Extraction of Design Factors of Chinese Dance Culture based on Analytic Hierarchy Model

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Abstract

To protect, inherit and develop minority culture, this paper proposes the extraction of design factors of Chinese dance culture based on the analytic hierarchy model. Taking the traditional dance culture of the Qiang nationality as an example, this paper studies the characteristics of its traditional national dance culture and extracts the design factor model from it, then designs the relevant cultural and creative products for verification. The product not only contains the traditional culture of the Qiang ethnic group but also conforms to the contemporary aesthetic. Cultural and creative products as the carrier of the traditional Qiang ethnic culture to spread widely. Methods: The materials of the traditional dance of the Qiang nationality were collected, classified, and screened; The design form factor and color factor are extracted from the material by using the analytic hierarchy process (AHP) and analysis graph; Collect and sort out emotional words, conduct user research; Understand the needs of target users according to the survey data and calculate the factor weight through the survey data; Then redesign and optimize, to form the final scheme. Conclusion: From the study of Qiang dance culture, it can be seen that ethnic dance is an important window of minority culture. Extracting design factors from minority dance culture and applying them to design products can effectively spread minority culture, thus achieving the purpose of improving the economic value of the minority cultural creative industry and spreading minority culture.

Keywords: Hierarchical analysis model; Dance; Cultural design; Factor extraction.
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1 Introduction

With the continuous improvement of living standards, people's demand for pure material and economics is relatively reduced, while the demand for culture is constantly increasing [1]. To meet this new demand, it is very important to explore culture and transform reality creatively. Creativity and design are behaviors of high added value and low cost. They originate from culture but are higher than culture. Through their development and re-creation of cultural resources, they can make meaningful connections between new things and familiar things or other things in time and space, and profound traditional cultural resources can enrich the connotation of design and enhance the added value of creative design. The integration of traditional culture and creative design not only highlights the aura and taste of original cultural creative product design but also enhances the market competitiveness of products, to realize the organic unity of cultural value and practical value [2]. To better promote the integration of culture and design, improve product connotation, and spread traditional culture, based on the analysis of form perception, this paper analyzes the visual and connotation characteristics of the form composition of traditional instruments and its influence on the characteristics of form perception, to extract the characteristic cultural factors with emotion [3-4].

Dance culture has always been an important part of the culture of various ethnic minorities. It is a kind of instant performing art with strong visual appreciation. The performer displays a series of simple or complex body movements according to the melody and rhythm of the music to represent the theme of the dance. Through dance, we can show the religious culture, customs, culture, and daily life of ethnic minorities, as well as weddings and funerals. Due to the great differences in environmental climate and historical development in different regions, the content and theme of the dance culture of various ethnic minorities are also different. This paper proposes a design factor extraction model based on the analytic spectrum and analytic hierarchy process (AHP) and designs a set of cultural creative products based on the traditional dance culture of the Qiang ethnic group in A region for verification. The tea set needs to meet the physical use function and aesthetic function, not only to highlight the national characteristics but also to adapt to the aesthetic times, to meet the needs of target users; Let the minority culture in the design of products as the media, so that more people understand and protect the minority culture, to build the contemporary people's cultural confidence and national confidence. Figure 1 shows the relationship between the design factors of Qiang traditional dance culture and cultural and creative products [5].

![Figure 1. The relationship between design factors of Qiang traditional dance Culture and cultural and creative products](image-url)
2 Research Methods

2.1 Factor analysis model

Factor analysis is a method used to analyze the research object that is not a variable. Factor analysis is common in analysis, and the main way of analysis is to find the correlation between variables. The variables are classified according to correlation, and those with correlation are put in one group, and those without correlation are not put in the same group so that there will be no confusion[6]. After classification, the group as the basic structure, is the common factor in factor analysis. In the study of a certain book, the data of this book is usually composed of different variables, among which there is a certain degree of correlation. The role of factor analysis is to find out the correlation between these variables and reduce the number of variables, to analyze and explain complex problems. This method of finding correlations in variables allows people to understand the data more easily and quickly [7].

Suppose the existing research object X,X has a set of n p data, in this set of data,n is the number of samples,p is the number of variables of the research object*. A factor analysis model is established. There are unmeasurable random variables in model X. In common factors, such variables are denoted as F,F=(F1,F2,... Fm), special factors in the model have variation sources, denoted as:

\[ \varepsilon, \varepsilon = (\varepsilon_1, \varepsilon_2, ..., \varepsilon_p) \]

(1)

Therefore, the factor analysis model can be written as:

\[ X = AF + \varepsilon \]

(2)

In Formula (3),A represents the factor load matrix, and A=(aij) represents that the load of the ith variable in A is on the JTH factor. The greater the absolute value of A is, the higher the correlation between this xi and Fj is; The smaller the absolute value of A is, the less relevant it is. To establish the factor model, the following assumptions should be satisfied:

\[ E(F) = 0, Cov(F) = E(F') = I, E(\varepsilon) = 0 \]
\[ Cov(\varepsilon) = E(\varepsilon') = \Omega \]

(3)

In the equation:

\[ \Omega = (\sigma_{ij}) \]

(4)

And F is independent of \( \varepsilon \), so:

\[ Cov(\varepsilon, F) = E(\varepsilon F') = 0 \]

(5)

So the covariance matrix for X can be calculated using the factor analysis model:

\[ \sum = Cov(X) = E(AF + \varepsilon)(AF + \varepsilon)' \]

(6)
\[
\sum = AE(FF')A' + AE(F\varepsilon') + E(\varepsilon F')A' + \\
E(\varepsilon\varepsilon')
\]

(7)

It can be known from the above formula analysis:
\[
\sum = AA' + \Omega
\]

(8)

This means that the variance of object \( X \) is composed of both the effect of the common factor (F) and the variance of the special factor (\( \varepsilon \)). As mentioned above, factor analysis is to find the relation between variables through calculation, so that the common factor can affect the variance of the original variable, so it is necessary to find out the load matrix A of the factor. There are two methods to calculate the load matrix A: the principal component method and the maximum likelihood method [8-9].

2.2 Determination of target cultural and creative products and target user groups

China has a long history of tea culture. According to records, tea was first discovered in Shennong Period. Pottery and porcelain also began to be used to hold things, and then they interacted with tea, gradually forming a tea culture. With the development of society, tea culture also kept developing and progressing. In the current market of cultural and creative products, tea set design is a very important field. In the general impression, tea culture seems to be closely related to older, male-dominated groups. This paper surveyed a university to investigate the tea-drinking habits of people of different ages. The results showed that 63% of people in the age group of 20~25 years old have the habit of drinking tea, among which 36.66% are female and 26.66% are male. 75% of people in the age group of 25~30 years old have the habit of drinking tea, among which 40% are female and 35% are male. People in the age group of 30~35 years old who have the habit of drinking tea account for 90%, among which 45% are female and 45% are male. See Table 1, Figure 2,3 for the survey data on tea drinking habits of 20-35 years old. The subjects are students and teachers of a university. The subjects have a certain level of education, spend a lot of time studying and working at their desks, and have the time and opportunity to drink a lot of liquid drinks. According to the survey results, the number of men and women drinking tea tends to increase with the growth of age, and the proportion of women drinking tea is slightly higher than that of men. How to improve young people's interest in tea drinking, and expand the tea set market of young consumer groups, think can start with the tea set design[10].

| Table 1. The tea habit survey data table of the 20-35-year-old group |
|---------------|---------------|---------------|-------------|
| age           | male          | female        | Add up      |
|               | drink tea     | Don’t drink tea | drink tea | Don’t drink tea | drink tea | Don’t drink tea |
| 20-25         | 8             | 7             | 11          | 4           | 19       | 11          |
| 25-30         | 7             | 3             | 8           | 2           | 15       | 5           |
| 30-35         | 9             | 1             | 9           | 1           | 18       | 2           |
In the current market of cultural and creative products, the cultural and creative products of the Palace Museum have research value from the design, publicity, sales, and other ways and have opened a new situation in the market of cultural and creative products. The main audience group is the young group under 35 years old, mainly females [11]. The cultural and creative products designed in this paper, the porcelain tea set, are motivated by Salang and sheepskin encouragement. Among them, Salang is a folk self-entertainment dance with high participation of the public. In some tourist areas that experience the Qiang culture, visitors can participate in sailing, or dance together around the fire pit. It is an impressive form of participation for non-Qiang people to experience the Qiang song and dance culture. In addition to a group dance, Salang can also be a solo dance form, mainly female performance, performance clothing for the traditional ethnic costume of the Qiang nationality, the body is equipped with Qiang characteristics of embroidery film 6, bright color, strong contrast, can cause visual attention. Based on the research and analysis of the above three aspects, this paper sets the target cultural and creative product as a porcelain tea set, and the target user group is the female group aged between 20 and 35[12].

### 2.3 Design factor extraction model

In dance culture, the more obvious features include dance movements and performance costumes. This paper extracts form design factors based on dance movements and color design factors based on
performance costumes. Analytic Hierarchy Process (AHP) and analytical graph are common methods to extract design factors. The analytic hierarchy process can transform qualitative problems into quantitative analysis problems by evaluating and making decisions based on various criteria. The core part of the analytic hierarchy process is to construct an analytic hierarchy matrix[13]. Through this matrix, the weight of each design factor can be calculated. The value of the matrix element of the analytic hierarchy matrix is derived from the data of the user survey table, which satisfies the basic idea that the design is carried out according to the needs of users. The analytical graph is to extract the key attributes of complex comprehensive phenomena, aiming at extracting the commonness from the complicated representation. In this paper, the analysis map was used to extract the characteristic lines of related dance movements to form the morphologic factors, and then form the morphologic factors. The color of the performance clothing is extracted to find the color commonality and prepare for the extraction of color factors[14].

The form factor is one of the dominant design factors, showing the morphological characteristics of the extract, and this factor will be integrated into the form of the target design product. In this paper, representative dance movements of Salang and sheepskin drum are selected and characteristic lines are extracted. Then refine the hand or leg movements of the characters in the characteristic lines, and form morphologic factors; Based on the demand of the target design product porcelain tea set, the design is optimized, and the final form factor is formed. Salang performers are predominantly female and wear national costumes. In the form of solo dance, the performer's body moves from time to time, such as turning the body axis to the side of the body, drawing a circle along the calf and the top crotch, to the light and melodious melody of the music. In this paper, the five movements of the Salang dance are selected to extract the form factor, which includes the basic movements such as turning to the circle and the top hip, with rich hand movements, showing the hospitality of the Qiang women, the body graceful and graceful gesture.

The sheepskin drum dance is a sacrificial dance, mainly performed by men, showing the religious culture and beliefs of the Qiang people. The theme of this kind of dance is Shibi praying to the God of heaven to bless the children of the Qiang people for generations of peace and peace. The dance rhythm is downward, and the dance atmosphere is full of mystery and appeal. In this paper, three dance movements of the sheepskin drum are extracted. The performer holds the sheepskin drum and bends down slightly, reflecting the simplicity and steadiness of the ancient style, which is in line with the dance characteristics of the sheepskin drum[15].

The color factor is one of the dominant design factors, which is the main color or color set extracted, and the color set will be organically integrated into the target design products. Color is a very important visual element of design products. People can intuitively feel colors through their eyes, and have a deeper interpretation of colors through cultural background, psychological connection, and brain feedback. Salang performers wear the traditional costumes of the Qiang ethnic group, which are colorful and colorful. Different parts of the costumes are distributed with exquisite Qiang embroidery pieces, showing the dexterity and ingenuity of Qiang women. The traditional national costume of the Qiang nationality is an important display window of its national culture and national aesthetics. The sheepskin drum is a dance performed by the Qiang people during the sacrifice. Not only the atmosphere of the dance is mysterious, but also the costumes and props of the performers serve the religious theme. The performers are male, their costumes are mainly white, they wear golden monkey skin hats, and the main props are sheepskin drums[16-17]. The costumes and props of the dance performance are all expressions of the Qiang religious culture. In this paper, the collection of the Qiang people's jumping salang and sheepskin drum clothing information, sorting, classification, and screening, extract the characteristic color black is the common color of all clothing, and is the main color of the Qiang ethnic costume of various characteristics. In addition, Salang is mostly performed by women, who wear traditional national costumes. The samples are removed and affected
by environmental factors such as illumination and the degree of old and new. It is concluded that the colors of Salang performers' costumes are mainly warm colors and neutral colors (big red, peach, bright yellow, bright blue, emerald green), with high saturation and strong contrast. The colors of sheepskin-inspired performers' costumes are mainly cool (white, dark blue, gray, brown, brown, yellow, etc.), highlighting the sense of mystery.

2.4 Porcelain tea set design scheme generated

Emotional words are adjectives used to describe the attributes and characteristics of designed products or design-related materials. In this paper, through the Qiang ethnic costume, traditional dance movements, Qiang ethnic cultural and creative works related to literature and historical data, ethnic legends, and other primary emotional vocabulary extraction. After the preliminary perceptual vocabulary is formed, discussion and communication with ethnographers, experts, and product designers are carried out. To design products according to the national cultural characteristics of the target, filter out repetitive and meaningless words[18]. After sorting out the perceptual words are as follows: national, human, beautiful, complex, soft, unique, lively, and sedate. On this basis, the perceptual lexical pairs are formed as follows: a nation's popular, humanized, inhuman, beautiful, grand, simple, complex, soft, cold, unique, popular, lively, and sedate.

The user is the end user of the product. In the early stage of design, it is helpful to understand the product demand of the target user group to better grasp the direction of product design. The target user group of the porcelain tea set product designed in this paper is the female group between 20 and 35 years old. In the preliminary research, the user role should conform to the attributes of this group. In this paper, 30 potential users who conform to the attributes of this group are selected for investigation. Since the target users are not professional designers, the user survey table is established based on perceptual vocabulary, and the seven-level scale is used as the evaluation scale. The seven-level scale method measures and divides the perceptual lexical pairs into seven levels and expresses them into seven scales equal to "very general" and "very". The feelings of the measured users can be expressed numerically to realize the transformation from qualitative to quantitative.

The hierarchy analysis matrix is a commonly used method to determine the weight of design factors. Its matrix form is as follows:

\[ A = \begin{bmatrix}
  a_{11} & \cdots & a_{1n} \\
  \vdots & \ddots & \vdots \\
  a_{n1} & \cdots & a_{nn}
\end{bmatrix} \]

(9)

In this matrix, \( n \) represents the number of all design factors and \( a_{ij} \) represents the importance of the \( i \)th design factor corresponding to the \( j \)th design factor, namely, \( a_{ij} = \frac{S_i}{S_j} \) (\( S \) is a set of design factors). After determining the values of each element of the judgment matrix \( A \), the maximum eigenroots and corresponding eigenvectors can be calculated.

\[ K = (k_1, k_2, \ldots, k_n)^T \]

(10)

In the equation, the larger the \( k_i \) value is, the greater the weight of the corresponding design factor \( S_i \) will be.

According to the data extracted from the user survey table, the analytic hierarchy matrix is constructed and calculated, and the weight of each design factor is reshown in Table 2 and sorted. The surveyed
users prefer rounded and curved shapes, which are suitable for the handle design of teapots and teacups. To match this shape, the teapot's body and the tea cup's body are mainly curved. The body of the pot is based on the spherical shape, and the design of the cup body is wide and gradually closed down, which forms a contrast and echo with the shape of the teapot. In terms of color factors, the surveyed users prefer black, pink, and blue. Pink and blue can form a contrast and echo. The base color of the teapot and teacup are designed as blue and pink respectively [19].

### Table 2. Design factor weight

<table>
<thead>
<tr>
<th>Color factor</th>
<th>S4</th>
<th>S7</th>
<th>S5</th>
<th>S3</th>
<th>S1</th>
<th>S6</th>
<th>S2</th>
<th>-</th>
</tr>
</thead>
<tbody>
<tr>
<td>color</td>
<td>black</td>
<td>pink</td>
<td>blue</td>
<td>red</td>
<td>yellow</td>
<td>white</td>
<td>grey</td>
<td></td>
</tr>
<tr>
<td>ki</td>
<td>0.0542</td>
<td>0.0336</td>
<td>0.019</td>
<td>0.012</td>
<td>0.0085</td>
<td>0.0031</td>
<td>0.0029</td>
<td></td>
</tr>
<tr>
<td>form factor</td>
<td>S14</td>
<td>S9</td>
<td>S12</td>
<td>S8</td>
<td>S11</td>
<td>S13</td>
<td>S15</td>
<td>S10</td>
</tr>
<tr>
<td>ki</td>
<td>0.032</td>
<td>0.0289</td>
<td>0.0251</td>
<td>0.013</td>
<td>0.012</td>
<td>0.0099</td>
<td>0.0088</td>
<td>0.0042</td>
</tr>
</tbody>
</table>

Azaleas represent marriage in the Qiang culture, with good connotations for love and marriage and a belt around the waist. The belt has a waist-tightening effect on the overall costume, showing that the Qiang women are graceful and the Qiang men are powerful. In this paper, black and yellow are used in combination with the texture of azaleas in Qiang embroidery to design a striped porcelain tea set decorative belt. Attached to the waist of the teapot and teacup, the azaleas belt is fitted into the porcelain tea set teapot body and cup body, which forms an echo of the traditional clothing of the Qiang people. Sheep is a totem of the Qiang ethnic group and has a symbolic significance of religious culture. The image of sheep exists in all kinds of living objects and in the ethnic culture of the Qiang people. The Qiang people will use sheepskin and wool as vests to keep warm; There are sheep texture patterns in the texture pattern of Qiang embroidery; The sheepskin drum is a dance to sacrifice Shibi to the gods and bless the people. Sheep holds a very high position in the faith of the Qiang people. Form factor 4 is taken from the shape of the drum in the sheepskin drum drum, which can be used for the upper hand part of the teaspoon. The background color is white, and the texture pattern of the sheep in Qiang embroidery is printed on it, reflecting the religious culture of the Qiang people and the sacrificial dance culture [20].

### 3 Conclusion

Starting from the dance culture of the Qiang nationality, this paper establishes a set of design factor extraction models and designs a set of porcelain tea sets for verification, which provides a research idea for the development and dissemination of cultural creative products relying on minority culture. Chinese minority cultures have a long history. How to use modern design knowledge and theory to explore the beauty in them, and to reflect and express it in modern design products is a long and significant task. Design runs through people's lives and makes up every bit of their lives. It endows the soul and beauty of the nation to design and let more people experience the beauty of the nation in their daily life. It is a successful design behavior, a successful business behavior, and an effective way to spread the culture of ethnic minorities.

### References


