky, 2006). This is manifested not only by the inclusion of research constructs that go beyond the traditional instrumental focus of the field but also in terms of embracing a research framework and evaluation criteria that integrate marketing and HCI and demonstrate its applicability to the core concerns of both.

NOTES

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Authors' Present Addresses. Talya Porat, Ben-Gurion University of the Negev, Industrial Engineering and Management; and Deutsche Telekom Labs at Ben-Gurion University, P.O. Box 653, Beer-Sheva 84105, Israel. E-mail: talya@bgu.ac.il. Noam Tractinsky, Ben-Gurion University of the Negev, Information Systems Engineering, P.O. Box 653, Beer-Sheva 84105, Israel. E-mail: noamt@bgu.ac.il.

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APPENDIX A. E-STORES SCREEN CAPTURES

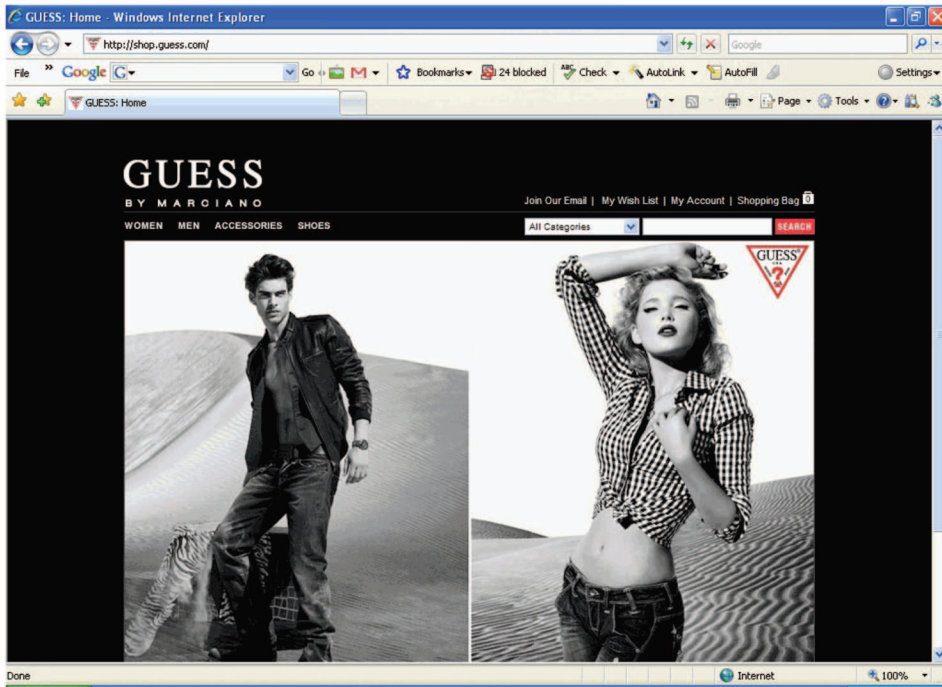
Angus & Robertson bookstore



Collins bookstore



Guess apparel store



Blair apparel store



APPENDIX B. STUDY INSTRUCTIONS

Task 1 – Shopping at a book store

1. Please click on the following link to enter *<store name>* online book store. The site will open in a new window. Note you can navigate from the site to the questionnaire by pressing “Alt+Tab”.
2. Surf the store site so you could get familiar with its design and the various products it contains.
3. Imagine that you are interested in buying a book as a present to a good friend. Try to remember which books he or she likes (such as science fiction, cook books, “spiritual” books).
4. Find the desired books category in the site.
5. Now check your available options and select the book you would like to buy as a present to your friend.
6. Continue with the process of buying the book until the stage you will be requested to select your payment method.

- a. Which category did you select? _____
 - b. What is the name of the book you selected? _____
 - c. What is its price? _____

Task 2 – Shopping at an apparel store

1. Congratulations! You have won a big raffle of the students association. You won a \$500 credit at the ‘Guess’ apparel store.
2. Please click on the following link to enter *<store name>* online apparel store. The site will open in a new window. Note you can navigate from the site to the questionnaire by pressing “Alt+Tab”.
3. Surf the store site so you could get familiar with its design and the various products it contains.
4. Choose for yourself or for someone close to you one or more products that fit your wining budget.
5. Add the products to the shopping cart and continue with the buying process until the stage you will be requested to select your payment method.

- a. Which products did you select? _____
 - b. What is the total cost of the products? _____

APPENDIX C. FINAL ITEMS INCLUDING STANDARDIZED ITEM

Loadings of the Measurement Model

<i>Please mark the one square (out of nine) which best represents your feeling while visiting the site (For example: in the first line, if you felt more unhappy than happy, mark the square that is closer to the word “unhappy”, according to the extent that you felt unhappy. If you felt unhappy and happy to the same extent, mark the middle square).</i>		
Name	Items	loadings
PLS1	Happy – unhappy	.73
PLS2	Satisfied – disappointed	.73
PLS3	Hopeful – despairing	.73
PLS4	Relaxed – bored	.60
PLS5	Content – annoyed	.76
ARS1	Energetic – languid	.80
ARS2	Excited – calm	.56
ARS3	Wide-awake – sleepy	.77
ARS4	Restless – slow	.79
ARS5	Aroused – unaroused	.87
ARS6	Enthusiastic – serene*	
DMN1	In control – helpless	.70
DMN2	Respected – insignificant	.55
DMN3	Dominant – submissive	.81
DMN4	Autonomous – guided	.60
DMN5	Active – passive	.80
DMN6	Free – restricted*	
<i>Please indicate the extent to which you agree or disagree with each of the following descriptions regarding the <u>design</u> of the site that you have just visited (1 = strongly disagree; 7 = strongly agree):</i>		
CLS1	Clean	.77
CLS2	Pleasant	.85
CLS3	Symmetrical	.66
CLS4	Aesthetic	.86
EXP1	Original	.76
EXP2	Sophisticated	.76
EXP3	Spectacular	.88
EXP4	Creative	.89
USB1	It was convenient navigating in this store site	.83
USB2	The buying process in this site is simple	.74
USB3	It's easy using this site	.93
USB4	One can find information easily in this site	.86
<i>Please indicate the extent to which you agree or disagree with each of the following descriptions (1 = strongly disagree; 7 = strongly agree):</i>		
ATT1	I liked the store	.93
ATT2	I enjoyed being in the store	.95
ATT3	I would like to return to the store	.90
ATT4	I will recommend to others to browse the store	.85
ATT5	The store made me feel like buying	.85

*Item dropped from final analysis

APPENDIX D. INTER-ITEM CORRELATION MATRIX

	CLS1	CLS2	CLS3	CLS4	EXP1	EXP2	EXP3	EXP4	USB1	USB2	USB3	USB4	PLS1	PLS2	PLS3	PLS4	PLS5	ARS1	ARS2	ARS3	ARS4	ARSS	DMN1	DMN2	DMN3	DMN4	DMN5	ATT1	ATT2	ATT3	ATT4	ATT5
CLS1	1.000																															
CLS2	0.659	1.000																														
CLS3	0.497	0.512	1.000																													
CLS4	0.671	0.713	0.638	1.000																												
EXP1	0.232	0.346	0.144	0.238	1.000																											
EXP2	0.353	0.380	0.215	0.349	0.631	1.000																										
EXP3	0.352	0.448	0.195	0.387	0.638	0.655	1.000																									
EXP4	0.272	0.421	0.166	0.326	0.682	0.661	0.790	1.000																								
USB1	0.391	0.477	0.299	0.392	0.215	0.288	0.299	0.223	1.000																							
USB2	0.286	0.341	0.242	0.288	0.099	0.162	0.189	0.140	0.598	1.000																						
USB3	0.404	0.455	0.308	0.395	0.137	0.207	0.226	0.169	0.762	0.727	1.000																					
USB4	0.337	0.433	0.259	0.354	0.172	0.235	0.246	0.201	0.741	0.584	0.799	1.000																				
PLS1	0.255	0.336	0.168	0.228	0.266	0.301	0.334	0.310	0.296	0.197	0.269	0.251	1.000																			
PLS2	0.273	0.357	0.234	0.265	0.263	0.303	0.318	0.307	0.348	0.307	0.375	0.354	0.536	1.000																		
PLS3	0.204	0.295	0.146	0.183	0.193	0.203	0.258	0.252	0.253	0.166	0.261	0.241	0.468	0.365	1.000																	
PLS4	0.265	0.407	0.268	0.283	0.288	0.333	0.346	0.321	0.368	0.236	0.325	0.309	0.496	0.585	0.407	1.000																
PLS5	0.258	0.383	0.230	0.276	0.249	0.294	0.296	0.309	0.360	0.228	0.337	0.344	0.581	0.592	0.503	0.565	1.000															
ARS1	0.233	0.342	0.188	0.255	0.283	0.336	0.349	0.340	0.290	0.246	0.305	0.236	0.561	0.432	0.484	0.510	0.482	1.000														
ARS2	0.071	0.123	0.035	0.077	0.233	0.268	0.281	0.231	0.120	0.100	0.105	0.119	0.392	0.225	0.305	0.281	0.276	0.507	1.000													
ARS3	0.221	0.378	0.206	0.256	0.237	0.283	0.326	0.310	0.302	0.221	0.291	0.287	0.485	0.449	0.425	0.536	0.457	0.602	0.371	1.000												
ARS4	0.161	0.297	0.174	0.242	0.208	0.240	0.301	0.296	0.220	0.165	0.207	0.198	0.427	0.366	0.417	0.478	0.354	0.609	0.465	0.571	1.000											
ARSS	0.207	0.383	0.221	0.273	0.266	0.306	0.344	0.336	0.288	0.196	0.234	0.226	0.478	0.434	0.439	0.576	0.436	0.656	0.475	0.692	0.733	1.000										
DMN1	0.286	0.329	0.217	0.265	0.045	0.144	0.147	0.114	0.427	0.368	0.464	0.401	0.413	0.415	0.362	0.364	0.412	0.366	0.063	0.353	0.278	0.296	1.000									
DMN2	0.158	0.228	0.145	0.174	0.057	0.179	0.184	0.171	0.246	0.187	0.255	0.232	0.298	0.394	0.327	0.380	0.302	0.340	0.174	0.351	0.359	0.342	0.357	1.000								
DMN3	0.128	0.196	0.093	0.158	0.073	0.137	0.143	0.134	0.242	0.193	0.267	0.259	0.358	0.280	0.294	0.343	0.294	0.370	0.191	0.341	0.291	0.304	0.304	0.550	0.422	1.000						
DMN4	0.087	0.125	0.106	0.095	0.014	0.056	0.052	0.025	0.231	0.140	0.201	0.161	0.183	0.228	0.152	0.267	0.160	0.230	0.126	0.297	0.210	0.231	0.339	0.317	0.516	1.000						
DMN5	0.155	0.203	0.146	0.150	0.084	0.119	0.126	0.128	0.271	0.197	0.317	0.288	0.390	0.308	0.324	0.358	0.326	0.413	0.225	0.332	0.289	0.322	0.523	0.412	0.688	0.497	1.000					
ATT1	0.386	0.509	0.313	0.417	0.406	0.429	0.482	0.469	0.510	0.371	0.460	0.465	0.537	0.598	0.419	0.639	0.597	0.539	0.349	0.524	0.426	0.528	0.400	0.327	0.302	0.187	0.348	1.000				
ATT2	0.367	0.516	0.305	0.379	0.368	0.437	0.460	0.454	0.514	0.358	0.465	0.465	0.551	0.592	0.419	0.650	0.601	0.546	0.355	0.545	0.444	0.538	0.384	0.329	0.284	0.182	0.327	0.500	1.000			
ATT3	0.291	0.472	0.291	0.359	0.347	0.413	0.474	0.424	0.444	0.328	0.404	0.408	0.473	0.536	0.398	0.597	0.526	0.489	0.351	0.506	0.398	0.507	0.353	0.286	0.258	0.182	0.267	0.819	0.836	1.000		
ATT4	0.316	0.454	0.285	0.329	0.401	0.438	0.485	0.453	0.437	0.315	0.393	0.390	0.469	0.528	0.363	0.549	0.495	0.441	0.302	0.456	0.356	0.455	0.316	0.242	0.214	0.142	0.223	0.754	0.777	0.858	1.000	
ATT5	0.333	0.486	0.297	0.380	0.360	0.422	0.509	0.454	0.471	0.324	0.418	0.431	0.516	0.536	0.390	0.568	0.521	0.505	0.382	0.521	0.444	0.537	0.348	0.281	0.286	0.171	0.333	0.764	0.792	0.770	0.738	1.000

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