

# The Multisensory Effects of Atmospheric Cues on Online Shopping Satisfaction

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**Abstract.** This study investigates the way how consumers react to colors and scents as two independent atmospheric cues in stores, given that the two independent variables, were classified into two different levels of cool (blue or citrus-mint) and warm (red or citrus-vanilla) depending on the properties of those. In this study, a 2 (color: blue vs. red)  $\times$  3 (scent: no scent vs. cool vs. warm) factorial design was conducted. The results show that ambient cues have an impact on customer emotions such as pleasure and arousal, leading to better shopping satisfaction when they interact together. The results of these sensory interactions indicated that cool visual and olfactory cues received higher ratings than warm cues did.

**Keywords:** Online shopping · Atmospherics · Store environment · Color · Scent · Multisensory · Emotion · Satisfaction

## 1 Introduction

Consumers usually prefer e-commerce to brick and mortar retail stores because of the many benefits from online shipping such as delivery services, times savings, as well as better price for shopping [1]. As the number of online shoppers increases, Digital marketers have heavily focused on shopping mall site design to attract more customers' attentions among over other sites. Website design creates the store environment, which produces the atmosphere, and then it affects emotional states of shoppers [10, 11, 15]. These affective states increase customer satisfaction [16]. Therefore, a web-based environment plays a significant role in the context of online shopping.

By differently setting surrounding cues in a store atmospherics can take a different form. The environmental features consist of social, design (e.g., color and layout) and ambient factors (e.g., sound, smell, and lighting) [10]; thus, marketers manipulate these factors to improve the store environment by stimulating five senses [12]. On a website, we have mainly investigated whether color dominates an entire interface [25] as a

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visual cue or design factor. In other words, color causes a sight sensation when consumers face a website. The visual aspects such as colors, blue or red, induce pleasant and arousing feelings [2], and these emotional states modify shopping-related behaviors [3, 15, 36]. In this respect, we manipulated design factors strategically in order to produce an atmospherics within a website. Researchers, however, have rarely addressed ambient factors, compared with design factors; this study investigates ambient factors as non-visual cues in terms of diversity and then, we suggest a new interaction model by considering ambient factors.

Based on design factors, the sensory modalities using ambient factors such as audition and tactility have been generally used in order to improve overall experience and satisfaction. The interaction model for vision and olfaction has yet to be established in the context of web-based environment. However, TTA, IT association, suggested “olfaction and its applications will make next computing environments promote the related industries” as olfactory technology increases such as user interface for olfactory information presentation [34; p. 8] and thus, we anticipate the effects of olfactory cue by interacting visual cues in computer environment’ context.

One of ambient factors, olfactory cues are likely to interact with visual information in the ambiguous state; for example, color can help enhance the ability to recognize olfactory information (e.g., yellow with lemon) [4]. In addition, the sense of smell induces pleasant or arousing emotions [32] and leads to changes of behavior [5], evaluation [32], and satisfaction [22]. Therefore, the interaction of visual and olfactory cues is not informative but situational and ambient cue that can provoke positive responses or behaviors from shoppers using the browser. To elicit a plenty of sensation, olfactory researches have studied in various industries such as gallery, movie, and advertisement. For instance, DunkinDonuts ads in the U.S. domestic market used olfactory stimulus by using automatic aroma spray. This Ad provides viewers with a scent related to a visual information, resulting in sales increase. In this light, a physical environmental feature, olfactory cue should reflect on web-based environment in order to enhance affective consumer behavior in online shopping. Technological approach such as olfactory display [17], which is not universally developed, can be provided to shoppers who face website; thereby the influences of olfactory cue in web-based environment are expected to result in effectiveness as much as an external environment. Therefore, this study examines the effects of color, scent, or both of those cues on satisfaction toward e-commerce by changing an emotional state and this study investigates which type (blue vs. red) of environmental background is preferred. Then, this research proposes a new interface to utilize olfactory cue.

## 2 Literature Review

### 2.1 S-O-R Framework

Robert and John provided the framework on the effects of environmental features in the context of store environment [26]. They examined the model with three levels of stimulus - organism - response (S-O-R) and their study showed that surrounding cues as the stimulus have significantly influence on customer’s emotional state as the organism. Furthermore, these emotional states have subsequent effect on approach/

avoidance, which is positive/negative actions by evoked feelings, as responses [15]. To investigate store environment, previous researches have been applied this model [10, 15]. Therefore, we used an S-O-R framework in this study.

## 2.2 The Environmental Features

In a situation in which a website created and operated, a wide variety of determinants of changes in the store environment such as social (interactions between customers and employees), design (visual cue), and ambient (smell, lighting, and sound as non-visual cue) factors have been investigated in previous studies [10, 15, 39]. These factors can influence a mood within retail stores positively or negatively, because individual perception on stimuli and responses is relevant to one's senses [27]. Dijkstra [7] indicated that all environmental conditions come into operation among architectural features, design features and ambient features. Similarly, web environment features, such as color, scent, and lighting, affect consumers' emotions [12]. Color and scent as ambient cues play a key role in evoking a feeling focused on pleasure and arousal [10, 32]. With the application of these determinants, digital marketers configure websites to present a design the first time a shoppers logs on. The can easily update and redesign a website, which is not possible in the case of offline stores [6]. By allowing consumers to enjoy an emotional experience from a website visit, atmospheric cues can greatly improve overall customer satisfaction during online shopping.

As far as the most dominant design factors are concerned, color is an easy and convenient cue to change the atmospherics of the environment compared to other cues [36]. Although visual features can help consumers enjoy shopping by directly delivering a plenty of information, they are less likely to provided differentiated experience as diverse sensations in e-commerce as in brick-and-mortar stores. In other words, digital markers use ambient factors as a method to create a new atmospherics, and thus, shoppers can experience a wide range of sensations as soon as possible. In a study by Wang [38], olfactory cues are associated with an environment in the context of situation. That means, the sense of smell depends on surrounding cues. Thus, researches regard the application of olfactory cue as potentially important ones.

Olfactory display can enable user's nose to deliver olfactory cue [17]. In other words, a user can sense the diffused olfactory information through tube or air canon attached to the side of the screen. In this respect, in e-commerce, it is possible to improve the store environment not only with a typical application using design factors but also with a new application employing ambient factors.

## 2.3 Affective Emotions Depending on Types of Colors and Scents

**Color.** In store design, colors can attract customer attention and deliver a different mood in accordance with their properties; those have a wide range of meanings, such as excitement, energy, calmness, happiness, and so on [24]. The types of colors are divided into cool (short) and warm (long) by wavelength, which are concerned with eliciting feelings [2]. In a study, colors in the same category are likely to show a similar expression. Bellizzi and Hite [3] mentioned that cool colors (blue) make people feel

relaxed, peaceful, calm, pleasant, tender, and comfortable. Colors such as red, in contrast, convey a sense of arousal, excitement, distraction, negation, tenseness, and stimulation [37]. In other words, emotions are opposite depending on the color attributions [3]. Red color has disadvantages such as tenseness and negation, and therefore, cool-colored backgrounds are perceived positively by shoppers [2, 12]. Despite the disadvantage, marketers use red-based environments in stores or on websites because a red design draws more attention than blue [3]; however, in previous studies, shoppers prefer blue-based environment, which induces pleasure and arousal, in shopping malls because they feel to be pleasant and peaceful. Therefore, it is necessary to explore what color is meaningful in a web-based environment and what color produces higher levels of positive affective states in online shopping.

**Scent.** Ambient scent may have influence on behavior, mood, and response, as well as memory [4], in comparison with other sensory cues [28]. A study by Spangenberg et al. [32] examined whether environmental scents affect consumers in store evaluations, which, in turn, lead to positive behaviors [4, 5]. In general, scents are categorized as floral, citrus, woods, spices, and mints [32]. Spangenberg et al. [32] evaluated citrus and mint as pleasant scents. Research by Doucé and Janssens [8] showed that citrus mixed with mint creates a pleasant environmental mood. The smells of citrus and mint belong to the cool category and they have fresh/light features [21] and high-arousing [12]. In the warm category, floral, woody, and oriental are affiliated, most of which form a warm, calm, soothing, and relaxed atmosphere [18] and those are low-arousing [12]. To produce a pleasant and arousing web-based environment, citrus has mainly used in marketing. The smell of citrus elicits feelings of pleasure, happiness and serves as a powerful way of affecting product perception, resulting in sales [5]. In this light, there is no problem of blending citrus as the base-scent with different scents (cool or warm) to derive environmental atmospherics in dissimilar directions.

## 2.4 Multisensory Between Vision and Olfaction

Generally, the aim of marketing is to deliver an experience for a product by stimulating a great deal of senses. In the traditional method, vision or hearing as the dominant senses is available; however, the other senses (touch and smell) are now possible in e-commerce with the development of technology. In recent years, other methods have been applied to produce cross-modality as well as to present diverse senses [20, 28, 39]. In a wide range of multi-modality, there has been little research on the interacting application of visual and olfactory cues such as colors and scents in online shopping [20]. The combination of vision and olfaction has been studied in advertisements [29, 35] as well as marketing [10, 12], both of cues are similar in that they provide people with information via visual media. For example, a study by Seo et al. [29] showed that the sense of smell could help immerse viewers in visual content. Ellen and Bone [9] demonstrated that the effects of scent have impact on attitudes and product-related evaluation in the context of advertising. Kaye [13] showed that the possibility of delivering olfactory cues in combination with visual media (e.g., web sites, games, and films). In summary, the olfactory information helps drawing shoppers' attention, interacting with visual cue. In addition, color enhances a consumer's

ability to identify the sense of smell [12, 30, 40] when surrounding cues are coherent [21] because it is difficult to recognize olfactory cue alone [4]. The combination of vision and olfaction has influence on experience [21] and satisfaction [16] by causing a pleasant and arousing emotion. By appealing to visual and olfactory cues, a web-based environment enables shoppers to change their emotional states, and then it leads to an improved shopping experience compared to other environment provided by only one sense.

## 2.5 Customer Satisfaction

By creating an emotional state by using website features, a store environment contributes to customer satisfaction [16, 33]. According to Szymanski and Hise [33], website design as an atmospheric cue (e.g., convenience, merchandising, site design, and financial security) affects satisfaction through a pleasurable shopping experience. Pleasure describes a sense of positive responses, and these reactions induce a hedonic experience in the Internet environment [20]. In other words, website design aims to form customer experience [31]. Thus, this study examined how visual and olfactory cues as components vary affective states and then it demonstrated the effects of the combination with surrounding cues on consumer satisfaction over the Internet.

## 3 Method

We designed a 2 (color: cool vs. warm) by 3 (scent: no-scent vs. cool vs. warm) factorial design in order to explore the effects of sensory cues, both independently and dependently, and identify the preference for different types of visual and olfactory cues on customer satisfaction as affective approach toward e-commerce. In this experiment, we manipulated the color and scent stimuli of environmental cues as independent variables and we measured satisfaction with the shopping experience as a dependent variable. Before the main experiment, we had conducted some pretests on visual and olfactory stimuli were. In addition, we have performed the experiment in the laboratory, maintaining the same environment as much as possible, because the olfactory technique could not be directly applied again repeatedly right after a specific scent was used. Besides, it would be difficult to use the olfactory technology that still is not universally developed.

### 3.1 Pretest: The Color Stimulus

To select relevant visual stimulus (color), thirty participants consisting of 13 males (43.3 %) and 17 females (56.7 %) performed a manipulated check on preferences for some specified websites involved in colors such as G-market and Enuri with a blue background and the other websites such as 11st, Interpark, and Auction with a red background. The mean age of the participants was 25.57 years ( $SD = 2.909$ ) in the age category of 21–36 years. A scale consisting of 25 items on a 5-point Likert-type scale (e.g., web appearance (6 items), entertainment (6 items), information (4 items), transaction (4 items), response (3 items), and trust (2 items)) was used [14]. We have conducted a repeated measure ANOVA and analyzed the meaning of the results for each color conditions. For the blue environment, G-market was chosen as a cool type

( $M_{G\text{-market}} = 2.89$ ,  $M_{Enuri} = 2.81$ ,  $F = 10.012$ ,  $p < .01$ ); Interpark as a warm type was selected as the red environment ( $M_{1\text{st}} = 2.63$ ,  $M_{\text{Interpark}} = 2.78$ ,  $M_{\text{Auction}} = 2.61$ ,  $F = 4.725$ ,  $p < .05$ ).

### 3.2 Pretest: The Scent Stimulus

We blended the smell of citrus with two different scents (citrus-mint and citrus-vanilla) so that shoppers might enjoy and improve their shopping experience. The smell of citrus conveys a sense of pleasure and arousal [32], and it acts as a powerful way of improving product perception and the increasing sales [5]. Moreover, it has a substantial impact on satisfaction [20]. The smell of mint makes people pleased and aroused, as the same as citrus does [32]. Finally, the smell of vanilla has a positive effect on pleasant emotion [12]. In this light, the smell of mint as a cool category and the smell of vanilla as a warm category were selected, depending on previous studies [8, 18] and their properties [21].

### 3.3 Participants & Design & Measure

To measure overall satisfaction toward e-commerce in response to environmental stimuli, 90 South Korean undergraduate students who were not visually or olfactorily impaired participated in the experiment. The mean age of the participants was 24.32 years ( $SD = 2.731$ ) in the age category of 17–36 years. Furthermore, they already have some experiences of online shopping on the G-market and Interpark websites. By the scheme of the experiment, we have randomly assigned the ninety participants to the six groups with different conditions. Each group was composed of 15 participants. The stimuli were composed of different types (cool vs. warm) of colors and scents. The satisfaction questionnaire was adapted from studies by Lin [16] and McKinney et al. [19]. In addition, a satisfaction measurement of the effects of pleasure and arousal were added [23]. All responses were evaluated with a 7-point Likert-type scale, ranging from 1 (totally disagree) to 7 (totally agree). The Table 1 shows the questionnaire's factor, items, and sources for independent and dependent variables.

**Table 1.** The questionnaire dependent variable

Category	Factor	Sources	Items
Satisfaction	Overall satisfaction	McKinney et al. [19]	2
	Customer satisfaction	Lin [16], Oliver and Swan [23]	9

### 3.4 Main Experimental Hypothesis & Procedure

This study provides an explication of the effects of environmental features such as visual cue only, olfactory cue only, and both visual and olfactory cue by evoking emotional states. In this light, this study proposes the following research hypotheses:

H1: Visual cues have an influence on the satisfaction.

H2: Olfactory cues have a positive effect on the satisfaction.

H3: The interaction between visual and olfactory cues has an influence on the satisfaction.

To explore how the effects of environmental cues contribute to improving satisfaction toward e-commerce, we have conducted the experiments in a laboratory room with five seats and no windows in four experimental stages. Table 2 shows the experimental procedure.

**Table 2.** The experimental procedure

Stage	Explanation
1: Preparation	All the necessary conditions (laptop, environmental conditions) and the visual and olfactory stimuli were prepared. The purpose of the study and expected outcomes of the environmental features such as visual and olfactory stimuli were told to the participants; then, they were asked to fill out confirmation on data collection.
2: Experimental task	The participants had to search and purchase a specific item by instructions (e.g., electronics devices and related accessories) within a controlled category on specific websites for approximately 20–30 min.
3: Questionnaire	Upon completion, participants filled out a digital questionnaire, as in Table 2, about shopping satisfaction.
4: Question & Answer	After participants had finished the overall experimental tasks, their answers were debriefed.

Prior to the experimental task, we randomly arranged online shopping malls such as G-market and Interpark depending on the number of participants on the laptop. In addition, the icon toward digital questionnaire was prepared to be getting started within the laptop computer. For olfactory conditions, a diffuser and a candle were placed, out of sight, in the room in order to spray into the air 2 h before the experiment started. We controlled the olfactory stimulus in the room in which the experiment took place by means of an automatic injection that operated whenever a new participant comes in the laboratory. To change the olfactory cues, we suspended the experiment for two days, and we ran the air conditioner to get rid of the previous olfactory cues in the room. We also maintained the other conditions the same as for the other olfactory stimuli. The experiment proceeded in an orderly way (no scent, citrus-mint, and citrus-vanilla). The total time spent by an individual was approximately 30–40 min. We conducted the other conditional experiments were conducted in the same way as designed.

## 4 Results

The effects of visual and olfactory cues such as colors and scents in e-commerce for the six different conditions. The main data were statistically analyzed with two-way analysis of variance (ANOVA;  $F(5, 84) = 3.210, p < .05$ ). We observed a statistically significant difference between groups in accordance with the scent condition (Table 4). Table 3 shows that the interaction effect was significant ( $F = 5.044, p < .01$ ); thus, satisfaction differed depending on the interactions of cues. We conducted a post-hoc comparison with the Duncan test and the test results indicated that the effect of ambient scent was larger than that of the no-scent (Table 4).

The effects of both independent variables are illustrated in Fig. 1. The results suggested that satisfaction was enhanced if two independent variables were congruent (Table 4 and Fig. 1); Under the cool-type conditions, the participants were significantly likely to feel satisfaction compared with the warm-type conditions ( $M_{Cool-Blue} = 5.28$ ,  $M_{Warm-Red} = 5.09$ ). Therefore, this study found a significant main effect and interaction. In several conditions, the subject and variables with cool properties had more impact on satisfaction in e-commerce than warm ones.

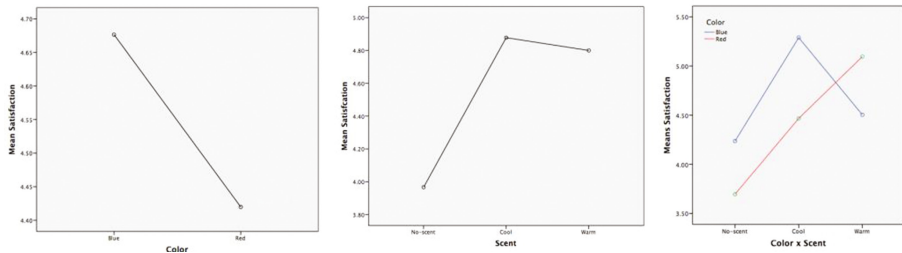
**Table 3.** The results of analysis of variance of the mean catch by color and scent

Source of variation	df	MS	F	P	Partial Eta Squared
Color	1	1.484	1.779	.186	.021
Scent	2	7.653	9.177	.000***	.179
Color × Scent	2	4.207	5.044	.009**	.107
Error	84	.834			
Total	90				

\*p < .05, \*\*p < .01, \*\*\*p < .001

**Table 4.** Mean and standard deviation values for each experimental condition

Source	M	SD	N	Source	M	SD	N	F	P	Duncan
<i>No-scent (a)</i>				<i>Warm (c)</i>						
Blue	4.23	1.013	15	Blue	4.50	1.141	15			
Red	3.69	.900	15	Red	5.09	.697	15	3.210	.011*	a <
<i>Cool (b)</i>				<i>Total</i>						b,c
Blue	5.28	.483	15	Blue	4.67	1.009	45			
Red	4.46	1.069	15	Red	4.41	1.054	45			
				Total	4.54	1.034	90			



**Fig. 1.** Effects of color, scent, and color × scent satisfaction (Color figure online)



## 5 Discussion and Conclusions

The aim of our research is to analyze the interactions between visual and olfactory cues in e-commerce and then to determine whether surrounding features are appropriate for a web-based environment. Environmental cues, which in turn contribute to better emotional states, lead to the satisfaction toward e-commerce.

Our findings demonstrate the effect of ambient scent to enhance satisfaction and support visual cues. The results also suggest higher levels of satisfaction when scent and color are matched. As indicated in studies by Milotic [21] and Shankar et al. [30], vision and olfaction increase their sensory effect when they mutually depend the other. The effects of color, however, could not be demonstrated. Although the results do not support the color's influence, the blue-based environment's rating is higher than red-based environment based upon the research. Furthermore, the participants generally preferred cool olfactory cues (citrus-mint) which evoke pleasant and arousing emotions to the warm olfactory cues (citrus-vanilla), although the presence of scent tends to be favorable compared with the absence of scent in common with Bellizzi and Hite [3]'s research. Therefore, the cool-related environment increased customer satisfaction likewise the results from the previous researches [2, 12]. In other words, sensory cue with cool properties can act as a trigger to induce a pleasure and arousal in environments. By taking advantage of these effects, digital marketers can make individual shoppers improve a satisfaction in their own environment.

The sensory cues have a significant influence on affective response in the context of online shopping; thereby we can expect that to the sensory cues substantially change affective behaviors such as intention. In this respect, the application of olfactory may broaden the scope of the interaction such as auditory and haptic cues. Besides, it is meaningful to use the combination of olfactory and visual cues, except for color, to improve behavior or response evoked by emotional state. These environmental cues carry a shade of meanings depending on their properties. The interaction between visual and olfactory cues increased satisfaction levels for shoppers. This study provides empirical support to retailers how to construct a web-based environment that influences customer satisfaction. Despite these findings, this research has limitation; for example, it does not reflect on a wide variety of properties.

Even though we reached some meaningful conclusions, we could not prove the effects of color. So, future research are recommended to expand the types of colors not limited to red and blue which interact with ambient scents in order to examine the effects of color. In website design, as a practical application of this research, it is believed to test other colors in addition to blue and red; this research investigated the effects of surrounding cues to specific products only, however a wide range of products may be extended to explore the surrounding cues at diverse levels in e-commerce. Finally, future study should consider that the olfactory technology is not widespread and not commercially available in the market. This study also conducted an experiment through the reproduction process rather than to the experiment via olfactory technology directly; thereby there may be differences on the results between laboratorial and commercial environments. In this respect, future study needs to consider approaching this point in a different way.

With these suggestions, knowing that environment features have relevance to atmospherics and satisfaction based on conditions, digital marketers have opportunity to propose a new interface that can be applied to a variety of visual contents such as ads and website in that design is required for content.

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