

# UNDERSTANDING HOW COLOUR CONTRAST IN HOTEL & TRAVEL WEBSITE AFFECTS EMOTIONAL PERCEPTION, TRUST, AND PURCHASE INTENTION OF VISITORS

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## **ABSTRACT**

*To understand how colour contrast in e-Commerce websites, such as hotel & travel websites, affects (1) emotional perception (i.e. pleasant, arousal, and dominance), (2) trust, and (3) purchase intention of visitors, a two-phase empirical study is conducted. In the first phase of this study, 120 volunteer participants are asked to choose the most appropriate colour from a colour wheel for a hotel & travel website. The colour "Blue Cyan", the most chosen colour from this phase of study, is then used as the foreground colour to develop three hotel & travel websites with three different colour contrast patterns for the second phase of the study. A questionnaire is also developed from previous studies to collect emotional perception, trust, and purchase intention data from another group of 145 volunteer participants. It is found from data analysis that, for visitors as a whole, colour contrast has significant effects on their purchase intention. For male visitors, colour contrast significantly affects their trust and purchase intention. Moreover, for generation X and generation Z visitors, colour contrast has effects on their emotional perception, trust, and purchase intention. However, no significant effect of colour contrast is found in female or generation Y visitors.*

## **KEYWORDS**

*Colour Contrast, e-Commerce, Website Design*

## **1. INTRODUCTION**

Previous studies suggest that proper website design and proper use of colours in websites can lead to visitors' trust [17][26][30] and affect their purchase intention [17][22]. Proper use of colours includes using the right colour contrast. Colour contrast in websites can be in many formats, for example, colour contrast between text colours and background colours, as well as colour contrast between background and foreground of the website. Lin, Lo, & Huang (2016) found that colour contrast in e-Commerce websites can have effects on emotional perception (pleasant, arousal, and dominance) of visitors and lead to advantages in business competition [18]. Hence, better understanding about colour contrast can help web vendors and/or website designers in using more appropriate colours in their websites. The main purpose of this research is to study how colour contrast in e-Commerce websites, such as hotel & travel website, affects (1) emotional perception, (2) trust, and (3) purchase intention of visitors. In this study, colour contrast is the contrast between foreground and background colours of websites. The idea of achromatic colours and chromatic colours is also applied in the study to demonstrate different patterns of colour contrast.

To understand the importance of colour contrast in e-Commerce websites, such as hotel & travel websites, a two-phase empirical study is designed [29] and conducted. A hotel & travel website is selected for the study based on its popularity among Thai Internet users in 2018 [10]. Data in this two-phase empirical study is collected from Thai Internet users, both males and females, from generation X (Gen X), generation Y (Gen Y), and generation Z (Gen Z).

The remainder of this paper is divided into four sections as follows. Literature reviews are in Section 2. Research framework and hypotheses are in Section 3. Research methodology and results are presented in Section 4, and conclusions are made in Section 5.

## **2. LITERATURE REVIEWS**

### **2.1. Colour Contrast**

Colour contrast is perceived by human eyes. Colour contrast can make objects appear more obviously [15]. Colour contrast can happen from two or more colours, or from similar colours with different saturation [28]. Using colour contrast in websites can lead to reading efficiency [27]. Colour contrast in websites can be contrast between text and background colours, or contrast between background and foreground colours. Since background of a website occupies a big area of website, using colour contrast can make visitors see other components, or foreground components in the website better [16].

The idea of chromatic and achromatic colours is also applied. Chromatic colours are colours with a hue or a shade of colours. Chromatic colours are colours other than white, black or grey which lack a hue, hence considered achromatic colours. In this research, contrast between chromatic and achromatic colours is studied.

### **2.2. Emotional Perception**

PAD theory was created with three emotional dimensions which are (1) Pleasant, (2) Arousal, and (3) Dominance. PAD was used to explain positive and negative emotions of people in past researches [3]. To collect data concerning emotional perception, adjective words have been used [9][18]. For pleasant emotion, adjective words such as happy/unhappy, pleased/annoyed are used. For arousal emotion, stimulated/relaxed, excited/calm are used. And for dominance emotion, control/helpless, dominant/submissive are used. Emotional perception of customers can lead to advantages in business competition [18]. There are studies which use pleasant, arousal, and dominance from PAD theory to measure emotional perception of visitors toward websites [24].

### **2.3. Trust**

In e-Commerce, trust is a belief of customers that web vendor is honest and will not take advantages of its customers. Trust is one of the most important factors in doing e-Commerce, and trust can be communicated through website design. Proper use of colours can help building trust in e-Commerce websites [17][26]. Previous studies also indicate that contrast of foreground and background colours can have effects on visitors' trust towards the website [21].

### **2.4. Purchase Intention**

Intention or attempt of customers to buy products/services from a website is called purchase intention. Generally, purchase intention can be induced by store characteristics, brand, quality of stores, and products [8]. However, intention to purchase from a website is related to customer experiences and website features. [25]. Proper website design, including proper use of colours in

websites was studied and concluded that it can cause aesthetic and lead to purchase intention [13][17][26].

## 2.5. Gender

Gender is indicated by social condition and social role of a person, while sex is indicated by physical appearance of human body [2]. Sex and gender are often studied to gain better understanding of customers or potential customers of businesses. The results of previous researches indicate that colours in websites have different effects on customers with different genders regarding their feelings toward the website [20], perceived profession look, perceived trustworthiness, intentions to purchase from the website, intentions to revisit the website, as well as intention to the recommend the website to others [17]. In this study, gender is studied as one of moderator variables.

## 2.6. Generation

Generation is a group of people who were born in a same period of time. Generally, people of the same generation have the same social and political experiences [1]. Generation X or Gen X are people who were born in 1963-1977, generation Y or Gen Y are people who were born in 1978-1995, and generation Z or Gen Z are people who were born in 1996 and onward [12]. Generation is another moderator variable in this study.

## 3. RESEARCH FRAMEWORK AND HYPOTHESES

### 3.1. Research Framework

In order to understand effects of colour contrast in e-commerce websites, such as hotel & travel website on (1) emotional perception (pleasant, arousal, and dominance), (2) trust, and (3) purchase intention of visitors with different genders and different generations, a research framework is developed, as shown in Figure 1. The framework demonstrates one independent variable (colour contrast), five dependent variables (pleasant, arousal, dominance, trust, and purchase intention), and two moderator variables (gender and generation).

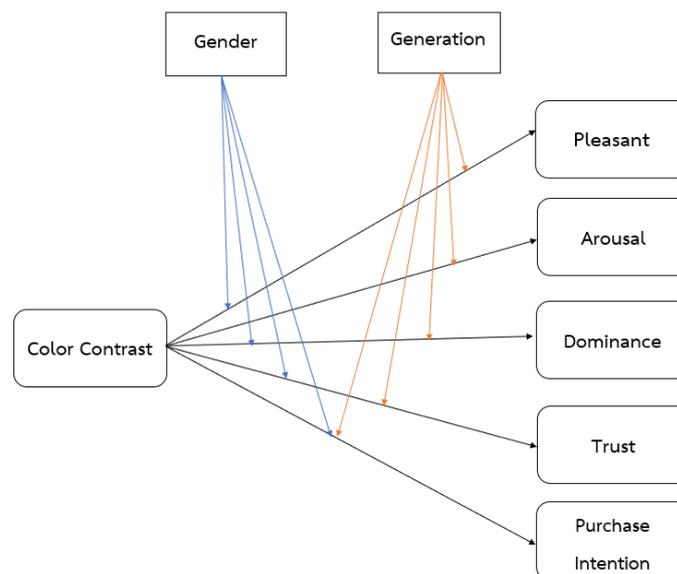


Figure 1. Research Framework

### **3.2. Hypotheses**

From the research framework in Figure 1, there are five hypotheses to be tested.

Hypothesis 1: Colour contrast in hotel & travel websites has effects on emotional perception (pleasant, arousal, and dominance) of visitors.

Hypothesis 2: Colour contrast in hotel & travel websites has effects on trust of visitors.

Hypothesis 3: Colour contrast in hotel & travel websites has effects on purchase intention of visitors.

Hypothesis 4: Colour contrast in hotel & travel websites has different effects on emotional perception, trust, and purchase intention of visitors with different genders.

Hypothesis 5: Colour contrast in hotel & travel websites has different effects on emotional perception, trust, and purchase intention of visitors of different generations.

## **4. RESEARCH METHODOLOGY AND RESULTS**

To answer our research question and test the proposed hypotheses, a two-phase empirical study was designed [28]. The objective of the first phase of this study is to acquire a chromatic colour, chosen by participants as the most appropriate foreground colour for hotel & travel website. This selected chromatic colour is used to develop three hotel & travel websites with three different colour contrast patterns for data collection in the second phase of the study.

### **4.1. The First Phase of Empirical Study**

#### **4.1.1. Research Tools**

A colour wheel with 12 RGB colours is presented to our participants in order to choose the most appropriate foreground colour for hotel & travel website. A questionnaire is also used to collect data on gender and year of birth of each participant.

#### **4.1.2. Participants**

120 Thai Internet users who have experiences in e-Commerce shopping volunteered to participate in the first phase of the study. The participants consist of 32 (26.7%) males and 88 (73.3%) females. There are 21 (17.5%) Gen X, 78 (65.0%) Gen Y, and 21 (17.5%) Gen Z participants.

#### **4.1.3. Results**

Table 1 presents foreground colours chosen by 120 participants. The colour Blue Cyan has the highest score with 37.4%. Hence, the colour Blue Cyan will be used to build websites for the second phase of the study.

### **4.2. The Second Phase of Empirical Study**

#### **4.2.1. Research Tools**

There are two research tools for this second phase of the study, (1) hotel and travel websites with different patterns of colour contrast, and (2) a questionnaire.

## 1. Websites

A book called “The principles of beautiful web design” [4] is used as a guideline to develop websites for this study. This book explains that proper components in websites include containing blog, logo, navigation, content, footer, and white space. Containing blog and white space are background components, while other components are foreground of websites. Three patterns of colour contrast with achromatic and chromatic colours, as presented in Table 2, are used for website development.

Table 1. Foreground colours chosen for hotel & travel website.

Rank	Colour	Percentage
1	Blue Cyan	37.4%
2	Green Cyan	10.3%
3	Cyan	9.4%
4	Orange	8.4%
5	Red	7.5%
6	Green	5.6%
7	Blue	4.7%
8	Magenta	4.7%
9	Yellow	4.7%
10	Green Yellow	2.7%
11	Red Magenta	2.7%
12	Blue Magenta	1.9%

Table 2. Patterns of colour contrast used in this study.

Patterns of Colour Contrast	References	Colours for Websites
Achromatic colour contrasts with achromatic colour, such as black contrasts with white.	Lin et al., 2016 Nordeborn, 2013	Foreground: Black Background: White (Web#1: Black on White)
Achromatic colour contrasts with chromatic colour, such as black contrasts with blue.	Nordeborn, 2013 Lin et al., 2016 Nordeborn, 2013	Foreground: Blue Cyan Background: White (Web#2: Blue Cyan on White)
Chromatic colour contrasts with chromatic colour, such as blue contrasts with darker/lighter shade of blue.	Bonnadel et al., 2011	Foreground: Blue Cyan Background: Darker Blue Cyan (Web#3: Blue Cyan on Darker Blue Cyan)

Three patterns of colour contrast in developed hotel & travel websites are (1) Black foreground with White background (achromatic colour contrasts with achromatic colour), as shown in Figure 2, (2) Blue Cyan foreground with White background (chromatic colour contrasts with achromatic colour) as shown in Figure 3, and (3) Blue Cyan foreground with Darker Blue Cyan background (chromatic colour contrasts with darker/lighter chromatic colour) as shown in Figure 4.

## 2. Questionnaire

In this second phase of the study, each participant visits one of these three developed websites and then fills in a questionnaire. This questionnaire is for collecting data on emotional perception (pleasant, arousal, and dominance), trust, purchase intention of each participant using 5-point score ranging from 1 to 5. Questionnaire items to measure each variable are from past researches and are translated to Thai as our participants are Thai Internet users. Other data such as gender, generation, and e-commerce shopping experience of each participant are also collected.

### 4.2.2. Participants

145 volunteer participants participate in the second phase of this study. Number of participants using each website break down by genders and generations are presented in Table 3 and Table 4.

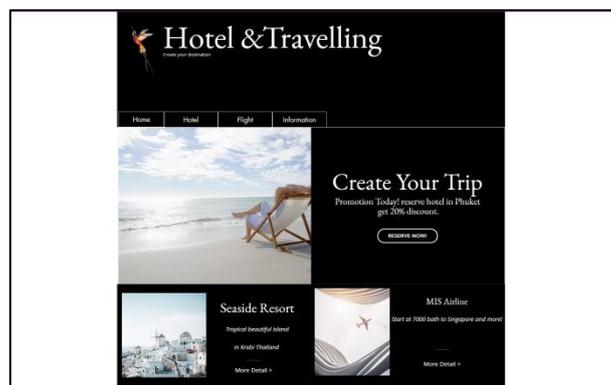


Figure 2. Website#1: Achromatic Colour Contrasts with Achromatic Colour



Figure 3. Website#2: Chromatic Colour Contrasts with Achromatic Colour



Figure 4. Website#3: Chromatic Colour Contrasts with Darker/Lighter Chromatic Colour

Table 3. Number of participants break down by genders.

Website	Gender		Total
	Male	Female	
1: Black on White	15	31	<b>46</b>
2: Blue Cyan on White	16	32	<b>48</b>
3: Blue Cyan on Darker Blue Cyan	15	36	<b>51</b>
<b>Total</b>	<b>46</b>	<b>99</b>	<b>145</b>

Table 4. Number of participants break down by generations.

Website	Generation			Total
	X	Y	Z	
1: Black on White	16	18	12	<b>46</b>
2: Blue Cyan on White	16	16	16	<b>48</b>
3: Blue Cyan on Darker Blue Cyan	17	17	17	<b>51</b>
<b>Total</b>	<b>49</b>	<b>51</b>	<b>45</b>	<b>145</b>

#### 4.2.3. Measures

To ensure high validity and reliability of items used to measure all five variables, we conducted a pilot test of the questionnaire with 30 participants. After using one of the three websites, each participant filled in a questionnaire and gave suggestions about the questionnaire for improvement. Some questionnaire items were adjusted before the actual data collection. Cronbach's alpha coefficients of all five variables from the actual data collection are calculated, as shown in Table 5. Cronbach's alpha coefficients of all variables are higher than 0.7, and very close to 1, indicating reliability of measures used in the study.

Table 5. Reliability of measures.

Variable	Number of questions/items	Cronbach's alpha coefficient
Pleasant	5	0.943
Arousal	5	0.881
Dominance	5	0.843
Trust	4	0.943
Purchase Intention	4	0.949

#### 4.2.4. Analytical Approach

To test our proposed hypotheses, we start by examining the distributions of collected data using Skewness and Kurtosis tests. The results of these tests indicate that all five independent variables are normally distributed. Hence, one-way ANOVA are used to further analysed data and test the hypotheses.

#### 4.2.5. Descriptive Statistics

Table 6 presents mean scores and standard deviations of all five variables for each website calculated using data from all participants. Table 7 and Table 8 present mean scores and standard deviations of all variables calculated using data from male and female participants consecutively. From Table 6 to Table 8, it can be concluded that colour contrast used in Website#2: Blue Cyan foreground on White background (or chromatic foreground colour on achromatic background colour) is most preferred by all participants as a whole, as well as for male participants, and female participants. The Blue Cyan foreground on White background gains highest mean scores of all variables.

Table 6. Mean scores and standard deviations: **All** participants.

Website	Pleasant	Arousal	Dominance	Trust	Purchase Intention
1: Black on White	2.76 (0.90)	2.40 (0.66)	2.86 (0.77)	2.73 (0.98)	2.61 (1.01)
2: Blue Cyan on White	3.26 (0.79)	2.74 (0.84)	3.13 (0.73)	3.11 (0.81)	3.16 (0.80)
3: Blue Cyan on Darker Blue Cyan	3.06 (0.96)	2.62 (0.94)	2.99 (0.74)	3.01 (1.04)	2.83 (1.00)

Table 7. Mean scores and standard deviations: **Male** participants.

Website	Pleasant	Arousal	Dominance	Trust	Purchase Intention
1: Black on White	2.61 (0.73)	2.36 (0.79)	2.67 (0.70)	2.25 (0.85)	2.30 (1.04)
2: Blue Cyan on White	3.29 (0.93)	3.01 (0.96)	3.36 (0.82)	3.30 (0.85)	3.33 (0.85)
3: Blue Cyan on Darker Blue Cyan	3.11 (1.17)	2.99 (1.17)	3.17 (0.87)	3.13 (1.21)	3.03 (1.24)

Table 8. Mean scores and standard deviations: **Female** participants.

Website	Pleasant	Arousal	Dominance	Trust	Purchase Intention
1: Black on White	2.84 (0.98)	2.43 (0.60)	2.97 (0.80)	2.99 (0.95)	2.78 (0.97)
2: Blue Cyan on White	3.25 (0.73)	2.62 (0.76)	3.03 (0.68)	3.03 (0.79)	3.09 (0.77)
3: Blue Cyan on Darker Blue Cyan	3.04 (0.87)	2.47 (0.80)	2.91 (0.67)	2.96 (0.98)	2.74 (0.89)

Table 9, Table 10, and Table 11 present mean scores and standard deviations of all variables calculated using data collected from Gen X, Gen Y, and Gen Z participants consecutively. From Table 9, it shows that Gen X participants prefer Website#3: Blue Cyan foreground with Darker Blue Cyan background (chromatic colour contrasts with darker/lighter chromatic colour), while Gen Z participants prefer Website#2: Blue Cyan foreground on White background (or chromatic

foreground colour on achromatic background colour). However, for Gen Y participants, there is no obvious preference of colour contrast in websites at this point.

Table 9. Mean scores and standard deviations: **Gen X** participants.

Website	Pleasant	Arousal	Dominance	Trust	Purchase Intention
1: Black on White	2.53 (0.88)	2.37 (0.67)	2.53 (0.76)	2.50 (0.75)	2.54 (0.94)
2: Blue Cyan on White	3.45 (0.64)	2.66 (0.68)	3.07 (0.55)	3.08 (0.59)	3.14 (0.62)
3: Blue Cyan on Darker Blue Cyan	3.40 (0.52)	3.01 (0.83)	3.18 (0.73)	3.62 (0.78)	3.44 (0.75)

Table 10. Mean scores and standard deviations: **Gen Y** participants.

Website	Pleasant	Arousal	Dominance	Trust	Purchase Intention
1: Black on White	2.71 (0.84)	2.40 (0.68)	3.14 (0.67)	2.54 (0.90)	2.49 (1.04)
2: Blue Cyan on White	2.91 (0.85)	2.48 (0.72)	2.93 (0.73)	2.75 (0.86)	2.86 (0.83)
3: Blue Cyan on Darker Blue Cyan	2.94 (1.25)	2.54 (1.05)	3.04 (0.73)	2.99 (1.05)	2.80 (0.93)

Table 11. Mean scores and standard deviations: **Gen Z** participants.

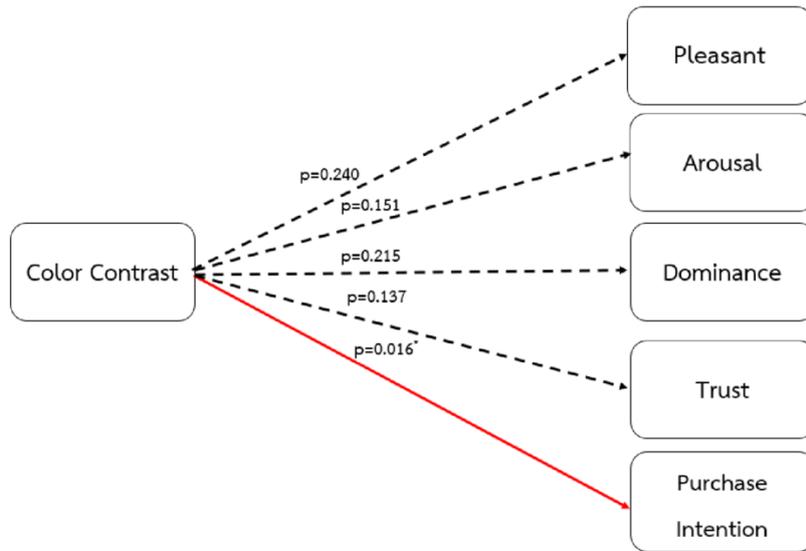
Website	Pleasant	Arousal	Dominance	Trust	Purchase Intention
1: Black on White	3.07 (0.98)	2.45 (0.60)	2.77 (0.83)	3.23 (1.16)	2.85 (1.06)
2: Blue Cyan on White	3.38 (0.83)	3.11 (1.04)	3.43 (0.89)	3.50 (0.87)	3.48 (0.89)
3: Blue Cyan on Darker Blue Cyan	2.84 (0.91)	2.31 (0.85)	2.77 (0.73)	2.43 (0.96)	2.25 (0.98)

#### 4.2.6. Hypothesis Testing

Hypothesis testing results using one-way ANOVA test are shown in Figure 5 to Figure 10. From Figure 5, it can be concluded that, for all participants as a whole, colour contrast has significant effects on their purchase intention.

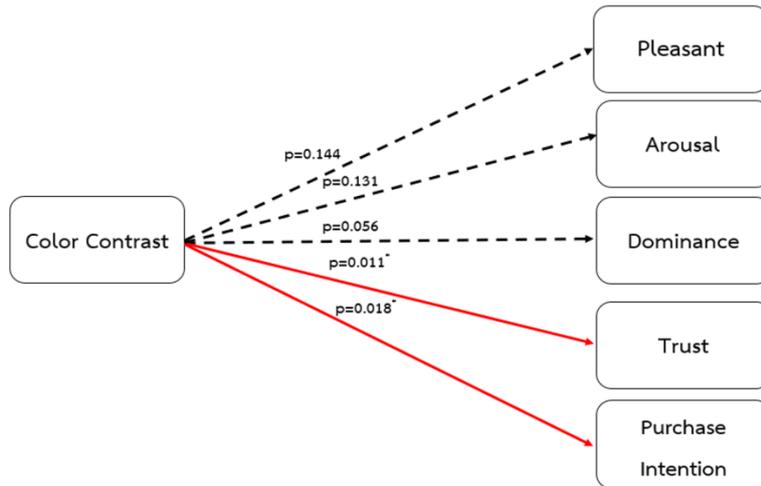
It is shown in Figure 6 that, for male visitors, colour contrast significantly affects their trust and purchase intention. However, from Figure 7, no significant effect of colour contrast is found in female visitors.

For generation X and generation Z visitors, colour contrast has effects on their emotional perception, trust, and purchase intention. Figure 8 indicates that colour contrast significantly affects pleasant, dominance, trust, and purchase intention of Gen X participants. From Figure 10, colour contrast significantly affects arousal, dominance, trust, and purchase intention of Gen Z participants. However, it can be concluded from Figure 9 that, for Gen Y participants, there is no significant effect of colour contrast on any of the variables.



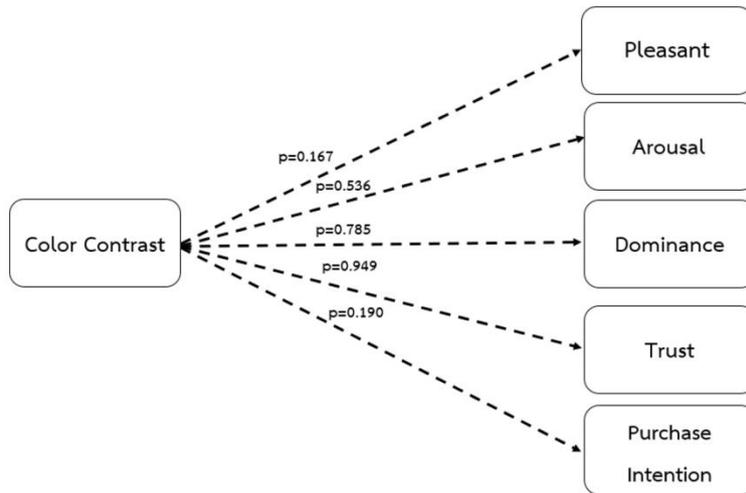
\* Significant at the 0.05 level  
 \*\* Significant at the 0.01 level

Figure 5. Hypothesis testing results: All participants as a whole



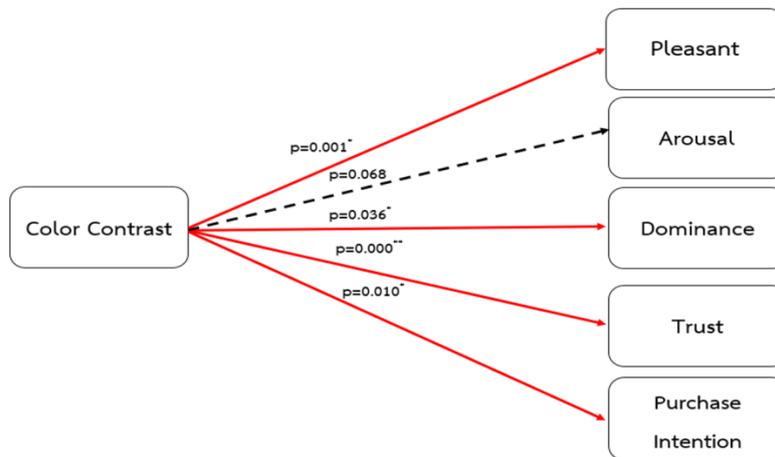
\* Significant at the 0.05 level  
 \*\* Significant at the 0.01 level

Figure 6. Hypothesis testing results: Male participants



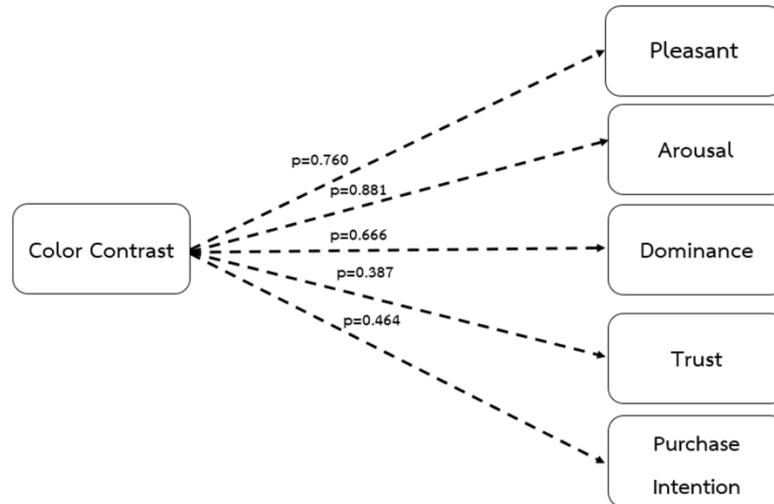
\* Significant at the 0.05 level  
 \*\* Significant at the 0.01 level

Figure 7. Hypothesis testing results: Female participants



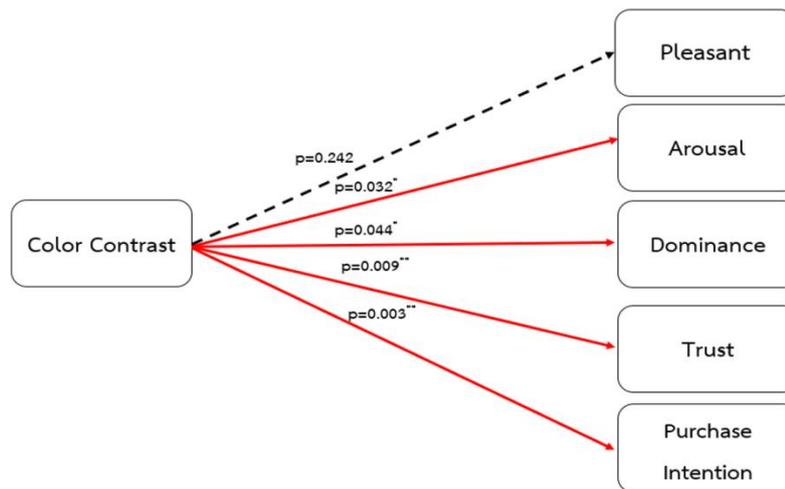
\* Significant at the 0.05 level  
 \*\* Significant at the 0.01 level

Figure 8. Hypothesis testing results: Gen X participants



\* Significant at the 0.05 level  
 \*\* Significant at the 0.01 level

Figure 9. Hypothesis testing results: Gen Y participants



\* Significant at the 0.05 level  
 \*\* Significant at the 0.01 level

Figure 10. Hypothesis testing results: Gen Z participants

## 5. CONCLUSIONS

It could be concluded from the study that colour contrast can have significant effects on website visitors and these effects can be varied from variable to variable, from gender to gender, and from generation to generation.

Moreover, some patterns of colour contrast are more preferred by certain groups of visitors. For example, Blue Cyan foreground on White background (or chromatic foreground colour on achromatic background colour) is more preferred by all visitors as a whole, male, female, and Gen Z visitors, while Blue Cyan foreground on Darker Blue Cyan background (or chromatic

foreground colour on darker/lighter chromatic background colour) is more preferred by Gen X visitors.

Results from this study can be used as a design guideline for website developers or web vendors to choose the right colour or colour contrast for their websites. However, this study examines only Thai Internet users. Different results can be found if the data is collected from people with different cultures or nationalities. Further research on different cultures and nationality should be further examined.

Also, only one type of websites, hotel & travel, is studied in this research. Other types of businesses or websites should be investigated to gain more understanding. Moreover, we used only three formats or patterns of colour contrast in this study which are (1) Black foreground with White background (achromatic colour contrasts with achromatic colour), (2) Blue Cyan foreground with White background (chromatic colour contrasts with achromatic colour), and (3) Blue Cyan foreground with Darker Blue Cyan background (chromatic colour contrasts with darker/lighter chromatic colour). There are many more combinations of colour contrast which can be studied.

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