Computer Simulation Research of Desk Design Based on ABC Attitude Theory

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Abstract. In this study, researchers use quantitative variable analysis methods to describe the decomposition process of desk design by establishing desk design models. A series of purposeful and conditional processes are used to decompose the features of the desk, so as to obtain the quantitative index of the overall favourability, and provide decision makers with the analysis results of the favourability of the desk design as a theoretical basis for decision-making.

Keywords: Computer Simulation Research, Design Model, Design Features

1. Introduction

The traditional desk design process is similar to other manufacturing products. The entire design process is personally subjective. Before the product is available, the user's satisfaction with the design plan is unpredictable.

This research is about building a desk design model. By substituting feature data into the model, it is possible to predict the satisfaction of combined products. Scientific design prediction methods will improve the current design state, that is, individual subjectivity affects the overall situation. This is the issue to be discussed in this part of the article.

2. ABC attitude theory

Attitude theory refers to the theory about the formation, transformation and measurement of attitude. Attitude is an individual's psychological tendency to a certain kind of social things [1]. R.G. Fazio (1995) publicly put forward that attitude is the connection between an object and an evaluation. Based on the attitude theory, the user's feelings about the research object can be effectively studied [2].

Evaluation is the main element of attitude response [3]. H. Eagly and Shelly Chaiken (1993) proposed that attitudes were expressed through a certain degree of approval or disapproval of specific entities [4].

After the introduction of attitude theory by psychology, American psychologist Albert Ellis put forward the Affective-Behavioral-Cognitive Model of Attitude in the 1950s. Based on the ABC theory of attitude, attitude is divided into three components: emotional component, behavioral component and cognitive component. The three attitude components jointly express the user's evaluation of the research object. The user's cognition of objects may affect their emotions, cognition and even their
behavior, so the three components have a causal relationship. However, the three components are not always highly correlated and need to be comprehensively studied [5].

The cognitive part includes the user's knowledge, understanding, memory and decision-making on the research object. The process of cognition is the process of information reception, information processing, information storage, and information use by the user on attitude objects.

Behavioral components are the behavioral actions generated by users who want to achieve their goals on the platform of the research object. The behavior component includes the user's understanding of the use and operation of the research object, the interaction relationship established between the research object and the user, and helping the user to obtain some conveniences and services in the operation and use process. The emotional component is the user’s attitude, experience, or absence, positive or negative emotions, emotions, and evaluation of the research object, which is based on the emotional factors generated by the user during the research process of the object.

The emotional component is the user's attitude towards the research object, existence or non-existence, positive or negative emotion, feeling and evaluation, which is based on the emotional factors generated by the user in the research process of the research object.

To build a design model, the variables that make up the user model need to be found. In this study, the desk was disassembled into several features, the user's attitude towards the desk and features was measured, and the data was waiting to be analyzed to verify whether it was used to form a design model.

3. Research objective and method

3.1. Research objective

The purpose of this research is to propose a design model that serves furniture designers and furniture company personnel. 1. In the past, the design process was driven by the subjective decisions of designers or related enterprise personnel, lacking scientific and objective evaluation. 2. Based on the design model, designers devote more energy to effective features. 3. In the case where the design effect diagram is not drawn, the design model can be used to predict user satisfaction with the feature combination product.

3.2. Method

In this study, the user is involved in the evaluation method to score the favorability of the features and the overall of the desk. With the help of statistical analysis, it can be concluded that there is a linear relationship between the favorability of the features of the desk and the overall favorability, so as to construct a regression model. Data analysis is done by SPSS.

4. Acquisition of research data

There are many styles of desks with different styles and functions. The first step is to find the desk category that is closest to the needs of the project. In this study, the wooden table was selected as the research object. The features of the table was dismantled and used in experiments based on the ABC attitude theory.

The user's attitude towards cognitive component of the desk includes the design elements, composition features, and process requirements. Among them, the design elements are divided into: desktop, desktop storage area, desk body, table legs, storage area below; the composition features are divided into four features of style, color, material, and other decorations; the process requirements are divided into two features: paint craft and other decorations.

The attitude of the user towards the behavioral component factors of the desk includes the requirement for the operation space and the convenience for the operation. Among them, the operating space are divided into two sub-features: the width of the work area and the height of the work area; the requirements for convenient operation are divided into three sub-features: adjustment of the desktop angle, adjustment of the desktop height, and changeable desktop space.
The user's attitude towards the emotional component of the desk includes cultural and spiritual factors. Among them, cultural factor conclude a feature of cultural identity; spiritual factors are divided into three sub-features, privacy, identity symbol and taste symbol. The user's attitude towards the emotional component of the desk includes cultural and spiritual factors. Among them, cultural factor conclude a feature of cultural identity; spiritual factors are divided into three sub-features, privacy, identity symbol and taste symbol.

During the experiment, 20 people engaged in different industries were invited to score 1-9 on the desk features. The variables tested included cognitive factors, emotional factors, and behavioral factors. The higher the score in each item, the higher the satisfaction with this feature under this category.

5. Data analysis

5.1 Regression analysis

In order to ensure the accuracy of the data, this study first tested the reliability and validity of the data. It can be seen from Figure 1 below that the Alpha value and KMO value of Cronbach are above 0.9, which shows that the reliability and validity are very good, and data analysis can be continued.

![Figure 1. Reliability and validity results](Image)

Before performing regression analysis, the correlation between variables should be ensured. Test the pairwise correlation of variables. Based on the results of correlation analysis, all P values are less than 0.05, and R values are mostly between 0.3-0.8. This study can determine the correlation between the total desirability and the desirability of each sub-function, and regression analysis can continue.

5.2 Regression model building

The purpose of this study is to establish a predictive regression model. These features are decomposed according to the above attitude theory. Due to too many features, variables need to be selected. In order to select the best combination, this study used a stepwise regression method to select independent variables.

Prompted by Variable Entered / Removed table from regression analysis, among the 17 features, 6 features were selected into the regression equation. Through the Model Summary Table, the cumulative amount of interpretation is 0.859, which means that the combination of the six features of favorability can explain 85.9% of the total favorability. It shows that the model fitting effect is very good.

The significance P values of the F tests of the six models are all 0.000, all of which are significant, and the regression effects are statistically significant.

Through ANOVA table, the first model to enter the independent variable is the Desktop model, which is the best independent variable feature. From the output results, it can be seen that the six features of Desktop, Color, Taste Symbol, Other Decorations, Style, and Other Decorations are selected as the best independent variable combination.

The Desktop features were selected in the first model, and the Desktop favorability can explain 58.2% of the overall favorability. The adjusted R2 value shows that there is still more than half of the explanatory power; the second selected feature is Color, which can explain 10.2% of the overall favorability; the third selected feature is Taste Symbol, which can explain 1.6% of the overall favorability; the fourth selected feature is Other Decorations, which can explain 1.2% of the overall favorability; the fifth selected feature is Style, which can explain 1.5% of the overall favorability; the sixth selected feature is the Desktop Storage Area can explain 1% of the overall favorability. This
shows that the Desktop and Color have the greatest influence on the overall favorability. In this study speculates that, Other Decorations are regarded as redundant decorations. The more extra decorations used for desk design, the lower the user's favorability.

| Model | Unstandardized Coefficients | Standardized Coefficients |
|-------|-----------------------------|---------------------------|
| 1     | B   | Std. Error | t    | Sig. |
| 1 (Constant) | 1.546 | 0.354 | 4.367 | 0.000 |
| Desktop | 0.754 | 0.598 | 12.774 | 0.000 |
| 2 (Constant) | 0.370 | 0.347 | 1.004 | 0.000 |
| Desktop | 0.582 | 0.000 | 5.399 | 0.000 |
| Color | 0.372 | 0.001 | 3.748 | 0.000 |
| 3 (Constant) | 0.498 | 0.346 | 1.448 | 0.000 |
| Desktop | 0.514 | 0.002 | 5.200 | 0.000 |
| Color | 0.308 | 0.005 | 3.140 | 0.000 |
| Taste_Symbol | 0.182 | 0.000 | 1.930 | 0.000 |
| 4 (Constant) | 0.554 | 0.347 | 1.598 | 0.013 |
| Desktop | 0.554 | 0.000 | 5.656 | 0.000 |
| Color | 0.372 | 0.000 | 3.750 | 0.000 |
| Taste_Symbol | 0.180 | 0.000 | 1.000 | 0.000 |
| Other_Decorations | -0.013 | 0.076 | 0.199 | 0.000 |
| Style | 0.173 | 0.000 | 2.310 | 0.013 |
| 5 (Constant) | 0.404 | 0.345 | 1.044 | 0.000 |
| Desktop | 0.441 | 0.000 | 4.440 | 0.000 |
| Color | 0.293 | 0.000 | 2.950 | 0.000 |
| Taste_Symbol | 0.177 | 0.000 | 1.750 | 0.000 |
| Other_Decorations | -0.029 | 0.000 | 2.227 | 0.000 |
| Style | 0.181 | 0.000 | 2.184 | 0.000 |
| Desktop_Storage_Area | 0.064 | 0.000 | 0.013 | 0.000 |

Figure 2. Regression model regression coefficient table

Base on the regression coefficients in the Figure 2, the regression model can be derived:

\[ Y = 0.441X_1 + 0.293X_2 + 0.177X_3 + 0.181X_4 + 0.131X_5 - 0.229X_6 + 0.404 \]  (1)

In the formula
- \( X_1 \) -- Desktop;
- \( X_2 \) -- Color;
- \( X_3 \) -- Taste Symbol;
- \( X_4 \) -- Style;
- \( X_5 \) -- Desktop Storage Area;
- \( X_6 \) -- Other decorations

The histogram in Figure 3 below shows that the graph conforms to the normal distribution. It can be seen from the PP graph that the distribution of points is concentrated on a straight line. Therefore, in line with the requirements of regression, there is a regression relationship.(6)

Figure 3. Histogram and PP graph

5.3. Usefulness of the model
1. Design model can help designers understand the weight relationship between features, so as to focus on effective features;
2. Through the design model, the user can estimate the overall favorability of the product formed by the combination of features without drawing the feature combination design table (the design drawing).

6. Conclusion
Based on ABC's attitude theory, this study disassembled the features of the desk. Then the features were selected through statistical analysis to construct the design model of the desk. When designing products, the design models can help designers focus on effective features. Using the design model, decision makers no longer rely on design renderings or proofing. They can calculate the overall favorability based on the favorability of the features, thereby improving R & D efficiency and gaining a competitive advantage in the market.

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