Web Design for different User Generations: The Impact of Aesthetics on Emotions and Quality Perceptions

Exploring the user experience from electronic commerce websites across generational cohorts

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ABSTRACT

Purpose. With widespread lockdowns and consumers encouraged to social distancing brought about by COVID-19, e-commerce has become more important than ever to the apparel industry. An increased number of consumers have embraced online apparel as a channel for consumption. Generation X and Z form two important online consumer segments to apparel companies. Yet, little is known about their decision-making in online environments based on aesthetic website preferences. This study explores Generation X and Z's emotional and behavioral responses towards aesthetic web designs in a comprehensive model incorporating the classical and expressive aesthetics framework, theory of core affect, and appraisal of website quality.

Design. A 2x2 mixed factorial design by means of an online survey was conducted to measure the implicit perception from generational cohorts towards the aesthetical design of four self-designed website stimuli (classical: high vs. low; expressive: high vs. low) in addition to their emotional and behavioral responses.

Findings. The findings reveal that both classical and expressive aesthetics impact core affect (valence and arousal). While classical aesthetics and expressive aesthetics are both positively linearly associated with valence, their relationship with arousal can be described with a curvilinear relationship (inverted U-turn). Although generational cohorts do not moderate the relation between aesthetics and core affect, their affective response towards web designs differ. Generation X experience more positive valence and higher activating (arousal) levels being exposed to expressive aesthetics than Generation Z. Whereas valence has an effect on appraisal of website quality, arousal has not.

Key-words: aesthetics, core affect, valence, arousal, website quality, generational cohort, Generation X, Generation Z

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1. Introduction

With widespread physical store lockdowns and consumers obliged to social distancing brought about by COVID-19 ("Coronavirus"), a severe recession may await the apparel industry (McKinsey, 2020). The European Apparel and Textile Confederation (EURATEX) estimated that in Europe, the virus may cause a plunge in apparel sales and production by more than 50 percent by the end of 2020 (EURATEX, 2020). Yet, there is silver lining emerging from electronic commerce (e-commerce). It was reported that COVID-19 has pushed 13 percent of European consumers to engage in e-commerce for their first time (McKinsey, 2020). Moreover, online apparel is believed a major bounce-back e-commerce category across generations (Kantar, 2020). Thus, though the economic impact of lockdowns is likely to be significant for an industry heavily reliant on its brick-and-mortar business, it might be leveraged by apparel companies that seek opportunities in serving the increasingly multigenerational online consumer community in European e-commerce (McKinsey, 2020). A recent report on e-commerce in Europe published by the European Commission (European Commission, 2020) in January 2020 indicates that Generation X, Y and Z form important consumer generations in online apparel consumption in terms of numbers and economic impact. Accordingly, more than 70 percent of Internet users who among Generation X (in the report denoted as whom between 40-55 years old) bought goods over the Internet in 2019, and almost two thirds (65 percent) of their online purchases involved clothes. Generation Y (whom between 25-39 years) had the highest proportion among Internet shoppers (more than 80 percent), and more than two in three (67 percent) bought clothes online. Ultimately, Generation Z (whom between 16-24 years) had the lowest proportion of Internet shoppers (65%), but took the lead in purchasing clothing online (73 percent). Based on these findings, in view of COVID-19, it seems reasonable to conclude that apparel companies would benefit from addressing their online marketing efforts to these generational cohorts. Thus, there is an increasing need to understand how to provide generational cohorts a pleasurable online shopping experience they will like to repeat.

In the literature on online consumption behavior, there has been active research on e-commerce success based on consumers' perceptions about website quality (Kim & Stoel, 2004; Lin et al., 2007). This line of research considers the website's aesthetic qualities for insights into developing more attractive and successful online stores (Hartman et al., 2008; Lorenzo-Romero et al., 2013). That is, the online shopping experience is based, to a great extent, on the website's visual appearance such as images, information presentation, and video clips of products that will minimize the effort needed to perform choice and purchasing tasks online (Wang et al., 2011; Cai & Xu, 2011). So, the promise of e-commerce success is largely dependent on the critical question of how to create an aesthetic e-commerce website that can let apparel consumers enjoy their online shopping experience.

There are at least two reasons for the investigation of online consumer responses to aesthetics. First, aesthetics as influencing factor in online consumer behavior has been for quite some time an issue of extensive research and debate in marketing (Park & Kim, 2003; Constantinides, 2004) and human-computer interaction (hereafter: HCI) (Tractinsky et al., 2000; Tractinsky, 2004), but few studies provide empirical validation on the relationships among aesthetics and consumer emotional and relational behavior in an online shopping context. Mahlke (2008) was one of the first scholars who has raised this issue and classified the user experience from websites as a compound of instrumental (i.e. usability) and non-instrumental (i.e. aesthetics) quality features in addition to the user's emotional and behavioral responses to these qualities. These features were identified as salient dimensions to determine the user experience from any technology (Thüring & Mahlke, 2007). Nonetheless, while usability, in general, has long served as key-concept for capturing website quality judgment (Agarwal & Venkatesh, 2002; Hartman et al., 2008), scarce research has emphasized the joint effects between aesthetics, emotions and consumer behavior in an online shopping context (Porat & Tractinsky, 2012; Kim & Lennon,

2013). Second, while these aforementioned studies provide a fruitful avenue in understanding how websites can be aesthetically designed to contribute to e-commerce success by making use of the S-O-R paradigm (Mehrabian & Russell, 1974) as theoretical underpinning, little is known how consumer characteristics may affect aesthetic perceptions, emotions, and online decision making. Despite a host of studies focusing on the impact of sociodemographic characteristics such as gender, education, or culture, on consumers' aesthetic preferences for e-commerce websites (e.g. Tuch et al., 2012; Reinecke & Bernstein, 2013), consumer characteristics in terms of generational cohorts have been largely overlooked. Yet, it has been shown that consumer segmentation based on generational cohorts provides useful insights into determining (online) consumption behavior (Parment, 2011; 2013; Herrando et al., 2019). Nonetheless, to the best of our knowledge, except for the works from Djamasbi and colleagues on aesthetic web design preferences of Generation Y and the Baby Boomers (Djamasbi et al., 2010; Djamasbi et al., 2011), no study so far has connected the study of aesthetics in context with emotions and website quality evaluations to Generation X and Z. Therefore, research efforts on Generation X and Z's emotional and behavioral responses to aesthetics in an online apparel consumption context seem essential.

In order to fill this niche, the purpose of this study is to develop and test a more comprehensive model based on extant literature on user experience from websites, aesthetics, emotional and behavioral responses to aesthetics, as well as generational cohorts'. Specifically, we suggest that the aesthetics of e-commerce websites (classical and expressive; Lavie & Tractinsky, 2004), acting as stimuli in positive online shopping experiences, will influence Generation X's and Z's experienced valence and arousal as emotions and perceptions of the website's attractiveness as behavioral outcomes differently. A 2 (high classical vs. low classical) x 2 (high expressive vs. low expressive) mixed factorial design by means of an online survey is conducted to answer the following research question *"how do aesthetics in e-commerce web design affect emotional and behavioral responses across generational cohorts?"* The primary objectives of this study are to:

(1) assess the effect of website aesthetics (classical and expressive) on emotional responses (valence and arousal)
(2) examine the relationship between emotional responses (valence and arousal) and behavioral responses in terms of appraisal of website quality (judgements on website attractiveness); and
(3) test the influence of consumer characteristics (Generation X and Z) on the relationships between aesthetics, emotional responses, and behavioral responses.

This study provides two major contributions. First, through the theoretical lens of the components of user experience framework (Thüring & Mahlke, 2007), the S-O-R paradigm (Mehrabian & Russell, 1974) and the classical and expressive aesthetics framework (Lavie & Tractinsky, 2004), this study predicts that Generation X and Z perceive an e-commerce website's quality through the two dimensions of classical and expressive aesthetics and their resulting emotions. Second, it provides apparel companies and web designers with detailed information how the two dimensions of aesthetics can be incorporated into the e-commerce website's interface such that they induce favorable emotions across Generation X and Z.

The outline of this study is as follows. Section 2 initiates the literature review, which introduces the theoretical framework used as a basis to this study and then discusses the proposed research constructs as of aesthetics, emotional responses, behavioral responses, as well as generational cohorts. Later, it develops the conceptual framework followed by the development of research hypotheses presented in section 3. Section 4 presents a description of the experimental design and data collection. Study results are then presented (section 5) and discussed (section 6). Ultimately, section 7 summarizes the academic and practical contributions by reconsidering the research objectives. Moreover, areas for future research are presented.

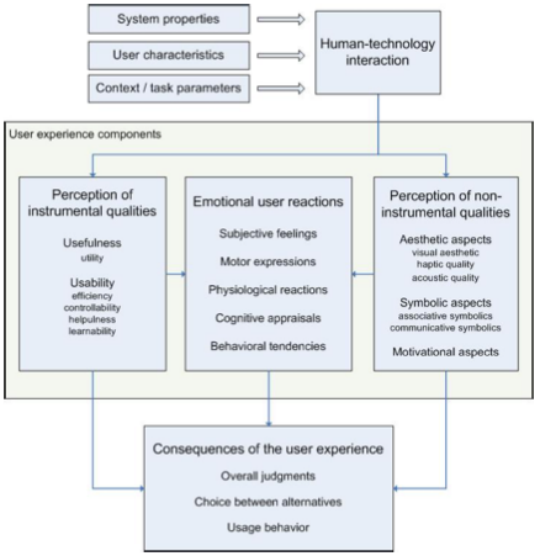
2. Literature review and theoretical framework

2.1. Literature review

As the number of Internet shoppers is constantly increasing across generations, apparel companies may find themselves competing among each other to create e-commerce websites that are thought to provide single or multiple generational cohorts a pleasurable online shopping experience depending on their definition of target groups. For an e-commerce website, to be perceived as qualitative and pleasurable by consumers, it will need to be designed such that the consumer's individual preferences, emotions and context of usage are taken into consideration (Mahlke, 2008). Although a vast body of literature has looked at various factors as central components to the design of websites that enhance positive emotional response and desirable behaviors, such as the interplay between visual complexity and affect (Tuch et al., 2009; Deng & Poole, 2010), however it is not yet clear the underlying mechanisms how aesthetic website qualities and emotional reactions can cause significant impacts on evaluations of website quality.

The components of user experience framework, also called CUE framework, brought forward by Thüring and Mahlke (2007), helps in establishing a conceptual framework on the relationships between aesthetics, emotions, evaluations of website quality, and generational cohorts. The major premise behind the CUE framework is that any user experience with an interactive system consists of three central components: "perception of instrumental qualities" (e.g. usability), "perception of non-instrumental qualities" (e.g. aesthetics), and "emotional user responses" (e.g. subjective feelings and cognitive appraisals) (Thüring & Mahlke, 2007). Both types of qualities may evoke emotions, and all three components together influence the "consequences of the user experience", also regarded as "user's appraisal of the system", which dependent on the interaction context comprise of various outcome variables, for example "overall judgements", or "usage behavior" (Thüring & Mahlke, 2007). The CUE framework is depicted in Figure 1.

Figure 1. *Components of user experience (CUE) model (Thüring and Mahlke, 2007)*



Though the CUE framework is not specifically tailored to understand the user experience from websites, it has proven to be a suitable framework in this field as well. In a subsequent study, Mahlke (2008) adopted the CUE framework to consumer evaluations of website quality and found that individual differences in aesthetic preferences had significant impact on emotional

responses and the overall user experience from websites. Consistent with this finding, several studies reported a correlation between websites' aesthetics qualities and users' experienced emotions (Lindgaard et al., 2006; Tractinsky et al., 2006). This line of research further suggests that consumers do not only evaluate website quality in very a short time based on their affective response to aesthetics, but they tend they tend to make more positive judgments on other website attributes consistent with the halo effect (Hartman et al., 2008; Minge & Thüring, 2018). Though this finding has been recently contradicted by an experimental study from Lorenzo-Romero et al. (2013) who found no correlation between short exposure, website quality perceptions and buying intentions, researchers nonetheless widely deem emotions as direct antecedents to the online shopping experience (Éthier et al., 2006; Cai & Xu, 2011; Kim & Lennon, 2013). With a limited number of exceptions (Porat & Tractinsky, 2012; Sonderegger et al., 2014), however, few approaches have been undertaken on how classical and expressive aesthetics might influence consumers' evaluation of website quality. In addition, as discussed in section 1, the role of sociodemographic characteristics in terms of generational cohorts have been largely overlooked.

Taking into account the impact of consumer preferences in website quality evaluations based on the aesthetic design of websites (Mahlke, 2008), the CUE framework offers a valuable basis to examine how different aesthetic web designs are perceived by Generation X and Z from an emotional standpoint, and, how these perceptions and emotional responses together result in appraisal towards website quality (e.g. whether a higher perceived aesthetic quality leads to a more positive attractiveness evaluation of the website). To explain the relationships between these user experience components from e-commerce websites in more detail, we use different theories and approaches to develop a conceptual framework that are relevant to the research question and scope of this study. Based on the CUE framework (Thüring & Mahlke, 2007), we begin to review literature on aesthetics followed by emotional and behavioral responses from aesthetic perceptions to examine how aesthetics influence online consumers' affective changes (valence and arousal); and further, how these changes influence their appraisal of website quality. Ultimately, we look at literature on generational cohorts with regard to online consumption behavior to draw hypotheses on Generation X and Z's aesthetic web design preferences.

2.1.1. Aesthetics (Classical and expressive aesthetics framework)

Extant research has offered multiple notions and treatments towards the notion of aesthetics which originally stems from the Greek word αἰσθητικός („aesthetikos") and refers to experiences individuals enjoy in their senses (Lorenzo et al., 2013). For example, some studies treat aesthetics as "aesthetic experience" (Jennings, 2000), "beauty" (Schenkman & Jönsson, 2000), "aesthetic response" (Mathwick et al. 2001), "design aesthetics" (Cyr et al., 2006), "visual aesthetics" (Moshagen & Thielsch, 2010), or "web aesthetics" (Wang et al., 2010). Though these notions vary in many aspects, most scholars agree that aesthetics are important cues of perceived website quality (Lorenzo-Romero et al., 2013). Earlier studies have examined the relationship between aesthetics and other website quality features as part of the user experience. Tractinsky et al. (2000) brought forward the notion "*what is beautiful is usable",* which assumes that aesthetics enhances the perception of usability. While the value of and current standing of aesthetics has been frequently disputed by scholars focusing on the relationship between usability and aesthetics (DeAngelini et al., 2006; Hartman et al., 2008; Sonderegger & Sauer, 2010), researchers nonetheless widely deem aesthetics as a main contributor to favorable experiences in online consumption (Constantinides, 2004; Wang et al., 2011; Cai & Xu, 2011).

The question how to assess and measure user perceptions of aesthetic quality in websites remains under debate (Tuch et al., 2012; Seckler et al., 2015). Fundamentally, there have been two approaches to the evaluation of aesthetics website qualities in the extant literature: a unidimensional perspective and a multidimensional perspective. Scholars within the unidimensional perspective focused on genuine web design elements, such as images (Cyr &

Head, 2009), colors (Cyr et al., 2010; Moss et al., 2006), advertising banners (Cyr & Smith, 2004; Benway & Lane, 1998), or navigation elements (Webster & Ahuja, 2006; Fleming & Roman, 1998). Their focus on distinct web elements was under criticism from scholars within the multidimensional perspective who argued that aesthetic perceptions are influenced by numerous elements (e.g. colors, shapes, shades) in addition to design principles (e.g. balance, contrast, proportion) (Moshagen & Thielsch, 2010; Lim et al., 2007).

Lavie and Tractinsky (2004) were one of the first HCI scholars who raised the issue of multidimensional structure of aesthetics in web design. The authors proposed the classical and expressive aesthetics framework which identifies two high-order aesthetic dimensions that users perceive when interacting with websites: "classical aesthetics" and "expressive aesthetics" (Lavie & Tractinsky, 2004). Accordingly, classical aesthetics denote to the order and harmony of the website interface, and are described through attributes as of "cleanliness", "clarity", "symmetry" and "order", and refer to the website's "usability-related" dimension. Expressive aesthetics, in contrast, denote to the web designer's personal creativity and originality, and the ability to break design conventions. Attributes such as "creativity", "special effects", "novelty", "sophistication", and "being fascinating" fall into the expressive aesthetics dimension, and relate to the pleasure an aesthetically website interface might evoke in the user (Lavie & Tractinsky, 2004).

The primary purpose of Lavie and Tractinsky's (2004) study was not to introduce a multidimensional view on aesthetics, but to emphasize the importance of aesthetics in HCI in general. Prior to their work in 2004, discussions of aesthetics in HCI were almost invariably qualified by the question of how to design visually appealing interfaces so that they are perceived as more usable, both before (Tractinsky, 1997) and after the interaction (Tractinsky et al., 2000). Similarly, the guidelines provided for aesthetically web design mainly resembled issues of usability (Schenkman & Jönsson, 2000). This has motivated Lavie and Tractinsky (2004) to provide concepts and measures of aesthetics that advocate user's satisfaction and pleasure (i.e. expressive aesthetics). In a later study, Tractinsky et al. (2006) argued that aesthetics satisfies basic human needs when users strive for more complete and satisfying interactive experiences that not only achieve well-designed goals but also involves the senses and generates affective responses. In consequence, if once the value of aesthetics in web design was measured mostly by its usability, the consideration of affective responses as well as their influence on behavioral outcomes in online shopping have emerged. Table 1 provides a historical outline of HCI research on aesthetics in (web) design evaluation.

Down to the present day, the classical and expressive aesthetics framework has been one of the most influential works on aesthetics in HCI (Bargas-Avila & Hornbaek, 2011). Numerous studies have provided empirical evidence in support of the premise that a website's aesthetical design can be described by the two dimensions of classical and expressive aesthetics (Lindgaard et al., 2006; Tractinsky et al., 2006; Sonderegger et al., 2014). Ultimately, Lavie & Tractinsky's (2004) framework has become an integral part in the study of consumer's emotional and behavioral responses towards e-commerce websites (Porat & Tractinsky, 2012; Kim & Lennon, 2013). Therefore, as outlined before, this study taps into the investigation of aesthetic website quality based on the two dimensions of classical and expressive aesthetics brought forward by Lavie and Tractinsky (2004).

2.1.2. Emotional responses towards aesthetics (S-O-R paradigm)

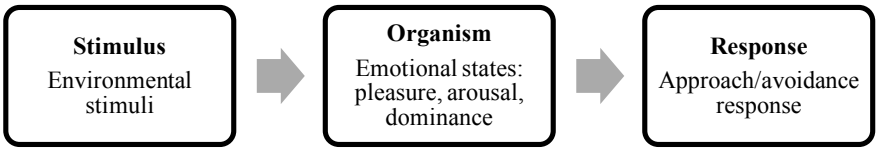
For years, scholars have recognized emotions as important antecedents of consumption behavior (Holbrook & Hirschman, 1982; Bagozzi et al., 1999). This line of research regards the shopping experience as a phenomenon directed toward the pursuit of pleasant feelings. In a similar vein, Donovan and Rossiter (1982) initiated a stream of research demonstrating the ability of physical

Publication	Main topic	Perspective	Main results
Tractinsky, 1997	user's perceptions of interactive systems	aesthetics; usability	perceptions of aesthetics are closely related to perceptions of usability
Tractinsky et al., 2000	user's perceptions of interactive systems	aesthetics; usability	artefacts that are perceived as aesthetically pleasing are perceived as more usable
Schenk-man, 2000	user's overall impression of websites	aesthetics; usability	beauty is more closely related to other abstract evaluative constructs than to specific usability attributes
Lee and Koubek, 2010	effects of usability and aesthetics on user preference for e-commerce websites	aesthetics; usability	user preference for web design is more affected by visual aspects than functional aspects
Kim et al., 2003	relations between web design factors and emotion	aesthetics emotion	several web design factors are closely related to the evocation of secondary emotions or aesthetics responses
Lindgaard et al., 2006	first impression of a website (visual appeal)	aesthetics; emotion	user judgements of websites are determined by first impressions in a very short time based on emotional (affective) responses
Tuch et al., 2012	first impression of a website (visual complexity)	aesthetics; emotion	websites with low visual complexity and high prototypically were shaping first impressions and affective responses
Lavie and Tractinsky 2004	dimensions and measures of aesthetics in web design	aesthetics; usability; emotion	perceptions of website aesthetics comprise of two dimensions: classical aesthetics (i.e. usability-related aspects of web design); and expressive aesthetics (i.e. user's emotional responses towards website aesthetics)
Wang et al, 2011	effect of classical and expressive aesthetics and emotion on emotional and behavioral consumer responses in online shopping	aesthetics; emotion; behavior	consumers' cognitive, affective, and conative outcomes can be significantly evoked by aesthetic stimuli, but dimensions of web aesthetics exhibit different patterns of influences
Porat and Tactinsky, 2012	effect of classical and expressive aesthetics as well as usability on emotional as well as behavioral responses in online shopping	aesthetics; usability; emotion; behavior	consumer attitudes towards e-commerce websites (behavioral response) based on perceptions of aesthetics (stimuli) are mainly mediated by affect (organism); whereas perceived usability was partially mediated by affect

store design, often referred to as 'atmospherics' (Kotler, 1973), to induce pleasant emotions and thereby influencing behaviors that drive retail performance. To explore how atmospherics in physical store have influence on consumers' emotional and behavioral responses, Donovan and Rossiter (1982) adopted Mehrabian & Russell's (1974) environmental psychology model (also called S-O-R model), an approach which later has been frequently applied in the study of physical shopping environments and later adopted by scholars who have explored the impact of web design qualities on emotions and corresponding behaviors (Porat & Tractinsky, 2012; Kim & Lennon, 2013). Therefore, a useful approach in the study of online consumption behavior can be found in the S-O-R paradigm.

The major premise behind the S-O-R paradigm (Mehrabian & Russell, 1974) is that environmental stimuli ("stimuli") such as the shopping environment evoke human emotions ("organism") which in turn result in more generally human responses under the concept of approach-avoidance ("approach/avoidance response"). In an online shopping environment, an approach response would for example mean greater tendency to browse, search and interact with an e-commerce website for a longer period; greater willingness to buy from the site; thus a better chance of actual purchase. An avoidance response would simply mean the opposite (Porat & Tractinsky, 2012). This makes it important to investigate consumers' emotions in a consumption context. The basic environmental psychology model is depicted in Figure 2.

Figure 2. *S-O-R model (adapted from Mehrabian and Russell, 1974)*



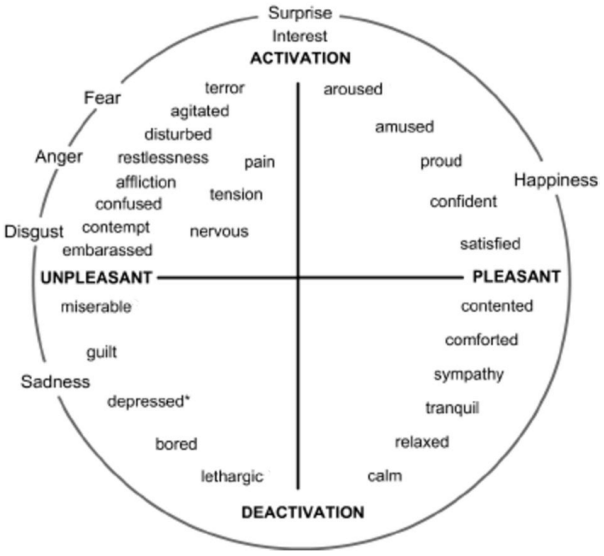
As of today, Mehrabian and Russell's (1974) approach has been used extensively in the study of online consumer responses towards aesthetics. Consistent with the S-O-R paradigm, several studies have treated web design features as external influence in the stimulus stage and revealed that aesthetics can significantly influence online consumer's emotions which result in corresponding consumption behaviors, i.e. (re-)purchase intention, or search on other websites (Porat & Tractinsky, 2012; Kim & Lennon, 2013; Peng & Kim, 2014). Similarly, in the domain of HCI, Thüring and Mahlke (2007) have incorporated the S-O-R paradigm in their CUE model which assumes that any user experience with a system comprises of by perceptions of system quality features which can evoke emotions and lead to the user's appraisal of the system (cf. section 2.1.). In consequence, to study how perceptions of classical and expressive aesthetics affect generational cohorts' emotional responses and corresponding behaviors, we adopt Mehrabian and Russell's (1974) theoretical underpinning of stimulus-organism-response.

In this view, the critical question arises how to assess and measure emotions evoked from classical and expressive aesthetics in web design. Mehrabian and Russell (1974) propose that emotional states can be captured by three orthogonal dimensions of emotions that underlie human responses to environmental stimuli: "pleasure", "arousal", and "dominance" (PAD scale). Accordingly, pleasure refers to the degree to which an individual feels happy or satisfied; arousal refers to the degree of stimulation caused by atmosphere; and dominance refers to the degree to which an individual feels he or she has influence or control over the situation (Mehrabian & Russell, 1974). In this view, classical and expressive aesthetics as environmental (web design) stimuli can evoke emotional consumer responses, which further lead to behavioral responses in online shopping.

However, while Mehrabian and Russell's (1974) S-O-R paradigm has received few criticism, studies in the domain of affective neuroscience have posed significant challenges to their proposed PAD scale. Affect theorists have criticized that environmental psychology has

primarily explored expressive and behavioral manifestations of emotions, and have instead suggested that emotions arise from cognitive interpretations of core physiological experiences (Cacioppo et al., 2000; Russell, 2003). This stems from previous arguments that dominance should be deleted in consumer behavior studies since it represents a rather cognitive than affective state (Russell & Barrett, 1999), in addition to the difficulties of empirical studies to establish its independence from valence and arousal (Brengman & Geuens, 2004), or respectively its effects on approach/avoidance behaviors (Babin & Attaway, 2000). These findings have motivated Russell (2003) to develop a dimensional model of emotion to understand and explore the core physiological bases of affective experiences. In repeatedly interpreting the proposed 2-D structure of emotions of valence and arousal (Russell, 1980), Russell (2003) proposed the circumplex model of affect. This model suggests that all affective states arise from two fundamental neurophysiological systems, one related to "valence" (a pleasure-displeasure continuum), and the other related to "arousal" (an activation-deactivation continuum), which together constitute the "core affect". As per definition, core affect is *"a neurophysiological state that is consciously accessible as a simple, nonreflective feeling that is an integral blend of hedonic (pleasure-displeasure) and arousal (sleepy-activated) values"* (Russell, 2003, p. 147). The circumplex model of affect is depicted in Figure 3.

Figure 3. *Circumplex model of affect (Russell, 2003)*



Down to the present day, Russell's (2003) 2-D perspective on core affect has been adopted in a host of studies focusing on emotional response to aesthetics in online consumption (Mahlke, 2008; Tuch et al., 2009; Moshagen & Thielsch, 2010; Seo et al., 2015). While most scholars agree that aesthetics is positively correlated with valence, the findings for arousal are contradictory. For instance, Seo et al. (2015) could not establish a relationship between aesthetics and arousal, whereas Wang et al. (2011) suggested that online consumer's behavioral consequences from aesthetics are largely dependent on their physiological reaction. This inconsistency in results indicates the need for a better understanding of what levels of classical and expressive aesthetics constitute to arousal in online consumption. Lowengart and Tractinsky (2007) have begun to link the classical and expressive aesthetics framework to core affect. Based on an extensive literature review to explain the driving forces behind the potential effects of classical and expressive aesthetics, the authors tentatively relate classical aesthetics to the valence dimension and expressive aesthetics to the arousal dimension. In a later empirical study, Porat and Tractinsky (2012) examined the effects of classical and expressive aesthetics on emotions using the PAD-scale. Their results revealed significant direct links between online consumer's

experienced valence and arousal and his or her attitudes towards the store. Overall, it appeared that core affect partially mediates aesthetic evaluations and attitudes. For dominance and attitudes, however, no significant relationship could be established. The authors concluded that dominance is more a cognitive than an affective state (Porat & Tractinsky, 2012). As of today, to our knowledge, no study in marketing and HCI could provide significant evidence for the effect of dominance on consumer response related to website quality. In consequence, to capture and measure emotions evoked by classical and expressive aesthetics, we adopt Russell's (2003) theoretical underpinning of core affect.

2.1.3. Emotional and behavioral responses towards aesthetics

In view of the behavioral responses towards aesthetics, the CUE model's theoretical underpinning is similar to the S-O-R paradigm and relates emotional response variables to a diversity of behaviors dependent on the interaction context, such as user's overall preference for a system or choice between alternatives (Thüring & Mahlke, 2007). In the context of website evaluations, these behaviors can be more generally subsumed under the concept of appraisal/dispraisal of website quality (Mahlke, 2008; Hartman, 2008). Several studies have connected response variables from aesthetics relevant to e-commerce practice, such as consumer's purchase intention (Chang et al., 2008; Wu et al., 2014), impulse buying behavior (Chang et al., 2011), satisfaction (Hsu et al., 2012), consumer's attitudes towards the store (Porat & Tractisnky, 2012), or a mix of various outcome variables (Tuch et al., 2009; Wang et al., 2011). Based on these studies, a positive effect of aesthetics on consumers' responses in e-commerce environments can be expected.

However, though these outcome scenarios are highly relevant to practice, it has been criticized that they may not adequately reflect consumers' intrinsic appreciation of website quality (Hartman, 2008). This argument was based on Frijda's (1994) appraisal theory of emotions which assumes that appraisal of any hedonic stimulus is not only driven by emotions (i.e. positive valence), but also contingent upon other decision-making criteria, such as the shopping task or consumer goals (Frijda, 1994). On the other hand, in the absent of contextual background criteria, Frijda (1994) contends that individuals' preference is stimulus-driven. Under these circumstances, individuals tend to prefer aesthetic stimuli based on the personal meaning they give to it that is likely to be driven by their needs as Maslow (1943) has postulated.

Congruent with these assumptions, several scholars demonstrated the moderating role of contextual criteria in online consumer's judgement and preference for aesthetic web design (Hartman et al., 2008; Deng & Poole, 2012; Tuch et al., 2012). These studies further demonstrated the variability of overall website quality judgement dependent on the decision context, but have neglected the role of individual background criteria. This indicates the relevance to study the relation between aesthetics and appraisal of website quality between generational cohorts without any contextual criteria to assess their intrinsic perception of the website's attractiveness.

While Frijda's (1994) appraisal theory of emotions helps to establish the linkage between aesthetics and valence, Berlyne's (1974) behaviorism paradigm, also known as aesthetics theory, helps in describing the consumers' arousal in response to classical and expressive aesthetics. The author posits that user's valence stands in relationship with the arousal potential of an aesthetic stimulus. This relationship is expressed in an inverted U-shaped curve for the arousal potential of a stimulus. Accordingly, aesthetic stimuli with a moderate arousal potential contribute positively to valence ("pleasant"), whereas stimuli with high arousal potential contribute negatively to valence ("unpleasant") (Berlyne, 1974). Thus, aesthetic stimuli that differ in their arousal potential lead to different physiological responses which in turn have impact in evaluating aesthetic preferences. This is helpful in this study because as it brings together classical aesthetics

and expressive aesthetics, thus different aesthetic stimuli, to explain the impact of generational cohorts' emotion and appraisal of website quality.

2.1.4. Consumer characteristics (generational cohorts)

The segmentation of online consumers into multiple segments that have similar characteristics and behavior patterns, yet externally different from other segments, has been considered key to marketing effectiveness and efficiency in e-commerce (Wu et al., 2011). Inglehart first proposed generational cohort theory to divide populations into smaller segments – generational cohorts (Inglehart 1977; 1997). A generational cohort is conceptualized as a group of people born in the same time span, extending to the point where they have children of their own (Meredith & Schewe, 1994). Based on the passage of the same birth years, together with the shared macro-level events occurred during their coming-of- age years (age 17-24), generational cohorts develop similar attitudes, values, and beliefs (Strauss & Howe, 1991). These may persist constant throughout their lifetimes, and create a generational identity (Inglehart, 1977). The segmentation of consumers into generational cohorts has been considered the more efficient segmentation tool rather than age, since Generational Cohort Theory delves below the descriptive surface and addresses the 'why's' in behavior that are crucial to consumers' responses to marketing (Schewe, 2000; Schewe et al., 2000; Lancaster & Stillman, 2002).

As outlined before, this paper delves into the segmentation of generational cohorts by means of Generation X and Z. In review of the literature on these generational cohorts, the research revealed that there are no single accepted ranges or labels for neither Generation X nor Generation Z. For Generation X, for instance, scholars denote individuals of this generation as whom born between 1960 and 1980 (Sayers, 2007), between 1961-1981 (Howe & Strauss, 1993), or 1963-1981 (Tulgan, 1995). Likewise, for Generation Z, scholars put Generation Z to birth years ranging from 1991-2000 (Tulgan, 2009), to 1993-2005 (Turner, 2015), or 1993-2012 (White, 2017). In addition, probably none of the previous generations has as many labels as Generation Z. For example, Post-Millennials, Online Generation, Facebook-Generation, or Gen-Techs (Turner, 2015). Though many theorists have laid on specific ranges and labels to define members of a generational cohort, and categorizations are still under debate (cf. Lissitsa & Kol, 2016; Aksoy et al., 2013), these remain just guidelines (Lancaster & Stillman, 2002). In this view, following the segmentation approach from the European Commission (2020), this study denotes Generation X and for online apparel consumers in Europe born between 1965 and 1980, currently between 40 and 55 years old; and Generation Z for online apparel consumers in Europe born between 1996 and 2004, now around 16 and 24 years old. Between Generation X and Z there is Generation Y, those online apparel shoppers born between 1981 and 1995 and 25-39 years according to the European Commission (2020). However, as a vast majority of marketing studies has focused on Generation Y in context with online consumption (Bilgihan, 2016; Lissitsa & Kol, 2016) and the fact that scholars have begun to study Generation Y's aesthetic web design preferences (Djamasbi et al., 2010; 2011), this study attempts to look at Generation X and Z's aesthetic preferences in online consumption exclusively.

Previous marketing studies showed that information about online consumers uncovered by segmentation approaches enable companies to refine their e-commerce web designs to match aesthetic preferences of their target segments and drive favorable consumer responses (Djamasbi et al., 2011; Lee & Koubek, 2010). Congruent with this argument, socio-demographic variables such as gender (Cyr & Bonanni, 2005; Djamasbi et al., 2007), culture (Cyr et al., 2005; Reinecke & Gajos, 2014), or education level (Reincke & Gajos, 2014) were identified as influential factors in consumer's aesthetic perception and experience from websites. As mentioned before, hardly two studies have connected the study of aesthetic web design preferences to generational cohorts (Djamasbi et al., 2010; Djamasbi et al., 2011). Overall, these studies reported similar aesthetic preferences across Generation Y and the Baby Boomers towards websites with large images,

pictures of celebrities, and little text (Djamasbi et al., 2010; 2011). Thus, insights on Generation X's and Z's aesthetic preferences in web design are lacking, and the question arises how generational cohorts influence the expected relationships between aesthetics, core affect, and website quality perceptions. Looking at research on generational cohorts' consumption behavior, this line of research reveals that the different experiences across cohorts are reflected in their shopping experience (Parment, 2011; 2013), something that has also been proven in the online context (Bilgihan, 2016; Lissitsa & Kol, 2016; Herrando et al., 2019). This suggests that this research field could be very beneficial as an alternative approach to explore aesthetic web design preferences across Generation X and Z. Apart from detailed characterization of each generation, this study discusses characteristics of Generation X and Z that may facilitate their behavior in an online shopping environment.

In view of Generation X, scholars reported that members of this generation like to research while shopping online (Lissitsa & Kol, 2016), as they want to hear the features of the product or service in addition to an explanation of why these features are essential (Himmel, 2008). In this vein, Generation X has a reputation of having an attitude of risk avoidance and low capacity of risk (Reisenwitz & Iyer, 2009). Members of this generation tend to focus greatly on the opinion of others and often need reassurance that their choices are solid, and consequently reads more opinion websites than any other generation (Lissitsa & Kol, 2016). Generation X further integrates traditional search in their decision-making (Heaney, 2007), and is turned off by slick and generalized marketing promotions aimed at them (Dunne & Lusch, 2008). In sum, these studies indicate the sense of skepticism of Generation X in online consumption along with its demand for information to reduce the perceived risks.

Generation Z is the newest generation, and the advancement of digital technologies has been widely considered the most distinctive trait of Generation Z from previous generations (Berkup, 2014). It is the first generation that was born with the Internet rather than being accustomed to it, with the result that being online almost 24/7 has become the 'norm' to Generation Z'ers rather than the unusual (Bencsik, Horváth-Csikós, & Juhász, 2016). Different to Generation X, Generation Z has a reputation of being less risk avoidant, as they are more agile and look for new innovations continuously (Bencsik, Horváth-Csikós, & Juhász, 2016). They often virtually integrate with companies and brands through various channels where they not only consume content but also create and control it (Priporas, Stylos, & Fotiadis, 2017). They engage with sophisticated technologies and are more accustomed to multitasking, which has shortened their attention span and which is why they usually prefer visualizations over written information (Williams & Page, 2011). In a similar vein, they tend to have higher expectations about the experience with interactive technologies rather than system features (Lissitsa & Kol, 2016). Following these studies, Generation Z puts great stress on pleasant shopping experiences and appreciates visualizations over extensive product descriptions.

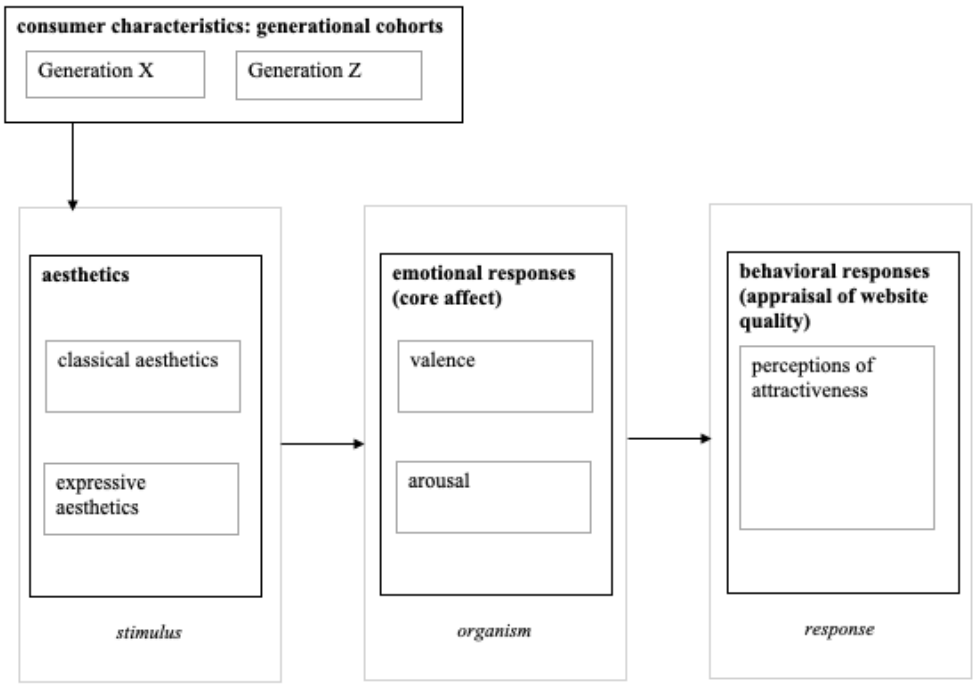
2.2. Theoretical framework

In summarizing all the above-mentioned theories and frameworks on user experience, aesthetics, emotional and behavioral responses, and consumer characteristics, extant research has established the conceptual structure of aesthetics judgement of web design and its relationships with core affect, website quality perceptions, and socio-demographic variables. However, extant research has yet to investigate the role of generational cohorts in this context, as they are considered strong predictors in online shopping behavior. Moreover, aesthetics is assumed to have unanimous impact on emotional responses based on individual web design preferences. Core affect in turn may have significant impact on overall perceptions of website's attractiveness. Based on the reviewed generational cohort literature, Generation X and Z may experience the same web design as pleasant/unpleasant or activating/deactivating, and in turn respond differently due to their different values and experiences. Likewise, based on generational cohorts' different needs and

desires in online shopping, the different levels of classical and expressive aesthetics in web design may trigger their online shopping experience differently based on their potential differences in web design.

To address these issues, this study proposes a conceptual framework based on Thüring and Mahlke's (2007) CUE model in addition to Mehrabian and Russell's (1974) S-O-R paradigm to examine the effects of aesthetics (i.e. classical and expressive) on core affect (i.e. valence and arousal) on appraisal of website quality (i.e. perception of attractiveness) taking into account generational cohorts (i.e. Generation X and Z). Based on our literature review on generational cohorts' online consumption behavior, our framework posits that Generation X and Z moderate the relationships between evaluation of aesthetic qualities and emotional responses (Herrando et al., 2019), which may result in differences in the perception of a website's attractiveness. Further, it is proposed that emotional responses mediate the relationship between aesthetics and behavioral responses. To empirically assess emotions induced by aesthetics, this study adopts Russell's (2003) approach on core affect. Investigations on behavioral responses are rooted in literature from psychology. Frijda's (1994) appraisal theory of emotions helps in explaining aesthetic web design preferences and online shopping experiences across generational cohorts resulting from valence, whereas Berlyne's (1974) behavioral paradigm helps in the investigation towards arousal. Behavioral responses are reflected by the evaluation of the website's attractiveness which stems from HCI research to assess the consumer's overall website quality evaluation (Mahlke, 2008; Hartman, 2008). Based on these theories and frameworks, the following theoretical framework (cf. Figure 4) is proposed.

Figure 4. *Theoretical framework (own elaboration)*



3. Hypotheses development

3.1. Aesthetics and core affect

Originally, the work from Lavie & Tractinsky (2004) was not guided by any affective approach but based on a bottom-up approach on what users considered as aesthetics in websites. Later,

Tractinsky & Lowengart (2007) associated the two dimensions of aesthetics to the affective quality of an environment as postulated in Mehrabian and Russell's (1974) S-O-R model and later modified by Russell (2003) with regard to the individual's emotional state. According to Tractinsky & Lowengart (2007), classical aesthetics refer to the user's valence experienced from web design, whereas expressive aesthetics refer to arousal. To see whether empirical research has also found support for this relationship, the next sub-sections review studies on classical and expressive aesthetics in relation with valence and arousal an online shopping context.

3.1.1. Effects of aesthetics on valence

Classical aesthetics, which relates to how the web design elements are well organized in an orderly and clarified way (Lavie & Tractinsky, 2004), induces a more pleasant interaction with the site (Tractinsky & Lowengart, 2007). This premise is based not only on theoretical grounds in psychology that individuals intrinsically prefer objects that are easy to follow (Frijda, 1994; Maslow, 1943) which reduces their cognitive efforts to process the design (Leder et al., 2004), but also on empirical evidence from numerous scholars. Sonderegger and Sauer (2014) find that classical aesthetics is more strongly related to valence than expressive aesthetics. Cai & Xu (2011) demonstrate the importance of classical aesthetics on valence and consumers perceived online shopping value. Likewise, Porat and Tractinsky (2012) show that valence mediates the relationships between perceptions of classical aesthetics and approach/avoidance tendencies towards online stores. In context with mobile commerce, Bhandari et al. (2019) support the importance of classical aesthetics on valence which in turn significantly impact user decisions. Accordingly, attractiveness and quality perceptions are two such user decisions that can be predicted by valence (Bhandari et al., 2019). Based on these studies, a positive relation between classical aesthetics and valence can be expected.

While classical aesthetics based web designs factors have been largely explored in relation to valence, the role of expressive aesthetics on valence remains underexplored. As suggested by Tractinsky and Lowengart (2007), classical aesthetics induce more positive valence than expressive aesthetics, something that has been supported by Sonderegger and Sauer (2014). On the other hand, Porat and Tractinsky (2012) were able to empirically show an association between expressive aesthetics and feeling of pleasure. This finding is contingent with the new wave of user experience research which suggests that users expect systems to have modern interface design which emphasize emotional aspects such as pleasure, fun, and excitement (relative to expressive aesthetics) whilst they likewise take issues of functionality and usability (relative to classical aesthetics) for granted (Hassenzahl, 2003; Tractinsky, 2006). Therefore, a positive relation between expressive aesthetics and valence is expected, too.

(H1). *Aesthetics is positively associated with valence*
(H1a). *Classical aesthetics is positively associated with valence.*
(H1b). *Expressive aesthetics is positively associated with valence.*

3.1.2. Effects of aesthetics on arousal

Lowengart and Tractinsky (2007) imply that expressive aesthetics affect arousal, whereas the role of classical aesthetics on arousal remains less understood. Based on this finding, Porat and Tractinsky (2012) expected that websites following an expressive aesthetics approach of creativity and sophistication in interface design may lead to increased amounts of arousal, whereas websites following higher levels of classical aesthetics will not influence consumers' level of arousal. Contrary to their expectation, however, high levels of classical aesthetics were associated with higher arousal levels. Yet, Porat and Tractinsky (2012) did not further specify this finding. In general, while a vast body deals with the valence (pleasure/displeasure) in relation

with classical and expressive aesthetics, arousal has been rather overlooked and its impact in the online shopping environment has not been tested extensively (Bhandari et al., 2019).

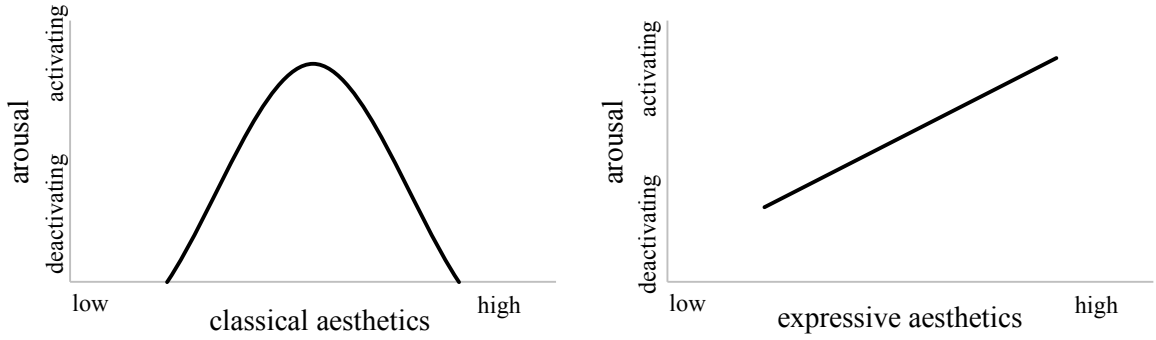
To explore the relation between classical aesthetics and arousal in more depth, it is considered fruitful to look at studies on the visual complexity of websites that is a closely related factor to the classical aesthetics dimension (Lavie & Tractinsky, 2004). Extant research has shown that visual complexity is a strong predictor of aesthetics judgements towards websites (Moshagen & Thielsch, 2010; Tuch et al., 2009; 2012). Overall, these studies reported that an increase of visual complexity is positively related to increase in arousal, which then has carry-over effects on subsequent approach/avoidance tendencies towards websites (Deng & Poole, 2010). In other words, with increase in website complexity (achieved by lowering classical aesthetics), it becomes more difficult for a user to process the design, hence increasing arousal. Though the aesthetic theory of Berlyne (1974) would suggest an inverted U-shaped relationship between visual complexity and arousal, numerous studies (Tuch et al., 2009; 2012; Pandir & Knight, 2006) could not establish such a curvilinear relationship, while Geissler et al. (2006) instead were able to find just such an inverted curvilinear relationship. Tuch et al. 2009 argued that their finding of a negative linear relationship between visual complexity and arousal could be a result of a deficiency of less complex website stimuli in their sample. Contrary to Geissler et al. (2006), the authors used real websites rather than self-designed websites that all used custom design guidelines that have become familiar to consumers (Tuch et al., 2009). Familiarity, in turn, is considered to reduce ambiguity in aesthetic experience as postulated in psychology (Kaplan, 1987; Leder et al., 2004), and thus may have a calming effect on human senses, thus decreasing levels of arousal. In light of this, Tuch et al. (2009) assumed that the finding of Geissler et al. (2006) in contrast could be due to the usage of self-designed website stimuli which varied in the degree of visual complexity and may have weakened the effect of familiarity, thus increasing levels of arousal up to a certain threshold. In total, this would suggest that there is a curvilinear relationship between classical aesthetics and arousal which however can be only detected by using self-designed website stimuli that break design conventions. Web designs scoring lower on balance and order may lie on the first half of Berlyne's (1974) inverted U-shaped curve as they would stimulate online consumers' aesthetic processing more intensively. This however would only hold up until a certain threshold, where the design would become 'too structured' and thus 'too easy' to perceive or 'too familiar' with standard web designs. After this point, online consumers may become less encouraged to browse the e-commerce website. Thus, a curvilinear (inverted U-shape) relationship between classical aesthetics and arousal is expected.

While the direction and the magnitude of the relationship between classical aesthetics and arousal is less clear in the literature, the majority of studies are unified in the support of a positive relationship between expressive aesthetics and arousal. In general, the expressive aesthetics dimension is manifested by the ability to break design conventions and a strong determinant of excitement experienced (Lavie & Tractinsky, 2004). Studies have shown that websites that are designed on the premise of expressive aesthetics triggering the experience factor in online shopping have a positive relationship with arousal due to the online consumers' desire for fun and entertainment in online shopping (Jeong et al., 2009). The higher the magnitude of expressive aesthetic elements, the higher the induced levels of arousal which can have a positive impact on approach behaviors in online shopping (Ha & Lennon, 2010). Ultimately, Porat and Tractisnky (2012) identified a direct significant path between expressive aesthetics and consumers' attitudes towards the store. Hence, we hypothesize that there is a positive relation between expressive aesthetics and arousal. In sum, whereas both classical and expressive aesthetics dimensions are expected to be positively related with valence (i.e. pleasure), their effects on arousal are expected to differ (cf. Figure 5).

(H2). *There is a non-linear relationship (an inverted U-shape) between classical aesthetics and arousal.*

(H3). *Expressive aesthetics is positively associated with arousal.*

Figure 5. The proposed relationships between aesthetics and arousal (own elaboration)



3.1.3. Aesthetics, core affect, and generational cohorts

Ultimately, the question arises how Generation X and Z response emotionally towards aesthetics. Since this in an undeveloped field in research, we tentatively develop our hypotheses based on our literature review on generational cohorts' online consumption behavior in addition to research that has focused on age-related differences among consumers in an online shopping context.

Tractinsky and Lowengart (2007) provide an aesthetic grid for the design e-commerce websites by considering variations in consumer age in terms of young and old. Overall, the authors suggest classical and expressive aesthetics can affect valence and arousal across age groups in a different manner. Both younger and older consumers are expected to appreciate classical aesthetics which leads to more pleasant feelings (more positive valence), but younger consumers would probably be less enthusiastic about classical aesthetics for two reasons. First, since young generations are usually more open to new forms of expression (Reisenwitz & Iyer, 2009). This was supported from Feist and Brady (2004) who examined differences in aesthetic evaluations of paintings based on age and attributes of openness and sensation seeking. Their results revealed that younger age groups scored higher on these attributes showed more positive valence and higher levels of arousal while being exposed to expressive designs (Feist & Brady, 2004). Second, since young generations are expected to seek fun while online shopping and usually are usually less risk avoidant in their behavior (Zuckerman, 1994; Cyr et al., 2006). For example, Generation Z's capability and experience in digital technologies could help them to decrease their perceived risk for online consumption (Priporas et al., 2017) in contrast to Generation X who is less experienced in Internet technologies and often shows risk avoidance tendencies in online consumption (Lissitsa & Kol, 2016). Congruent with these arguments, our literature review revealed that Generation Z seeks fun and entertainment while online shopping and is less risk avoidant in contrast to Generation X who tends to prefer as much information as possible to secure themselves against potential frauds. Considering the moderating role of generational cohorts in consumption settings (Parment, 2011; 2013; Herrando et al., 2019), it is expected that generational cohorts moderate the relationship between aesthetics and valence.

Vice versa, Lowengart and Tractinsky (2007) postulated that older age groups are less enthusiastic about expressive aesthetics than the young. Again, this argument is based on the assumption that sensation seeking behavior declines with age (Zuckerman, 1994) such that Generation X is considered less open to experience something new (Reisenwitz & Iyer, 2009; Lissitsa & Kol, 2016). Thus, it is expected that older age groups are less open to web designs that are thought to break design conventions (i.e. expressive aesthetics) in contrast to more traditional and custom designs (i.e. classical aesthetics). This would lead to the assumption that levels of

arousal differ across Generation X and Z exposed to expressive web designs due to their different needs and preferences in aesthetic designs (Frijda, 1994). Last but not least, bearing in mind the natural process of vision loss with the passing of the years (Leder et al., 2004), it is expected that older people may have difficulties in processing expressive designs while classical designs support their visual processing (Lowengart & Tractinsky, 2007). Hence, congruent with Berlyne's (1974) behaviorism paradigm, the experienced arousal levels between Generation X and Z from the same web design may differ, for example in the extent that Generation X's arousal level would first increase from expressive web designs due to their aggravated visual processing, but only up to a certain threshold where the design would become too complex to process or too unconventional contrary to their preferences of custom designs. Vice versa, while web designs scoring high on classical aesthetics (e.g. structured content, high amount of text-based information) may be perceived as activating by Generation X, they may be deactivating to Generation Z who rather prefers to consume information via images and likes to be entertained as revealed in our literature review. In turn, as postulated by Berlyne (1974), the different levels of arousal are related to experienced valence which together determine generational cohorts' evaluation of classical and expressive aesthetics. Again, bearing in mind the moderating role of generational cohorts in consumption settings, it is expected that generational cohorts moderate the relationship between aesthetics and arousal.

(**H4**). *Generational cohorts moderate the relationship between aesthetics and core affect.*

(H4a). *Generational cohorts moderate the relationship between aesthetics (classical and expressive) and valence*.

(H4b). *Generational cohorts moderate the relationship between aesthetics (classical and expressive) and arousal.*

3.2. Aesthetics, core affect, and appraisal of website quality

Scholars suggest that core affect induced by aesthetic web design stimuli influences consumers' website quality perceptions (Kim & Lennon, 2013). Perceptions of attractiveness is one of the quality judgements in user experiences from e-commerce websites (Mahlke, 2008). Such evaluation however does not necessarily require cognitive elaboration. Neuroscience underpins that affect and cognition are potentially independent constructs (Storbeck & Clore, 2007). In consequence, attractiveness is one such user judgement that can be predicted through affective response to aesthetic web design stimuli. Congruent with this assumption, Lindgaard et al (2006) evidenced that users are able to judge the visual appearance of a website in a very short time based on their affective response to aesthetic stimuli. In addition, the overall pattern of results suggests that valence has a consistently positive effect on consumer responses in the online environment (Porat & Tractinsky, 2012; Kim & Lennon, 2013). Though the findings for arousal in this environment are less consistent and have varied across studies (Porat & Tractinsky, 2012; Tuch et al., 2009; 2012), this may stem from the reason that preferences for aesthetics depend on individual motivations and believes of different personal values (Frijda, 1994) which however was not considered in extant research as discussed already. Second, these relations may be contingent upon the different levels of aesthetics in web design which may be achieved though self-designed interfaces with rather unconventional designs opposed to the 'typical' e-commerce websites consumers are familiar with and thus induce less arousal levels (Tuch et al., 2009). In contrast, it is believed that consumers nowadays expect online shopping experiences to be fun and engaging (Bilgihan et al., 2016). Hence, it is expected that generational cohorts appraise websites which they perceive as visually attractive based on a particular combination of aesthetics that induce valence and arousal positively according to their intrinsic preferences that moderate their consumption behavior as discussed extensively in the generational cohort

literature. Thus, a positive direct relationship between core affect and appraisal of website quality is expected that is furthermore moderated by generational cohorts. Figure 6 and Table 2 provide a summary of the main hypotheses.

(H5). *Core affect (valence and arousal) is positively related with appraisal of website quality.*
(H5a). *Valence is positively associated with appraisal of website quality.*
(H5b). *Arousal is positively associated with appraisal of website quality.*

(H6). *Generational cohorts moderate the relationship between core affect (valence and arousal) on appraisal of website quality.*
(H6a). *Generational cohorts moderate the relationship between valence and appraisal of website quality.*
(H6b). *Generational cohorts moderate the relationship between arousal and appraisal of website quality.*

Figure 6. *Visual summary of main hypotheses*

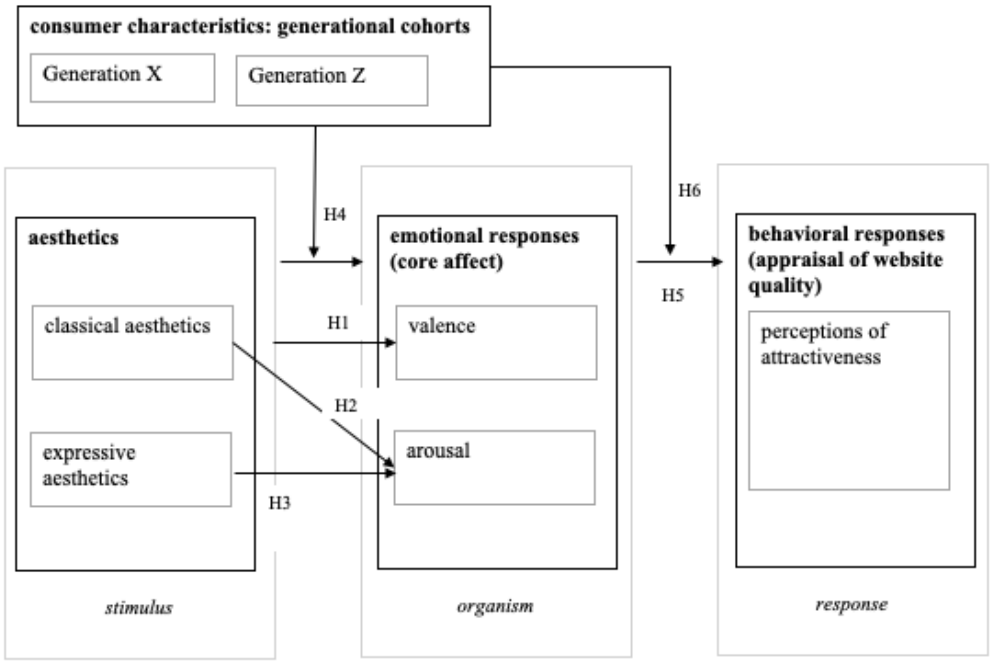


Table 2. *Summary of main hypotheses*

Hypotheses	Concept	Expected Effect
H1	aesthetics and valence	linear-relationship (+)
H2	classical aesthetics and arousal	quadratic-relationship (∩)
H3	expressive aesthetics and arousal	linear-relationship (+)
H4	aesthetics, core affect and generation	moderating role of generation
H5	core affect and appraisal of website quality	linear-relationship (+)
H6	Core affect, appraisal of website quality, and generational cohorts	moderating role of generation

4. Methodology

4.1. Sample

Out total sample included 168 participants that were recruited from the author's private circles and students from University of Twente on a voluntary basis without any rewards. 28 percent of the respondents (n=47) could be grouped to Generation X, and 25 percent (n=41) to Generation Z. The remaining half (53 percent) of respondents could be grouped to other generational cohorts to be used in later studies, for example to compare Generation X and Z's aesthetic preferences in comparison to Generation Y or the Baby Boomers. The focus of this study however is on Generation X and Z exclusively. All participants gave consent on ethical approval following the General Data Protection Guidelines and bought apparel online 12 months prior to the survey which was conducted in April 2020. This was the eligibility condition to eliminate to control for effects of online shopping experience on that can influence perceived website quality (Kim & Niem, 2009).

4.2. Experimental design

In order to understand the relationships between aesthetics, core affect, their effect on website quality perceptions and generational cohorts, a 2x2 (classical aesthetics: high vs. low; expressive aesthetics: high vs. low) mixed factorial design was developed with aesthetics as within factor and levels as between-factor. The experiment took place in form of an online survey which was implemented with the qualtrics software (www.qualtrics.com) and conducted in April 2020. Though there has been a recent debate on the shortcoming of subjective report on capturing affective response during the user experience with an interactive system (Lemon & Verhoef, 2016; Verhulst et al., 2019;), most scholars would agree that emotions arise from activation of behavioral tendencies and changes in subjective experience (Nielsen & Kaszniak, 2007). In addition, past studies warrant the value of questionnaire approach in the study of affective response towards aesthetics website stimuli in online consumption (Porat et al., 2007).

4.2.1. Procedure

The online survey was divided into two parts: an introduction part and the main study including the experimental treatments. The introduction was similar to every participant and collected information regarding sociodemographic variables including questions on education or employment situation that could help in deciphering the true aim of the experiment. Based on Latin Square design (Winer, 1962), participants were randomly allocated to two out of four treatments of mixed experimental design. The order in which the participants received the two treatments were randomized under the restriction of balance required for Latin square, which means that participants were either randomly allocated to treatments (1) and (4), which we called study (A), or treatments (2) and (3), denoted as study (B) (please refer to Table 3).

The treatments consisted of four website screenshots that were self-designed under the 2x2 condition of (classical vs. expressive; high vs. low). After the presentation of each website stimuli, participants were asked to indicate their aesthetic perception of this stimuli in addition to their feelings of valence and arousal. To control for the moderating role of tasks and consumer goals in aesthetic evaluations (Frijda, 1994), participants neither performed any task in the experiment, nor did they have to achieve a specific goal. The study concluded with an illustration of both website interface (stimuli 1 and 4 in study A vs. stimuli 2 and 3 in study B) next to each other which requested the participants' aesthetic preference based on the two design alternatives presented in each of the studies.

4.2.2. Stimuli

Study A consisted of two self-designed screenshots that illustrated the e-commerce startpage of a fictive shoe vendor ("www.shoes-everywhere.com"). Study B consisted of two self-designed screenshots of a fictive clothing vendor named ("www.clothing-everywhere.com"). We acknowledge that HCI scholars have criticized the usage of screenshots in comparison to real-world domains as the participants cannot freely use and interact with the website which may bias their user experience (Hassenzahl & Tractinsky, 2006). The aim of our study, however, is not to carry out a formal usability test. The focus on aesthetics is beneficial in studying online consumer behavior since in case for 'high-touch products', such as apparel, consumers feel the need to physically inspect the product (Levin et al., 2003), which is why they rely on other cues in decision-making due to the physical burden of the environment. Hence, apparel companies could potentially benefit from stressing aesthetics rather than usability in web design (Porat & Tractinsky, 2012). Moreover, the usage of self-designed screenshots helped us to create aesthetical variance (classical vs. expressive aesthetics; high vs. low) based on three items for each of the two aesthetics dimensions as suggested by Lavie & Tractinsky (2004) as well as to control for effects of brand familiarity in online apparel consumption (Park & Stoel, 2005). Prior to the main study, the experimental conditions were analyzed in a series of manipulation checks (cf. section 4.3.3.).

Guided by the guidelines from Lavie and Tractinsky (2004) on classical aesthetics, the interfaces were manipulated based on the dimensions of cleanliness, clarity, and symmetry that overall denote to the balance of web design. For example, for interfaces with low classical aesthetics (cf. stimuli 2 and 4), product pictures were non-lineary assorted next to each other. This was believed to be a simple yet effective way to contribute to the overall disbalance of the design as counterpart to human intrinsic preference for order and symmetry (Maslow, 1943) while online shopping without any specific goal or task (Frijda, 1994). For high levels of classical aesthetics in contrast (cf. stimuli 1 and 3), products were presented in rectangles of equal size to evoke the 'orderliness' in web design. This was believed to inhibit the participants' visual processing of aesthetics (Leder et al., 2004).

Guided by the guidelines from Lavie and Tractinsky (2004) on expressive aesthetics, the interfaces were designed based on dimensions of creativity, originality, and specialty that overall denote to the 'originality' of the web design. For low expressive aesthetics (i.e. low originality), for example (cf. interface 3 and 4), the website elements such as the navigation were illustrated in a regular 'list-based' menu format that is commonly used in e-commerce. These standardized ways of displaying e-commerce functionalities were sought give the designs a lack of novelty in design as there was nothing special about the design that might excite the user. In contrast, high interfaces on high expressive aesthetics (cf. stimuli 1 and 2) rather have unique ways of displaying products and navigation that were sought to add to the creativity in design, such as navigations that were illustrated via mannequins rather than text, or products that stand out in a 3-D way.

Table 4 and Table 5 provide a detailed overview on the manipulated design parameters. Figure 7 provides a visual presentation of the four stimuli.

Table 3. *Allocation of treatments*

Stimuli	Manipulation	Study	n (total)	Gen X (n)	Gen Z (n)
1	high classical & high expressive	A	43	23	20
2	low classical & high expressive	B	45	24	21
3	high classical & low expressive	B	45	24	21
4	low classical & low expressive	A	43	23	20

Table 4. *Manipulation of classical aesthetics design parameters for website stimuli*

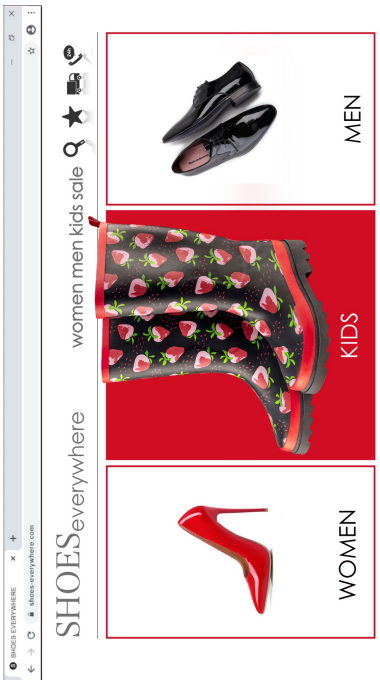
Attribute	High	Low	Source
clear	high contrasts between web elements achieved through signal colors (red), large images and products framed in rectangles, unified color schemata	low contrasts between the different web elements, e.g. blurred or almost transparent light grey) product frames	self-developed, based on Lavie & Tractinsky (2004)
clean	repeating colors, captions and product images in similar frames/sizes	no unitary color schemata, random size of product images	self-developed, based on Lavie and Tractinsky (2004)
symmetry	grouped arrangement of web elements so that text and images are equally spaced throughout the interface	random arrangement of web elements so that text and images are in one quadrant and the rest of the interface is almost empty	self-developed, based on Lavie and Tractinsky (2004)

Table 5. *Manipulation of expressive aesthetics design parameters for website stimuli*

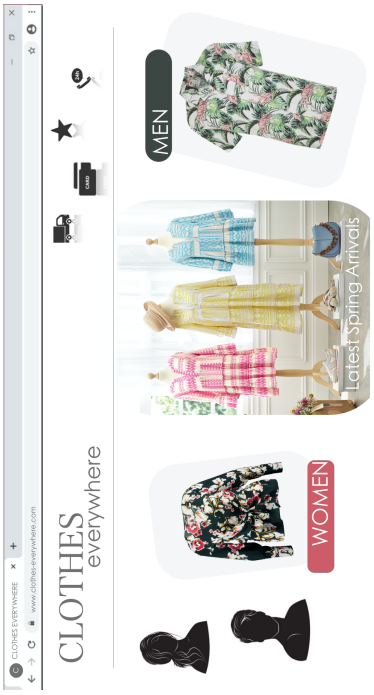
Attribute	High	Low	Source
originality	custom shapes rather than 'regular' e-commerce symbols and text, e.g. navigation illustrated through mannequins, usage of shades	Interface design is inspired from custom design guidelines, e.g. text-based navigation without shade effects etc.	self-developed, based on Lavie and Tractinsky (2004)
creativity	display of products and e-commerce functions in an unusual and unexpected way (e.g. usage of custom shapes, non-linearity assignment of navigation symbols, 3-D product presentation)	display of products and e-commerce functions in a standardized way (e.g. navigation on the left corner, text-based navigation, etc.)	self-developed, based on Lavie and Tractinsky (2004)
special	cascading style sheets (shadows) are used to create more 'depth' (e.g. shadows under navigation symbols), 3-D effects in product presentation	lack of cascading style sheets and regular methods of product and information presentation	self-developed, based on Lavie and Tractinsky (2004)

Figure 7. *Stimuli used in the experimental conditions (own elaboration)*

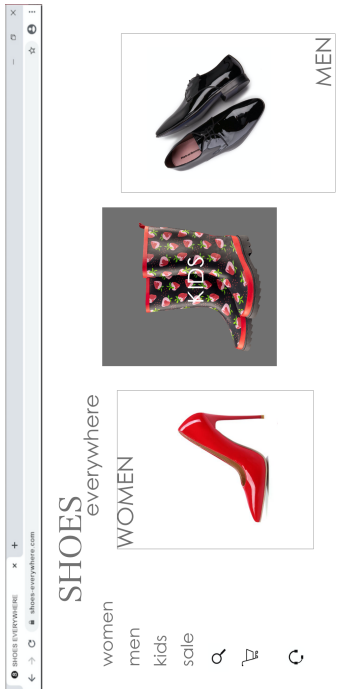
Study (A) – Stimulus 1
High Classical vs. High Expressive



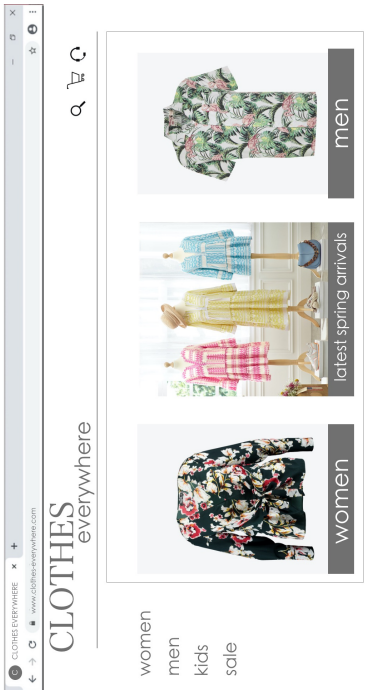
Study (B) – Stimulus 2
Low Classical vs. High Expressive



Study (A) – Stimulus 4
Low Classical vs. Low Expressive



Study (B) – Stimulus 3
High Classical vs. Low Expressive



Note: Please refer to Appendix for high-solution images.

4.3. Measurement

4.3.1. Independent variables

A number of independent variables are included in the research framework. *Classical aesthetics* and *expressive aesthetics* and *high* and *low* were treated as independent variables in the 2x2 experiment. In the survey, participants were first asked to indicate their immediate aesthetic perception to each of the two website stimuli in their respective study. The items used for this aesthetic evaluation were derived from Lavie and Tractinsky's (2004) aesthetics scale. For the purpose of our study, however, we only used three instead of five items for each of the two dimensions of aesthetics as presented in Table 6. Moreover, we combined the three items into one question of six items respectively (*"Please indicate the extent to which you agree or disagree with the following descriptions?")*. The reduction and combination of the items into one question was chosen to hide the true purpose of the study to grasp intrinsic aesthetic evaluations and preferences across individuals without leaving them too much thinking about the design. Likewise, our intention was to gather the participants' immediate response to the aesthetic design that can influences their affective response (Lindgaard et al., 2006; Tractinsky et al., 2006). To make sure that participants can respond in a quickly manner, a 5-point-Likert scale (strongly disagree-neutral-strongly agree) was used. This is in contrast to subsequent questions in the survey which utilized 7-point-Likert scales. Though we acknowledge that the usage of different Likert-scales in the same questionnaire could be irritating to participants (Sullivan et al., 2013), researchers in marketing widely deem 5-point Likert scales a sufficient tool utilizing immediate consumer response descriptors (Dawes, 2008). Moreover, the 7-point-Likert scales used in the following course of the survey were bipolar items measuring two extremes of the same construct as discussed next, that could help participants' distinguishing the scales from each other. Prior to the data analysis, the different scales were checked for normal distribution and standardized based on Z-scores for data comparability reasons.

The participants' emotional responses (i.e. *core affect*) were measured through the independent variables *valence* and *arousal*. To capture subjective emotional responses, 7-point bipolar scales which label one category at either endpoint of the response scale were adopted from extant literature. Specifically, the items and scales used in the study were proposed by Porat et al. (2007) based on the original items forwarded in the PAD scale by Mehrabian and Russell (1974) and later modified by Russell (2003) in addition to the self-assessment manikin proposed by Bradley and Lang (1994). Porat et al. (2007) modified these scales to the evaluation of online shopping experiences. Opponents have argued that bipolar scales may have several limitations. For instance, it has been pointed out that bipolar scales may not distinguish between ambivalence and neutrality (Kaplan, 1972; Cacioppo et al., 1997), or that the two concepts measured by the same scale may not vary inversely (Solomon, 1978). Nonetheless, recent user experience studies with focus on aesthetics as stimuli to affective response in online consumption have verified the adequacy of bipolar scales (Porat & Tractinsky, 2012; Kim & Lennon, 2013). As a result, for *valence*, participants were asked to indicate their subjective feeling based on six items in a 7-point bipolar scale (e.g. significantly unhappy-neutral-significantly happy). For arousal, participants were asked to indicate their physical reaction based on six items in a 7-point bipolar scale (e.g. significantly relaxed – neutral – significantly stimulated).

Lastly, the independent variable *generational cohort* was captured and measured by two categories: *Generation X*, for participants born between 1965-1980, and *Generation Z*, those born between 1996-2004. Please note that these conceptualizations are based on the report on the published by the European Commission in January 2020, which could be different from segmentation provided in the literature on generational cohorts. Nonetheless, for the scope of this study, we consider this conceptualization as fruitful to shed light on the web design preferences of Generation X and Z in online apparel consumption.

4.3.2. Dependent variable

There is one dependent variable relevant in this study that denotes the user's appraisal of website quality: *perception of attractiveness*. Evaluations of participants' *perception of attractiveness* towards the four website stimuli covered six items brought forward in the AttrakDiff scale by Hassenzahl (2001) that were examined on a 7-point bipolar scale (e.g. unattractive-neutral-attractive). Table 6 provides a summary of the measurement scales and sources used.

Table 6. *Measurement scales used in the online survey*

Variable	Items	Acquisition	Source
Independent variables			
classical aesthetics	clean, clear, symmetric	5 point-Likert scale	Lavie and Tractinsky (2004)
expressive aesthetics	creative, original, special	5 point-Likert scale	Lavie and Tractinsky (2004)
valence	six items in the pleasure scale	7-point-bipolar scale	Mehrabian and Russel (1974); Bradley and Lang (1994); Porat et al. (2007)
arousal	six items in the arousal scale	7-point-bipolar scale	Mehrabian & Russel (1974); Bradley and Lang (1994); Porat et al. (2007)
Dependent variable			
attractiveness perception	global evaluation of attractiveness	7-point bipolar scale	Hassenzahl (2001)

Note: Prior to the analysis, variables were standardized based on Z-scores.

4.3.3. Data preparation and manipulation checks

All data were processed by SPSS. Prior to the main analysis, all data were checked for normal distribution using Shapiro-Wilk test ($p > .05$). Homogeneity assumption was confirmed using Levene's test ($p > .05$). Univariate outliers were inspected and rejected from the data using box-plot, for multivariate outliers the Mahalanobis Distance Test was used. All statistical tests were conducted at significance level of $\alpha = 0.05$. Further, we performed confirmatory factor analysis to confirm the validity of each questionnaire-item which resulted in an acceptable fit: χ^2 587.72, df 276 ($p < .001$). All estimated path coefficients had t-values significant at $p < .001$.

As a first step, to see whether the experimental conditions have been effectively manipulated, we conducted a set of analyses of variance (ANOVA). First, we ran a 2x2 mixed factorial ANOVA for study A with the two dimensions of aesthetics (*classical* vs. *expressive)* and the two treatments (high vs. low) according to interface 1 and 4 as within-subjects. Overall, the results presented in Table 7 indicated higher ratings on classical aesthetics for interface 1 than for interface 4 ($M = 4.48$ vs. 2.10, $F(1, 41) = 250.21$, $p < 0.01$). Likewise, higher expressive aesthetics were reported for interface 1 compared to interface 4 ($M = 4.20$ vs. 1.75, $F(1, 41) = 250.21$, $p < 0.001$). Furthermore, results in Table 8 showed significant individual effect of the

type of aesthetics ($p < 0.001$) and the level of treatments ($p < 0.001$). No interaction occurred between *aesthetics* and *level* ($p > .05$). Thus, the manipulation check confirmed the experimental conditions for study A.

For study B, we followed the same analysis procedure. Results in Table 7 indicated lower ratings on classical aesthetics for interface 2 than for interface 3 ($M = 2.68$ vs. 2.98, $F(1, 44) = 39.37$, $p < 0.001$). At the same time, interface 2 received higher ratings on expressive aesthetics than interface 3 ($M = 2.97$ vs. 2.68, $F(1, 44) = 39.37$, $p < 0.001$). Results in Table 8 showed significant individual effect of the type of aesthetics ($p < 0.001$) and the level of treatments ($p < 0.001$). No interaction occurred between *aesthetics* and *level* ($p > .05$). The manipulation check indicated successful experimental manipulation for study B as well. In consequence, *classical aesthetics* and *expressive aesthetics* could be used as independent variables in the main study.

Table 7. *Ratings on classical aesthetics and expressive aesthetics by study and stimuli*

	Condition							
	Study A				Study B			
Stimuli	**1**	**4**	**total**	**n**	**2**	**3**	**total**	**n**
Classical Aesthetics								
M	4.48	2.10	3,29	42	2.68	2.97	2.83	45
SD	.53	.87	.70	42	1.28	1.41	1,35	45
Expressive aesthetics								
M	4.20	1.75	2.98	42	2.98	2.68	2.83	45
SD	.68	.83	.76	42	1.41	1.28	1.35	45

Note. Attributes were rated on a 1-to-5 scale.

Table 8. *Manipulation check for the experimental factors*

	df	**Mean square**	***F***	**Sig**
Study A			$F(1,41)$	
aesthetics (classical vs. expressive)	1	245.29	250.21	.000
level (high vs. low)	1	.98	15.44	.000
aesthetics x level	1	.26	.09	.766
Study B			$F(1,44)$	
aesthetics (classical vs. expressive)	1	24.422	39.367	.000
level (high vs. low)	1	24.322	39.367	.000
aesthetics x level	1	8.668	2.320	.135

5. Results

5.1. Interface stimuli comparison on classical and expressive aesthetics

Prior to the hypotheses analysis, we investigated the changes in perceived aesthetics from the two interfaces presented in each of the two studies. This was to get a more detailed insight into the overall evaluation of the four website stimuli. Therefore, a repeated measure analysis of variance (ANOVA) with *interface* (A: 1 vs. 4; study B: 2 vs. 3) as within-subject factor and *classical-expressive-aesthetics* and *high-low* as between-subject factors. As dependent variables we used the scales on *classical aesthetics* (cf. Table 4) and *expressive aesthetics* (cf. Table 5).

For study A, a one-way within-subjects ANOVA was conducted to compare the effect of interface type on evaluations of *aesthetics* and *high-low* conditions. There was a significant effect of interface type, Wilks' Lambda = .070, $F(1,11) = 120.148$, $p < .001$). Thus, we can conclude that there was a significant difference between the experimental conditions in study A (interface 1 vs. interface 4). Since we have found a statistically significant result, we computed additional paired *t*-tests to make post hoc comparisons between the conditions (expressive aesthetics: high vs. low; classical aesthetics: high vs. low). A first paired sample *t*-test indicated that there was a significant difference in the score for the high expressive aesthetics ($M = 4{,}20$, $SD = .69$) vs. low expressive ($M = 1{,}75$, $SD = .83$) condition $t(41) = 12.379$, $p < 0.001$). The second paired sampled *t*-test indicated that there was a significant difference in the score for the high classical ($M = 4.46$, $SD = .55$) vs. low classical ($M = 2.09$, $SD = .86$) conditions $t(42) = 13.887$, $p < 0.001$). These results suggest that the type of aesthetics (classical vs. expressive) and level of aesthetics treatments (high vs. low) both have an effect on participants' aesthetic appreciation. More specifically, our results from study A suggest that when generational cohorts are exposed to web designs with higher levels of classical and expressive aesthetics each, they rate these designs significantly higher (more positively) compared to when they are exposed to web designs of lower classical and lower expressive aesthetics.

The same analysis procedure was applied to study B with the adaption to interface 2 and 3. There was a marginally significant effect of interface type, Wilks' Lambda = .070, $F(1,11) = 4.721$, $p = .053$). Though this result is not significant by definition ($\alpha > 0.05$), it exceeds the alpha level only marginally which is why we also computed post hoc *t*-tests to compare the conditions. The results indicated that there was a significant difference in the score for the high classical ($M = 4{,}15$, $SD = 1.01$) vs. low classical ($M = 2.70$, $SD = 1.04$) conditions $t(44) = -5.990$, $p < 0.001$), whereas there was not statistically significant different between the high expressive ($M = 2.98$, $SD = 1.41$) vs. low expressive ($M = 2.68$, $SD = 1.28$) conditions $t(44) = .853$, $p > .05$).
These results suggest that if generational cohorts are exposed to web designs with higher levels of *classical aesthetics,* they rate the aesthetic design of the websites significantly higher (more positively) compared to those of low classical designs. The data however revealed that interfaces 2 and 3 did not differ significantly regarding their perceived *level* (high vs. low) of *expressive aesthetics* ($F(1,19) = .735$, $p = .752$). This was not expected since *expressive aesthetics* implies attributes of originality, creativity, or novelty (Lavie & Tractinsky, 2004). In this vein, interface 2 was manipulated using illustrated mannequins instead of a text-based vertical navigation as in interface 3 which however was not perceived statistically different from an *expressive aesthetics* point of view. Nonetheless, given that our self-designed stimuli aimed only at the surface of aesthetics evaluations, expressive attributes remained unchanged in the analysis. We will further turn to the difference in the discussion.

5.2. Hypotheses testing

5.2.1. Effects of classical and expressive aesthetics on valence

As a next step, we examined the structural model (i.e. the relationships between variables) and began with the relationships between *aesthetics* and *valence* as proposed in the main hypothesis H1. Results of the Pearson's correlation indicated that there was a moderate positive relationship between *classical aesthetics* and *valence* (r (88) = .49, p < .001). This indicates that generational cohorts who perceived the website stimuli as having higher levels of classical aesthetics reported more positive valence (more pleasant feelings). Likewise, there was a positive association between *expressive aesthetics* and *valence* (r(88) = .49, p < .001). This suggests that generational cohorts who perceived the website stimuli as having higher levels of expressive aesthetics indicated more positive valence (more pleasant feelings). In addition, linear regression was calculated to predict the magnitude of *aesthetics* on *valence*. A significant regression equation was found (F(2,85) = 22.133, p< .001, with an R^2 of 34.2%. In addition, there were significant individual effects for both *classical aesthetics* on *valence* (F(2,85) = .372, p< .001) as well as for *expressive aesthetics* on *valence* (F(2,85) = .420, p< .001). To conclude, there is a positive linear relationship between *aesthetics* and *valence*. Thus, H1, H1a and H1b were supported.

5.2.2. Effects of classical and expressive aesthetics on arousal

Next, in line with the main hypotheses H2 and H3, we examined the relationships between *aesthetics* and *arousal*. First, we began with exploring the relationships between *classical aesthetics* and *arousal*. It was proposed that there is a non-linear (quadratic) relationship between these variables (H2). Nonetheless, we first computed Pearson correlation. The results showed that there was a moderate positive association between *classical aesthetics* and *arousal* (r(88) = .39, p < .001). This suggested that participants who rated classical web designs higher reported higher levels of activation. Yet, the immediate visual analysis of the scatterplot indicated that there could be a curvilinear relation between the two variables. Therefore, we further computed a quadratic function to be implemented in a curvilinear regression. A significant regression equation was found for both the linear (F(1, 86) = 15.103, p < 0.001) with an R^2 of 14.9% as well as the quadratic function (F(2, 85) = 13.782, p < 0.001) with an R^2 of 24.9%. This suggests that the quadratic function explained almost 10% of variability being accounted in addition of the linear function. Accordingly, if Generation X and Z are exposed to web designs scoring high on attributes of orderliness, cleanliness and clearliness, their activating level increases with higher levels of *classical aesthetics* but only up to a certain threshold at which their level of *arousal* starts to decrease and turns to deactivating behaviors (the point at which the slope turns negative, cf. Figure 8). Thus, there is a quadratic relationship in form of an inverted U between *classical aesthetics* and *arousal*. H2 was supported.

Then, we examined the relationship between *expressive aesthetics* and *arousal* which was believed to be positively linearly associated (H3). Again, Pearson's correlation showed that there was a moderate positive association between the two variables (r(88) = .48, p < .001). A linear regression was calculated to predict participants' experienced *arousal* based on *expressive aesthetics*. A significant regression equation was found (F(1, 86) = 25.486, p < 0.001) with an R^2 of 19.5%. However, just with *classical aesthetics* and *arousal,* the visual scatterplot analysis indicated that there also could be an inverted U relationship which is why we also computed a quadratic function for *expressive aesthetics* and *arousal*. The curvilinear regression revealed a significant regression equation (F(2, 85) = 14.4073, p < 0.001) with an R^2 of 24.9%. This suggests that the quadratic function explained around 5% of variability being accounted in addition of the linear function. Thus, different to our assumption, if generational cohorts are exposed to web designs scoring high on attributes of , their activating level increases with higher levels of expressive aesthetics but only up to a certain threshold at which their level of *arousal* starts to decrease and turns to deactivating behaviors (the point at which the slope turns negative, cf. Figure 9). Thus, there is a quadratic relationship in form of an inverted U between *expressive*

aesthetics and *arousal* as well. Therefore, the expected positive linear relationship between these variables (H3) was rejected.

Figure 8. *The linear and quadratic relationships between classical aesthetics and arousal*

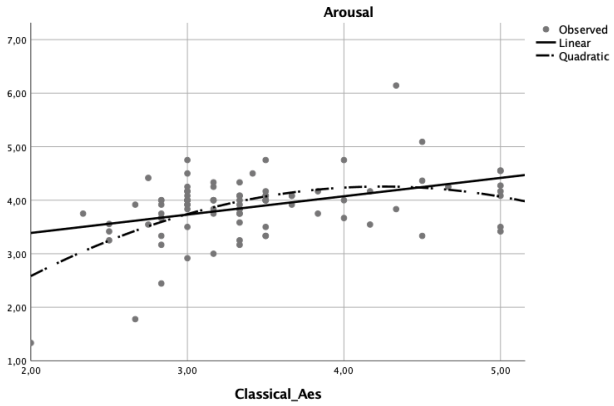
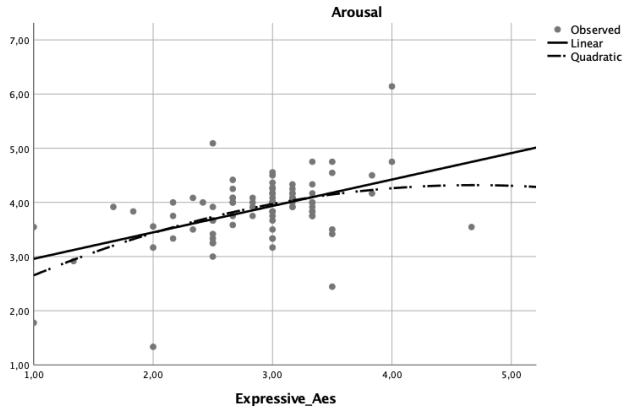


Figure 9. *The linear and quadratic relationships between expressive aesthetics and arousal*



5.2.3. Generational cohorts and core affect

In line with our main hypotheses H4, it was proposed that Generation X and Z moderate the relationship between *aesthetics* and *core affect*. To examine this, we calculated multiple two-way ANOVA to compare the main effects of *aesthetics* and the interaction between *generational cohorts* on *valence* (H4a) and *arousal* (H4b).

In view of the aesthetics-valence-generational cohort relationship, all effects were significant at the .05 significance level except for the *generational cohorts* factor. The main effect for *aesthetics* yielded an *F* ratio of ($F(33,87) = 4.524$, $p < .001$), indicating a significant difference between *classical aesthetics* ($M = 3.06$, $SD = .1.03$) and *expressive aesthetics* ($M = 2.91$, $SD = .1.10$). The main effect for *generational cohorts* yielded an F ratio of $F(1,87) = .09$, $p > .05$), indicating that the effect for *generational cohorts* was not significant between *Generation X* ($M = 4.13$, $SD = .70$) and *Generation Z* ($M = 4.00$, $SD = .76$). A post hoc test was conducted which revealed that the interaction of *generational cohorts* on the relationship between *classical aesthetics* and *valence* was not significant ($F(3,87) = 9,398$, $p > .05$), whereas the interaction was significant on the relationship between *expressive aesthetics* and *valence* ($F(3,87) = 14,655$, $p < .001$) such that participants from *Generation X* indicated more positive valence for expressive aesthetics than participants from *Generation Z*. In consequence, though H4a could be partially supported for the *expressive aesthetics* condition, it was rejected based on the overall insignificant relationship between aesthetics-valence-generational cohorts.

The same procedure was conducted to compare the main effects of *aesthetics* (classical and expressive) and the interaction between *generational cohorts* on participants' experienced *arousal.* All effects were significant at the .05 significance level except for *generational cohorts*. The main effect for *aesthetics* yielded an F ratio of $F(3,87) = 5.302$, $p < .05$), indicating a significant difference between *classical aesthetics* ($M = 3.06$, $SD = .1.03$) and *expressive aesthetics* ($M = 3.88$, $SD = .61$). The main effect for generation yielded an F ratio of ($F(1,87) = .551$, $p > .05$), indicating that the effect for *generational cohorts* was not significant between *Generation X* ($M = 3.75$, $SD= .09$) and *Generation Z* ($M = 3.96$, $SD = .08$). Again, a post hoc test was conducted which revealed that the interaction of *generational cohorts* on the relationship between *classical aesthetics* and *arousal* was not significant ($F(1,87)= 1.30$, $p > .05$), whereas the interaction was significant on the relationship between *expressive aesthetics* and *arousal* ($F(1,87)= 10.301$, $p < .001$) such that participants from *Generation X* indicated higher levels of arousal (activating) induced from expressive aesthetics than Generation Z. As a result, though H4b could be partially supported for the *expressive aesthetics* condition, it was rejected based on the overall insignificant relationship between aesthetics-arousal-generational cohorts.

In sum, the results suggest that *generational cohorts* only moderate the relationships between *expressive aesthetics* and *valence* and as well as *expressive aesthetics* and *arousal*. In both scenarios, participants from *Generation X* perceived more positive *valence* and were more activated from expressive designs (experienced higher levels of *arousa*l) than *Generation Z*. However, in view of *classical aesthetics*, *Generation X* and *Generation Z* did not differ in their *valence* or *arousal levels.* In consequence, the expected moderating role of *generational cohorts* on the relationships between *aesthetics* and *core affect* according to H4 could not be supported.

5.2.4. Effects of core affect on appraisal of website quality

Finally, we analyzed the dependent variable which was further decomposed into the participants' *perception of attractiveness* of the website stimuli. In line with H5 which assumed a positive association between *core affect* and *appraisal of website quality*, we first split the examination of the relationships between these variables into the different components of *core affect,* hence *valence* and *arousal*.

In line with H5a, it was predicted that *valence* was positively linearly associated with *appraisal of website quality*. Pearson's correlation coefficient showed that there is a strong positive relation between these variables ($r(88) = .85$, $p < .001$). This leads to the assumption that positive valence (more pleasant feelings) induced from website stimuli leads to higher website quality perceptions. Likewise, in line with H5b, *arousal* was positively related with *appraisal of website quality* ($r(88) = .70$, $p < .001$), which suggests that higher levels of arousal (more activating behaviors) relate to positive website evaluation as indicated by the linear relationship. The visual analysis of both scatterplots supported the existence of positive linear-relationships for both dimensions of *core affect* (i.e. *valence* and *arousal)* and *appraisal of website quality.* The main effect for *core affect* on *appraisal of website quality* yielded an F ratio of $F(2,85) = 5.302$, $p > .05$) which was insignificant between *valence* ($M = 4.13$, $SD= .70$) and *arousal* ($M = 4.00$, $SD= .76$). A post hoc test was conducted which revealed that the interaction on *valence* and *arousal* on *appraisal of website quality* was not significant ($F(2,87) = 3.458$, $p > .05$). More specifically, the individual effect for *valence* was significant ($F(2,87) = 8.517$, $p < .05$), whereas the individual effect for *arousal* on *appraisal of website quality* was not $F(2,87) = .371$, $p > .05$). These results suggest that *valence* had significant impact on the relation between *core affect* and *appraisal of website quality*, while *arousal* had not. The latter is a contradictory finding as opposed to the expected positive linear-relationship between *arousal* and *appraisal of website quality* according to H5b. We will come back to this in the discussion. After all, H5 was partially supported, with H5a supported and H5b rejected.

5.2.5. Appraisal of website quality and generational cohorts

Ultimately, in line with H6, we examined whether *generational cohorts* moderate the relationship between *core affect* and *appraisal of website quality*. The main effect for *generational cohorts* yielded an *F* ratio of $F(1,87) = .09$, $p > .05$), indicating that the effect for *generational cohorts* was not significant between *Generation X* and *Generation Z*. Post hoc tests were conducted which revealed that neither the individual effect *generational cohorts* on the relationship between *valence* and *appraisal of website quality* was significant ($F(3,84) = 76.820$, $p > .05$), nor the individual effect of *arousal* and *appraisal of website quality* ($F(3,84) = 34.288$, $p > .05$). These results suggest that *generational cohorts* had no impact on the relation between *core affect* and *appraisal of website quality*, neither direct nor indirect. Thus, H6 was rejected (H6a rejected, H6b rejected). Table 9 provides an overview on the results of Pearson's correlation. Table 10 provides a summary of the hypotheses results.

Table 9. *Summary of correlations based on Pearson's r*

	Correlations					
	1	2	3	4	5	6
1. classical aesthetics						
2. expressive aesthetics	.40**					
3. valence	.49**	.49**				
4. arousal	.39**	.48**	.81**			
5. generation	.07	.16	.09	-.20		
6. attractiveness perception	.46**	.48**	.85**	.70**	.14	

** *Correlation is significant at the .01 level (2-tailed).*

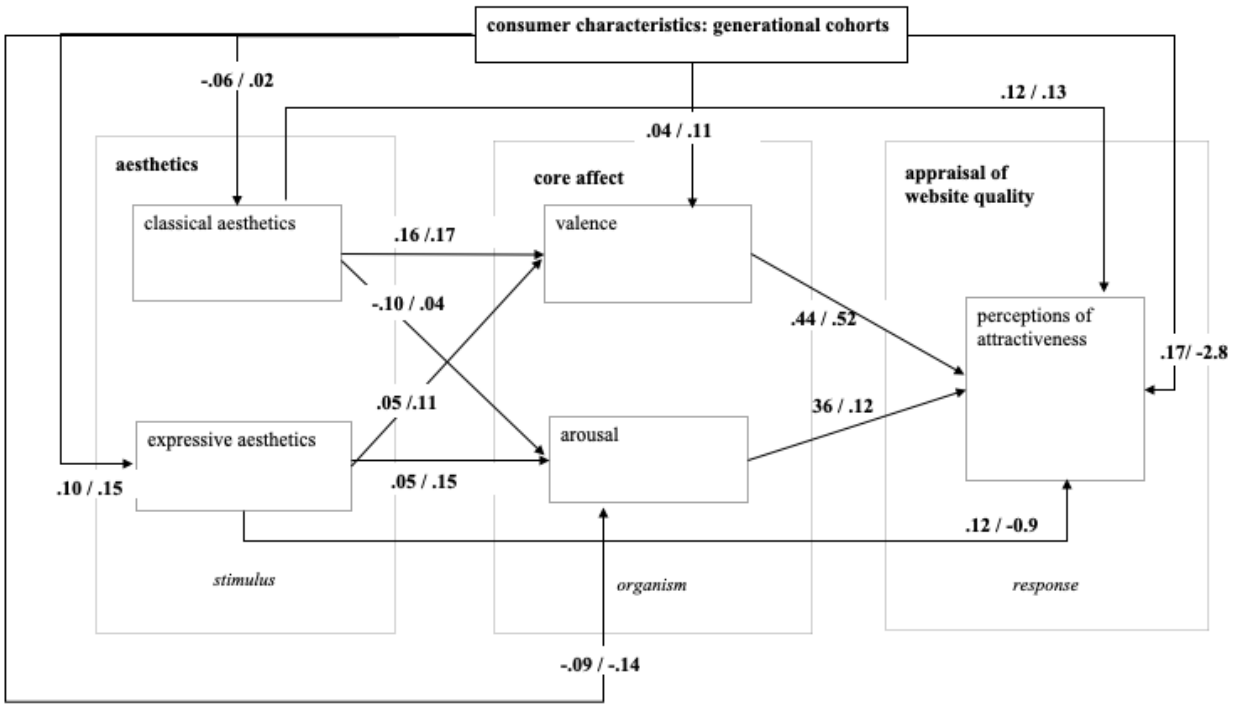
Table 10. *Summary of hypotheses*

	Concept	Expected Effect	Supported Y/N
H1	aesthetics and valence	linear-relationship (+)	Y
H1a	classical aesthetics and valence	linear-relationship (+)	Y
H1b	expressive aesthetics and valence	linear-relationship (+)	Y
H2	classical aesthetics and arousal	quadratic-relationship (∩)	Y
H3	expressive aesthetics and arousal	linear-relationship (+)	N
H4	Aesthetics, core affect, and generational cohorts	moderating role of generation	N
H4a	aesthetics, valence, generational cohorts	moderating role of generation	N
H4b	aesthetics, arousal, generational cohorts	moderating role of generation	N
H5	core affect and appraisal of website quality	linear-relationship (+)	Y/N
H5a	valence and appraisal of website quality	linear-relationship (+)	Y
H5b	arousal and appraisal of website quality	linear-relationship (+)	N
H6	core affect, appraisal of website quality, and generational cohorts	moderating role of generation	
H6a	valence, appraisal of website quality, generational cohorts	moderating role of generation	N
H6b	arousal, appraisal of website quality, generational cohorts	moderating role of generation	N

5.2. Regression analysis

Although the hypotheses results generally support our proposed conceptual model, it was argued that aesthetics (high vs. low) can influence online consumers' perception of attractiveness directly without any interaction by core affect (Porat & Tractinsky, 2012). To examine this possibility and the magnitudes of the independent variables on appraisal of website quality as the dependent variable in more depth, we estimated a path model for each of the experimental studies (A) and (B) using a bivariate regression in SPSS. As it can be seen in Figure 10, valence had the most prominent influence on perception of attractiveness, both in study A (.44) and study B (.52). Combined, the magnitude of the classical aesthetics dimension on valence was higher than those of expressive aesthetics. The analysis further indicates that the indirect links between of classical and expressive aesthetics remained almost absent as predicted in the conceptual framework. Ultimately, different to the basic assumption of this study, generational cohorts only contributed indirectly to the model.

Figure 10. *Standardized path coefficients for study (A) and (B)*



*Note. Path coefficients (study A) / (study B). ** (p < .001)*

6. Discussion

The main research question of this study was how aesthetics in e-commerce web design affect emotional and behavioral responses across generational cohorts. Although previous studies drove to the thought that generational cohorts would differ in their web design preferences, the overall pattern of results indicate that there are no significant differences between Generation X and Z. Nonetheless, to provide an answer on this question, we first reflect our hypotheses in light of the objectives of this study.

The first goal of this research was to assess the effect of website aesthetics (classical and expressive) on emotional responses (valence and arousal). Overall, as it was predicted, our findings demonstrate that both classical and expressive aesthetics can impact emotional

responses. It was found that both dimensions of aesthetics in web design had significant positive effect on valence (H1). This indicates that if generational cohorts perceive an e-commerce's aesthetic design to be high classical and high expressive, they will tend to experience more pleasant feelings (more positive valence). This supports the previous stream of literature that indicated the positive influence on both well-designed, easy to follow websites next to designs that imply creativity and fascination (Hartman et al., 2008; Tuch et al., 2012). On the other hand, prior research has offered different views towards arousal-based emotions that might impact emotional responses evoked by aesthetic stimuli (Porat & Tractinsky, 2012; Seo et al., 2015). Theoretically, classical aesthetics appeal to the more valence-based emotions and expressive aesthetics to the more arousal-based part of emotion spectrum (Lavie & Tractinsky, 2004). An interesting finding of the present study was to identify quadratic relationships between both dimensions of aesthetics and arousal (H2, H3). It was shown that there is an inverted U-curve relationship between classical aesthetics and arousal which was assumed due to its symmetrical and clean interface design and human preference for order as postulated in psychology (Berlyne, 1974; Frijda, 1994). Another explanation could be that classical aesthetics is more salient and relatively easy to assess which makes it easier to participants to access classical designs (Leder et al., 2004). In contrast, different to our expectation, an inverted U relationship was also found for expressive aesthetics and arousal (H3). One such explanation could be that we followed the recommendation from Tuch et al. (2009) to design the stimuli by-hand rather than to use or screenshot real websites. This might have had the advantage that we could generate e-commerce landing pages that did not correspond to the custom designs in the 'real' world to control for familiarity effects and to stimulate participants' arousal levels more intensively. However, some results for the manipulations were non-significant in case of interface 3. One explanation could be that the participants' fount it difficult to differentiate between classical and expressive aesthetics which in turn indicates that experimental conditions in a future study would need to be even be stronger than the proposed high vs. low combinations.

The second objective of this study was to identify the relationships between emotional and behavioral responses. In general, the results indicate that both type of aesthetic qualities evoke emotional reactions. However, while with valence the motto could be applied to 'the more the better', this was not the case for arousal. According to our results, if web designs become at some point too 'ordered, clear and symmetric' based on the classical aesthetics dimension (Lavie & Tractinsky, 2004), or likewise too 'original, creative and special' based on the expressive aesthetics dimension (Lavie & Tractinsky, 2004), generational cohorts will start showing dispraisal behaviors. In view of the halo effect (Lindgaard et al., 2006), such negative impression could for example result in generational cohorts stop browsing the e-commerce website and switching to another online store which would be harmful to the apparel company's e-commerce success. However, higher levels of arousal (more activating behaviors) were obtained almost exclusively from Generation X which is in line with past studies who argue that judgements of aesthetics are highly dependent on personal background (Deng & Poole, 2009; Tuch et al., 2009) and individual preferences (Frijda, 1994). To our surprise, the proposed positive linearly relationship between core affect and appraisal of website quality (H5) could only be partially supported, with significant effect for valence (H5a) but insignificant effect for arousal (H5b). A recent study by Bhandari et al. (2019) could also not establish such a linkage. The authors assumed that the reason behind this may lie in human difficulty to express which particular emotion is at play. With subjective measures, it could not be said with absolute certainty how different aesthetic stimuli influence consumers at the biological level. Accordingly, studies would benefit from using neuropsychophysiological measures in addition.

The third and last goal of this study was to explore the impact of generational cohorts on the proposed relationships relationships. As outlined before, the overall pattern of results indicate that the overall user experience from e-commerce is almost similar across Generation X and Z. In our study, Generation X and Z made similar aesthetic judgements on classical and expressive

aesthetics. Though the proposed hypotheses regarding the moderating roles of generational cohorts on the relationships between aesthetics and core affect (H4) and core affect and behavioral responses (H6) could not be supported, the results revealed one very interesting finding. Different to the assumption that younger generations would prefer expressive web designs (Tractinsky & Lowengart, 2007), it was shown that Generation X both moderated the relation between expressive aesthetics and valence as well as between expressive aesthetics and arousal, while Generation Z did not. An explanation could be that expressive aesthetics affect more the excitement spectrum in the user which may be prone to individual's experience with the Internet (Lavie & Tractinsky, 2004). For example, whereas the more digitally experienced Generation Z may have been less impressed about the expressive stimuli, Generation X may have been positively surprised about the same stimuli. Our finding should, therefore, not be taken as evidence for the absent of a moderating effect of generational cohorts in online consumption. Rather, we would like to encourage other scholars to further find out which core emotions are driving behaviors from generational cohorts in an online consumption context.

Reflecting these findings to the research question of this study, it can be concluded that both Generation X and Z appreciate e-commerce websites that are designed based on the premise of cleanliness, clarity and symmetry according to the classical aesthetics dimension (Lavie & Tractinsky, 2004). For both generations, these web designs evoked the most pleasant feelings (highest ratings on valence) which resulted in the most positive evaluations of the website's attractiveness and appraisal of website quality. With regard to e-commerce websites designed on the premise of expressive aesthetics, i.e. original, creative and special (Lavie & Tractinsky, 2004), the emotional and behavioral responses across Generation X and Z were less consistent. Nonetheless, though Generation X in total reported more pleasant feelings (higher levels of valence) from perceptions of expressive aesthetics, the difference in ratings compared to Generation Z was only marginal. In addition, both generational cohorts reported that at some point for both classical and expressive aesthetics, their perception of the attractiveness of the design turned negative, something that could be illustrated with curvilinear (inverted U) relationships for both dimensions of aesthetics and arousal. Ultimately, though the effect of core affect on appraisal of website quality was significant, it was only hold for valence but not for arousal. This supports Berlyne's (1974) theory that arousal relates to perceptions of valence. Consequently, the both the direct and indirect effects for classical aesthetics and valence were stronger in generational cohorts' appraisal of website quality than for expressive aesthetics and arousal.

6.1. Contribution

Although online consumption behavior has been studied for years, the field of customer experience in a digital world remains an evolving area (cf. MSI's research priorities 2018-2020 on "*The Customer-Technology Interface").* This study contributed to knowledge on the technology-interface factors in e-commerce websites that can affect generational cohorts' perception of website quality and the overall online shopping experience from the site. Extant research has emphasized the criticality behind aesthetics in the deployment of website quality. Nonetheless, a pleasurable online shopping experience can be not simply determined just by adapting the e–commerce website's aesthetic qualities. This research adds knowledge on the impact of emotions on online consumer's perception of an e-commerce website's aesthetic quality. Specifically, by knowing what levels of classical and expressive aesthetics influence generational cohorts' website quality perceptions favorably, companies can design and improve their e-commerce websites accordingly. Moreover, a more thorough understanding of the impact of valence and arousal as antecedents of appraisal towards e-commerce web designs could help adding insights on implicit processes in online decision-making. From a practical view, this may be further beneficial in learning about how to entice Generation X and Z to shop apparel online

more frequently, or respectively how to initiate first online apparel transactions. Another important contribution of this study comes from distinguishing the user experience based on generational cohorts, more specifically, Generation X and Z. These cohorts are very important segments for apparel companies and other e-commerce practitioners but have been overlooked in extant research in terms of their web design preferences. To the best of our knowledge, this is the first study that has looked at Generation X and Z taking into account consumer's aesthetic evaluation and emotional experiences in online shopping. Lastly, this study also adds to current HCI research and user experience literature relevant to online consumer behavior, by incorporating generational cohorts as consumer characteristics that can influence the relation between expressive aesthetics and core affect.

6.2. Limitation and future research directions

This research clearly has several limitations. Our findings are limited to the several characteristics of the study design. Though the manipulation checks on the experimental conditions were statistically confirmed, we recognized that participants from study B (interface 2 vs, 3) have had difficulties in distinguishing website stimuli from another based on the two dimensions of aesthetics. Specifically, the results revealed that participants only reported marginally difference between the expressive aesthetics treatments of high (interface 2) vs. low (interface 3). One explanation could be that in study B, the interface stimuli were not manipulated based on the two extremes between the treatments of high/high vs. low/low as in study A and were therefore probably harder to distinguish from another. Thus, although we tried to self-design the website stimuli in an exaggerated, 'non-typical'-e-commerce way, future studies may benefit from self-designed manipulations of expressive aesthetics that are even more extreme. Likewise, we acknowledge that the generality of the results is limited to the extent that participants could not browse the website, something that has been frequently criticized by HCI scholars (Tuch et al., 2010). Moreover, different to the CUE model that served as theoretical conception, this study disregards instrumental quality perceptions (i.e. usability) as a distinct user experience component for practical reason (length of the study). After all, a significant body of research has focused on usability as key indicator of user experience from websites (Albert & Tullis, 2013; Belanche et al., 2012). Nonetheless, following the seminal work from Tractinsky et al. (2000) on *"What is beautiful is usable"*, additional research in the interplay between usability-emotions-aesthetics as postulated by Thüring and Mahlke (2007) could be vital in understanding online consumer behavior. Another limitation that relates to the measurement is that our study has concentrated on 'perception of attractiveness' as global measure to perceived website quality as appraisal tendency. Although attractiveness perceptions may serve as a good predictor in HCI (Hassenzahl, 2001; Hartman, 2008), future studies could improve the predictor power of online consumer decision making using other criteria that are more closely relevant to the e-commerce context, such as purchase intention. In this view, the direct association between arousal and perceptions of attractiveness but its non-significant individual effect on appraisal of website quality calls for additional explanation. Lastly, emotions related to core affect were measured using subjective reports. Though they may give a hint to cognitive emotions, future research may clearly benefit from incorporating neuropsychophysiological measures to benefit from both subjective and objective measures.

7. CONCLUSION

The potential threat of COVID-19 on the apparel industry calls for the convergence of two seemingly incompatible disciplines: marketing and HCI. This study intertwined the two disciplines through emphasis on aesthetics in e-commerce websites as important aspects in the online shopping experience, which influences consumers' affective response and their appraisal

of website quality. The results of this study confirmed the approaches from Mehrabian and Russell (1974) which was later modified by Thüring and Mahlke (2007) to HCI context. By establishing a conceptual framework according to the theoretical conception of these approaches in addition to the classical and expressive aesthetics framework proposed by Lavie and Tractinsky (2004), this study is the first to our knowledge that examined generational cohorts' emotional and behavioral responses towards aesthetics in online consumption in a factorial 2x2 experimental design. Classical aesthetics were manipulated on aspects of the orderliness and balance of a website had significant impact on cohorts' emotional responses as well as website quality perceptions. Expressive aesthetics, on the other hand, were manipulated using novel design shapes that also had significant impact on both emotional responses and website quality perceptions. Though it was expected that Generation X and Z value those levels of web design stimuli differently (i.e. preference of Generation X for classical designs; preference of Generation Z for expressive designs) we could not establish an interaction effect. Though Generation X and Z overall reported similar web design preferences, findings hinted at the existence of curvilinear relations between classical and expressive design components and arousal, which however only applied to Generation X. The findings on core affect lend support to the argument that emotions mediate the relations between perceptions of e-commerce websites and approach/avoidance tendencies towards as manifested in the extant literature. Overall, our results confirmed that whether it is a clothing or online shoe store, the website's aesthetic qualities are likely to impact Generation X and Z's experienced valence, arousal, and consequent behaviors in an online shopping environment. Therefore, despite the ongoing crisis brought about by COVID-19, apparel companies may withstand the crisis by addressing generational cohorts' perceptions of the e-commerce website's aesthetics, as manifested by classical and expressive design aspects, to stimulate favorable emotional and behavioral responses towards their e-commerce website.

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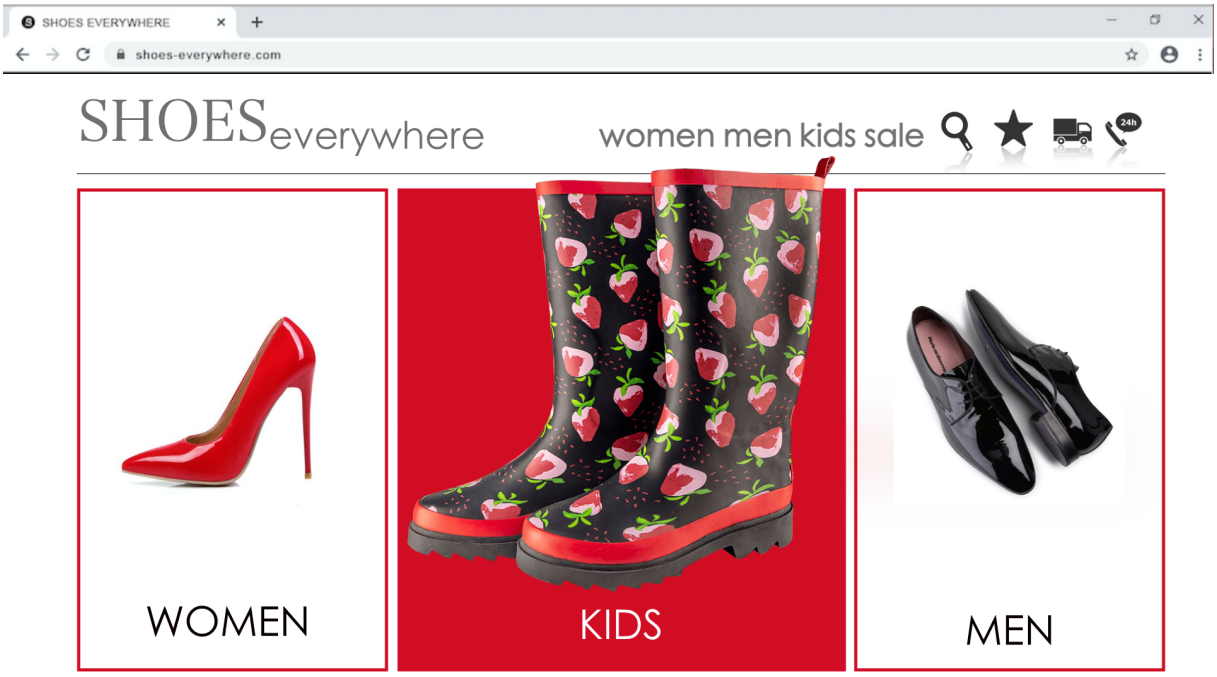
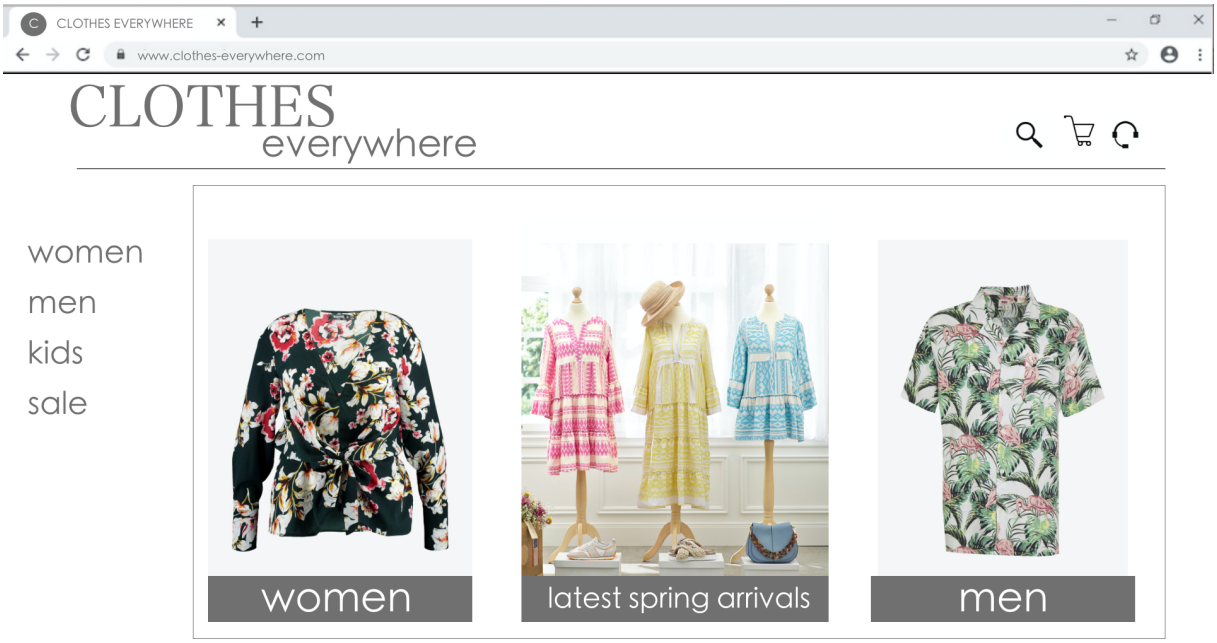
Appendix

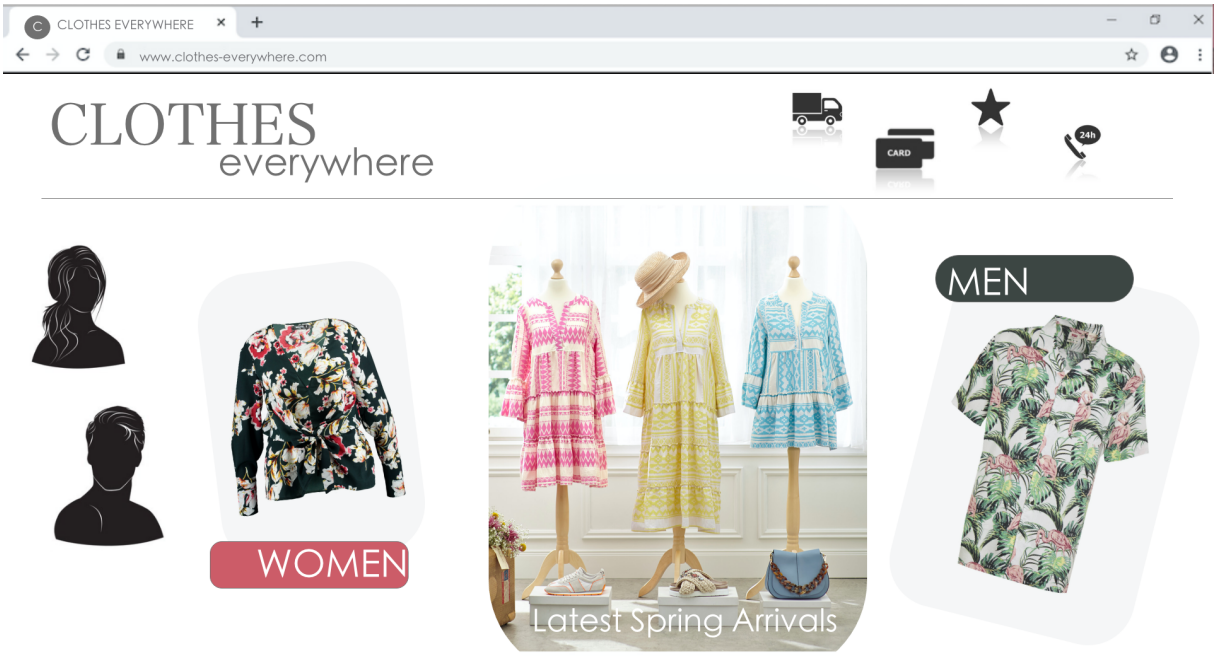
A1. Interface Manipulation 1: High Classical and High Expressive



A2. Interface Manipulation 2: High Classical and Low Expressive



A3. Interface Manipulation 3: Low Classical and High Expressive



A4. Interface Manipulation 4: Low Classical and Low Expressive