Research on Product Affective Image by the Way of Empathic Design

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Abstract. Continuous development of science and technology and continuous innovation of products have changed users' needs. People not only pay attention to practical and functional products, but also pay more attention to satisfying emotional needs in the process of experience. In such a highly information-based era, designers actively and deeply understand users' various emotional experience instead of passively designing products only by relying on obtaining users' feedback information. Starting from design's emotional factors, this study firstly introduces empathetic design's concept and basic method, leads to the key of empathetic design method–focusing on users' experience, and then combining with theories and methods of design morphology and statistics, discusses empathetic design method applied in product design. Taking design of office chair as an example, with empathetic design's concept and method as research's foundation, this paper analyzes and carries questionnaire investigation combining with users' behavior, and demonstrates user experience's influence on formation of products' emotional imagery using contrast technique, and with the help of Chi-square test and non-parametric test. In addition, combining with product design method, based on summarizing users' demands, this paper puts forward the concept of new office chair's design.

Keywords: Empathy · User experience · Emotional imagery · Office chair

1 Introduction

With the development of social economy and improvement of life level, product design has gradually shifted from focusing on rational design of product performance to focusing on perceptual design of users' spiritual needs, so that an important design method appears–perceptual design. This method regards users' perceptual demands as the guidance and user experience's feelings as research's foundation. In the traditional process of product design, before designing products, designers often obtain users' needs through observation, investigation and interview, and then give products modeling and new quality with their own subjective imaginations. When designing products, apart from considering design factors such as function and structure, designers

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should give product certain form. And the form can often reflect certain emotional factor and make products full of vitality [1]. In the process of using products, users will get emotional information through all aspects of products' quality, so as to stimulate their inner feelings.

2 Empathetic Design

Empathy refers to the process of combing perceptual image and emotion through direct combination of intuition and emotion. When people attentively appreciate the aesthetic object, they would inject their own preferences and tastes into the object, in order to make the object show emotional color and vitality. That is to say, they shift subject's emotion into the object and endow the object with subject's emotion [2]. When designing products, designers integrate emotion into products and stimulate people's association through products' various design elements [3]. Therefore, for product design, empathetic design integrates users' past emotion and experience into product design, and leads to users' association of past experience in the process of using products. Empathetic design also de-signs users' needs in more detail and redesigns user group with common experience [4]. In short, through design elements such as products' shape, color, material, texture and function, empathetic design integrates users' emotional factors into products, so that users can arouse association and resonate through products' various design elements when using products, so as to obtain spiritual pleasure and emotional satisfaction [5]. Empathetic design is mainly divided into following three steps:

The first step is to observe. After selecting user group and using environment, designers will observe users' real reactions and record them. Designers can try to imagine themselves as members of this user group, participate in using environment of user group, feel the things felt by user group, record their experiences and experience of using products, communicate and exchange with users, express their own thoughts and feelings, perceive users' inner world through emotional imagery, and can understand potential demands at the bottom of user's heart themselves which are possibly not noticed by users [6]. This empathetic design involving design personnel refers to being absorbed as the party instead of pondering emotional experience as an outsider, so that product design will trans-form from meeting users' needs into meeting their own needs. As a result, deviations caused by users' unclear expression or designers' unclear understanding in traditional mode can be avoided.

The second step is to infer. Designers will collect firsthand data obtained in the first step, and display information and various recorded data (including photos and videos) in graphic form. After induction and analysis, designers put for-ward some tentative conclusions, verify results with data obtained in the above, analyze whether hypothetical conclusion is founded or not, and find some opposite cases for reverse inference on conclusion [7]. If the selected user group is the main user group, designers can find some cases of secondary user group and user group with special needs to reversely infer.

The third step is to regard the above inference result as products' conceptual framework. The conceptual framework may be ambiguous, for the reason that in the process of observation, many users can not accurately express their feelings. In many cases, users themselves don't understand their potential demands. Only under special environment and situation, this demand will appear. It is necessary to choose secondary user group and user group with special needs for re-verse inference so as to stimulate designers' inspiration. Therefore, designers are requested to repeatedly observe and infer, stimulate their imagination, and continue to communicate with users to verify imagination. This process must be repeated until clear product conceptual framework is obtained [8].

Empathetic design method is based on user experience, but also will cause a problem that in the process of empathetic understanding, design personnel will often be immersed and lose the identity of policymakers. Therefore, the conclusion will be too subjective and ignore its objective condition, which requires finding a balance point between the two sides [9].

Empathetic design method requires constantly inference and verification in order to make research results more accurate. Therefore, this study selects 40 respondents as objects of secondary user group to be investigated.

3 Questionnaire Design and User Survey

The key of empathetic design is observing user experience, inducting and reasoning data. Taking the office chair as an example, through user experience's intuitive feelings and feelings in the process of experience, this paper analyzes users' demands for office chair's design, so that this research has designed two questionnaires. Questionnaire one is the investigation of office chair's perceptual image, has 12 questions, and mainly focuses on office chair's ten design elements: using time, material, size, backrest, color, armrest and etc.; questionnaire two has first 12 questions exactly same with questionnaire one, and adds 4 open questions about user experience. Questionnaire two requires respondents to fill in questionnaire after 15-days office chair experience. During these 15 days, respondents are requested to record their states, feelings of using office chairs and description of using environment every day.

This study has selected 40 respondents: 20 men and 20 women; 12 college students, 12 company management personnel, and 16 staff. They are divided into two groups for questionnaire survey. In the first group (direct group), 20 respondents directly fill in questionnaire without experiencing office chairs. In the second group (experience group), 20 respondents experience 15-days using office chairs. During these 15 days, every respondent firstly should record moods and weather conditions in the morning every day, should record when to start using products, their feelings and using environment, and finally summarize comprehensive situation of using products in the whole day before sleeping at night, whether their moods change, and whether they encounter problems in the process of using products. After 15-days experience, they will fill in questionnaire two.

4 Analysis of Survey Data

This paper discusses whether questionnaire data is independent, or associated. Therefore, X2 is applied to inspect whether two variables' observation values obtained from samples have special relevance. If two independent variables are independent and have no association (X2 value is not significant), it means that for one independent variable, another variable's various classification number will change in the range of sampling error. If two factors are not independent (X2 value is significant), variables are associated with each other [10]. Analysis of users' survey data is divided into two aspects:

1. Contingency table X2 (Chi-square) inspection is carried out with gender, occupation, education degree and office chair's related elements as independent variables, and with frequency as the dependent variable.
2. Independence test: mainly used for analysis of count data on two or more than two factors' multiple classification, namely studying correlation and dependency between two kinds of variables.

Assuming H0: line variable and column variable have no difference, H1: line variable and column variable have differences, when p is less than 0.1, if rejecting the null hypothesis H0, or accepting the null hypothesis.

4.1 Analysis of Users' Office Hours

According to survey data of relationship between office hours and office chair of users in two groups, by using non-parametric tests of two independent samples, men and women have no difference in office chair and office hours in direct group, experience group, and analysis of integrating two groups.

In the aspects of users' age, occupation and education degree, it can be found through non-parametric tests of various independent samples (see Table 1): There's no difference separately between direct group and experience group. However, after analyzing integration data of direct group after group and experience group, it can be found that by using non-parametric tests of multiple independent samples, Chi-Square is 7.013 and $p = 0.071$ (less than 0.1), which indicates that users with different occupations have different time in the office chair. The survey finds that company management personnel have time in office chair significantly higher than students, company staff and other occupations. In addition, students and company staff has time in office chair higher than other occupations, but with little difference. In the aspects of age and education degree, users have no difference in the time spent on office chair.

4.2 Analysis of Office Chair's Material

Inspection results of survey data on office chair's material can be seen in Table 2. It can be found from Table 2 that users in two groups with different genders, occupations, ages and education degrees have no obvious preference for office chair's material.

Table 1. Analysis of office hours

Office hours								
Direct group			Experience group			Total		
Variable	Chi-square	P	Variable	Chi-square	P	Variable	Chi-square	P
Occupation	5.389	0.145	Occupation	3.226	0.199	Occupation	7.013	0.071
Age	3.445	0.179	Age	3.606	0.165	Age	7.520	0.023
Education degree	3.239	0.356	Education degree	5.450	0.142	Education degree	8.016	0.046

Table 2. Analysis of office chair's material

Office chair's material					
Direct group			Experience group		
Variable	Chi-square value	P	Variable	Chi-square value	P
Gender	5.254	0.154	Gender	1.385	1
Occupation	9.258	0.483	Occupation	6.32	0.366
Age	5.844	0.617	Age	6.103	0.627
Education degree	5.879	0.973	Education degree	9.835	0.455
Total					
Variable		Chi-square value		P	
Group		7.549		0.045	

However, through analysis from contingency table of direct group and experience group, it's found that Fisher's Exact Test value is 7.549, and P is 0.045 (less than 0.05). Therefore, users in two groups have different preference for seat's material: users in direct group prefer leather and canvas, while users in experience group prefer mesh material.

4.3 Analysis of Office Chair's Size

Inspection results of survey data on office chair's size can be seen in Table 3. Data in Table 3 shows that users with different genders and education degrees and data integration of two groups have no special tendency to office chair's size. For occupation, the direct group shows that users with different occupations have no particular preference for office chair's size. However, in the experience group, Fisher Exact Test value is 9.349 and P is 0.018 (less than 0.05), which shows that users with different occupations have different preference for office chair's size, company employees prefer office chair with wide base wide and moderate size, while college students prefer office chair with moderate size.

Table 3. Analysis of office chair's size

Office chair's size					
Direct group			Experience group		
Variable	Chi-square value	P	Variable	Chi-square value	P
Gender	1.435	1	Gender	3.851	0.171
Occupation	10.173	0.38	Occupation	9.349	0.018
Age	6.184	0.632	Age	6.54	0.098
Education degree	8.181	0.742	Education degree	5.921	0.474
Total					
Variable		Chi-square value		P	
Group		3.318		0.352	

4.4 Analysis of Backrest Type

Through analysis of office chair, backrest has following types: backrest's angle can be adjusted, backrest's elasticity, and backrest's height and lumbar sup-port. Results obtained after inspection of survey data are shown in Table 4: men and women in direct group and experience group have no special tendency on selecting backrest type. At the same time, people with different ages, occupations and education degrees have no difference in selecting backrest type. After inte-grating survey data in group 2, it can be found that men prefer high and flexible backrest with adjustable angle, while women prefer the backrest with lumbar support ($X2 = 9.295$, $p = 0.014$).

With direct group and experience group as line variables, and with backrest type as column variable, it's found that though analysis from contingency table, Fisher's Exact Test value is 6.13, and P is 0.072 (less than 0.1), which indicates that users in different groups have different preferences for backrest type. Users in direct investigation group prefer high backrest, while users in experience group prefer the backrest with moderate height which can adjust elasticity and angle.

Table 4. Analysis of backrest type

Backrest type					
Direct group			Experience group		
Variable	Chi-square value	P	Variable	Chi-square value	P
Gender	4.954	0.162	Gender	5.23	0.103
Occupation	12.176	0.152	Occupation	3.512	0.622
Age	5.033	0.909	Age	3.378	0.692
Education degree	8.799	0.632	Education degree	5.524	0.546
Total					
Variable		Chi-square value		P	
Group		6.13		0.072	

4.5 Analysis of Office Chair's Colors

We divide office chair's colors into three options: monochrome assortment, assortment of two colors and assortment of three or more colors. Results can be seen in Table 5 through analyzing survey data that men and women in direct investigation group have no difference in their preference for office chair's color style. However, in experience group, Fisher's Exact Test value is 9.055, and P is 0.018 (less than 0.1). Through analysis, it's found that men prefer dual tones with two colors' assortment, while women prefer clear and bright monochrome. The results also show that: users in direct group and users in experience group have no difference in preference for office chair's colors in aspects of occupation, age and education degree.

Table 5. Analysis of office chair's colors

Office chair's colors					
Direct group			Experience group		
Variable	Chi-square value	P	Variable	Chi-square value	P
Gender	1.974	0.75	Gender	9.055	0.018
Occupation	8.206	0.65	Occupation	4.162	0.85
Age	8.073	0.165	Age	8.339	0.184
Education degree	9.222	0.452	Education degree	9.816	0.373
Total					
Variable		Chi-square value		P	
Group		3.029		0.416	

In addition to analysis of the above 5 experience factors of office chair, this paper also discusses users' focus to purchase office chairs, and analyzes investigation data factors such as armrest type, office chair's style and adjustment frequency of chair surface's height. In the aspect of users' focus when buying office chairs, users in direct group and users in experience group mainly concern two points: good comfort and reliable function, and users in direct group also pay attention to office chair's quality. In the aspect of selecting armrest type, users in experience group are more inclined to adjustable and removable armrest with special function. In the aspect of office chair's style, users in direct group prefer classical, comfortable, fashionable and lovely style, while users in experience group prefer comfortable, simple and fashionable office chair. Users in these two groups have little difference in chair surface's adjusting frequency, but man's adjusting frequency is lower than woman's.

Through the above analysis, we determine new positioning of office chair's design concept: good comfort, reliable function, simple fashion; adjustable chair surface, adjustable and detachable armrest with additional functions; high, flexible and adjustable backrest; clear and bright color collocation, and new materials with mesh.

5 Result-Discussion

Through discussing empathetic design's theory and method, and analyzing corresponding relations between users and design elements of office chair design, it can be drawn through user investigation and data analysis that: respondents who have not experienced and respondents who have experienced for 15 days show obvious difference in office chair's emotional imagery. Respondents who have not experienced have no obvious tendency, while respondents who have experienced user experience prefer adjustable and removable handrail with additional functions, office chair's material tends to adopt mesh material, office chair's volume tends to be moderate, backrest tends to be able to adjust elastic and angle, and office chair's colors tend to be clear and bright monochrome.

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