Does Color Matter on Web User Interface Design?

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Abstract—**Emotional advertising on the Internet such as websites and social media can be highly beneficial for Small Medium Enterprises (SMEs). However, not all of SMEs have a website that meets all of the principles of website design which are persuasive. Moreover, the color is rarely considered in making websites to raise the emotional bonding between the products and audiences of SMEs. Literature review, observation to four websites as case studies, and questionnaires distributed to respondents randomly were performed. This research aimed to evaluate the extent to which SMEs from Bandung exploited the use of color as an element in the web User Interface (UI) design and to analyze whether the color could provide emotional bonding, so the visitors were interested in purchase or trial of the product. This research finds that participants responses to color are various in different demographic factors. Zananachips.com is considered to successfully utilize the color in the web UI design to build its brand identity, raise interest in the trial of the product, and engage the consumer with the website. This research is expected to be a reference for SMEs in creating emotion, motivation, and persuasion through website design.**

Index Terms—**Colors, Persuasive Design, SMEs, User Interface Design, Website**

I. INTRODUCTION

CREATIVE industries are derived from the utilization of creativity, skills, and talent of individuals to create wealth, to generate job opportunities, and to empower the creativity and inventiveness of the individual. The start of Small Medium Enterprises (SMEs) in Bandung can be advantageous since Bandung is identical with the creative city. There are 23 000 SMEs in Bandung [1] from various creative industry subsectors such as fashion, culinary, craft, and others. The growth of SMEs has a positive impact on economic development, employment growth, equity in income distribution and reduction of poverty. Moreover, SMEs in Bandung have constraints in promotion and brand building beside production capacity and capital.

Regarding promotion, one of the less expensive promotional strategies that can reach a large audience is through online marketing. Online marketing can be conducted in four ways. There are creating a website, placing ads online, participating in online social networks or communities, and using e-mail. The first phase is to create a website that is engaging, easy to use, and worthwhile to attract visitors [2]. Besides being easy to use, the other advantage of the website is it can interact better with the audience and give a unique online experience. Moreover, the previous research indicates that in creating a memorable online experience, emotional appeals are better than rational appeals. The online experience helps to establish a high service expectation and enhance the trial of the product [3]. Thus, emotional advertising on the Internet such as websites and social media can be highly beneficial for SMEs.

The element of making an emotional, motivating and persuasive website is a User Interface (UI). It should be attractive and easy in terms of navigation. To make a persuasive web design, there are five principles of design. There are clarity, good layout, good visual hierarchy, good use of color, and easy navigation. Thus, the hypothesis formulated about color as a design element can help to improve the visual appeal to make the website more attractive with the right composition and the striking colors. It allows the visitor to see the hierarchy or sequence which is the most important part and directs them to take action such as register, purchase, and others. Similarly, in an e-commerce website, the context, logo, text and background color, and motion graphic influence emotions and mood when consumers are browsing the websites [4].

The problem formulation in the research is that not all of SMEs have a website fulfilling all of the principles of website design which are persuasive. Moreover, the color is rarely considered in making websites that raise the emotional bonding between

the SMEs products and audiences. Furthermore, some previous researches support the idea that the colors used in websites are an essential factor of the perception of aesthetic appeal. Therefore, this research aims to evaluate the extent to which SMEs from Bandung exploit the use of color as an element in the web User Interface (UI) design and to analyze if the color can provide emotional bonding, so the visitors are interested in purchasing or trying the product. In addition, this research is expected to be a reference for SMEs in creating emotional, motivating and persuasive website design.

II. LITERATURE REVIEWS

A. User Interface (UI)

There are five principles to make persuasive web design, namely clarity, good layout, good visual hierarchy, good use of color, and easy navigation. Meanwhile, the design principle and element that influence harmony sequentially are balance and color. When a website uses the harmonious color combination, it engages the visitors and generates a balance of visual experience. Otherwise, when the website design is not harmonious, it becomes chaotic and boring [5]. Theoretically, the Internet allows the website to be personalized for the individual consumers [6].

The color theory with web UI design consists of contrast, complementary, and vibrancy which each color evokes specific moods [7]. For example, red color creates alert, and the green color brings peace. In addition to the appearance of color emotion, color coding guidelines can also be used in the web UI design like red button to attract attention and make user alert on the web. Moreover, color theory in web design is more than just a visual accompaniment. Colors can have effects on business [7]. For instance, some businesses even become associated with colors such as IBM (blue), Ferrari (red), or Starbucks (green). Then, the chosen characters, symbols, and other design elements such as colors must be communicated through advertising that suggests the personality of the brand or organization [2]. Table I shows that color emotion in web UI design and its meaning.

B. Color on Web UI Design

The previous research has observed 100 homepages of actual websites. This would suggest that the colors used on a website might be one of the key factors of the visual appeal. Moreover, the subjective reactions to those colors might be created in 50 milliseconds [8]. It has found a substantial correlation between aesthetic ratings of websites that are diverse color combinations in text-background and ratings of intention to

TABLE I
COLOR EMOTION ON WEB UI DESIGN.

Color	Promotes
Red	Importance, power, youth
Orange	Uniqueness, friendliness, arise energy and a sensation of movement
Yellow	Happiness, enthusiasm, antiquity (darker shades)
Green	Growth, stability, financial themes, and environmental themes
Blue	Safety, calm, openness (lighter shades), strength and reliability (darker shades)
Purple	Luxury, romance (lighter shades), mystery (darker shades)
Black	Power, edginess, sophisticated and timeless
White	Simplicity, cleanliness, virtue,
Gray	Formality, neutrality, melancholy
Ivory	Elegance, simplicity, comfort
Beige	Traits of surrounding colors, humility, a secondary or background color

purchase [8]. However, the response and preference of color are affected by both personal and environmental factors [9]. Thus, the cause of a person in responding to colors is determined by psychological, physiological and cultural responses. For example, colors are sometimes interpreted differently for different nations.

Although there are many factors that affect how consumers purchase a product, it is determined that visual factor especially color as the strongest and most persuasive factor. Some previous researches have found that color is more persuasive than black or white. In printing advertisement and direct mail, color gains attention and response [10]. In this e-commerce case, when consumers are not motivated enough to purchase, colors as one of the web UI elements can help to persuade and accelerate decision making. In addition, persuasive web design is obtained through the users' first impression [11]. It has been developed to influence the users' behaviors or attitudes [12].

III. RESEARCH METHOD

A. Data Collection

The research was conducted in Bandung in September to November 2016. After conducting the literature review on theories, academic journals, and related articles to the color and website design using an online database, the observation is performed to four websites as the case studies such as kandurastudio.com, sneaklinid.com, zananachips.com, and nabatafashion.com. To determine whether the SMEs' website can make the

TABLE II
THE RESPONDENTS' DATA.

Demography	Frequency (in percent)
Male	62
Female	38
16–25 y.o.	85
26–35 y.o.	8
36–45 y.o.	4
>46 y.o.	3
Undergraduate	87
Graduated	12
Postgraduate	1
SES A	11
SES B	52
SES C	35
Abstain about SES	2

Fig. 1. The most important factors in the web design.

audiences interested in the products offered (emotional advertising) or not, the questionnaires are distributed to respondents randomly to people in Bandung and the surrounding areas. In addition, the questionnaires were conducted to determine public opinion about SMEs website design.

B. Participants

Out of 100 respondents, 62% are male, and the rest 38% are female. Their age is ranging from 16 to 25 years old (85%), 26 to 35 years old (8%), 36 to 45 years old (4%), and above 46 years old (3%). Moreover, the educational background of respondents also varies. There are undergraduate (87%), graduated (12%), and postgraduate (1%). Then, the expenditure per month is asked to determine the respondents' perception whether there is an agreement between the respondents and the target audience of SMEs. Similarly, the spending is also observed. The Social Economic Status (SES) with spending over Rp3 million per month is 11% of respondents, SES B with spending of Rp1–3 million per month is 52%, and SES C with spending below Rp1 million per month is 35%. Table II illustrates the respondents' data.

C. Procedure

For the procedure, respondents observe a website approximately in one minute and answer the questions addressed on the website. After that, the respondents are shown other websites and answer the same questions. There are four websites selected as case studies which are the official website of the SMEs from Bandung. SMEs used as case studies are selected randomly from various industries like craft, service, food, and
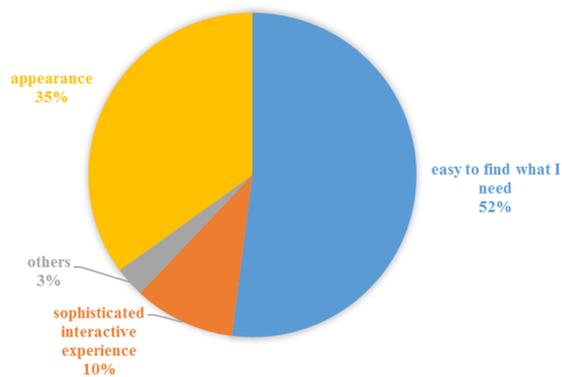
fashion. The criterions are already operating for 3 to 6 years and in the growth phase.

Once the data are collected, the analysis is conducted by qualitative and quantitative approaches. From the observations, a thorough analysis is made on all the websites of the case studies. Then, the analysis is carried out by assessing the five principles of a persuasive website. After that, the questionnaire results are analyzed using a cross-tabulation and Chi-Square test.

IV. RESULTS AND DISCUSSION

The analysis starts with the analysis of the four websites based on five principles on how to make the persuasive web design. It is shown in Table III.

According to distributed questionnaire to 100 participants, it reveals that the most important factor in designing website is easy to find (clarity) about what they need rather than beautiful appearance as shown in Fig. 1. However, a beautiful appearance like interesting illustration, good use of color and good layout cannot be neglected. As mentioned before, a website using harmonious color combination will engage the visitors and generate a balance in the visual experience [6]. Thus, the first impression is very important in website design because it determines whether the visitors still continue accessing the website or not.

Participants have completed the first impression evaluation consisting of a 6-item interest survey adapted from [13]. Low scores indicate that the results lead to the good points. Table IV shows that zananachips.com has a good evaluation in every item including interesting and well-designed web, good use of color, good layout and easiness to navigate. Otherwise, nabatafashion.com has a poor evaluation in every item including complex, boring, and poorly designed web, bad use of color, and bad layout. Moreover, participants evaluate that sneaklinid.com has a simple

TABLE III
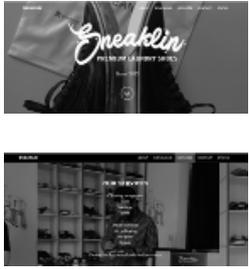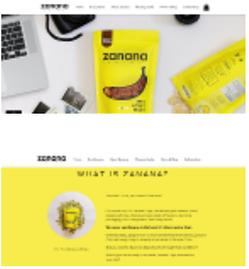THE RESULTS OF THE DESIGN AUDIT OF THE FOUR WEBSITES ON THE STUDY.

	kandurastudio.com (K)	sneaklinid.com (S)	zananachips.com (Z)	nabatafashion.com (N)
Clarity	In the first time, the UX is less clear and does not directly explain about this website (39% agree). The menu button on the homepage is less clear. However, after getting into the menu, clarity begins to appear because the website provides the latest news, projects & activities, contact and product catalog.	It is clear homepage by using the tagline text to communicate. It shows the type of service being offered, but it is less comprehensive because it does not display the price and other details about the services. The menu button seems obvious with the layout.	The intent and purpose of the website are clear and provide information about its products.	The homepage is clear by using tagline text and product images. There is important information on the menu such as a catalog of fashion product and contact information.
Layout	The simple layout contains a bit of picture and information on each page.	UI design is in accordance with the target audience (teenagers), but it is monotonous because of monochrome and greyscale photos.	It uses yellow color as brand identity and has simple layout.	It has the complex and busy layout. The rigid and monotonous colors, layout and typeface, are less attractive.
Hierarhy	The illustration is the strongest element that draws attention to the website. There is no hierarchy and similar size on the design elements.	It is arranged in the order of logo, tagline text, background image then menu.	It consists of illustration, logo, and menu. The hierarchy comes from the size.	It has a logo, image, and menu. The hierarchy comes from the size and color.
Emphasize	Animated gif images are alternated each time visit or the website reloading.	It is lack of stands out images.	It uses color and photo.	It has complete information about products.
Navigation	It is unclearly defined regarding the most wanted action for the homepage.	The sequence in web design is pretty neat with the scroll up and down design.	Each tab has a function menu page that is different and focused.	It has more than one primary call to action.

TABLE IV
THE RESULTS OF THE FIRST IMPRESSION EVALUATION.

	Simple/ Complex	Interesting/ Boring	Well/Poorly Designed
K	4.49	4.66	4.73
S	3.46	4.50	4.40
Z	3.75	3.08	3.39
N	5.31	5.69	5.20

website due to its one-page website design. Meanwhile, kandurastudio.com is seen as hard to navigate because of the unusual user experience and non-contrast color of the menu bar.

Furthermore, the results are divided into demographics and the first impression of four websites as shown in the Tables V–VIII. Based on the result of crosstab test carried out between gender to the first impression survey in kandurastudio.com as shown in Table V, it reveals that out of 61 male respondents with the majority respondents about 41 people or 67.2%

TABLE V
THE RESULTS OF THE CROSS-TABULATION BETWEEN GENDER AND THE PART OF THE FIRST IMPRESSION.

		Illustration Count (%)	Color Count (%)	Pearson Chi-square
K	Male	41 (67.2)	2 (3.3)	.056
	Female	21 (55.3)	1 (2.6)	
S	Male	24 (39.3)	3 (4.9)	.575
	Female	17 (44.7)	1 (2.6)	
Z	Male	38 (62.3)	8 (13.1)	.159
	Female	16 (42.1)	10 (26.3)	
N	Male	50 (82.0)	1 (1.6)	.000
	Female	24 (63.2)	1 (2.6)	

TABLE VI
THE RESULTS OF THE CROSS-TABULATION BETWEEN AGE AND THE PART OF THE FIRST IMPRESSION.

	Age	Illustration Count (%)	Color Count (%)	Pearson Chi-square
K	16–25	52 (61.9)	2 (2.4)	.353
	26–35	5 (62.5)	0 (0.0)	
	36–45	4 (100.0)	0 (0.0)	
	46 <	1 (33.3)	1 (33.3)	
S	16–25	34 (40.5)	2 (2.4)	.362
	26–35	33 (7.5)	2 (25.0)	
	36–45	25 (0.0)	0 (0.0)	
	46 <	1 (33.3)	0 (0.0)	
Z	16–25	46 (54.8)	15 (17.9)	.985
	26–35	4 (50.0)	1 (12.5)	
	36–45	3 (75.0)	1 (25.0)	
	46 <	1 (33.3)	1 (33.3)	
N	16–25	63 (75.0)	3 (3.6)	.993
	26–35	5 (62.5)	0 (0.0)	
	36–45	3 (75.0)	0 (0.0)	
	46 <	2 (66.7)	0 (0.0)	

state that illustrations including photography, pictures and animations are the part of the first impression. Meanwhile, only 2 people or 3.3% of male respondents state that the color is the part of the first impression in kandurastudio.com. Similarly, this also happens in female respondents. Out of 38 female respondents, around 21 people or 55.3% agree that illustrations including photography, pictures, and animations are the part of the first impression. However, only 1 respondent or 2.6% says that the colors are the part of the first impression in kandurastudio.com.

As in sneaklinid.com, the majority of male respondents (24 people or 39.3%) sees illustrations including photography, pictures, and animations as the part of the first impression. Only 3 people or 4.9% of male respondents agree that the colors are the part of the first impression. The same situation also occurs in female respondents. The majority of female respondents about 17 people or 44.7% state that illustrations consisting of pictures or animations are the part of the first impression, and only about 1 or 2.6% of respondents see the colors as the part of the first impression in sneaklinid.com. The results of crosstab test of two other websites are presented in Table V.

Based on the result of Chi-Square test carried out between gender against the part of the first impression in Table V, it finds out that kandurastudio.com has the probability value above 0.05% (0.056 > 0.05). It means that gender does not have a significant relationship if the research has an error rate of 5%. Meanwhile, if the research has an error rate of 10%, the Chi-Square test between gender and the part of the first impression shows that there is a significant relationship (0.056 <0.1). It means, in the error rate of 10%, the better illustrations including photography, pictures, and animations on the website increasingly attract the attention of the respondents.

Similarly, in sneaklinid.com and zananachips.com, gender does not have a significant relationship if the error rate is 5%. In addition, if the error rate is 10%, gender cannot determine the trend assessment on the part of the first impression. However, in nabatafashion.com, gender has a significant relationship to the assessment on the part of the first impression. It implies that the gender tendency can determine the first impression parts of the website.

Moreover, based on the result of Chi-Square test conducted for age and the part of the first impression in Table VI, it is revealed that all websites as case studies have the probability value above 0.05%. It means that age does not have a significant relationship when the error rate is 5%. In addition, if the error rate is 10%, age cannot determine the trend assessment on the part of the first impression.

Next, it is the result of Chi-Square test between educational background and the first impression part as shown in Table VII. It shows that kandurastudio.com and sneaklinid.com have the probability value above 0.05%. It means that educational background does not have a significant relationship in error rate of 5%. In addition, in error rate of 10%, the educational background cannot determine the trend assessment on the part of the first impression of those websites. However, in zananachips.com and nabatafashion.com, the educational background has a significant relationship to the assessment on the part of the first impression.

TABLE VII
THE RESULTS OF THE CROSS-TABULATION OF THE EDUCATION
BACKGROUND AND THE PART OF THE FIRST IMPRESSION.

	Education	Illustration Count (%)	Color Count (%)	Pearson Chi-square
K	Undergraduate	51 (59.3)	3 (3.5)	.627
	Graduated	10 (83.3)	0 (0.0)	
	Postgraduate	1 (100.0)	0 (0.0)	
S	Undergraduate	36 (41.9)	3 (3.5)	.196
	Graduated	5 (41.7)	1 (8.3)	
	Postgraduate	0 (0.0)	0 (0.0)	
Z	Undergraduate	47 (54.7)	15 (17.4)	.000
	Graduated	7 (58.3)	3 (25.0)	
	Postgraduate	1 (100.0)	0 (0.0)	
N	Undergraduate	65 (75.6)	3 (3.5)	.000
	Graduated	8 (66.7)	0 (0.0)	
	Postgraduate	1 (100.0)	0 (0.0)	

TABLE VIII
THE RESULTS OF THE CROSS-TABULATION OF THE
SOCIO-ECONOMIC STATUS (SES) AND THE PART OF THE FIRST
IMPRESSION.

	SES	Illustration Count (%)	Color Count (%)	Pearson Chi-square
K	SES A	17 (48.6)	1 (2.9)	.363
	SES B	35 (67.3)	2 (3.8)	
	SES C	9 (81.8)	0 (0.0)	
S	SES A	13 (37.1)	0 (0.0)	.176
	SES B	22 (42.3)	3 (5.8)	
	SES C	4 (36.4)	1 (9.1)	
Z	SES A	17 (48.6)	5 (14.3)	.720
	SES B	31 (59.6)	9 (17.3)	
	SES C	6 (54.5)	3 (27.3)	
N	SES A	25 (71.4)	3 (8.6)	.538
	SES B	40 (76.9)	0 (0.0)	
	SES C	8 (72.7)	0 (0.0)	

It means that the tendency of educational background can determine the parts of the first impression.

Table VIII shows the result of Chi-Square test carried out between Socioeconomic Status (SES) and the part of the first impression. It shows that all websites used as case studies have the probability value above 0.05%. It implies that SES has no significant relationship if the error rate is 5%. In addition, if the error rate is 10%, SES cannot determine the trend assessment on the part of the first impression part of those websites.

Moreover, most of the websites investigated have used color as an element in the web User Interface (UI) design to reflect their brand identities in Table IX.

TABLE IX
THE USE OF COLOR AS A BRAND IDENTITY.

	K	S	Z	N
Yes	63	71	89	49
No	34	27	11	49
Abstain	3	2	0	2
Total	100	100	100	100

It is supported by the results of a survey in which majority of the participants agree that the colors in web UI design have reflected the visual identity of each brand. However, nabatafashion.com has not seen the use of color as a visual identity. Only 49% which are less than half participants who agree that color in web design reflects the visual identity of its brand.

Finally, this research analyzes whether the color can provide emotional bonding, so the audience is interested in purchasing or trying the product. Based on the result of Chi-Square test conducted between the favored color and interest in purchasing in Table X, kandurastudio.com has the probability value of less than 0.05% or $0.002 < 0.05$. It means that the most of the favored colors have a significant relationship if the error rate is 5%. Moreover, if the error rate is 10% or $0,002 < 0.1$, it shows the favored color can give a stimulus to consumers' interest in purchasing on this website.

However, the other three websites have the probability value above 0.05%. It means that the favored color has no significant relationship with interest to purchase if the research uses the error rate of 5%. In addition, if the error rate is 10%, the favored color cannot determine a trend assessment on the interest to purchase on those websites.

V. CONCLUSIONS

According to the crosstab test results between demography consisting of gender, age, educational background and Socioeconomic Status (SES), and the part of the first impression from Tables V–VIII, they reveal that all people who come from different circles state illustrations including photography, pictures, and animations as the part of the first impression in kandurastudio.com, sneaklinid.com, zananachips.com, and nabatafashion.com.

However, participants' responses to color vary on different demographic factors. Female participants agree that color as the first impression in zananachips.com. Whereas, people who are 46 years old above state that color as the first impression in kandurastudio.com and zananachips.com. Meanwhile,

TABLE X
THE RESULTS OF THE CROSS-TABULATION BETWEEN THE FAVORED COLOR AND THE INTEREST-TO-PURCHASE.

	K		S		Z		N	
	Yes	No	Yes	No	Yes	No	Yes	No
Red	20.0	80.0	40.0	60.0	80.0	20.0	83.3	0.0
Orange	0.0	100.0	100.0	0.0	100.0	0.0	23.1	76.9
Yellow	0.0	100.0	100.0	0.0	100.0	0.0	31.6	68.4
Green	83.3	16.7	83.3	16.7	83.3	16.7	14.3	57.1
Blue	23.1	73.1	53.8	46.2	80.8	19.2	12.0	84.0
Navy	16.7	66.7	50.0	50.0	50.0	33.3	0.0	75.0
Pink	85.7	14.3	57.1	42.9	85.7	14.3	33.3	66.7
Purple	50.0	0.0	100.0	0.0	100.0	0.0	18.2	81.8
Black	69.2	30.8	65.4	34.6	88.5	11.5	28.6	71.4
White	66.7	33.3	66.7	33.3	100.0	0.0	0.0	100.0
Grey	100.0	0.0	100.0	0.0	100.0	0.0	0.0	100.0
Brown	33.3	66.7	33.3	66.7	100.0	0.0	28.6	57.1
Tosca	100.0	0.0	33.3	66.7	100.0	0.0	0.0	100.0
Others	16.7	83.3	66.7	33.3	66.7	33.3	0.0	100.0
Chi-Square	0.002		0.672		0.304		0.119	

graduated and SES C participants state that color as the first impression in zananachips.com.

Moreover, a successful persuasive web UI design is when a website succeeds in getting people to purchase the product offered on the website. In this case, zananachips.com is considered to successfully utilize the color in the web UI design to build its brand identity, raise interest to purchase and engage the consumer with its website. The thing that can be learned from four websites as case studies is that SMEs need to use a distinguish colors which are aligned with the brand identity in creating emotional, motivating, and persuasive website design.

Last, the limitation of the research is it is only conducted on four websites of SMEs originating from Bandung. There are not websites of global companies. In addition, this research only observes, reviews, and rates websites based on the theory of persuasive website. The authors have not done an in-depth experiment about color on the websites. Therefore, for further research, it is interesting to study the color experiments on UI websites by changing the color of the UI. It can prove whether there is a deeper connection between color, emotion and intention to buy in terms of psychological, physiological, and cultural responses to colors.

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