Research and design application of the extraction of prototype factors in traditional cultural design

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Abstract: In order to inherit and protect traditional culture, enhance the creativity and cultural connotation of products, effectively narrow the cognitive gap between designers and consumers, and support the better development of cultural and creative industries, this paper proposes to use modern design methods to extract and research characteristic cultural factors based on traditional cultural characteristics. At the same time, modern analysis methods are used in the research process to construct factor extraction models and design factor perception maps according to certain rules, so as to solve the relationship between different design attributes and consumer preferences. The design team combines the whole process of cultural and creative product development to extract and design the combination of cultural factors such as form, color, and connotation, and verifies the feasibility of the research methods and test models. The results of this research will find out the key factors in the design of cultural and creative products of museum and provide reference for designers.

With the advent of the era of globalized knowledge economy and the improvement of national living demand level, cultural competition ushered in an unprecedented circumstance. This means consumer market has entered in an era emphasizing on culture and experience economy. Experience economy is a kind of service economy based on life and situation, focusing on users' sensory and consumption experiences and shaping emotion and thinking identity to capture users' attention and change their consumption behaviors. This kind of economy finds new survival values and spaces for commodities and realizing demand orientation characterized by user-centered and cultural perception. In the culture-driving era, product itself has no longer been the only concern of consumers. The culture contained in the product has unconsciously been the driving force for consumers to pay for it. There is no doubt that the value created by a brilliant product culture cannot be measured with money. Hence the design of cultural and creative product must take into account innovative approaches of design like cross-industries, grafting and integration, and constantly launch innovative aesthetic products with cultural basis.

The development of the cultural and creative products of the Palace Museum in Beijing triggered a trend of designing the cultural and creative products of museums. Experts point out that many cultural and creative products fail to accurately and faithfully convey the cultural and historical implication and improve the cultural connotation in the products. Culture had entered into the academic field since the middle of 19th century, and Edward Burentt Tylor in Briton came up with the definition of culture: culture is a sort of synthesis containing knowledge, belief, art, morality, law, custom, and other abilities and habits individuals acquired as members of a society. Hence the beauty of design of traditional culture lies in the culture and it is the respect but definitely not the appendage to the culture. From the perspective of design, any culture can be the product equipping with or producing infinite possibility. So the inheritance and materialization of traditional culture are reflected in artefacts and are realized by the symbol system of the products which belong to cultural products [1]. In order to enable traditional culture to better promote the design, creativity and cultural connotation in the products, organically integrate with modern design, and improve brand culture and carry forward national culture, this paper proposes a method of extracting cultural prototype factors and combine with traditional culture symbols to design, apply and verify the

designing process of characteristic cultural and creative products.

1. Research status of the design of traditional culture

Chinese traditional culture is one of the most influential and guiding cultures in the world. Since ancient China, the thought of Chinese people, experiencing thousands of years' national development, had left rich and high-quality cultural and artistic heritage, and had provided abundant related resources for cultural and creative designs, and thus traditional Chinese cultural symbol has become indispensable prototype factors in the design of cultural and creative products. The symbol contained in the gene form of culture in design is called design factor. Factor is a kind of cultural gene element, and an important component existing in design "cell" to send signals (in this case, cultural spirit) to control the inheritance and innovation of the designs [2]. Traditional Chinese culture has strong design factors, showing supernatural modeling ability, and fully possessing the basic characteristics of modern symbols. In which cultural graphics such as Tai Chi and Bagua (or the Eight Diagrams) integrate reality and fantasy, having strong modeling ability, and all the models are based in one concept: all the complexity comes from simplicity. Lao Tzu, founder of Taoism, said the Tao gives birth to one, one to two, two to three, three to all things..., suggesting the infinite possibility of the cultural factor design in traditional culture and the colorfulness of the design evolution [3]. At present, China's research team of Zhejiang University is exploring the brand characteristics in product family design and users' emotions, and based on which, they come up with research methods of product family design and extraction and application of cultural genes. This method provides important theoretical basis for researches of the extraction and application of the prototype factors in traditional culture. Traditional cultural design factors are represented as the langue of design symbols. Current researches on traditional cultural symbols mainly focus on studying the the product images of corporations and arts and crafts, for instance, Apple, Samsung and some outstanding automobile enterprises have formed the product identification of their own brand. Yet researches on the traditional culture in the design of arts and crafts mainly reflect references of forms and transformations of superficial styles, and there is a lack of systematic researches on characteristic cultural factors. Based on above researches, this paper would deeply study and analyze and extract traditional cultural factors, and come up with the extraction model of traditional cultural factors to better adapt the deep needs of the practicality of today's cultural and creative industry.

2. Extraction and analysis of prototype factors of traditional culture design

Under the rapid pace of economic development, Consumers' consumption view becomes impetuous and lost. However, when they calm down and reflect on themselves at this moment, they will find that there are just two kinds of consumption behaviors: rational consumption and emotional consumption. Emotional consumption needs to touch the heart, and cultural product design is a design form from life but higher than life. China's abundant traditional culture enables China's cultural and creative industry to cover various respects of life. This paper would serve as a overview of the cognition of traditional culture and the use of traditional culture in the design products and spaces, and describe the influence of cultural differences (background knowledge, memory, attention control, sensation, personality differences, and environment) based on the cognitive variables of the cultural factors and how these variables are used to explain the the concept of product and the culture and interactive interface design [4]. As the most common culture of human beings, cultural symbols are also the unique way of human behavior conveyed through design. From the original intention of symbols, design itself can be regarded as a sort of extension. In cultural and creative design, traditional cultural symbols or graphics must experience the process of recreation, which is also the fundamental problem to be addressed by cultural design.

2.1 Digging in the prototype of cultural factors

Cultural factors dig into the cultural prototype and its inner information to expand the borders of

its connotation and recreate on this basis, and the cultural factors contained in cultural prototypes are the starting point of triggering the recreation. In the thousands of years' inheritance and spread of Chinese traditional culture, the same starting point may lead to countless new creations, and these new forms will not separate from the cultural prototype. Looking at the form of Chinese traditional culture, it can be clearly recognized that the evolution of traditional cultural graphics in each period is not a complete negation of the original source, but a continuous enrichment and expansion. Cultural factors have realized the recreation process which is endowed with the characteristics of each era in a new form through rich design means [5]. Although the traditional cultural symbols have been processed and changed, many symbols have complex structures, which do not meet the demands of modern aesthetics and cannot be directly used. They have to undergo the secondary design process of refinement and generalization.
Drawn by the author

2.2 The method of extracting cultural factors

The method of extracting traditional cultural factors is mainly aimed at the traditional culture itself, analyzing and extracting the significant genes of features (forms, colors and patterns), next abstracting and transforming the extracted factors, and then self-constituting the changed factors and integrating them together. In this way, more unexpected factors can be obtained. Taking Chinese knot as an example, the Chinese knot is one of the most idealized graphic cultures created by the Chinese ancestors. It has been repeatedly evolved and applied between the concrete and abstract forms. With the progress of science and technology, people can refine and process cultural factors with the help of computer languages. As shown in Table 1, this is a process from disassembling to integrating, based on the reversing idea of the extracting cultural factors: whole-disassembling-integration, to obtain the language of forms.

Finally, analyzing the weight of factor features to obtain the most influential feature to the traditional cultural prototype in a bid to accurately extracting cultural factors.

Table 1: Extraction and analysis of traditional cultural factors based on cultural characteristics (take Chinese Knot as an example)

prototype	factor extraction	factor variation	self-constitution	mutual composition

Drawn by the author

3. Construction of cultural factor extraction model

The research of the design of traditional Chinese culture is a grand project. In this study, representative and typical cultural elements such as Chinese dragon, lantern, Chinese knot, the Six-Dynasty Culture and the Great Wall are selected as the main research objects, constructing the factor model based on the factor extraction of traditional culture factors, analyzing connotations of relevant factor symbols and the process of their graphic evolution, variation and isomorphism, finding the characteristics of these factor symbols, and finally digitally presenting the two-dimensional graphics and product rendering based on 3D models. The extraction of cultural factors is a transformation process from natural cultural form to abstract form and from the prototype to a new form and this sort of process is realized by creativity. There is nothing

immutable in nature. Every changes from seasonal change and the wax and wane of the moon to the metamorphosis of silkworms of egg-worm-cocoon-pupa-moth is a change of form [3]. This is also an inspiration for the creation in terms of traditional culture: culture form factors can be extracted through disassembling the process, and these factors contribute to conditions of innovation and creation.

3.1 The model of cultural factor extraction

Culture is always a human-centered symbolic activity and form and a behavior mode, while people are the creators and communicators of culture, and products are the communication media [6]. Therefore, the design should not be subject to the cultural pattern, but let the culture become a spiritual symbol as an aesthetic form. As shown in figure 1, "factor" is the basic unit of modelling and any product must be constituted of factors. Chinese traditional culture is constituted of factors of national and regional traditional symbols. Modern modelling ideas and methods are applied to constitute and transmute the cultural prototype. Starting with traditional culture prototypes, this model spark imagination with the help of various factors; based on the understanding of cultural prototype and recognizing the variable factors of cultural archetypes, relevant factors are extended and transformed to generate new forms; the trade-off disassembling is performed and the transmuted factors are recombined and remodified, and the exploration of a brand new form is completed. In this process, through association-inspiration-disassembling-integration, the cultural factors go through the process of secondary abstraction, tertiary abstraction, etc., and are further shaped by modern art design techniques, and the traditional culture based on the prototype is recreated in line with modern aesthetics.
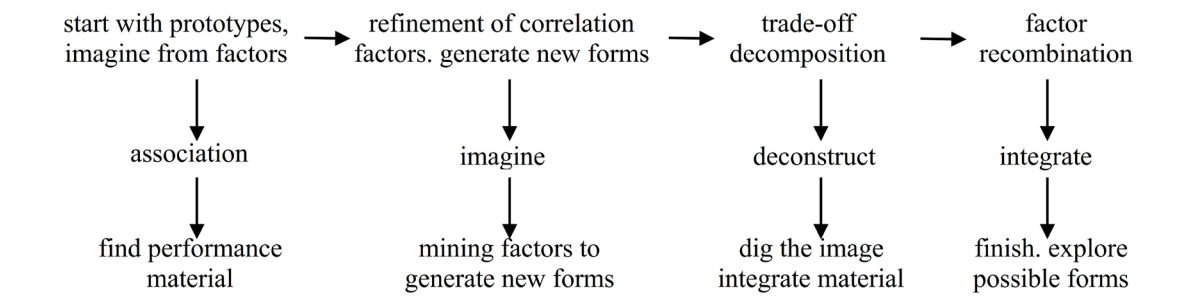
Drawn by the author

Figure 1: Extraction model of traditional cultural factors

3.2 Identification of cultural factors

Cultural design factors are the core function of the design objects of cultural identification, which requires design factors must have knowledge carrying and passing ability of a certain culture, and at the same time users' identification barriers should be considered in the process of factor extraction and creation, so that the "origin" and "extension" of cultural symbols are related to extension and connotation, and consumers can feel the existence of their cultural spirit [7].

4. Design application - taking the cultural and creative design of the musical band figurines from the Six Dynasties as an example

Cultural and creative product designs do not directly transfer culture and its elements to products. Needless to say, the characteristics of cultural and creative design are nothing more than creation—that is, a more avant-garde and more suitable for the market demand process of purification and simplification, namely, simplifying and cutting unnecessary elements and only the essence left, such as the design of the chair: four legs (or even less), a seat, and a backrest connected with the armrests, and this is a complete chair [8]. As shown in Figure 2, the abstraction in cultural and creative design is the generalization and refinement of the concrete object, so that the

performance of the product dissolves the external figurative outlines and details of culture and becomes highly symbolic. From the evolution of Picasso's Cow, we can understand the meaning of abstract refinement and simplification of cultural elements. After mastering the symbol of essential characteristics, the external image and object image of concrete prototype are completely got rid of, which is actually the use of the inner manifestation of prototype reflected in symbolic symbols.
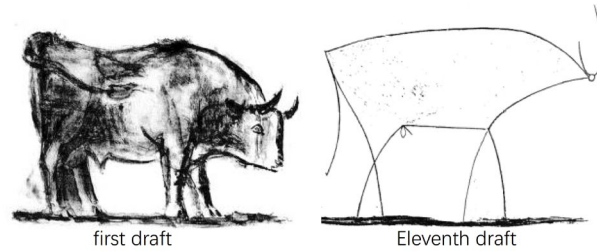

first draft   Eleventh draft

Figure 2: The evolution of Picasso's "bull"

## 4.1 Case-based cultural and creative design process

According to the above analysis results, taking the Six Dynasties figurines as an example, cultural analysis, factor extraction, evolution, integration and innovation are carried out. Firstly, researches and analyses on the culture of the Six Dynasties period are conducted, a large amount of background information (books, museums, and the Internet) are collected, and extract characteristic factors based on the characteristics of summarization and meanwhile analyze the appropriate function of the product as a carrier. Secondly, redesign the extracted available factors, conduct visual and functional correlation research and evaluation between the factors and the product carrier, and screen out the optimization plan. Finally, use the design method to properly integrate the cultural factors and the product carrier, as shown in Figure 3.
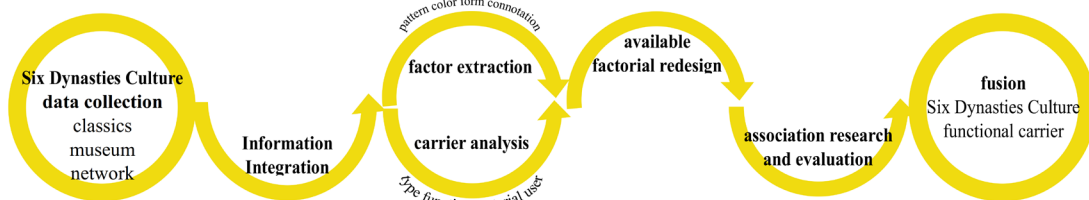
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Figure 3: The cultural and creative design process of the Six Dynasties figurines

4.2 Cultural factors extraction framework
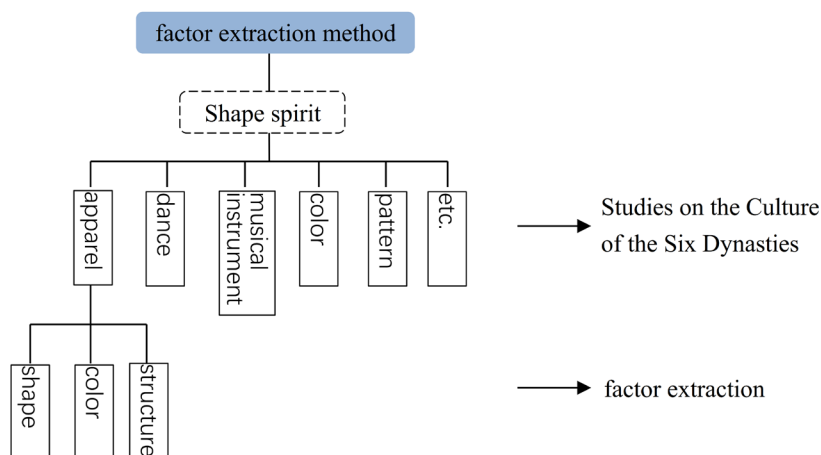
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Figure 4: Framework of cultural factor extraction

Based on the above understanding of "prototype" and "essence", the characteristics of cultural factors are extracted from the two aspects of "shape" and "spirit", as shown in Figure 4. The surface element of the external "shape" is a specific and materialized form, and is mainly an innovation of the prototypes of costumes, dances, daily utensils, musical instruments, colors, patterns, etc. The outline or partial form of the archetype of the musical band figurines is served as a reference, as well as the pattern and color matching of the costumes of the Six Dynasties are used in color and pattern. However, the extraction of the inner essence "spirit" is invisible and abstract, mainly exploring the humanistic spirit and cultural mood of the Six Dynasties period, including human civilization, regional characteristics, national culture, traditional customs, etc. These inherent "spirit" transcend the appearance, conveying the human civilization, prosperity and spiritual outlook of the Six Dynasties to future generations.

4.3 Evolution of factors

The continuation and development of cultural factors in current product design is not simply copying the prototype, but creatively presenting cultural symbols to meet the aesthetic needs of modern society. The information extraction of factors is to consciously process the prototype and then disassemble and convert, break up and reconstruct, replace, and transform, etc. according to a certain direction, structure and other rules [9], and there is still an inherent and essential correlation existing with the prototype to create accurate modeling symbols, and then achieving psychological resonance with the audience [10].

Researches on the cultural prototypes of the Six Dynasties period like utensils, culture, costumes, music forms, musical band figurines, colors, patterns draw an analytical conclusion that the Six Dynasties period was a period of complete spiritual liberation, and the music forms, costumes, colors, etc. all reflected the openness, inclusiveness and relatively advanced regional civilization of this period [11]. Therefore, in order to not affect the characteristics of overall style, when factor extraction and variation are performed on the prototype of the musical band figurines on the basis of information integration, in accordance with the prototype characteristics, changes strictly follow the dynamism, proportional relationship, and clothing elements, as shown in Table 2. In the model of extracting characteristic factors, rational logic analysis and sentimental analysis are combined. Method 1: Reorganize the factors to convey information on the basis of imitating and borrowing the existing prototypes of musical band figurines; Method 2: Combining cultural factors into abstract products with functional significance directly according to the cultural theme of the design to spread certain emotional information. The prototype of the Six Dynasties figurines is interpreted from the perspectives of vision and connotation, and effective design factors were obtained, and the meanings of the figurines were fully reflected in modern household products, so that the prosperous Six Dynasties culture could be extended.

Table 2: perceptual map of design factors of the Six Dynasties figurines

NO.	a1 a2 a3 a4 a5 a6	b1 b2 b3 b4 b5 b6	c1 c2 c3 c4 c5 ....
design factor		earthy-yellow gray-blue crimson light-blue medium-green dark-brown	
semantics	elegant dignified solemn cool beautiful lively soft tall calm noble smooth rhythm	brisk calm solemn energetic wise friendly healthy generous enthusiastic bright deep modest	broadband informality, freedom free and easy flowy natural

Drawn by the author

4.4 Design scheme

Design and research are conducted from the two levels of "shape" and "spirit" of the musical band figurines from Six Dynasties, to extract the characteristic cultural factors of the Six Dynasties

period, and to realize the diversified expression of cultural factors. The extraction of the "shape" is mainly based on the characteristic factors of the characters, artifacts, costumes and other archetypes from the Six Dynasties; the extraction of the "spirit" mainly focuses on the essential characteristics and cultural artistic conception contained in the musical band figurines of the Six Dynasties [12]. Comprehensively explore the two levels of "shape" and "spirit", and adopt the method of factor perception map in Table 2 for formal presentation, so as to realize the diversified transmiission of the culture of the Six Dynasties.

During the evolution process of the shape of the figurines of the Six Dynasties, a large curvature base was used at the bottom to make the design appear to be vigorous and magnificent. At the same time, on the basis of maintaining the basic functions of the product, a series of household items (chopstick containers, tea containers, toothpick boxes, sticks fruit, tea maker, business card case) were innovatively developed. This series of products accurately captures the characteristic information of the prototype factors of the musician figurines. On the basis of certain changes, it records every move, frown and smile of the figurines, which meets the needs of household goods in terms of function. Meanwhile, the characteristics of the costumes of the Six Dynasties are analyzed and refined, and the design results are shown in Figure 5. From this design, it can be seen that the design scheme is in line with the cultural factors, the characteristics and semantic description of the cultural factors, and has the visual characteristics of modern home furnishing. This series of furniture products is chosen as the carrier because this series of products is the most commonly used in home life, and each single product contains profound meanings. When the lifelike ancient figurines meet modern civilization, it evokes people's memories of the civilization of the Six Dynasties, and further experience the lasting culture of the Six Dynasties

Designers: Pan Siyu, Kang Hongna, Yao Ziqian

Figure 5: series homeware design

5. Conclusion

After years of historical changes, from the Pre-Qin period to modern times, China's cultural creativity has also experienced the evolution and development of various periods, and all walks of life are trying to discover and seek the beauty of cultural and creative design. There may be a beautiful legend behind a tree or a stone, a song or a piece of lyrics may be telling a beautiful story, and a work of art may be expressing a certain complex... Here, an extraction and analysis method based on cultural factors such as patterns, shapes, colors, and connotations in traditional culture is proposed, so that the excellent traditional culture that is increasingly forgotten by people in China can be effectively expressed through products that are closely related to people, and can penetrate into people's daily life by integrating modern aesthetic elements, realizing the communication between traditional culture and modern products, and providing a way of thinking and method for excellent cultural inheritance and cultural and creative product design.

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