Abstract – This study was to explore the affective qualities which influence subjects’ aesthetic preferences. Forty-six subjects assessed sixteen skins on an aesthetic preference scale and eleven affective meaning scales. The aesthetic preference was regarded as a dependent variable; the eleven affective meanings were independent variables. The Stepwise Regression Analysis was performed. The result showed that six affective meanings: “exquisite”, “original”, “strong”, “childlike”, “intense” and “pure” entered the model. Besides, “exquisite”, was the most important affective quality in judgment of aesthetic preferences. It implied that designers had to create the interactive interfaces with an “exquisite” affective quality to please users’ aesthetic affects. Furthermore, the other five affective meanings which were not selected into the model were called LoSPA affective meanings. It indicated that subjects had different aesthetic preference levels for skins evoking the affective meaning in LoSPA. It implied that a specific user group would prefer the skins evoking the affective meaning.

Keywords – Aesthetics, affective meaning, skin

I. INTRODUCTION

An aesthetically pleasing design can be more influential in affecting user preferences than conventional operational usability in interactive systems [1]. Previous studies tried to find out factors which influenced human judgment of beauty, such as studies on physical features, aesthetic prototypes, audience arousal…etc. However, they could not completely explain why aesthetic preferences for an object were various for different audiences, or in different occasions. Therefore, the author proposed that aesthetic judgments were subject to the mediator variable, i.e. affective quality evoked from an object. However, little literature discussed this topic. Therefore, this paper tried to find out the affective meanings which affected aesthetic preferences for interactive skins. The outcomes of this paper would suggest designers to create a skin with these affective meanings to make an aesthetically pleasing design.

II. LITERATURE REVIEW

A. Physical Features

Previous studies believed that physical features of an object influenced human aesthetic judgment on the object. Empiricism in the philosophy of science emphasizes evidence, especially as discovered in experiments. Aesthetic empiricism believed that aesthetic pleasure was occasioned simply by “formal quality” of objects, such as colors, shapes, lines and the relationships between these [2]. However, in the studies of aesthetic preferences of color combinations in computer displays, the authors’ recommendations about subjects’ aesthetic ratings for color combinations were not always consistent with each other [1]. Hence, the configurations of object itself might not be key factors to affect one’s aesthetic judgment.

B. Prototypes

Aesthetic prototypes are used to explain why physical features are not the key factors of aesthetic judgment. An aesthetic prototype is a typical form in the category the audiences prefer [3]. The degree of an object close to an aesthetic prototypic exemplar of the preferred category decides the degree of human aesthetic preference for the object. However, human aesthetic prototypes may be different due to diversities of cultures [4]. Besides, an audience’s aesthetic prototype would be changed when he is educated, or trained, to learn more the contents of the work [5]. Numerous studies demonstrated profound differences in the aesthetic preferences of novices and experts. In general, people without art training preferred simple and symmetric visual elements, whereas people with art training preferred complex and asymmetric visual elements [6].

C. Arousal Theory

Arousal theory explains why one’s aesthetic prototypes are changed by way of training. Cupchik believed that the judgment of aesthetic preferences was decided by object configurations that evoked pleasure or arousal [6]. Human preferred the objects eliciting their certain middle degree of arousal [6, 7]. Winston & Cupchik explained that naïve audiences who had no experience on complex arts preferred middle complex arts which elicited their middle arousals [6]. Thus naïve audiences had a “middle complication” prototype. However, the “middle complication” prototype was replaced with a “more complication” prototype when they were trained with complex High Art and became experienced audiences. Consequently, middle complex arts did not elicit enough their middle arousals for experienced audiences. Only more complex arts could elicit their middle arousals because they had a “more
complication” prototype, no more a “middle complication” one.

D. Affective Meanings

However, in some situations, some objects whose appearances are proximal to one’s aesthetic prototypes are not preferred although his aesthetic prototypes are not changed. For example, Meegeren’s painting, Disciples at Emmaus, imitated the painting style of Vermeer realistically and claimed that the fake was Vermeer’s work. Art critics gave it high appraisals. However, when the painting, Disciples at Emmaus, was found to be by Meegeren and not by Vermeer, the world’s estimation of its value fell dramatically [2]. In this situation, the aesthetic prototypes in audiences’ mind are not changed and their arousal levels are not changed either because the recognized complexity of the fake work is the same as the original work. However, their aesthetic preferences for the fake are degraded. Hence, the arousal theory and aesthetic prototypes do not properly explain why audiences reject fakes.

An affective quality of an object might explain why audiences degrade the aesthetic appraisals for a fake work. An affective quality of an object is commonly described with affective meanings, such as simple, vivacious, or elegance [8]. It is one’s affective impression of an object he perceives. When the Disciples at Emmaus is found to be a fake work, the affective quality, “original”, audiences feel, or perceive, from the work is changed into “fake”, or “plagiarizing” which evokes audiences’ negative feelings. Therefore, the work’s affective quality which presents negative affective meanings elicits audiences’ negative affective responses and resulted in detriment of aesthetic ratings. Hence, the audiences tend to depreciate a fake work and give it a low rating of aesthetic preferences even though the fake work is almost the same as the original one.

E. Context

Besides, Contextualist believes that most works are not to be considered in isolation; and each of them has a history and a context [2]. The affective quality of an object might change when the context in which the object exists is changed. For example, the form of “Fountain”, one of the works of Marcel Duchamp (1887-1968), is a ready-made urinal. It is deemed as an aesthetic work when being exhibited in a museum, but it is not an admirable work when being put in a restroom. It is because that the affective quality of the “Fountain” might include affective meanings, “original”, “masculine” and “amazing” when it is exhibited in a museum, but it might include “foul”, or “disgusting”, when it is set in a restroom. The affective meanings, “original”, “masculine” and “amazing”, elicit positive affective responses; but “foul”, or “disgusting”, negative. Therefore, audiences preferred “Fountain” in a museum to “Urinal” in a restroom. Therefore, for an object (i.e. “urinal” here), the different contexts where it exists would change its affective quality.

In that case, audiences’ prototypes do not change although audiences do prefer “Fountain” in a museum to “Urinal” in a restroom. It seems that aesthetic preference judgment might not depend on aesthetic prototypes, but on an object’s affective quality. That is, when an object is presented, one perceives not its feature quality that evokes arousal, but the affective meanings which it presents in a specific situation. The affective meanings serve as affective prototypes which would provide essential reference points to permit people to judge objects quickly.

F. Perceived Usability and Beauty

Previous research suggested that aesthetic perceptions of an interface were highly correlated with perceived usability of the interface [9]. Huang [10] also found that color combinations with bad quality in both legibility and comfortability degraded subjects’ aesthetic preference. Huang [11] extended the idea of “halo effect” to explain why aesthetic perceptions were highly correlated with perceived usability. He believed that a positive feeling about an interface with high perceived usability was extended to the aesthetic rating dimension. Therefore, aesthetic perceptions were highly correlated with perceived usability.

Affective meanings could be used to explain why aesthetic perceptions are highly correlated with perceived usability. When an object is perceived with “good usability”, it presents a positive affective meaning, “good”, resulting in a positive affective response. Therefore, the object with high perceived usability is assessed as a high score of aesthetic preference.

G. Perceived affective meanings without contextual cue

An object’s affective quality still exists even though we do not know the content, or knowledge, of the object. For example, one admires the beauty of a sunset scene not because of the knowledge of the scene, but the scene itself eliciting his affective meaning “glory”. He likes the scene because he likes the feeling of glory. Therefore, the affective meaning could explain why the aesthetic objective views believe that intrinsic properties of an object (such as shape, color, texture, etc.) would sway audiences’ aesthetic judgment on it even when the viewers do not have any information (extrinsic properties) about the object. This affective meaning of the object would sway their judgment of beauty for the object.

However, the sunset scene may become not so beautiful after he quarrels with his friend because the quarrel (i.e., context) which plays a role of priming task changes the affective quality of the sunset scene. In this situation, he does not like the sunset scene because the affective quality of sunset scene might become vile at that moment. Audiences’ bad emotions, or core affects, change an object’s affective quality. That is, physical prototypes do not decide audiences’ aesthetic preferences,
but the affective quality which plays as a mediator variable influences audiences’ judgment of beauty.

In summary, Affective meanings are crucial to human aesthetic judgment on objects.

III. METHODOLOGY

Therefore, the purpose of this paper was to find the affective meanings which affect aesthetic preferences of interactive skins. First, subjects were recruited to assess the 16 skins on 11 affective meaning scales and an aesthetic preference scale (which is expressed with an adjective pair, “Ugly-Beautiful”, called “Beautiful pair” in this paper) with semantic differential methods. The rating score of Beautiful pair was regarded as a subject’s aesthetic preference on skins; the rating score of an affective meaning stands for a subject’s opinion of the intensity of the affective meaning evoked from the skins. Next, the Beautiful pair was regarded as a dependent variable; the other 11 affective meanings as independent variables. Regression analysis with stepwise was used to construct a predict model of aesthetic preference for interactive interfaces. By regression analysis, the independent variables which did not significantly predict aesthetic preference would be eliminated. Finally, the affective meanings which could predict skin aesthetics were found.

A. Collecting Affective meanings

Previous studies related to Kansei engineering collected affective meanings from various specialized journals, catalogues and websites. In order to reduce the amount of adjectives and find the typical affective meanings, Factor analysis was conducted to categorize these affective meanings. These categories were named and represented all the collected affective meanings.

However, these previous studies did not discriminate affective meanings from low to high level attributes. For example, when compared with “cheerful”, “colorful” is a low level attribute to an object. The judgment of a low level attribute (e.g. colorful) is clear and predictable for most of all audiences; however, the judgment of a high level attribute (e.g. cheerful) is varied among different audiences.

To avoid the pitfalls, my colleagues and I [12] classified 628 affective meanings (collected from master theses, PhD dissertations, journals, catalogues, books and websites) into six categories in light of their attribute levels. First level, “Form elements” referred to the affective meanings related to visual elements of forms; second, “Form organization” referred to the affective meanings related to the construction of visual elements; third, “Interactive features” referred to the affective meanings related to usability attribute; fourth, “Stylistic quality” referred to the affective meanings related to style description; fifth, “Feeling quality” referred to the affective meanings related to feelings evoked from the interfaces, such as gorgeous, vivacious, cheerful...etc.; sixth, “Emotional quality” referred to the affective meanings related to the emotions evoked from interfaces. We adopted “Feeling quality” as affective meanings to express interactive interface’s affective quality. There were 75 adjective pairs of affective meanings related to “Feeling quality”. Then, Semantic differential approaches were used to rate 16 windows media player skins (shown in Fig. 1) and factorize the 75 adjective pairs. Finally, eleven main factors were generated to represent all the 75 affective meanings. They were named as “exquisite”, “original”, “vigoroues”, “Hi-tech”, “strong”, “childlike”, “intense”, “supernatural”, “exaggerated”, “formal” and “pure”, respectively. Because the eleven factors were qualified to express all 75 affective meanings with “feeling quality”, the present paper would deem these adjectives as typical affective meanings and use them to predict the aesthetic preference of interface skins.

IV. RESULTS AND DISCUSSIONS

Forty-six subjects recruited from National Formosa University evaluated 16 windows media player skins (shown in Fig. 1) selected from Ms-office official website on 12 adjective pairs (a Beautiful pair and 11 affective meanings) with a 7-point Likert scale. The test was programmed with Director 8.0 and performed on a 20” TFT LCD screen. Each test screen only showed a skin and an adjective pair with 7 buttons scoring -3 to 3 from left to right between the adjective pair shown in Fig. 2. If subjects believed that their feelings evoked from the presented skin were closer to the adjective on the right side, they chose a button closer to the right adjective, and got higher positive score, vise versa. The combination of skins and adjective pairs was random to avoid the priming effect.

In this study, the rating score on a specific skin for a specific affective meaning reflects the strength of the affective meaning evoked from the skin. The author argued that not all affective meanings could be used to
predict aesthetics. Stepwise Regression analysis was used to select the affective meanings which could predict judgment of aesthetic preferences. By Stepwise regression analysis, the six adjective pairs enter into the model where R-square is 0.527. These adjective pairs that could predict the Beautiful pair (i.e. aesthetic preference of the skins) are listed on Table 1. They are “exquisite”, “original”, “strong”, “childlike”, “intense” and “pure”. Among these 6 affective meanings, the standardized coefficient (β) of “exquisite” (0.560) is larger then the others. Therefore, the affective meaning, “exquisite”, is the most important affective quality influencing subjects’ judgment of aesthetic preferences. The outcome implies that designers could create an interactive skin with an “exquisite” affective quality to please users’ aesthetic affects. Following-on studies might explore the product features which evoke user “exquisite” feelings. Besides, the affective meaning, “intense” has an inverse effect on beauty judgment because the β value (-0.158) is negative. That is, the interface with high “intense” has a low aesthetic preference.

Table I
THE REGRESSION MODEL FOR PREDICTING AESTHETIC SKINS

<table>
<thead>
<tr>
<th>Model</th>
<th>Unstandardized Coefficients</th>
<th>Standardized Coefficients</th>
<th>Tolerance</th>
<th>VIF</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Constant)</td>
<td>-0.173</td>
<td>0.056</td>
<td>-3.084</td>
<td>0.002</td>
</tr>
<tr>
<td>Exquisite</td>
<td>0.558</td>
<td>0.031</td>
<td>0.560</td>
<td>17.878</td>
</tr>
<tr>
<td>Childlike</td>
<td>0.155</td>
<td>0.029</td>
<td>0.155</td>
<td>5.415</td>
</tr>
<tr>
<td>Intense</td>
<td>-0.159</td>
<td>0.032</td>
<td>-0.158</td>
<td>-4.973</td>
</tr>
<tr>
<td>Original</td>
<td>0.145</td>
<td>0.029</td>
<td>0.161</td>
<td>5.083</td>
</tr>
<tr>
<td>Pure</td>
<td>0.101</td>
<td>0.032</td>
<td>0.096</td>
<td>3.152</td>
</tr>
<tr>
<td>Strong</td>
<td>0.085</td>
<td>0.039</td>
<td>0.068</td>
<td>2.199</td>
</tr>
</tbody>
</table>

*Dependent Variable: Beauty

Besides, the collinearity diagnostics show the independent variables do not depend linearly on each other. Tolerance, gives a value between zero and one, which is the proportion of a variable's variance not accounted for by the other independent variables in the regression. Table I shows that all tolerance values are close to one, so these independent variables do not depend linearly on each other. In fact, the possibility of high collinear correlations among the independent variables should be low because these independent variables are the main factors extracted by factor analysis with varimax rotation in the study of Huang et al. [12]. These variables should be orthogonal with each other.

A. Rating Consistency for Each Affective Meaning

Rating Consistency refers to the extent of the agreement on intensity ratings of a specific affective meaning among judges for a specific interactive skin in this paper. For example, a system interface would get high rating Consistency if all judges rate the aesthetic preference at a specific system interface with similar scores; otherwise, it gets low rating Consistency. The intra-class correlation coefficient (ICC) is used as an index of estimating inter-rater reliability, or called rating consistency here. ICC was performed to explore rating consistency by using SPSS. The Single Measure Intra-class correlation (0.305) shows a low correlation among these subjects. That is, the rating consistencies were low among subjects.

Huang [1] used the Standard Deviation (SD) as a criterion to evaluate the rating consistency of subject aesthetic preferences. Likewise, in this paper, a skin’s affective meaning with a large SD has a low rating consistency among all the recruited subjects. To explore the rating consistency of 12 adjective pairs (11 affective meanings plus a Beautiful pair), two-factor factorial design (12 affective meanings × 16 skins) was performed. The outcomes show that the effect of the affective meanings is significant (F(11, 165)=7.024, p<0.01). Table 2 shows the SD for each affective meaning. It shows that the “strong” has the less SD (1.2751) than the others; that is, the “strong” has higher rating consistency. Besides, all the values of SD of affective meanings are significantly smaller than “beautiful” (1.8008) except “super-natural (1.7351)”, “formal (1.7946)” and “original (1.8441)” which do not significantly differ from “beautiful”. As mentioned above, all the collected affective meanings were classified into six categories from low to high level construct attribute. The affective meanings used in this study were belonged to the category of “feeling qualities” in this paper; aesthetic preferences (i.e. “beautiful”) are a kind of “Emotional quality” whose construct level is higher that “feeling quality” because they are personally emotional (pleasure) responses to an interface skin. The judgment of a low level attribute on objects is more consistent among audiences than that of a high level attribute. The result agrees this argument.

Table II
THE SD FOR EACH AFFECTIVE MEANING

<table>
<thead>
<tr>
<th>Affective quality</th>
<th>N</th>
<th>Mean of SD</th>
<th>Duncan Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>strong*</td>
<td>16</td>
<td>1.2751</td>
<td>A</td>
</tr>
<tr>
<td>vigorous</td>
<td>16</td>
<td>1.4836</td>
<td>B</td>
</tr>
<tr>
<td>childlike*</td>
<td>16</td>
<td>1.4968</td>
<td>B</td>
</tr>
<tr>
<td>exaggerated</td>
<td>16</td>
<td>1.5198</td>
<td>B</td>
</tr>
<tr>
<td>pure*</td>
<td>16</td>
<td>1.5318</td>
<td>B</td>
</tr>
<tr>
<td>intense*</td>
<td>16</td>
<td>1.5487</td>
<td>B</td>
</tr>
<tr>
<td>Hi-tech</td>
<td>16</td>
<td>1.5666</td>
<td>B</td>
</tr>
<tr>
<td>exquisite*</td>
<td>16</td>
<td>1.6482</td>
<td>B</td>
</tr>
<tr>
<td>super-natural</td>
<td>16</td>
<td>1.7351</td>
<td>C</td>
</tr>
<tr>
<td>formal</td>
<td>16</td>
<td>1.7946</td>
<td>D</td>
</tr>
<tr>
<td>beautiful</td>
<td>16</td>
<td>1.8008</td>
<td>D</td>
</tr>
<tr>
<td>original*</td>
<td>16</td>
<td>1.8441</td>
<td>E</td>
</tr>
</tbody>
</table>

* The affective meaning selected in the Regression Model

B. Affective Meanings with HiSPA

The Stepwise Regression analysis divides the 11 affective meanings into two parts. First, 6 affective meanings are kept in the regression model. They are “exquisite”, “original”, “strong”, “childlike”, “intense”...
and “pure”. Excerpt “intense”, the β scores of all the others are positive; it indicates that the rating scores of aesthetic preferences at a skin would be high for all subjects when the skin’s aesthetic quality intensely presents these affective meanings, vice versa. Inversely, for the “intense”, which β score is negative, it means that the rating scores of aesthetic preferences at a skin for all subjects would be low when the skin’s aesthetic quality intensely presents these affective meanings, vice versa. This kind of affective meanings is called Affective meanings with High Stable Prediction of Aesthetic preferences (HiSPA). That is, the intensity of the affective meanings with HiSPA decides the subjects’ aesthetic preferences. The outcome implies that designers could design skins with these 6 HiSPAs, especially “exquisite”, in order to create an aesthetic pleasing skin. The following-on studies could focus on exploration of the skin physical features to satisfy these 6 HiSPAs affective meanings.

C. Affective Meanings with LoSPA

Second, the other 5 affective meanings do not enter the Regression model due to the low correlations with aesthetic preferences. They are “vigorous”, “Hi-tech”, “supernatural”, “exaggerated” and “formal”. It indicates that subjects’ rating scores of the 6 affective meanings are various among subjects when they assess a skin on one of the aesthetic meaning scales. That is, it is impossible to predict aesthetic preferences with these affective meanings. Therefore, these affective meanings are called Affective meanings with Low Stable Prediction of Aesthetic preferences (LoSPA) because they cannot stably predict subjects’ aesthetic preference. The LoSPA affective meanings could explain why an object presenting identical affective meanings is accepted by one audience group, but not accepted by the others. It implies that designers have to create a skin with LoSPA to satisfy specific target users.

D. Limitations

The Semantic Differential scale, used in this study, is the most prominent types of verbal scales. Verbal measures are language-dependent. The measure quality is dependent on subject’s language proficiency. The subjects recruited in this study are Taiwanese students who can speak mandarin well. The outcomes might be hard to generalize to the other subjects who do not speak mandarin. It needs more studies to recruit subjects who do not speak mandarin.

V. CONCLUSION

This study has demonstrated that six affective meanings would influence subject judgment of beauty on interactive skins. Among the six affective meanings, “exquisite” is the most important affective quality which influences subjects’ aesthetic preference judgment. Beside, the finding agrees with Huang’s argument [12] that the judgment of a low level attribute among audiences is more consistent than that of a high level attribute. Next, the outcomes imply that designers had to create the interactive interfaces with HiSPA affective meanings to satisfy most of Chinese speakers; and create a specific skin with LoSPA to satisfy specific target users.

ACKNOWLEDGMENT

The authors would like to thank the National Science Council, Taiwan for financially supporting this research under Contract No. NSC- 101-2221-E-150-005.

REFERENCES