Study of the Influence of Handset Modeling Characteristics on Image Cognition

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Abstract. The influence of handset modeling characteristics on people's image cognition was studied based on the theory of Kansei engineering and using questionnaire and statistical analysis. According to the results-designers can get the corresponding handset modeling characteristics which most fit the ideal Kansei image chosen by the consumers. It's a new way of directing the development of new products' modeling design.

Keywords: handset, modeling characteristics, image cognition, Kansei engineering.

1 Introduction

After years of development, the mobile phone has entered the product life cycle of maturity and has been widely used. Not only is the cell phone a communication tool, but also it carries much things such as the spiritual significance and the social image during the social activity, thus the appearances of the cell phone is a important factor that those consumers consider about a lot. With the development and popularity of the technologies used in mobile phones, similarization in cell phone industry among many brands leads to fierce competition and the consumers could not make their choice easily according to the parameters. In such a situation, the styling of those products plays an important role in the process of the consumers determination.

In the process of design activity, because of the subjective feeling of different people, the judgement of a good design is so difficult to make and the designers may become confused without the design rules. Kansei engineering is a method for translating feelings and impressions into product parameters. Kansei Engineering can "measure" the feelings and shows the relationship to certain product properties. In consequence, products can be designed to bring forward the intended needs and feelings of the consumers which lead to a more sucessful product design. The paper focus on the design of the cell phone ,mainly study the Influence of Handset

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Modeling Characteristics on Image Cognition in the perspective of Kansei engineering, aims at finding the most effective design solution only for the best products that the consumer feels. The sample we chose are the products of NOKIA which are well recognized and familiar, making the research more feasible and reliable .

Group of mobile phone users aged decreases evidently nowadays and the university students are the group of people who use mobile phone a lot and their preferences are quite important for designers and companies. Based on these reasons, we chose the university students as our study participations and tried to puts forward some useful opinions in the perspective of Kansei engineering in mobile phone design.

2 The Related Theoretical Analysis

Kansei engineering is a method for translating feelings and impressions (Consumer's feeling and desires of the target product)into product parameters. It utilizes engineering techniques to detect the relationship between consumer's perception and product features. Quantitative techniques are used in the process of translating people's perception into detailed consumers' attitudes to the products that we designed and sold. In consequence, products can be designed to bring forward the intended feeling. According these design elements worked out before, designers can make their designs much easier and reliable.

Relevant content Kansei engineering concerned about most as follows,

1. Detecting consumers' needs and perception from the perspective of HCI and Psychology.
2. Identifying the design elements according to the consumer's perception.
3. Constructing the HCI system of product design with Kansei engineering.
4. Changing according to the society and consumer's preferences.

Kansei engineering is very useful in the process of studying the relationship between new product design and consumer's psychology .The paper mainly focus on the second content , studying the Influence of Handset Modeling Characteristics on Image Cognition.

2.1 Morphological Analysis

A design unit can be regarded as part of the integrated combination. Such as the lid is part of the coffee pot,and the coffee pot is part of the coffee machine. Tree diagram can show this concept (Fig.1),which can absolutely describe the relationship of hierarchical structure and combination between each units. In addition, Mortenson also proposed combination of basic elements.

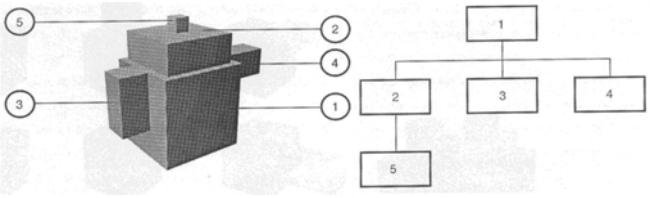

Fig. 1. Method of modality analysis

Morphological Analysis, put forward by Zwicky, is the most easily understood and widely used by designers. the method can create new modelling through arrangeing and combining different the design elements or component. In this paper, we try to deconstruct and classify the morphology of mobile phone samples by morphological analysis.

2.2 Quantification 1

The purpose of Quantification 1 is approximately to reveal functional relation between one variable(purpose variable)and all other "personality" Items (for taking 0 or 1 virtual variable), we determine the intension that each items effect the purpose variable by multiple regression analysis ;many categories compose a item. we assume that all samples will be chosen in every project, and each project only choose one sample to set up a regression formula, which forecast the variability between data and events. The minimum number of testing samples that set up a regression formula can be determined by the following formula.

$$NC= NL-NA+1 \quad (1)$$

NC: the minimum of product's sample that is able to work out a utility values
NL: the number of categories in Total
NA: the Total number of projects in Total

In this paper, each projects that have been deconstructed and classified are transformed into virtual variables by quantification 1,which will form the dependent variables of the multiple regression analysis.

3 Research Methods

3.1 Assessment Project of NOKIA Mobile Phone

We chose NOKIA bar phones of 2006 and 2007 on the market to avoiding excessive research, and collected 44 of NOKIA mobile phone labeled by high resolution face images. To effectively control the error, all images were handled as a monochrome and mobile phone unified same screen mapping.

According to subjective feelings,20 college students divided 44 mobile samples to7 or 8 categories by similarity degree of Morphology, and we recorded a result to get the phase heterosexual isometric matrix of the samples. Classified data was simplified by Multiple scales method, then each samples also were classified by clustering analysis method. At last, all samples were divided into 7 categories, and we chose 7 representative samples, which could represent center variables in the categories (Fig.2).

Fig. 2. 7 representative stimulators chose finally

3.2 Choosing Perceptual Semantic Adjectives in the Project

We widely collected 116 adjectives that could describe the Morphology of mobile phones; after preliminarily testing, we further chose 30 adjectives that could be more representative cognitive ability of participants. then we combined 7 representative samples with 30 adjectives by semantic difference method, and 30 college students took the test, we got the mean that each samples scored in the adjectives. This data were analyzed by factor analysis method and rotated by Maximum variance, we finally obtained 13 perceptual semantic adjectives that could be representative (table 1).

Table 1. 13 pairs of adjectives finally determined

calm-intense	demotic-elegant	leggiere-sedate	grim-amiable	careless-exquisite
popular-individual	common-professional	thin-full	motional-ational	artless-breathtaking
unimaginative imaginative	simple-complex	informal-orthodox		

3.3 Deconstruction and Classification of Product Modeling

Using morphological analysis method to make 44 mobile phone samples being morphology deconstruction and classification, the results include seven projects and 17 categories; Using one category quantification,the project will be converted into dummy variables,dummy variables will be the dependent variable in multiple regression analysis.

3.4 Determining the Number of Product Samples

The minimum number of samples this paper NC =17-7+1=11. As the principle that possibility distributed according to the various objectives for each project number, and the differences between the samples as large as possible,finally selected 12 mobile phone samples, with 13 pairs of representative adjective elected before, then made into a semantic image evaluation questionnaires.

3.5 The Issuance and Recovery of the Questionnaires

The issuance of questionnaires started at JiangNan University. When officially tested, the teachers (contacted before)assisted to distribute and recovery questionnaires at class. Because the question numbers are large and hard to answer, this move will ensure a high response rate and efficiency. Totally about 400 questionnaires were issued, returned about 384 copies, of which 330 are valid, the effective rate was 82.5%. Then use SPSS13.0 to entry and manage data.

4 Discussion about the Research Results

According to the 12 psychological evaluation of projects in 13 cell phone form adjective's score data, and the 12 samples of the modeling elements of disaggregated data, by the quantification one class method and multiple regression statistical analysis, You can get all adjective semantics' modeling elements functional, according to the weight value in functional, you can observe the interactional relationship between each pairs of adjective semantics and modeling elements.

Following this adjective " calm-intense " as an example of the analysis to the statistical results.

Table 2. Regressive equation summary of "calm-intense"

Model	*R*	*R Square*	*Adjusted R Square*	*Std. Error of the Estimate*	*Durbin-Watson*
1	0.968	0.936	0.921	0.59783	1.750

Summary of the regression equation (Table 2) shows the fit conditions, R Square coefficient of determination is equal to 0.921, indicating that the independent variables explain the dependent variable for a high degree, the regression equation fits well; Durbin-Watson is 1.750, closer to 2.0, indicating that there is no autocorrelation of variables [9]. The number of categories of a class project utility values and weights of the situation summarized in Table 3.

Utility values for each category has positive and negative points, negative means popular bias; positive means passion bias, The more negative bias that the more quiet, more positive bias on behalf of the more elegant. For example, make utility values for each category in the top shape (project) from small to large order: -0.677 (flat shape)

Table 3. Category scores of Quantification 1 on "calm-intense"

Project (Items)	A. top shape			B.waist shape		C. body ratio			D.bottom shape		E.screen ratio		F.surface segmentation			G.function position		key
(Categories)	A1 flatt-ened shape		A2 sm-all arc	A3 Gre-at cir-cle	B1 lin-ear	B2 arc-type	C1 th-in ty-pe	C2 mode-rate type	C3 wi-de	D1 sma-ll arc	D2 gr-eat ci-rc-le	E1 hori-zont-al	E2 ver-tic-al	F1 screen/ Keyboarc conjoinec	F2 screen/ keyb-oard separ-ate	G1 wi-th sc-ree-n	G2 In-de-pe-nd-ent	G3 With number keys
Category utility value	-0.917	-0.568	1.486	-1.065	1.065	-0.33	0.15	0.181	0.963	-0.963	-1.766	1.766	-0.53	0.53	-0.442	0.849	1.289	
Item weights	0.181			0.16		0.038			0.145		0.266		0.08			0.13		

Table 4. Relation between part of kansei image adjectives and form characteristics

Number	Adjective	Modelling Element						
		top shape	waist shape	body ratio	bottom shape	screen ratio	surface segmentation	function key position
1	intense	Great circle	Arc-type	wide type	small arc	vertical	screen/ keyboard separate	With number keys
2	calm	flattened shape	linear	thin type	great circle	horizontal	screen/ Keyboard conjoin	with screen
3	elegant	Great circle	Arc-type	wide type	small arc	vertical	screen/ Keyboard conjoin	With number keys
4	demotic	small arc	linear	moderate type	great circle	horizontal	screen/ keyboard separate	Independent
5	sedate	flattened shape	linear	moderate type	great circle	horizontal	screen/ keyboard separate	Independent
6	eggiere	Great circle	Arc-type	wide type	small arc	vertical	screen/ Keyboard conjoin	With number keys
7	individual	Great circle	Arc-type	wide type	small arc	vertical	screen/ Keyboard conjoin	Independent
8	popular	flattened shape	linear	thin type	great circle	horizontal	screen/ keyboard separate	With number keys
9	professional	Great circle	Arc-type	wide type	small arc	vertical	screen/ Keyboard conjoin	With number keys
10	common	small arc	linear	moderate type	great circle	horizontal	screen/ keyboard separate	Independent

<0.328 (small circle) <1.726 (large circle), which can be make out that the great circle most biased of intense, the flat shape most bias calm, while other projects can be the same way. Item weights reflect the design elements relative to the importance of other design elements. The greater its value, the relative importance is greater. For example, the item weight: 0.266 (screen ratio)> 0.181 (top form)> 0.16 (waist shape)> 0.145 (bottom shape)> 0.13 (function key position)> 0.08 (surface segmentation)> 0.038

(the proportion of body), Indicating that to the adjective "calm – intense " , screen ratio has greatest effect, and segmentation and the proportion of the surface and the effects was not significant. Therefore, when designers consider to design calm or intense mobile phone, they should focus on the screen ratio, ratio of body weight and other items with higher modeling elements.

Designers or consumers simply choose the ideal perceptual semantic, can get the product model of the semantic interpretation elements successfully, such as, " passionate mobile phone" modelling element combination for: great arc (top shape) + arc type (waist shape) + moderate type (body ratio) + small arc (bottom shape) + vertical (screen ratio) + screen/keyboard separate (surface segmentation) + With number key (function key position). As the same way, we can get other perceptual semantic mobile modelling element combination. The relationship between partial adjectives semantic and modelling elements is shown in table 4.

5 Conclusion and Limitations

Based on NOKIA cellular phone for test sample and college students for application under test object, using questionnaire and statistics methods according to the perceptual engineering theory construct the corresponding relationship between college students' perceptual semantics and mobile phone modelling elements, for example, "passionate mobile phone" modelling element combination for: great arc, arc type, medium type, small arc, vertical, the screen/keyboard apart, and the number key together. With such corresponding relation, according to the target consumer choice ideal perceptual semantic, stylist can get corresponding mobile modelling elements. thereby designers ensure its design most appropriate to target consumers expect perceptual semantic, and guide new product design as well.

There are also has some limitations in this paper, for instance, we cannot use of mobile phones as objects under test samples, and we have to use such proportion of the plan as the experimental samples; research object is only NOKIA cellular phone, its modelling characteristic brand still cannot cover all mobile phones; test object only for college students, failed to test more crowd, etc. If there is a follow-up study, I hope we can solve the problems above.

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