Marketing Customized Products: A Discussion on the Preference of Color Combinations

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Abstract--**Nowadays firms design personal products, that is, customized product s which included changing its color and material to fulfilled consumer diversified needs. The study focuses on exploring the relation between aesthetics lifestyle and color combination of the simple model of a cellular phone. The scale of aesthetics lifestyle is adopted in this study to investigate the consumers' preferences of color combinations. The research result shows that: First, there are the correlations between monochrome, double-color, and tri - colored. Second, different type and matching colors of products won't affect the choice of colors. Besides, the color preferences of the blocks on product want to highlight the block of trademark, but other blocks are only slightly differences.**

I. INTRODUCTION

As the development of economic and the increasing of GDP, consumers level of consumption rise at the same time. Therefore the times that when a firm released new products then consumers would purchase them had passed by. Nowadays information transmits quickly, and then it's hard to fulfill consumer needs easily. Furthermore, speed of the variation in the market changed faster than before, in this situation of keen competition, it has been an important issue that firms how to catch consumers eyes in order to produce consumers attraction for self-products. Besides the basic function, it's more important to have an attractive look and color. One of the most important factors that affect purchasing is the consumers' preference to the color of products. Due to everyone's preference to color of the same product is different, if firms can understand consumers' preference to color when they design the product at first and fulfill consumer needs of color for increase the attraction of the products to consumers in order to achieve the objective of rising the purchase intention and increasing selling.

There are a lot of products in the market now for consumers to choose. Consumers will be affected by many factors of products when they purchase a product. They will consider the attributions like its look, color, price and functions and so on, and those attributions will affect consumers purchase intention. Those factors that considered by consumers when they choose products will affected by social culture, level of economic and personality, therefore, firms have to consider those affected factors when they develop a new product. The marketing master- Kolter separates consumption behavior into three levels: from quantity to quality level and emotional level. At the first level, consumers seek for products affordable, at the second level consumers pursue for quality, texture and characteristic of products; when at the third level, consumers care more about the link between the emotion of shopping and products. This kind of experience is the purchasing behavior produced by consumers' emotional experience, and the purchasing decision standard is based on personal preference in order to reach the personal purchasing goal of satisfaction, personal needs and emotional enjoyment, consumers are much more concern about emotional value of products than the functional value of the products. In other words this is a kind of an emotional purchasing experience. To follow the increasing of social and economy, consumers nowadays seek mainly for the second level and the third level, and now the consumers who seek for the third level are gradually increased, firms now are using some marketing strategy to link between the brand or product and consumers.

When putting the same kind of products together, the look and color of products are usually the factors that catch consumers' eyes. A lovely and designed look will create more characteristics to a product. In general situation, color affects people's emotion more than type does. Color will give rise to memory and the associate with it in thinking through the acceptance by sight from psychological side, and it even gives rise to the reaction from side. The cause of this perceptual emotion will become an important factor to affect consumers' purchasing. For example: many high class boutiques will put purple element into their products in order to make a link between color and emotion in consumers when they are purchasing the products since purple has an elegant and luxury image in Easterners. The color-link will bring out perceptual impulse and then to affect consumers' purchasing behavior. Hence, the application of chromatology has become an important part in product design to how to use color plans of products to catch consumers' eyes and make them want to purchase it.

Today the firms' marketing strategies of products consider different types consumers to be the targets gradually to fulfill the niche market. There are merely products can fit most of peoples' needs and preference; the popular market is getting disappeared. Thus, we need to do the market survey and to analyze the information to understand what products to sell to different consumers. Then we can do segment to the market and make different sale strategies. Up to the present day, the segment of products to consumers that were brought up by general firms still think of the occupation types of population statistics or the usage of products as a basis. For example, firms often separate cars types from business type, sports type, family type and modern metro female type. Even though it seems complete, that regards use of function as product sale strategy, it ignores the different preference between individuals and what's more important is the influence that

every consumer affects to aesthetics perception and lifestyle.

Aesthetics perception affects consumers' decision deeply when they are choosing products. People pay more attention to aesthetics perception in product design [1,7]. The thinking of aesthetics perception was represented by outside behavior in a process of purchasing, and it is a behavior inclination with coherence and unity that not easy to change by purchasing space-time and object. In order to understand that a consumer's aesthetics perception will exercise influence over choosing the color of the product, this research investigates consumers' color combination preference of autonomous color matching products in aesthetics lifestyle.

There were lots of researches had investigated topics about color combination. However, most of them were about peoples' extents of preference of color combination, there were few investigated color combination of practical products, use two colors to match or use the same subjects to analysis. Hence, this research will discuss the following topics:

1. To discover the potential correlations between aesthetic lifestyle and preference of color combination of the product.
2. To compare consumers' color combination in one product and analyze the correlation when there are different numbers of colors to combine.
3. To discuss the purchase intention and willingness to pay toward autonomous color matching products of each aesthetic lifestyle sections.

So that firms can carry out the co-designed strategy and color combination plans of products more exactly in the future via the analysis of consumers' color combination preference.

II. LITERATURE REVIEW

A. A comprehensive review of color combination

There are many scholars that have researched about color combination. Tokumaru [4] brought up a system to give assistance for color design, and it is composed of color harmony, color combination, color combination image, image vocabulary output and image comparison. When a user inputs the file of color and color combination image into the system, it will choose the color that harmonized with the input-color from Munsell color data base to carry the color combination out. At last, the system will choose the color combination in accordance with the evaluation of the input-color image. Ou [5] indicated that there is an addition relationship existed between monochrome and color combination image. Bicolor combination image is an average of two independent colors, but it can't predict the color preference. This research developed subject's monochrome feeling model and construct a bicolor prediction model at last, through the three phases color preference model. The conclusion of this research showed that there is a direct relationship between subject's color preference and color harmony, but only some variation. After several years, Ou carried a bicolor matching research out, and the objective of it is to build up a numerical value model in the harmony of bicolor combination. He picked out 54 colors systematically from CIELAB color space, and resulted 1431 color combination to carry a harmony estimation experiment. In this experiment, the subjects see the color combination on the screen to estimate the harmony, and Ou finally got some principles of harmony color combination to build up a numerical value model. Deng et al. [2] used NIKEID's customize website on line as an experiment way to discuss the consumers' autonomous color matching preference on sneakers. They use CIELAB color space as the standard of colors to count the color distance between different specific sections and construct a set of color similarity model to verify the result of color combination. From this experiment above, they obtain a conclusion as follows: to customers, the influence of luminance is more than the influence of hue and saturation. In practical, the amount of color that customers used is less than expected statistic average.

In the past, researches showed that consumers' color combination preference is a popular question to many scholars, including color image or color harmony of color combination. Besides, there are more and more researches experiment with color combination preference on products to discuss that if there is any different characteristic between consumers' color combination preference. From what has been discussed above, however, they usually focused on just one target product, and most of them using bicolor combination not three kinds of color on the color combination of products. This research will combine autonomous color matching and the product to investigate consumers' color combination preference toward to different target products.

B. The constructions of Co-designed

Co-designed is to provide consumers a chance to change some parts of products to create a product with their own style and characteristics. Once the product is equipped with modular design, just change some parts of product then you can increase the sorts of products. In times of rapid change, a product with a flexible and diversified design can provide more advantage to firms in their markets. When a product is equipped with modular design, it can introduce a new product rapidly that make consumers get the attraction fresh through modifying the components of the product module and then to prolong the product life cycle. Furthermore, the product can attract consumers with different life style through a way of cost down and risk reduction. Gruner & Homburg [3] proposed that there will be a positive effect to the success of the product through joining the interaction with consumers in the design and development phase of the product.

Consumers' emotional consumption behavior has become a priority in considering product design and marketing so that firms provide the service of autonomous color matching as a co-designed way to consumers, and the most basic and common of all, is the color design of the product, like the

customize sneakers of NIKE ID, Mi adidas or other brands, Flip-flops of Havaianas, Backpacks of timbuk2 and so on. Due to the considering of manufacturing cost, it's easier for firms to form a difference through putting different colors on a product, consumers' autonomous color matching has become the most common way in co-designed to firms.

C. Purchase Intention

Purchasing behavior is a psychological decision making process. Consumers will search the information related their own experience and external environment in order to meet their needs. After accumulating enough information, consumers start evaluating the value and cost of the product, and finally, cause purchasing behavior after compare and estimation. How do consumers measure the value of products? Smith & Colgate [6] suggested that consumers' behavior was affected by four dimensions of customer value and divided the customer value into four dimensions as functional/instrumental value, experiential/hedonic value, symbolic/expressive value, and cost/sacrifice value. Besides, consumers' purchase intention will increase when the products make them feel higher customer value. Researchers had also investigated the impact of co-design customer value on purchase intention. The result of the research above shows that customer value has a positive impact on purchase intention. In addition, cost/sacrifice value has been found as the most important driver of purchase intention and attitude. In another words, if customers are willing to input more cost, they have the more expectancy and preference to the products.

D. Willingness to Pay

Willingness-to-pay (WTP) is the price that a consumer is willing to pay for the product and the price shows the value of the product to consumer; moreover, consumers would like to pay a higher price for the same kind of product in order to gain the value that other products couldn't provide, and that the source of value may come from the brand, the appearance and the warranty. Therefore, autonomous color matching products offer a different value from common products. Besides, to firms, it will increase more production costs, so autonomous color matching products will result in a premium. However, price will have a moderator effect to consumes' purchase intention that an inadequate price may hurt profit and sales volumes of firms. Consequently, this study is going to discuss consumers will pay how much extra price to purchase autonomous color matching products comparing to finished products when firms provide co-designed service for consumers to do the autonomous color matching on products.

E. Aesthetics Lifestyle

Modern people have more aesthetics perception in this time so that the appearance of behavior affected by individual's aesthetics experience becomes more obvious. Hence, there are many scholars in Taiwan start to study about the influence of aesthetics experience and related lifestyle to purchasing behavior in these years. Aesthetics lifestyle comes from life style. Besides, the source of lifestyle is from sociology and psychology, and that the researches about life style have been discussed for a long time. Lifestyle can be used to analyze peoples' viewpoint toward events or things and to understand their mind further. In modern times, scholars discuss lifestyle with aesthetics perception to more clearly understand the relationship between lifestyle and preference. However, common lifestyle can't definitely display the relationship with preference. Furthermore, the studies about lifestyles and vacation lifestyles in every territory can't have an explanatory adequacy on the difference between users' aesthetics perception, taste and style identification. For this reason, this study will investigate consumes' preference of autonomous color matching through the scale of aesthetics lifestyle to make it more accurate. aesthetics lifestyle can be defined as peoples' life experience, their own values, the resource of time, money and so on are different so that they have different extent of request for aesthetics and creativity. Hence, people will request for quality and live up to life to express their own aesthetics perception value, and to convey the appreciation of the beauty, characteristics and judgment that different from others. Besides, people have different attitude toward aesthetics perception in their life, therefore, they will express their own ideas and thinking through practical actions. The actions above include consumption, speech statement, interesting, creative works and attitude. Consequently, aesthetics lifestyle is based on aesthetics perception and turn into a kind of lifestyle.

Deng, et al. [2] has suggested that aesthetics perception and color preference are affected by individual's subject. According to the above reason, the same kind of color combination will have different reception to different person as that someone may feel pretty but others may feel blinding. The result shows individual's aesthetics perception is more obvious on color combination.

III. RESEARCH METHODS

A. Research Hypotheses

In this study, the aesthetic lifestyle group and demographics were set as the independent variables. The color combination preference, purchase intention, and willingness to pay (WTP) for color-customized products were set as the dependent variables. To examine the various aesthetic characteristics, color combination preferences, purchase intentions, and WTP among consumers, we propose the following hypotheses:

H1: The aesthetic lifestyle group demonstrates differences regarding purchase intention toward color-customized products.

H2: The aesthetic lifestyle group demonstrates differences regarding WTP for color-customized products.

H3: The aesthetic lifestyle group demonstrates differences regarding the WTP color-customized products when

receiving distinct types of information.

B. Research Participants, Sampling, and Data Collection

This study explored the varying aesthetic characteristics of consumers and their color preferences, purchase intention, and WTP for products that enable consumers to select colors. The participants were general consumers who were divided into two groups based on the results of an aesthetic lifestyle scale. Mobile phones were chosen as research samples because they are well-developed on the market. In addition, several mobile phone manufacturers provide color selection or customization services, and mobile phones are considered popular products. Therefore, mobile phones readily reflect individual aesthetic preferences. The questionnaire survey method was used and the questionnaires were distributed online. We referenced Deng et al. [2] to examine consumer preferences toward color combination. In their study on consumer preferences regarding product color combinations, Deng et al. designed and implemented a color customization system on a virtual platform, providing various product samples and colors that allowed consumers to select and build a color scheme based on their preferences. In the present study, 308 questionnaires were collected, yielding 300 valid questionnaires after removing the invalid questionnaires or those that contained repeated responses.

C. Variable Definitions and Measurements

1) Color customization criteria

The practical color coordinate system (PCCS) was selected as the basis for color customization. Hue and tone were used as the criteria for color selection.

a) Hue

Hues in the PCCS are spectral colors that resemble the three addictive primary colors and three corresponding secondary colors, that is, colors based on red, orange, yellow, green, blue, and violet. Visual perception was incorporated to adjust and add intermediary colors to extend the original palette. To avoid participant confusion because of excessive colors and to facilitate the research procedures, orange (which is close to red and yellow) was removed, and black was included in addition to the remaining five hues, yielding a total of six colors for selection.

b) Tone

Tone is a unique method used to categorize colors within the PCCS according to individual habits of using and perceiving colors. Tone represents a concept of mixing lightness and saturation. Based on this concept and considering tone variations and differences between lightness and saturation, nine tones were selected from the 12 tones in the PCCS, namely, bright, vibrant, deep, light, dull, dark, pastel, light gray, and gray tones.

Regarding the color sample, 50 colors were obtained from mixing five hues with nine tones, yielding 45 chromatic colors; five gray-scale values were added using achromatic colors. The final color swatch listed corresponding computer RGB values to facilitate producing the color combination system and related calculations. These color data were used in the color combination questionnaire design for further research. Table 1 lists the colors used in this study.

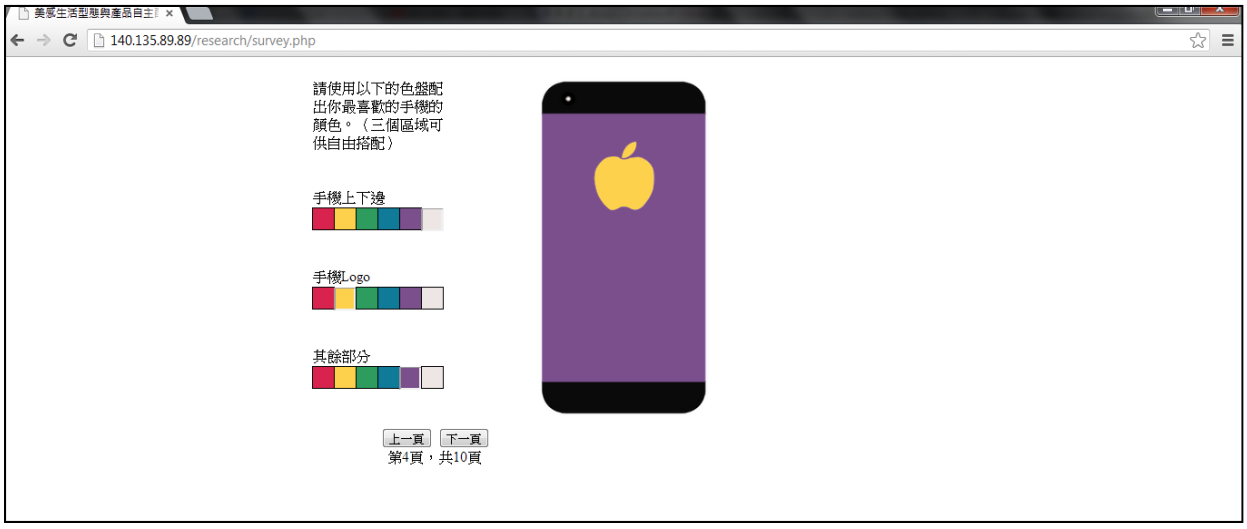

Fig. 1. Color combination system for a trichromatic mobile phone
Source of data: color combination website designed by this study

TABLE 1. HUES AND TONES SELECTED FOR USE IN THIS STUDY

	Red	Yellow	Green	Blue	Violet
Bright（B）					
Vibrant（V）					
Light（LT）					
Pastel（P）					
Dull（D）					
Dark（DK）					
Deep（DP）					
Light gray（LIT）					
Gray（G）					
Neutral					

2) Color difference calculation

In this paper we used CIELAB to calculate color differences regarding color-customized products since CIELAB color space demonstrated the optimal results when calculating color differences. In the CIELAB equation, *L*a*b* denotes the relative perceptual difference between any two colors, and each color is regarded as a point in a 3-dimensional space, in which the Euclidean distance between points is calculated. In the *L*a*b* space, the Euclidean distance is denoted by ΔE. Therefore, ΔE^*_{ab} represents the distance (i.e., color difference) between a (L^*_1, a^*_1, b^*_1) and b (L^*_2, a^*_2, b^*_2).

$$\Delta E^*_{ab}=\sqrt{(L^*_2-L^*_1)^2+(a^*_2-a^*_1)^2+(b^*_2-b^*_1)^2}$$

Color difference refers to the distance between two colors in the CIELAB color space, and implies that long distances translate into large differences in hue, lightness, and saturation. The greater the color difference is, the more inconsistent the visual presentation of colors is, and the more conspicuous the layers are. The largest color difference among the 50 selected colors was used as the standard in this study, which was 112.8 as obtained using the CIELAB equation. Dividing 112.8 by 3 yielded 37.6, this was set as the minimum threshold. Therefore, color differences smaller than 37.6 were regarded as small color differences, those ranging between 37.6 and 75.2 as medium, and those larger than 75.2 as large. Using these criteria, the color differences of each experimental group were categorized and the ratios were calculated. Regarding the trichromatic products used in this study, the color differences between any two colors were summed. The results were regarded as small color differences if smaller than 112.8, medium if ranging between 112.8 and 225.6, and large if greater than 225.6.

3) Aesthetic lifestyle dimension

An aesthetic lifestyle scale was developed into eight hypothetical dimensions and related implications were established for each of the aesthetic lifestyle scale: fashion, luxury, aesthetic knowledge, romantic and playful, unique style, simplistic and plain, artistic behavior, and introspective. To conform to the research requirements for color combinations of commercial products, irrelevant items were removed and items related to color and aesthetic dimensions were added. Any ambiguous items were simplified before the remaining 60 items underwent factor analysis. Next, a reliability analysis was performed to screen and remove items the presenting low levels of association to ensure the maximum reliability of each dimension. Finally, eight dimensions were determined for the aesthetic lifestyle scale used in this study, totally 57 items.

4) Purchase intention

Smith and Colgate [6] studied customer value and determined that the value of cost or sacrifice was the transaction cost that consumers must bear to purchase, own, and use a product. This cost includes monetary cost and other intangible sacrifices. In this study, purchase intention was defined as follows: the greater cost that consumers are willing to bear when purchasing a product, the higher their purchase intention is. In other words, regarding color-customized products, consumer purchase intention is measured by the WTP or the bearing of cost or sacrifice.

5) Willingness to pay

WTP is used to measure the price that consumers agree to

pay for a specific product. In this study, WTP was employed to assess the price that consumers were willing to pay to select preferred colors for a product. The respondents in the study were instructed to choose from six options: less than 10%, 10% to 20%, 20% to 30%, 30% to 40%, 40% to 50%, and more than 50%. The results were used to evaluate the consumer WTP for color-customized products.

6) Product price information

This study also examined whether consumer WTP was substantially influenced by the information that manufacturers provided regarding the product price. The respondents were randomly assigned to receive two types of product information before indicating their WTP. The first type of information provided the prices of general products on the market and was accessible to all respondents. The second type of information informed respondents of the price of color customization services. The two groups were assessed for significant differences in WTP to determine whether price information served as a reference for purchase decisions.

IV. EMPIRICAL ANALYSIS

A. Demographic Data Analysis

Male and female participants each accounted for approximately half of the total research population. Most participants (85%) were ages 20 to 29, and approximately 57% were college graduates. Regarding occupational and marital status, 70% were students and 96% were single. Overall, 25% of participants had received artistic training and 75% had not. The large proportion of young people and students among the respondents might be because the study questionnaires were distributed online and these two groups demonstrate high rates of Internet use.

B. Aesthetic Lifestyle Analysis

1) Factor analysis

The results of the completed questionnaires were assessed using factor analysis, a scree plot was used as the standard for extracting the number of components. The scree plot indicates a gradually leveling curve and eigenvalues greater than 1 when the number of components is eight. Therefore, items on the aesthetic lifestyle scale were simplified into eight dimensions, and the resulting values were used for analysis. If the eigenvalues are greater than 1 following axis rotation and the absolute value of factor loading for each variable exceeds 0.3, then the factor analysis results are viable. Reliability analysis for screening questionnaire items yielded results consistent with the recommendation of Zaltman and Burger. In addition, the Kaiser-Meyer-Olkin value obtained was 0.882, suggesting suitability for factor analysis. The cumulative variance explained of the eight dimensions was 49.248%.

Based on the implications for each factor component, the dimensions were named fashion, luxury, aesthetic knowledge, romantic and playful, unique style, simplistic and plain, artistic behavior, and introspective, yielding Cronbach's α values of 0.897, 0.853, 0.824, 0.706, 0.704, 0.646, 0.609, and 0.487, respectively. These figures indicate the reliability of the factor analysis results.

2) Cluster analysis

Cluster analysis required classifying the respondents into groups demonstrating distinct types of aesthetic lifestyle, enabling further assessment of how disparate groups demanded the same products. The cluster analysis was based on the respondent scores for the eight dimensions. After several clustering attempts, we found that clustering into five groups facilitated interpreting the results.

TABLE 2. QUESTIONNAIRE ITEMS REGARDING PRODUCT INFORMATION

Category	Operationalized content of information	Item assessing WTP
Information Type 1	Assume that the price of mobile phones is NT$20,000.	If you intend to purchase a color-customized mobile phone, what is the highest price you are willing to pay?
Information Type 2	If you wish to select a color for your mobile phone, an additional NT$6,000 is required.	If you intend to purchase a color-customized mobile phone, what is the highest price you are willing to pay?

TABLE 3. CLUSTER ANALYSIS SCORES FOR KEY AESTHETIC FACTORS

	Comfortable Creator	Design Pursuer	Aesthetic Taker	Contracted Pop Artists	Fashion Explainer	*F* value
Fashion and trends	-.54981	.53454	-.12508	-.43200	**1.34505**	49.094***
Materialism	**.42264**	.21538	**-.63090**	.17426	-.09585	14.501***
Artistic creation	**.56097**	.44384	**-.72513**	-.44495	**.48096**	34.453***
Romantic and playful	-.33894	**.65286**	.11416	.19960	-.64788	14.320***
Design preference	-.09716	**1.29145**	.12119	-.52853	-.80735	50.948***
Orderly	-.48399	.31654	-.40500	**.63186**	.42821	20.991***
Extravagant and luxurious	.00024	.17865	**-.61941**	**.90746**	-.34980	29.189***
Simplistic and plain	**.51471**	-.11228	-.28766	.06710	-.40710	9.517***
Number of participants	77	47	78	59	39	

Group 1: This group of participants attained high scores regarding *artistic creation*, followed by *simplistic and plain,* and *materialism*. People that demonstrate these traits are opinionated regarding aestheticism and are unlikely to easily conform to popular trends. They are concerned with the quality and value of products, and their individualistic styles are reflected in their creations and daily lives. We defined this group as *comfortable creators*.

Group 2: This group of participants demonstrated substantial results regarding *design preference*. People sharing these traits believe that design and aestheticism are directly correlated, and own numerous uniquely designed items. They are relatively sensitive to fashion trends. They actively collect design-related information and share with others. They attribute high quality and value to products that exhibit artistic design, and their design thinking manifests in their daily lives. We defined this group as *design pursuers*.

Group 3: This group of participants did not demonstrate noteworthy results for most factors; they obtained positive scores for *romantic and playful* and design preference, and negative scores for the remaining factors. These outcomes suggest that people exhibiting similar traits do not feel strongly about fashion trends or aestheticism. We determined that these traits applied to the general public. People in this population express slight interest in artistically designed products, and although they may seek pleasurable life experiences, they do not actively obtain further aesthetic knowledge. Conversely, the negative scores for artistic creation demonstrated by Group 3 participants suggest resistance to activities involving artistic expression and weak intentions toward performing creative tasks. This may be because such people believe their artistic abilities are inadequate, or they fear critique from others. In addition, they exhibit a low demand for materialistic possessions, and tend to dress modestly. They are primarily concerned with blending into the crowd. We defined this group as *aesthetic takers.*

Group 4: This group of participants achieved the highest scores for *extravagant and luxurious*, followed by *orderly*. These results indicate that people with these traits are highly concerned with how others view them, and wish to attract attention using their appearance. Thus, they tend to choose bright colors or combine colors that sharply contrast when selecting products or coordinating clothes, thereby highlighting their individualism. Conversely, these people demonstrate orderly behavior, and are inclined to maintain tidiness in their surroundings and use symmetric or structured home décor. For this group of people, order exists in vibrant colors. We defined this group as *contracted pop artists* (pop art, an art movement that developed in the 1950s in the United Kingdom, emphasized the relations between popular culture and art. Pop artists integrate art into daily lives to render a "pop expression" that embodies prevalence, youth, creativity, mass production, wit, and commercial undertones. Essentially, pop art is characterized by striking colors and geometric shapes.).

Group 5: This group of participants achieved substantial results for *fashion and trends*, followed by artistic creation. These results indicate that people exhibiting these traits are highly sensitive to popular trends, and are inclined to actively search for information regarding the latest trends. They serve as fashion experts among their peers. Because they hold an individualistic perspective toward fashion, they tend to express pioneering or unique opinions. They are willing to spend money and time on their wardrobe because they are extremely concerned with their appearance and maintaining a bright, glamorous look. We defined this group as *fashion explainers.*

C. Preference of Autonomous Color Matching

1) Correlations among monochromatic, dichromatic, and trichromatic color combinations

Trichromatic mobile phones and trichromatic backpacks were compared regarding the correlations among color combinations. The results indicated that for both mobile phones and backpacks, color was irrelevant to the combination for most participants (>30%), who expressed varying color preferences, followed by a match in one color.

- Irrelevant: Selection of product color is unrelated to hue or tone.
- Similar hues: The colors selected for the product contain the same hues but distinct tones.
- Match in one color: The colors selected have one color in common.
- Match in one color with similar hues: The colors selected have one color in common, and the remaining colors having the same hues but distinct tones.
- Match in two colors: The colors selected have two colors in common.
- Match in three colors: The colors selected have three colors in common.

2) Ratios of color differences selected

Analyzing the color differences regarding trichromatic mobile phones showed that small and medium color differences accounted for most participants. In addition, most participants selected a color combination presenting medium color differences for their customized mobile phones.

TABLE 4. RELATIONSHIP BETWEEN TRICHROMATIC BACKPACKS AND MOBILE PHONES REGARDING COLOR COMBINATION

	Irrelevant	Similar hues	Match in one color	Match in one color with similar hues	Match in two colors	Match in three colors
Trichromatic mobile phones	31%	20%	22%	9%	11%	7%

TABLE 5. COLOR DIFFERENCE RATIOS FOR TRICHROMATIC MOBILE PHONES

Category	Relationship	All	Comfortable Creator	Design Pursuer	Aesthetic Taker	Contracted Pop Artists	Fashion Explainer
Trichromatic mobile phone color difference	Small color difference	20%	21%	**(15%)**	★**27%**	18%	**(15%)**
	Medium color difference	66%	62%	★**77%**	**(56%)**	73%	70%
	Large color difference	14%	★**17%**	**(8%)**	17%	9%	15%

Note: ★ denotes the largest value for the item in that row, ( ) denotes the smallest value.

3) Relations between various physical areas regarding color combination

Color differences were also compared for the same products but in distinct areas on the product to assess the color preferences of the participants in each group. Based on the color application study by Deng et al. [2], we categorized the respondent color preferences and distance between colors

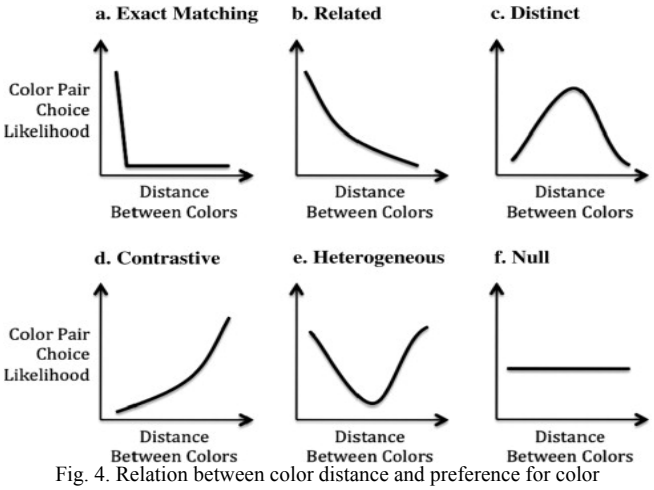

Fig. 4. Relation between color distance and preference for color combinations by area
Source of data: Deng et al. (2010)

into six relations: exact matching, related, distinct, contrastive, heterogeneous, and null (Fig. 4). These categories were used to describe the relation between the respondent preference and color distance. *Exact matching* occurred when most respondents preferred the same colors for two areas, *related* refers to a preference for similar colors, *distinct* represents a choice of distinct colors, and *contrastive* means combining contrasting colors. *Heterogeneous* refers to two prevailing preferences in one group of participants, in which some preferred small color differences and others favored large color differences. *Null* is the outcome in which the respondent preference cannot be predicted based on the color distance.

The color differences of the areas on mobile phones for color combination were calculated and compared. The areas were divided into top and bottom, product logo, and center. The trends regarding color combination were assessed and are listed in Table 6 based on area.

D. One-Way Analysis of Variance

1) Purchase intention

The respondents demonstrated various aesthetic lifestyles and preferences for color-customized products; thus, a one-way analysis of variance (ANOVA) was conducted to identify whether aesthetic lifestyle exhibited significant differences in relation to purchase intention and WTP, thereby testing the research hypotheses. Table 7 shows that the correlation between aesthetic lifestyle and purchase intention achieved significance ($p < .001$). This indicates that consumers of various aesthetic propensities demonstrated significant differences regarding the intention to purchase color-customized products, supporting H1.

TABLE 6. CHARACTERISTICS OF COLOR COMBINATION AREAS ON MOBILE PHONES FOR EACH GROUP

Group	Top/bottom and center	Product logo and top/bottom	Product logo and center
All	Related	Null	Contrastive
Comfortable Creators	Related	Null	Contrastive
Design Pursuers	Highly related	Null	Contrastive
Aesthetic Takers	Related	Related	Heterogeneous
Contracted Pop Artists	Related	Distinct	Heterogeneous
Fashion Explainers	Related	Distinct	Heterogeneous

TABLE 7. ANOVA RESULTS FOR THE PURCHASE INTENTION OF PARTICIPANTS WHO EXHIBIT VARIOUS AESTHETIC LIFESTYLES TOWARD COLOR-CUSTOMIZED PRODUCTS

Dimension		Total mean	Comfortable Creator	Design Pursuer	Aesthetic Taker	Contracted Pop Artists	Fashion Explainer	*F* value
Purchase intention items	Item 1	3.73	4.01	4.40	2.82	3.86	4.02	47.55***
	Item 2	3.54	3.84	3.93	2.50	3.98	3.89	35.22***
	Item 3	3.06	3.25	3.78	2.56	2.96	2.94	11.68***
	Item 4	3.46	3.80	3.76	2.52	3.83	2.71	33.36***
	Item 5	3.18	3.28	3.76	2.47	3.38	3.35	18.92***
Purchase intention		3.39	3.64	3.93	2.58	3.60	3.58	54.05***

Note: *$p < .05$, **$p < .01$, ***$p < .001$

TABLE 8. SUMMARY OF ANOVA RESULTS REGARDING WTP FOR PRODUCTS WITH COLOR CUSTOMIZATION BY AESTHETIC LIFESTYLE

Difference dimension	Total mean	Comfortable Creator	Design Pursuer	Aesthetic Taker	Contracted Pop Artists	Fashion Explainer	*F* value
Mobile phone WTP	9.63	9.15	7.76	10.89	8.38	12.17	2.102

Note: *$p < .05$, **$p < .01$, ***$p < .001$

2) Willingness to pay

To measure consumer WTP for products with color customization, the questionnaire scale was converted into WTP percentages before performing ANOVA, with the median of intervals on the scale set as WTP. In other words, 5%, 15%, 25%, 35%, 45%, and 55% were established as values for conversion. Table 11 shows that no significant differences existed between various groups of aesthetic lifestyles regarding WTP for mobile phones with color customization.

3) Independent Samples T-Test

In the research framework of this study, we hypothesized that product price information influenced WTP. Therefore, independent samples *t* tests were conducted to evaluate this hypothesis. The total research population and each of the five groups were assessed using *t* tests to evaluate the provision of price information. The first group of participants was informed of the market price of mobile phones, whereas the second group was informed the price of color customization services in addition to the market price. The effects of price information on consumer WTP were analyzed, and the results are presented in Table 12. The results indicated no significant differences regarding WTP whether additional price information was provided; this outcome applied to both the total population and each aesthetic lifestyle group. Therefore, H3, the hypothesis that distinct price information affected the WTP of various aesthetic lifestyle groups, was not supported.

V. CONCLUSIONS

A. The Preference of Color Combination to Products

In accordance with the data of subjects, the result of this study shows below:

There are the correlations between monochrome, double-color, and triple – colored in the same product.

When consumers face the selection of autonomous color matching products that there are different amount of colors to combine on the same product, there are over 75% of the subjects chose to use repeated colors, and there are 20% of them just change the tones. If we delete the inertia influence of selection that was affected by the first color, then we can infer that there is consistence and continuity in consumers' color combination preference.

Different products and number of colors will influence the choice of colors. Besides, the color preferences of the blocks of the product tend to highlight the trademark, while other blocks are only slightly different.

After calculating by color difference formula, it results in the conclusion of the color difference selected by subjects and the higher color difference rate in triple–colored cell phone is middle color difference, it rates to 60%. That is, functionality and combination will affect the color preference. Besides, consumers will have a tendency to use their own unique color to make the cell phone not be too monotone or have an over strong contrast of color difference.

B. Aesthetics Lifestyle Groups' Preference of Color Combination

1) Comfortable Creator

The result shows that this group prefers middle color difference combination in triple–colored products so that they are used to combine with similar colors. Comfortable creators' purchase intentions of autonomous color matching products slant toward high in whole subjects. Furthermore, the willingness-to-pay locates around the average and is affected

by information of products. Due to the factors of *artistic creativity* and *material life*, this group has a higher enthusiasm to create and is willing to spend money on the things they like. However, there is no attraction to this group may because that provided products in this study are not what they pursued or liked.

2) Design Pursuer

To analyze the preference from design pursuers' aesthetic factor, the result shows that this group has the factors of tasteful in design and romantic, consequently, they prefer to use the high value that can construct complete three-dimensional effect and design features. Besides, from the color difference of triple–colored products, the rate of using high color difference is the lowest. Furthermore, on the side of color combination for cell phone, the rate of using similar relationship in top, bottom and center of it is very high, and there is a contrastive relationship between trademark and center section. In other words, this group prefers to highlight trademark section. Moreover, this group has high purchase intention for autonomous color matching products because this kind of product can not only express their own taste but also bring about interesting through joining the design of products. Nevertheless, this group's willingness-to-pay of the service is lowest. The reason for the lower willingness-to-pay is that the group thinks the increase of design features from autonomous color matching is limited because this group has more understanding to the knowledge of design and has a higher request for design.

3) Aesthetic Taker

On the one hand, to analyze the preference from aesthetic takers' aesthetic factor, the result shows that this group prefers bright colors and the rate of using the same tone is the most highest in the five groups. As a result of lacking not only the knowledge related to aesthetics perception and fashion but also the factor of creativity, they will think that brightly colored is good and are used to combine with the same hue. On the other hand, the result from preference of selecting color distance also shows that the highest rate in the color combination of triple–colored is middle color difference so that this group prefers to use different hue but the same tone to do color combination. Furthermore, it separates the group's relationship in specific section from two kinds of preference. One of it has a tendency to the consistency of color combination, and the other has a tendency to highlight the color combination of trademark. That is, this group doesn't pursue unique and eye-catching color combination. In addition, this group's purchase intention of autonomous color matching products is the lowest of all Hence, it shows that they would rather to purchase finished products and are interested lower in design and creative. Although the willingness-to-pay of autonomous color matching products is not the lowest one, the influence of accepting information price declines willingness-to-pay on the contrary. Based on the above reasons, we can infer that they have no idea about the price of similar product design in accordance with the lacking the knowledge related to aesthetics perception and fashion, so the willingness-to-pay depends on individual's perception, experience and the level of liking the product. If they know the information of price, the information would turn into a standard of price. Due to the low purchase intention of autonomous color matching products, they don't seek for customized products or design features so that the willingness-to-pay with information of price is lower than the willingness-to-pay without information of price.

4) Contracted Pop Artists

Colorful, elegant and strong contrast is this group's aesthetic perception preference, hence, they will choose high chroma tone of more vivid. Besides, there are two kinds of tendencies toward color combination on cell phone. One is to highlight the color combination at top and bottom, another one is to highlight the color combination between top, bottom and trademark section. What's more, the color combination is very vivid and eye-catching with formal pop artists. Contracted pop artists have a not low willingness-to-pay and they get the highest rate of 21.27% for backpacks on the side of willingness-to-pay. However, the willingness-to-pay of cell phone is lower than average. In conclusion, this group is willing to spend money on autonomous color matching products to pursue colorful and eye-catching products, but they will not insist on purchasing when the price-to-pay goes too high.

5) Fashion Explainer

To analyze the preference from fashion explainers' aesthetic factor, the result shows that the most significant factor is *fashion* and the second one is *artistic creativity*. Therefore, they have more edgy or unique point toward aesthetic perception. Besides, the relationship of color combination on cell phone is the same as contracted pop artists group that they don't like the color combination with consistence but like to highlight the color of some sections. Hence, the color combination on cell phone with monochrome or similar colors can't display the fashion characteristic of products.

C. The Relationship Between Aesthetics Lifestyle Groups' purchase intention and willingness-to-pay

H1: The aesthetic lifestyle group demonstrates differences regarding purchase intention toward color-customized products. →HOLD

Due to the difference of every aesthetic lifestyle group's aesthetic perception, the different factor of aesthetic perception in groups will affect the purchasing decision. The result shows that the group gets higher scores on artistic creativity and material life as well as the higher purchase intention toward color-customized products. On the other hand, the consumer without this aesthetic perception preference has a lower purchase intention.

H2: The aesthetic lifestyle group demonstrates differences regarding WTP for color-customized products. →NOT HOLD

The result shows that there is no significant deference on willingness-to-pay to cell phone. In accordance with it, the willingness-to-pay gathers to lower price because the most subjects of this study are students with an income under NT$ 20,000 and the price of autonomous color matching cell phone is more expensive.

H3: The aesthetic lifestyle group demonstrates differences regarding the WTP color-customized products when receiving distinct types of information. →NOT HOLD

This hypothesis doesn't hold indicates that the influence of price information provided to subjects is not obvious. Hence, there is a fixed price to the service of autonomous color matching products in consumers' mind so that it's harder to affect the willingness-to-pay by the price of color combination service. Furthermore, the fixed price of autonomous color matching products in consumers' mind is hard to change and consumers would rather purchase common products if the real price exceeds the acceptable level in their mind.

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