Tongshan Wood Carving Innovative Design Based on Kano Model

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Abstract -- Objective: To explore users' preference for Tongshan wood carving and provide new design ideas. Methods: The three levels of culture theory was used to construct the user's demand level for Tongshan wood carving innovative design, and the Kano model was used to analyze the user's preference for each demand index; Results: The high sensitivity demand index was obtained, and the key points of cultural design of Tongshan wood carvings were analyzed. Conclusion: Based on the precise analysis of regional traditional culture and user needs, it not only promotes the development of regional traditional culture, but also endows products with aesthetic value.

Keywords - Kano model; analysis of the model; innovative design; Tongshan wood carving

1 Introduction

Tongshan wood carving is one of the Chinese folk wood carving schools. In 2014, Tongshan wood carvings were listed in the representative project list of national Intangible Heritage by The State Council. As an important intangible cultural heritage in China, Tongshan wood carvings have a glorious history. According to Tongshan County Record: "Shunzhi emperor fourteen years and sixteen years, class craftsmen set sail to Nanjing in addition to escape from the expulsion of the external class craftsmen ten people", in addition, Tongshan wood carvings have been exported to Singapore and Malaysia in large quantities. However, in recent years, with the change of people's living habits and value orientation, the development of Tongshan wood carving has been gradually affected. It is mainly divided into the following aspects. In terms of the traditional application scope of Tongshan wood carving, concrete modern buildings have completely replaced traditional wood structure buildings, and artificial wood furniture has replaced traditional carved furniture, and the use of Tongshan wood carving in sacrificial utensils has also gradually decreased; In terms of inheritance, the traditional craft of Tongshan wood carving has few successors; In the aspect of modern technology, with the development of industrialization, mechanization and mass production has become the normal state of product production, destroying the "manual" foundation of Tongshan wood carving; In terms of market sales, Tongshan wood carvings adapted to the living customs and aesthetics of Tongshan people at that time and developed together, but now Tongshan wood carvings are

difficult to be accepted by young consumers in the city. How to adjust the new ideas, from the perspective of user demand to explore Tongshan wood carving innovative design of the new path is particularly important.

The paper analyzes and constructs the innovative design of Tongshan wood carving from the following two aspects: in the early stage, the demand attribute is established with the three-level theory of culture, and the user demand is analyzed and the key needs of users are screened based on the Kano questionnaire survey; The latter part is a summary of the key points of Tongshan wood carving innovative design based on preliminary investigation and analysis. Specific research ideas are shown in Table 1.

Table 1 Research ideas

Earlier stage				Later period
Demand analysis		Analysis of design elements		
Hierarchical modeling requirements	The Kano model filters key requirements	Cultural characteristics of wood carving; Analysis of screening	Extracting design elements	Summary of design points

2 Construction of demand levels

Leong et al. proposed a three-level cultural framework for the study of cultural product design, which divides the cultural space into external level, intermediate level and internal level. On this basis, Lin corresponds the three levels of cultural space with each element of product design to form the product attributes of three cultural levels. Bao Defu combines it with cultural image and puts forward the theory of three levels of culture. This paper summarizes the characteristics of Tongshan wood carving art by market survey, literature collection and other methods. Based on the methodology of three cultural levels, the demand attribute of Tongshan wood carving is further extended and divided into three levels: external "material level", intermediate "use behavior" and internal "ideology". The attributes of three levels of culture are shown in Table 2.

Table 2 Demand levels of Tongshan wood carving

| Division of cultural level	Number	Level 1 Cultural product attributes	Level 2 Cultural product attributes
External "material" level	01	style	fresh and elegant
	02	pattern design	traditional realistic and vivid decorative patterns
	03	texture	retain the natural texture and color of logs
	04	modelling	simple and generous
	05	gradation	rich and exquisite
intermediate "use behavior" level	06	practicability	specific utility function
	07	manufacturing technology	traditional handicraft production method
	08	safety in use	ensure the use of safety
	09	adorn ability	with decorative function

	10	allegorical	with implied meaning
Internal "ideological" level	11	cultural connotation	embody the cultural connotation of Tongshan wood carvings
	12	collection value	with collection value
	13	exclusive customization	with exclusive custom products
	14	exclusive packaging	with exclusive packaging
	15	tour memory	evoke tour memory

3 Application analysis of Kano model

3.1 Kano model

Kano model is a model used to identify user needs and classify them, and finally obtain the key requirements. By establishing a bi-dimensional cognitive model between consumer satisfaction and product quality factors, this model can show the non-linear relationship between the two and categorize user needs into the following five categories (see Table 3): Must-be Quality, one-dimensional Quality, Attractive Qualiy and Indifferent Quality, re-verse Quality. Among them, the basic attribute M refers to the fact that the possession of this attribute will not affect the satisfaction of users; Expectation-type attribute O refers to that with this attribute, user satisfaction will improve, otherwise, it will decrease; Charismatic attribute A refers to that the possession of this attribute can improve user satisfaction, but it has no influence when it is not possessed. Indifference attribute I refers to the fact that whether it is possessed or not has no impact on users' satisfaction; The reverse attribute R refers to that the user's satisfaction will be reduced when this attribute is possessed, otherwise it will increase.

Table 3 Kano model of Tongshan wood carving innovative design
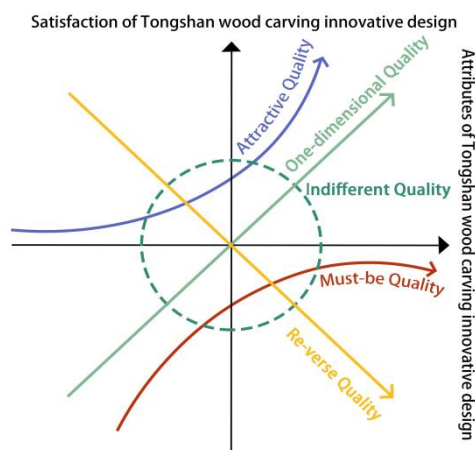
3.2 Application analysis of Kano model

The application of Kano model is as follows: Firstly, the questionnaire is designed, which is divided into three parts: the first part is the collection of basic personal information of the respondents, the second part is the research on the purchase intention of Tongshan wood carving innovative design, and the third part is the research on the demand for Tongshan wood carving innovative design based on Kano model. Therefore, the important part of the questionnaire is to set two kinds of positive and negative questions respectively according to the 15 specific user demand indicators obtained from the three-level theory of culture and the artistic characteristics of Tongshan wood carving, so as to obtain the evaluation of different design attributes of the respondents. The scale of answer options includes "satisfied", "taken for granted", "indifferent", "tolerable" and "dissatisfied". Secondly, according to the evaluation criteria of Kano model (see Table 4), attribute classification of user needs is carried out; After the calculation of user needs, the demand indicators are obtained:

Table 4 Evaluation criteria of Kano model

User attitude on demand	Reverse problem: Product does not meet user needs					note
	scale	satis fied	taken for granted	indiff erent	tolerab le	dissatis fied	A: Attractive Quality M: Must-be Quality O: One-dimensional Quality R: Re-verse Quality I: Indifferent Quality
Positive questions: Products meet user needs	satisfied	-	A	A	A	O	
	taken for granted	R	I	I	I	M	
	indifferent	R	I	I	I	M	
	Reluctantly accepted	R	I	I	I	M	
	dissatisfied	R	R	R	R	-	

Find index satisfaction coefficient -Better; dissatisfaction coefficient -Worse. The specific formula is as follows, where: A, O, M and I respectively represent the frequency of attribute indicators of Attractive Quality, One-dimensional Quality, Must-be Quality and Indifferent Quality.

$$Better = \frac{A+O}{A+O+M+I}$$
$$Worse = -1 \times \frac{M+O}{A+O+M+I}$$

A total of 123 questionnaires were sent out in this survey, and 100 qualified questionnaires were obtained after removing unqualified ones, with a pass rate of 81.3%. Among the respondents, most of them are teachers and students in school, design and art practitioners and other interviewees of different professions who are interested in buying innovative designs. Most of them are 18-45 years old. Among them, in the early stage of the analysis of the

purchasing intention of the respondents, it is found that the wood carvings that the respondents are most willing to buy are daily necessities that are both practical and decorative, accounting for 62.22%, and those for self-use account for the highest proportion, accounting for 84.44%.

Table 5 Kano attribute classification of Tongshan wood carving innovative design demand index

Classification	Number	User demand indicators	Percentage (%)					KANO attribute	Coefficient - Better	Coefficient - Worse
			M	O	A	I	R			
External "material" level	1	style	0.09	0.34	0.29	0.28	0.01	O	0.63	-0.43
	2	pattern design	0.35	0.25	0.23	0.21	0	M	0.48	-0.6
	3	color	0.13	0.27	0.38	0.21	0.01	A	0.65	-0.4
	4	modelling	0.07	0.13	0.21	0.58	0.01	I	0.34	-0.2
	5	gradation	0.18	0.16	0.39	0.30	0	A	0.55	0.34
intermediate "use behavior" level	6	practicability	0.5	0.27	0.1	0.13	0	O	0.37	-0.77
	7	manufacturing technology	0.06	-0.43	0.21	0.3	0	O	0.64	0.49
	8	safety in use	-0.17	0.47	0.19	-0.17	0	O	0.66	0.64
	9	adorn ability	0.1	-0.17	0.38	0.35	0	A	0.55	-0.27
	10	allegorical	0.13	0.37	0.3	032	0	O	0.67	-0.5
Internal "ideological" level	11	cultural connotation	0.32	0.28	0.19	0.1	0	M	0.47	-0.6
	12	collection value	0.22	0.34	0.2	0.24	0	O	0.54	-0.56
	13	exclusive customization	0.23	0.1	0.4	0.27	0	I	0.5	-0.33
	14	exclusive packaging	0.15	0.25	0.32	0.28	0	I	0.57	-0.4
	15	tour memory	0.07	0.1	0.39	0.44	0	I	0.49	-0.17

The demand data of users for the innovative design of Tongshan wood carving were summarized, the Kano attribute classification was carried out for 15 user demand indicators, and the Better-Worse coefficient was calculated. The results are shown in Table 5. There are 2 basic type (M) indicators, 6 expectation type (O) indicators, 3 glamour type (A) indicators, 4 non-difference type (I) indicators, and 0 reverse type (R) indicators.

3.3 Analysis of Kano model

By drawing the sensitivity scatter diagram of user demand indicators, as shown in Table 6. Priority ordering can be obtained more intuitively. Taking better value as abscissa and Worse value as ordinate into rectangular coordinate system, 15 demand coordinate points are obtained. The circle is then formed with the origin O as the center and the radius from O to P (the point with the Better and Worse averages). The index outside the circle is highly sensitive,

and it is higher than the low sensitive index within the circle. The farther the index is from the circle, the more sensitive it is. From this, you can determine the priority ranking, as shown in Table 7. As can be seen from Table 7, 10 user demand indicators are highly sensitive and 5 are low sensitive. In the design process, high-sensitivity indexes should be given priority, while low-sensitivity indexes should be considered as secondary indexes, as shown in Table 7.

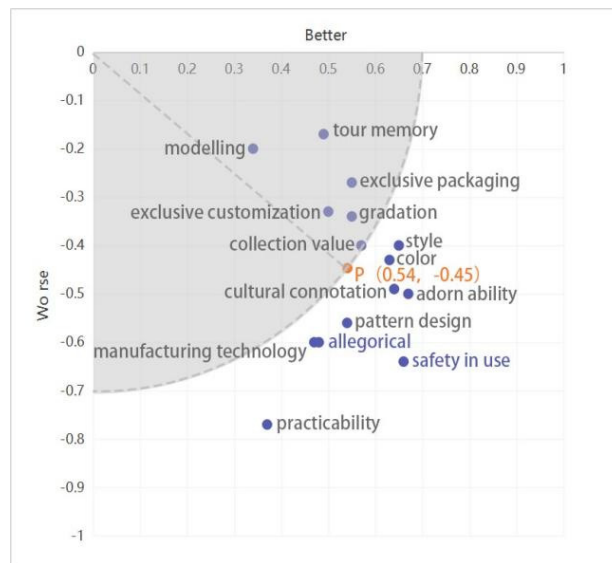**Table 6** Sensitivity scatter diagram of user demand index in Kano model

Table 7 Ranking of sensitivity of user demand indicators

Sensitivity sequencing	Attribute types	Demand number	user demand	sensitivity
1	O	8	safety in use	High sensitivity sensibility
2	M	6	practicability	
3	A	9	adorn ability	
4	M	11	cultural connotation	
5	A	2	pattern design	
6	O	10	allegorical	
7	O	1	style	
8	O	3	color	
9	A	7	manufacturing technology	
10	O	12	collection value	
11	M	5	gradation	Low sensitivity sensibility
12	O	14	exclusive packaging	
13	I	13	exclusive customization	
14	I	15	tour memory	
15	I	4	modelling	

4 Conclusion

According to Kano model, consumer preferences of Tongshan wood carvings are obtained. According to the research results of Tongshan wood carvings in the early stage, it is concluded that the type of wood carvings that consumers are most inclined to buy is daily necessities. And most users want the product to be both practical and beautiful. In Tongshan wood carving demand indicators, users are most concerned about the use of safety, practicality, decorative. The second is the cultural connotation, pattern design, allegory, style, color, production technology, collection value. After analysis of the above ten needs, we can sum up three design points: traditional craft, decorative art and safety and practical.

(1) Traditional craft

In the design process, the performance of traditional craft reflects the external "material" level of cultural attributes, among the three cultural indicators with high sensitivity, only "pattern design" belongs to the Attractive Quality, which has a high attraction to users, and should be mainly considered in the design process.

The traditional decoration of Tongshan wood carvings is very distinctive and diverse. People, animals and plants are common themes in wood carving. The theme of characters drama stories is an important theme in the decorative patterns of Tongshan wood carving, which comes from the development of drama culture at that time. In the decorative themes of movable plants, different pattern designs often represent different meanings, and their auspicious meanings are often expressed through homo phonic and symbolic techniques. In addition, there are also some traditional Chinese pattern designs, such as curly grass pattern, zigzag pattern, zigzag pattern, ice crack pattern, "福" pattern(refers to luck), "longevity" pattern, "卐" pattern and so on. Most of them are complementary to the main pattern. The patterns of Tongshan wood carvings are of high artistic value. Their fine carving techniques, clever modeling, unique composition and rich plots make Tongshan wood carvings famous for "seeing drama in paintings, never getting tired of it". The design and application of Tongshan wood carving pattern can not be simply transplanted into innovative design, but to retain the traditional basis, and adopt the method of reconstruction and reconstruction in the design.

Tongshan wood carving style as a whole presents a fresh and plain state, which is inseparable with its color form. Tongshan wood carving will retain the color of the wood itself in the treatment of color, pay attention to the natural texture of wood, only use tung oil for anti corrosion treatment on the wood surface, the overall color is light and simple and elegant. As their "style" and "color" belong to the One-dimensional Quality, the application of these two parts can be reserved in the process of innovative design.

(2) Decorative art and safe practical

Decorative art and safe practical reflect the cultural attributes of the middle "use behavior" level and the internal "ideology" level respectively. Among the remaining 7 highly sensitive demand indicators, "decoration" belongs to the Attractive Quality, which needs to be considered. "Cultural connotation" belongs to the Must-be Quality, "practical", "implicated", "use of security", "collection value" and "process" belongs to the One-dimensional Quality, and most of the indicators gathered in the second layer of "use" behavior level, indicating the user pay more attention to is to use the experience, should be consider in the design.

Therefore, in the design process, the first thing to start from experience. On the premise of ensuring sensitivity as the first priority and safety in use, we find a balance point between tradition and product to interpret Tongshan wood carving culture. This makes Tongshan wood carvings both cultural and practical, making them different from traditional handicrafts. In addition, it is necessary to pay more attention to emotion and retain the intangible culture in a perceptive way so that users can feel and understand the culture conveyed by Tongshan wood carvings.

Epilogue

Tongshan wood carvings contain thousands of years of tongshan people's unique cultural atmosphere and artistic aesthetics. Like many traditional handicrafts, Tongshan wood carving and Tongshan people are facing industrialization, talent fault and other problems. This paper tries to use Kano model to classify and sort the needs of users, and summarizes the key points of the design, which is scientific, effective and feasible innovative design planning, and also contributes to the spread and development of Tongshan wood carving.

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