Research on Design of Clay Sculpture Cultural and Creative Products Based on KANO

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Abstract. In order to stimulate the vitality of clay sculpture inheritance and solve the problems existing in the design of clay sculpture cultural and creative products, this paper puts forward a method of designing clay sculpture cultural and creative products based on KANO model. This paper takes Beijing's "rabbit doll" as the research object, and determines the design theme according to the user needs of Beijing's "Rabbit doll doll" cultural and creative products in the market. Through user interviews, determine user demand indicators; According to the KANO model, the classification of user demand indicators and user satisfaction are determined, and then the design scheme of rabbit's creative products is proposed based on the design requirements of high importance. The results show that the application of KANO model to the design of clay sculpture cultural and creative products is helpful to focus on design factors and improve design efficiency and quality.

Keywords: KANO model; Clay sculpture; Cultural and creative products

1. Introduction

At present, many traditional crafts in our country have encountered some problems in the development process, such as slightly obsolete shape, gradually disappearing entertainment properties, lack of practicality and being attacked by foreign high-tech products, and have gradually disappeared in people's vision [1]. With the country's emphasis on and support for traditional crafts, the development of traditional crafts and cultural industries has met new opportunities. As a prominent representative of traditional craft, clay sculpture has attracted extensive attention from cultural and creative product designers, among which Beijing Rabbit doll is deeply loved by the public because of its unique shape and gorgeous color, and has become an important object of clay sculpture cultural and creative product design. Due to the lack of deep understanding of clay sculpture, inaccurate positioning, and insufficient understanding of user needs [2], the design and development of clay sculpture cultural and creative products did not achieve the expected effect.

At present, the design and development of cultural and creative products in the market has been relatively mature. Wang et al. explored the development and application of Bengbu double-dun carved symbols in cultural and creative products[3]; Xu et al. applied Chu cultural elements in the design of cultural and creative products of Shouzhou Ancient City[4]; Qi explores the design

of cultural and creative products of museums based on the design theory of animation derivatives[5]. The above qualitative research on the design of cultural and creative products cannot accurately understand the needs of users, nor can it solve the practical problems faced in the design process. Designers and design teams prefer a quantitative, standardized approach where user needs can be accurately measured. For this reason, quantitative research based on user demand and big data has been gradually promoted in the design of cultural and creative products [6]. In the user-demand-driven design methods for cultural and creative products, some scholars obtain users' emotional needs through data crawler[7], KANO model[8], analytic hierarchy process (AHP)[9], quality function expansion theory (QFD theory), invention problem solving theory (TRIZ theory)[10] and other methods. Among them, KANO model is a good way to understand the needs of users, improve the design quality of cultural and creative products, and assist designers in analysis and decision-making. Based on this, based on the KANO model, this study discusses the innovative design method of clay sculpture cultural and creative products to provide reference for the design of clay sculpture cultural and creative products, and takes Beijing Rabbit doll's cultural and creative product design as an example to carry out design practice.

2.　KANO model

KANO model, proposed by Japanese scholar Noriaki Kano, is a typical qualitative analysis method [11]. Starting from two dimensions of user satisfaction and functional capability, KANO model uses two-dimensional attributes to identify the nonlinear relationship between user demand and user demand satisfaction. In addition, KANO model introduces five levels of perceived quality curves, namely basic demand (M), expectation demand (O), charm demand (A), indifferent demand (I) and reverse demand (R), into the two-dimensional demand attributes. [12]. KANO model analyzes the change of user satisfaction through the perceived quality curve, and then classifies different user needs to guide product design and development[13-14]. The traditional KANO model only emphasizes the classification method and qualitative description of user needs, and cannot analyze user needs quantitatively [15]. Therefore, domestic and foreign scholars have proposed an improved method on the basis of the traditional KANO model to expand the KANO model from qualitative description to quantitative analysis in order to understand customer needs more accurately.

3.　Research process

3.1 Capture user requirements

Firstly, based on the types of clay sculpture cultural and creative products gathered through market research, the strengths and weaknesses of such products are analyzed, and a design theme is selected. Secondly, interviews are conducted with target users to gain a comprehensive understanding of their specific needs and requirements. Finally, the outcomes of these user interviews are compiled and analyzed to identify the essential elements for the design of cultural and creative products that best align with user demands.

3.2 Determine the classification of user needs and calculate the initial user satisfaction

First, design the KANO survey questionnaire. KANO questionnaire consists of positive and negative questions, and each question contains five satisfaction level options, which are represented as satisfied, deserved, indifferent, acceptable and dissatisfied, so as to investigate the real feelings of users [16].

Second, collect questionnaires to classify user needs. According to the results of KANO questionnaire and the evaluation criteria of KANO model, the demand attributes of user demand indicators are determined [17].

Third, calculate the *Better-Worse* coefficient. The traditional KANO model prioritized the elements of user needs, but it could not distinguish the importance of user needs of the same category. Later, in order to determine the importance of user requirements, Berger et al. introduced the Better-Worse coefficient [18], the formula see equation (1)-(2):

$$B_i = \frac{A+O}{A+O+M+I}. \qquad (1)$$

$$W_i = -\frac{M+O}{A+O+M+I}. \qquad (2)$$

Where B_i is the satisfaction coefficient and W_i is the dissatisfaction coefficient. Usually, the B_i value is between 0 and 1. When the value is closer to 1, it indicates that providing the demand can significantly improve user satisfaction. When the value is closer to 0, it indicates that the requirement has little impact on user satisfaction. The W_i value is between -1 and 0, when the value is closer to -1, it indicates that if the requirement is not provided, the impact on user satisfaction will be greater. If the requirement is provided or improved, the user satisfaction will be better improved. Combined with the coefficient characteristics of user satisfaction B_i and user dissatisfaction W_i the user demand with higher absolute coefficient score needs to be given priority, then the initial satisfaction of user demand can be obtained, and the calculation results are shown see equation (3) [19].

$$\omega_i = \max\left[\left|\frac{B_i}{\sum_{i=1}^{m}B_i}\right|, \left|\frac{W_i}{\sum_{i=1}^{m}W_i}\right|\right]. \qquad (3)$$

4. Design practice of cultural and creative products

4.1 Determine the design theme

Taking into account the current state of creative product development for Beijing Rabbit Doll and the preferences of the audience, this study has opted to create a series of creative products centered around the Mid-Autumn Festival theme. This series will encompass Mid-Autumn Festival lanterns, ornaments, bookmarks, post-it notes, and various other items.

4.2 Analyze user needs

To explore the demand factors for cultural and creative products during the Mid-Autumn Festival, this study developed an interview outline encompassing product shape, color, function, and artistic characteristics. A preliminary survey was conducted to gather insights, and based on the survey results, the interview outline was refined to ensure a comprehensive coverage of user needs. The interviews were conducted in a one-to-one format, involving 24 participants comprising 16 females and 8 males, ranging in age from 23 to 42 years. The interviewees had diverse occupations, including freelancers, design professionals, and students. According to the interview outline, the interview content was collected by means of recording and shorthand. After integrating the interview content, a total of nine user demand factors have been identified for the design of Mid-Autumn Festival cultural and creative products. These factors are visual impact (A_1), production craftsmanship (A_2), cultural significance (A_3), economic value (A_4), enjoyment and entertainment value (A_5), innovative design (A_6), suitability as a social gift (A_7), durability (A_8), and practical applicability (A_9).

4.3 Calculate user demand satisfaction

First, the KANO questionnaire was designed and distributed. This KANO questionnaire is composed of 9 user demand factors, and the format of the questionnaire is shown in Table 1. Through wechat, QQ and other online platforms, a total of 300 users were invited to purchase the above products and Mid-Autumn gifts, and 293 valid questionnaires were finally collected, including 213 female users and 80 male users, whose age was mainly 22-43 years old, and whose occupation included company staff, teachers, designers, students, etc. According to the above sample description, it can be seen that the survey object is universal and perfect, and is in line with the expected goal.

Second, collect questionnaires, sort out questionnaire results and calculate factor weight values. According to the results of the questionnaire survey, the frequency of demand in each question is sorted out, and the highest frequency is indeed the attribute of user demand for this factor. According to the frequency of user demand, the user satisfaction coefficient B_i and the user dissatisfaction coefficient W_i are calculated through formula (1) and (2), and the weight of user demand ω_i is obtained according to formula (3). The specific results are shown in Table 2.

Table 1. The sample of KANO questionnaire survey

Design considerations	Like	Take it for granted	Indifferent	Reluctantly accept	Dislike
When the Mid-Autumn Festival cultural and creative products have good visual effects, what do you think?	√				
When the Mid-Autumn Festival cultural and creative products not have good visual effects, what do you think?					√

Table 2. KANO model results statistics

Encoding	M	O	A	I	R	Hierarchy of needs	B_i	W_i	ω_i
A_1	137	73	50	33	0	M	0.420	-0.717	0.123
A_2	79	142	30	42	0	O	0.587	-0.754	0.141
A_3	138	67	45	43	0	M	0.382	-0.700	0.120
A_4	108	138	29	18	0	O	0.570	-0.840	0.144
A_5	75	68	130	20	0	A	0.676	-0.488	0.162
A_6	185	29	37	42	0	M	0.225	-0.730	0.125
A_7	157	61	38	37	0	M	0.338	-0.744	0.127
A_8	64	43	87	99	0	I	0.444	-0.365	0.106
A_9	78	65	89	61	0	A	0.526	-0.488	0.126

According to the data in Table 2, A_1 visual impact, A_3 cultural significance, A_6 innovative design, and A_7 suitability as a social gift are all categorized as basic requirements (M) in the Mid-Autumn Festival cultural and creative product design. In the design process, these factors should be given priority, and the order of each demand factor should be determined based on their weight values. The sequence of basic requirements (M) is A_7, A_6, A_1, and A_3.

A_2 production craftsmanship and A_4 economic value are classified as expected demands (O). Considering the weight values, the priority of A_4 should be higher than A_2 in the design of Mid-Autumn Festival cultural and creative products.

A_5 enjoyment and entertainment value and A_9 practical applicability are categorized as demand factors (A). Based on the weight values, A_5 should have a higher priority than A_9.

A_8 durability falls under the indifference category (I). The presence of this factor does not directly impact user satisfaction with Mid-Autumn Festival cultural and creative products, so it will not be considered in the specific design process.

In summary, considering the classification level and weight values of demand factors, the final order of user demand elements for the design of Mid-Autumn Festival cultural and creative products is A_7, A_6, A_1, A_3, A_4, A_2, A_5, A_9, A_8.

4.4 Scheme design and presentation

Firstly, in the creative design process of Beijing rabbit doll's Mid-Autumn Festival, the primary consideration is the A_7 suitability as a social gift demand. The topic chosen for this design study starts with the Mid-Autumn Festival, and the inherent attributes of reunion and social interaction during the festival make creative products related to the Mid-Autumn Festival inherently significant for gift-giving. Secondly, in the selection of creative product types, in addition to the social gift-giving demand, there is a focus on integrating the A_6 innovative design requirement. Unlike the common Mid-Autumn Festival gifts associated with mooncakes in the past, the choice in this design is to use lanterns as the main product, meeting the needs for social gift-giving during the festival while also introducing innovation compared to the typical Mid-Autumn Festival creative products in the market.

Secondly, the design process of cultural and creative products pays attention to the aesthetics of A_1 visual impact. The product design is cartoonized based on the rabbit doll shape, and the amiable rabbit doll IP shape is drawn in combination with the hand-drawn expression form favored by contemporary young people. While basically retaining the original shape of the

rabbit doll, the anthropomorphic image is emphasized, and the carrot is held in both hands to add interest to its shape. Since the design is mainly based on the Mid-Autumn Festival, a moon is added as the background on the auxiliary elements, which also runs through the design of the cultural creation.

Third, the cultural significance of A_3 should be emphasized in the design process of cultural and creative products. As a typical representative of Chinese folk clay figurines, rabbit doll has been worshipped in every house since the Ming Dynasty by virtue of its beautiful meaning. In modern times, due to the gradual decline in attention and demand, the cultural connotation it contains has been gradually diluted by the public. Therefore, in the Mid-Autumn Festival, a series of cultural and creative product design inspired by the rabbit, including the public's daily study and work can be used to use bookmarks, post-it notes and other office supplies, to enhance the public's understanding and familiarity with the rabbit, and gradually integrate the rabbit into the life of the young generation. In addition, in the choice of cultural and creative products, but also combined with the rabbit and the inseparable elements of the Mid-Autumn Festival - lanterns. As early as the Northern Song Dynasty "Wulin Old Events" recorded in the autumn night festival custom, there will be a "little red" lamp into the river rafting play activities, the lantern into the Mid-Autumn Festival cultural design is not only the display of the cultural connotation of the rabbit, but also the heritage of the Mid-Autumn Festival traditional culture.

Fourth, A_4 economic value, A_2 production craftsmanship should choose a moderate cost and good texture of the production process and material. Among them, the Mid-Autumn Festival lantern shape is circular, the diameter is 200mm, and the lamp shade is paper, which is not only environmentally friendly and recyclable, but also reduces the production cost of the lantern and improves the cost performance. Rabbit doll decoration is about 60mm high, the use of resin material production, resin than gypsum, ceramic and other materials, usually has a light weight, easy to carry, but also has waterproof performance, strong application scene.

Fifth, A_5 enjoyment and entertainment value that the interactive entertainment experience between the product and the user should be considered in the product design process, and A_9 practical applicability that the product should not only be solid and durable in the material process, but also have a fairly strong application scenario. Therefore, in the product design, lanterns with certain interaction and entertainment are selected to bring users a good festival experience. At the same time, post-it notes, bookmarks, etc., can also be used as Mid-Autumn Festival gifts together with lanterns and rabbit ornaments for social gifts, whether students or workers have strong applicability, the specific design is shown in Figure 1.

Fig. 1. Design case

5.   Conclution

Clay sculpture is an ancient folk art in China, which often appears in areas with rich folk culture. It is not only a fossil in the long history, but also an important symbol of Chinese culture. Since the Neolithic Age, clay sculptures have been accompanied by the development of Chinese civilization and continue to the present day, and are an important carrier of Chinese cultural inheritance. With the development of society and the emergence of new culture, the living space of folk color sculptures is slowly being compressed. How to get rid of the dilemma of the development of folk colored sculptures and how to better inherit folk colored sculptures is a very worthy of in-depth exploration in the field of culture and art. After determining the design theme of Rabbit's creative products, this study determined the elements of user demand by mining user online comment data and user survey, comprehensively mined the real-time needs of users, used the KANO model to classify the elements of user demand, and calculated the weight of each user demand factor. In the practice process, the designer prioritizes the key user requirements according to the comprehensive weight value of the design requirements, and finally forms a complete design process.

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