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The Big Data Thinking in Furniture Innovative Design Under the Environment Configuration of Modern Chinese Houses

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Abstract: - "Big data" is a popular word at present, and its application in various industries has gradually become widespread. In the furniture industry, the application effect of big data in the market is more and more prominent, and the great value brought by big data to furniture enterprises is also more and more obvious. How to use big data to obtain the information advantage brought by big data is also an important problem faced by furniture enterprises. This paper introduces the application and application methods of big data in new furniture design, and discusses how furniture design can effectively use big data to seize market opportunities and achieve new business development. This paper discusses how to apply more extensive data thinking in furniture design, model development and subsequent design to improve product innovation design, so as to provide effective reference for the new development of furniture design. At the same time, we explored innovative furniture design in combination with reality, and found that using big data can effectively enhance the pertinence of furniture design and optimize user experience.

Keywords: Big data; Furniture innovative; Design modern Chinese.

I. INTRODUCTION

Large scale data gain insight and new value by combining new systems, tools and models to extract large, dynamic and continuous data [1]. The four typical signs of big data are large data volume, large data type, large demand for real-time data, and large data value. Through technological innovation and development, big data provides the world with a new method different from the past by sensing, collecting, analyzing and sharing data. This method will not rely on experience and intuition to make decisions, but will make corresponding behavioral decisions based on the analysis of relevant data [2]. Today, big data has penetrated into every industry and functional activity field and become an important factor of production. Many traditional industries are also being swallowed up and reshaped by big data, and the furniture industry, as a typical traditional industry, is certainly no exception [3]. At present, the key to the development of furniture enterprises lies in the analysis and processing of the massive data collected, and the effective use of information in management and operation. The effective application of big data will be the foundation for furniture enterprises to compete and grow in the future.

Chinese traditional furniture has a long history, complete categories, exquisite craftsmanship, and has high practical and artistic value. In the process of the development of traditional furniture, its craftsmanship plays an important role. Judging from the material achievements of the remaining traditional furniture, traditional furniture crafts mainly include mortise and tenon craftsmanship, weaving craftsmanship, lacquer craftsmanship, carving craftsmanship and inlay craftsmanship [4]. As a result of the long-term running-in between people and the living environment, traditional furniture craftsmanship has gone through different stages such as the budding period, the development period, and the active period. Its development process contains excellent creative ideas, profound cultural connotations, and unique local characteristics. Since the 20th century, great changes have taken place in people's living space, life etiquette and living conditions, which have also changed the scale, organizational elements, and combination of furniture [5]. However, during this period, traditional furniture basically continued the old materials and shapes, and could not interact with modern people's lifestyles, thinking, emotions, and aesthetic needs. At the same time, it was difficult to be accepted by the society and the market. In this regard, the static protection and passive maintenance of traditional furniture craftsmanship in China may be difficult to make it out of the fate of becoming a historical specimen [6]. In this case, innovative design based on traditional furniture craftsmanship becomes a way worth exploring.

Traditional furniture not only has the function of use, but also contains the unique cultural characteristics and life etiquette traditions of China. With the changes of the times, the aesthetic views and ideological values expressed by traditional furniture also change, and its production and design should also keep pace with the times [7].

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Therefore, traditional furniture craftsmanship should make full use of new technologies, new materials, and new craftsmanship, and combine it with modern life and fashion needs, and activate its new vitality through modern expressions, so that it can be established with people's production and life with a new look. more closely linked [8]. In this way, on the one hand, it can realize the inheritance of traditional furniture craftsmanship, expand its living space, and at the same time increase the social influence of traditional furniture craftsmanship. On the other hand, it injects the vitality of innovative design into traditional furniture, realizes productive protection, and interacts with people's new way of life, thoughts, emotions, and aesthetic needs, so that it can enhance its adaptability in the modern economic and social model and at the same time truly to meet the needs of modern people's life, so as to always show their own value in the ever-changing era. This is the most important research significance of this paper.

II. RELATED WORKS

Chinese traditional furniture has a long history, has high cultural value and use value, and has high reference value in the field of modern furniture design [9]. In the innovative design of new Chinese-style furniture, on the one hand, the aesthetics of the Chinese Dynasty has gradually entered people's field of vision, and innovative designs of Chinese-style furniture have emerged one after another [10]. In the graduation exhibition of Guangzhou Academy of Fine Arts in 2015, the "Undyed" team brought people back to the self-cultivation life of Chinese Dynasty people with Chinese tea and meditation [11]. Zen meditation series furniture, uncharacteristically, does not care about comfort, just to let people in the world "purify the impetuousness with meditation, and establish a market without pollution". The whole design is based on the cultural background of the Chinese Dynasty, in which elements are extracted [12]. Among them, "Zen Bed - High Mountains and Flowing Water" and "Coat Rack - Clouds Rising", after repeated consideration of the fine architectural structure of the Chinese Dynasty and the calligraphy fonts of Chinese Huazhong Junxia, the thin gold body was selected to express the design connotation with its charm as the overall shape Language elements [13]. At the same time, the series of furniture also wants users to re-experience the poetic slow life of Chinese people of "arranging flowers, hanging pictures, ordering tea, and burning incense". The design of the whole set of furniture is guided by the unique life taste and aesthetic taste of Chinese Dynasty society and is full of the light and elegant style characteristics of Chinese Dynasty furniture, which not only brings some freshness and comfort to modern life, but also allows the influence of Chinese culture to continue to contemporary society.

The development of ancient aesthetics can be said to have reached its peak in the Chinese Dynasty. In the aesthetics of the Chinese Dynasty, simple circles, squares, plain colors, and textures were the most important to express the beauty of elegance and simplicity[14]. Minimalism is now emphasized in various design styles, and the aesthetics of the Chinese Dynasty embodied the earliest minimalism. The elegant aesthetic tendency and style characteristics of Chinese furniture are the perfect condensation of the aesthetic concept of simplicity and elegance of the literati and scholars of the Chinese Dynasty on the furniture and living utensils[15].

As shown in Figure 1, Xiyu leisure chair series Chinese style furniture is born based on Chinese aesthetics, inheriting the minimalist lightness and elegant elegance of Chinese aesthetics, and on this basis, it is modernized, fashionable and practical. The orange leather chair surface is matched with a wooden frame with simple lines, supplemented by metal accessories. The design fully considers the requirements of ergonomics, and fully integrates the aesthetic elements of modern furniture into the traditional Chinese oriental design aesthetics [16].

Fig. 1 Chinese Feng Furniture

On the other hand, for Ming-style furniture, there is always no shortage of excellent designs. As one of the earliest original furniture brands in China, the design style of Suyuan always naturally reveals a little calm and Zen, and the works also have their own understanding of the philosophy of life (Figure 2). The Run series of home products "Run Single Sofa" and "Run Arhat Bed" convey the understanding of the ancient people's approach to life, and at the same time inherit the mellow and simple design language of Suyuan [17]. The hollow frame shape of "Single Sofa" is simple and not shabby and has a great architectural aesthetics. At the same time, the seat surface gently sinks from the outside to the inside, and the curved grille has natural support for the back and head. In terms of materials, the gray soft-packed seat cushion and the calmness of North American black walnut are selected to form a just right contrast [18]. The "Run Arhat Bed" continues the basic shape of the Ming-style Arhat bed. The original design and decoration are simplified, and the components are combined through the traditional and classic tenon-and-mortise structure. The simple frame structure expresses a gentle and restrained expression. design style.

Fig. 2 Run single sofa, Run Lohan bed

In addition, Oppo, an original brand that is committed to making each piece of furniture with art-level collection value, has also made a new attempt on Ming-style furniture from the perspective of materials. His works use almost line drawing techniques to outline the charm of Ming-style chairs with just a few strokes. Simple, but concise. Its design adheres to the design concept of being pure in heart and extracting in shape and inherits the morphological characteristics of Ming-style furniture, which is simple, clean, peaceful, and quiet. The perfect combination of modern life.

However, as far as the overall status quo of the modern and innovative design of traditional Chinese furniture is concerned, there is a lack of novel and individual furniture artistic expression in terms of the design expression; in the spirit of design, there is a lack of sufficient originality; in terms of the way of use, traditional Among the innovative furniture designs of China, there are also many furniture products that do not fit well with modern lifestyles (see Figure 3). Some products blindly respect the retro, and directly apply the traditional furniture form, which is not conducive to the protective inheritance and innovative development of my country's traditional furniture culture. From the author's point of view, good inheritance is not just about following "classics", but also having both cultural connotations and functional functions, and being able to truly base itself on reality, boldly take the essence of it, get rid of the dross, advance reality, and create the future.

Fig. 3 Related Chinese furniture

Domestic scholars began to study the theoretical system of Chinese-style furniture earlier. With the passage of time, Chinese-style furniture has derived a genre of modern Chinese-style furniture that is more in line with modern aesthetics. Beginning in 2001, domestic academics began to study the modernization of Chinese-style furniture. [19]. Its content ranges from conceptual research to actual combat design research. In [20], it puts forward his views on Chinese furniture, one is the re-creation of traditional Chinese furniture in line with modern concepts, the other is the exploration and research on modern aesthetics, and the research results are applied to modern Chinese furniture with Chinese characteristics [21]. In[22], through the study of the characteristic tenon and mortise technology of Chinese furniture, and from the perspective of tenon and mortise structure, he analyzed the symbolic representation concept of traditional furniture. In the design articles about the stylization of Chinese-style furniture, they mainly study the role of Chinese-style patterns in addition to decorative aesthetics, but also to express humanistic information under Chinese-style culture[23].

Simple disassembly and reassembly should be combined with aesthetic principles and rational thinking. The control of modern aesthetics determines whether the reconstructed furniture can be accepted by users. Reconstruction should also ensure its high-quality rhythm and rhythm rich in Chinese culture [24]. Comparing Nordic-style furniture with Chinese-style furniture, different design ideas for modern furniture are proposed: 1) Chinese-style furniture should integrate Chinese design elements. 2) Under the guidance of modern environmental protection ideas, Chinese furniture should pay attention to the selection of materials and the protection of wood species. 3. Accept and pay attention to modern innovative ideas. Based on national elements, it is proposed to select the modeling symbols of national characteristics and carry out modern ideological processing and material selection. It is proposed to combine it with modern humanistic characteristics to explore new channels for the development of Chinese furniture.

Time has entered the 21st century, and the rapid development of Internet technology has made information dissemination greatly break through the limitations of the past in terms of time and space. The transition from the post-industrial age to the information age has triggered profound changes in the economic and social pattern. Efficiency, speed, and diversification have become the main theme of the times, which also reflects people's ideas, lifestyles, aesthetic tastes, and other aspects. In the field of consumption, the cyclical and ever-changing fashion trends and fashion trends have put forward higher and higher requirements for producers, and it is a kind of "baptism" for traditional furniture craftsmanship. It is increasingly recognized that to realize the productive protection of traditional furniture craftsmanship in contemporary times, it is necessary to enter a new stage of exploration in terms of design innovation and production methods. On the one hand, we should make full use of advanced modern technologies, concepts and methods, give full play to the penetration, maintenance, activation and radiation of creativity to cultural heritage, so that the spirit of creation contained in traditional furniture craft culture can become the motif and source of inspiration for creativity, and through modeling , materials, craftsmanship, tools, functions and other aspects of the re-creation, so that it responds to people's new lifestyles, thoughts and emotions, aesthetic needs, and rejuvenates the glory of the times; on the other hand, actively explores the way of industrial development in the new era, In this way, on the basis of enhancing its own adaptability, the craft cultural heritage can be truly integrated into the modern economic and social life. In recent years, in the context of the vigorous development of the creative industry, more and more innovative explorations based on traditional furniture craftsmanship are being carried out. These practices provide reference and inspiration for the productive protection of traditional furniture craftsmanship and are worthy of attention and consideration by researchers.

III. METHODS

Furniture product design is a scientific and standardized process. After the creation of the creative point, through the research of the market environment, the establishment of target users, the collection of user information and scenarios, and the integration of constraints and favorable resources, as shown in Figure 4. Through the analysis of the above data, the design goals, strategies, and schemes are obtained. Finally, through the confirmation of the design and the implementation of specific projects, the product is landed, and the results are verified.

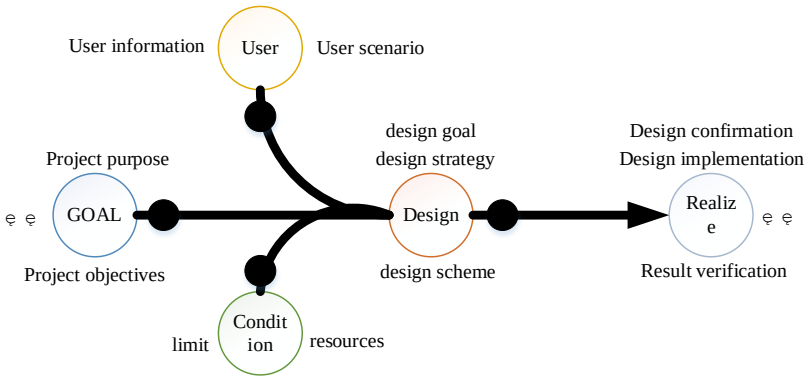

Fig.4 Furniture product design process

A. Basic Concepts of KANO User Requirements Model

In the early 1980s, Professor Norimaki Kano and his colleague Fumio Takahashi jointly published "Quality Hygiene Factors and Motivating Factors" based on research conducted by American psychologist Herzberg in the late 1950s based on the two-factor theory.

The relationship between the degree of satisfaction of user needs and user satisfaction is not always one-dimensional, and some of the relationships between the two are nonlinear. Enterprises should fully identify the relationship between the two to make more scientific planning for product quality attributes.

In the KANO user needs model, according to the relationship between the degree of user needs and user satisfaction, user needs are divided into six types: expected needs, exciting needs, basic needs, irrelevant needs, opposite needs, and Problematic needs. Its relationship with user satisfaction is shown in Figure 5 KANO model:

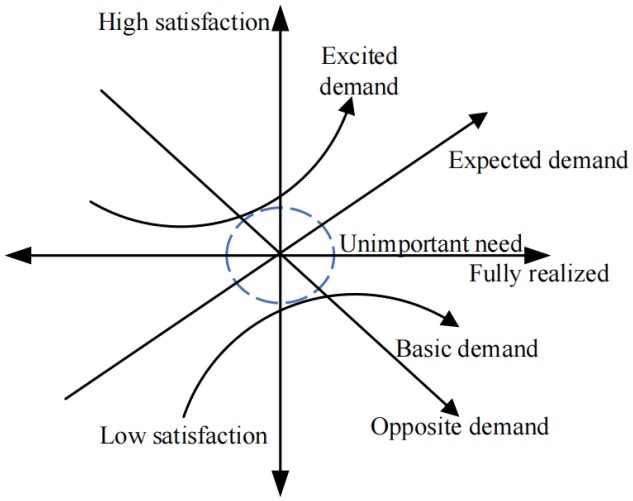

Fig.5 KANO model

In this paper, the KANO model is used in the process of obtaining users' needs for furniture. First, the KANO model is used to determine the categories of user needs, and through questionnaires, the needs obtained by the ratio of customer relative satisfaction coefficients are identified and screened. Requirement items are sorted by importance to effectively obtain important user requirements. The specific acquisition process is shown in Figure 6:

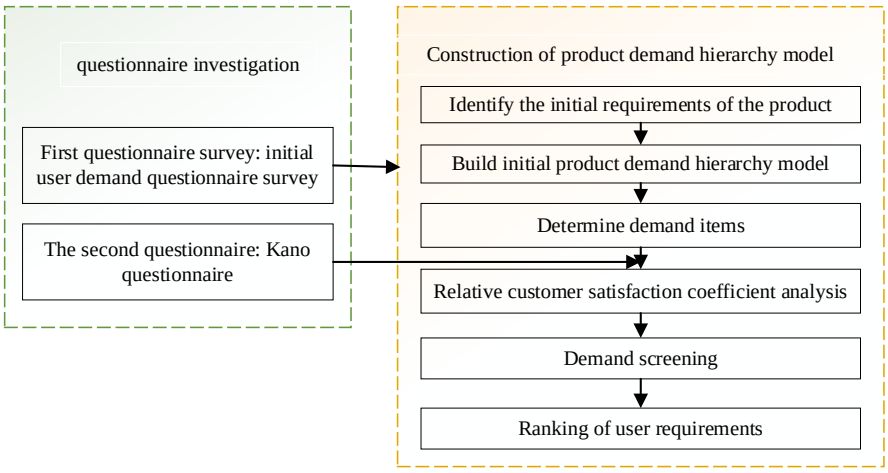

Fig.6 Obtaining process of user demand model based on KANO model

B. Advantages of KANO model in furniture design

The KANO model uses a two-dimensional model to explore the needs of users and different product attributes. It not only clearly defines the characteristics of different types of products, but also gives the relationship between different types of characteristics and user satisfaction, to better identify the user's different needs. The advantages of the KANO model are described in detail below:

(1) The KANO model helps furniture design companies understand the needs of users for furniture. Furniture design companies will conduct research on the market and users before product development, but traditional methods often make information not well connected with research and development, because designers do not Participate in product market research, and when the survey results are passed on to the design department, there will usually be incomplete user needs. The designer only sees the user's satisfaction with a certain demand of furniture and cannot clearly understand how much the improvement of this quality attribute will improve the user's satisfaction, and the KANO model can intuitively make the designer understand the demand and user satisfaction degree relationship.

(2) The KANO model provides the selection criteria for functional characteristics of furniture in the development stage

In the product development stage, when it is impossible to realize all the furniture functions one by one due to financial and technical reasons, the KANO model can provide its selection criteria. It can provide screening criteria from the degree of influence of various requirements on user satisfaction, and designers can design according to the ranking of user satisfaction.

(3) The KANO model can provide a basis for designing differentiated demand attributes

The KANO model divides requirements into different attributes, and the exciting requirements can help designers create differentiated functional attributes, which can help furniture designers develop product highlights that are more attractive than similar products. The production of furniture that only meets basic needs and expected needs is just ordinary furniture for users, which is not very attractive, while research and development and implementation of exciting needs will make users shine, greatly improve user satisfaction, and improve furniture competitiveness.

As far as we understand, the application of data collection, integration and analytical thinking for innovative design of furniture products is still relatively lacking. Designers use traditional design thinking to locate and grasp furniture product design, and do not really use large-scale design thinking. The data conducts accurate research on the entire industry market, and accurately obtains the geographical positioning, demand positioning, preference positioning, relationship positioning and other content of the product. It is difficult to realize the precise and personalized design and delivery of furniture product design.

C. Big data ideas in furniture product design research

The market research of furniture product design is indispensable in the product design process, and it can even be said to be one of the most important links. It takes people's fundamental needs for products as the starting point of design, to realize the purpose of people-oriented design. appeal. Design research generally includes the following six aspects: brand research, technology research, modeling research, human-machine research, user research and regulatory research. The six parts basically cover the data information required for furniture product design. Obtaining effective information is the key to the success of product market research. Scientific and accurate market research data is of great significance to the accuracy of product design positioning.

In the traditional furniture design research, large furniture companies can outsource market research institutions to investigate and study the market data, so as to master the market development direction and trend, analyze the product range, the competitive furniture product types produced in the target market, and study furniture. Different consumer needs and other factors; Some furniture companies can conduct surveys through their own marketing services to understand their needs; Some furniture companies may have low knowledge intensity, and product design concepts may even be compiled. Designers may not consider the actual needs of consumers, but collect and follow the emerging product concepts to guide new projects; Anyway, the result is the same. Analysts engaged in this work are related to their personal conditions, such as their personal conditions, experiences, thinking patterns, etc. because of this, they can't manually process, classify, analyze and summarize data, which usually takes a long time. However, in the era of big data, rapid changes such as changes in market trends, consumer buying behavior, and demand patterns have led to a significant decline in the accuracy and timeliness of data. It is not difficult to understand that these methods are no longer applicable in the era of big data.

How to collect data related to product design in the pre-research of product design in the era of big data? Consumers buy or not to buy a furniture product, market trends, consumption trends, changes in demand, etc., these may no longer be able to obtain detailed information through traditional questionnaires and other methods as well as purchase records of merchants and consumers. They are more likely to exist in "big data", in terms of keywords entered by consumers, web pages browsed, microblogs sent, logs written, pictures shared, chat records, etc. They are consumers in the product user market. data on preferences, wishes, and behavior patterns. Combined with market demand information, it is possible to with insightful and predictive analysis results, precise design positioning can be achieved. If the enterprise does not have a good grasp of this part of the information, it is difficult to accurately grasp the design positioning.

Using big data, it is easier, faster, and more effective to grasp consumer information, as shown in Figure 7.

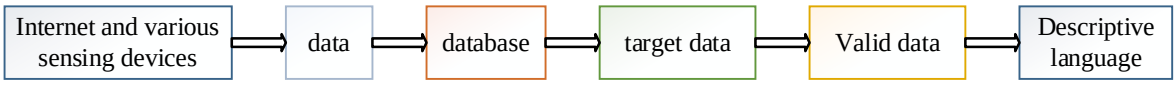

Fig. 7 Design and research process under big data

On the one hand, the big data platform provides designers with order information for subsequent production scheduling, and production also enters a reasonable and orderly process. Integration. It has been proved that experience oriented design and development thinking is an important part of innovative furniture design in the era of big data. In the process of product development assisted by information technology, the key to completing the product lies in obtaining information through a variety of information resources and consumers' input. Figure 8 shows an important development method.

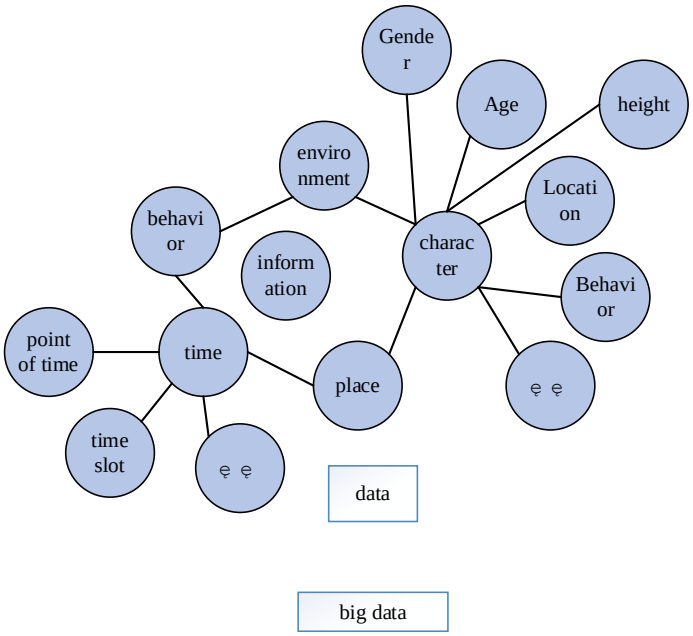

Fig. 8 The formation of big data

D. Big data assists in continuous optimization of design

The development and sale of any product in the market does not mean the completion of the whole process. The design process is a process of continuous testing, revision and improvement in the market. Designers must constantly pay attention to the market, study the reactions and perceptions of different consumers to product design, and constantly optimize the design. With the help of big data platform, the follow-up work of designers will be easier to achieve. Designers can extract relevant data through the big data platform. User evaluation can reveal some valuable hidden needs. This may be the beginning of the design. This method can also maintain and continuously improve the market vitality of new products being developed, identify potential competitive threats, avoid potential customer losses, and ensure the sustainability of products.

After nearly ten years of development, the database of the traditional furniture industry has been accumulated. According to the report of the McKinsey Global Institute, based on the total value of global cross-border flow of goods, services and finance, flow has become the inevitable development of the global economy. trend. Not only the government, enterprises and other commercial institutions are concerned about the flow economy, but design researchers have also begun to pay attention to the impact of flow data on the design itself, study flow data and infer design ideas and methods, and study its correlation and regularity.

E. Model

Design plays a key role in the driving force of the market. At the same time, the actual sales data affects the design of furniture components. It is difficult to solve complex problems with simple "manufacturing thinking" and "market thinking". This research relies on China's three major information platforms to obtain furniture product information data for small households in China, such as market capacity analysis, sales of the top ten similar products, popular search keywords for furniture products, conversion rate, category ranking, main Keyword natural ranking, material tendency, positioning, design style, design details, comments and QA analysis and other elements. At the same time, Python is used for data mining and analysis on the furniture-related sections of the three platforms, and the element information of similar products with the highest traffic is compared, to accurately locate user needs and lifestyles, and clarify product prices, materials, and design languages. Iteratively design small and medium-sized furniture products with high traffic and bring them to the market to obtain market feedback. This design process focuses on the iteration of furniture products. Therefore, this study proposes flow design thinking and the

corresponding model for the first time, as shown in Figure 9. The essence of flow design thinking is user thinking, but it is different from traditional user-centered design thinking. The difference is that the medium for designers to study users has expanded and changed. Designers no longer directly study a wide range of users, but gradually narrow the scope from general users to core users in the same way as funnel thinking. Uncertainties increase in the process of user refinement. Even different researchers will come to different conclusions, while the user research of traffic design thinking is to directly target the effective users of the group, which can portray a more accurate core target group portrait among the effective users of a small group (Figure 10). Therefore, traffic design thinking is to iteratively design the product by acquiring the data related to the traffic of the product, directly targeting the effective users, accurately describing them, and portraying the portrait of the core target group.

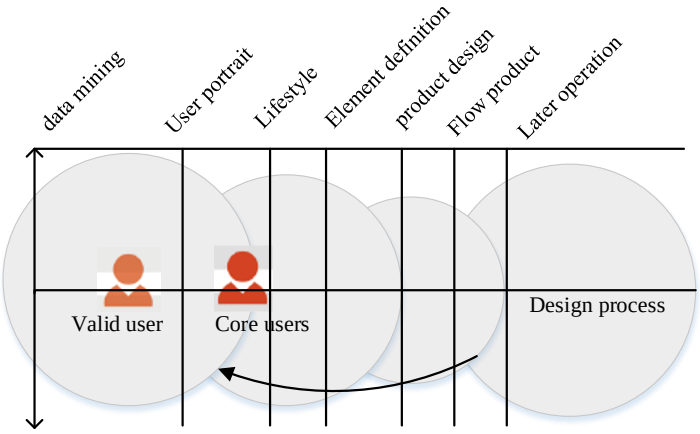

Fig.9 Process model of traffic design thinking

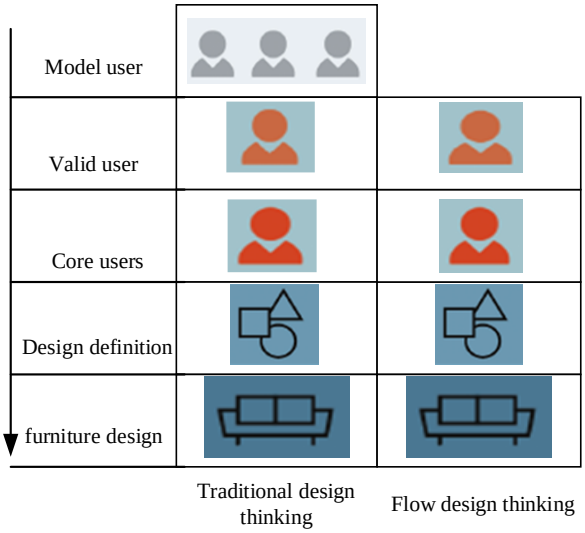

Fig. 10 Comparison of traditional design thinking and flow design thinking

IV. CASE STUDY

In the above, through the introduction of the innovative thinking method of big data, the user object is the characterization and simulation of the target user of furniture use. Show the target users more clearly to the designer. User portraits facilitate the formulation of information theory support for product design strategies and marketing techniques in the later stage.

In the early stage, the collection of user information was scattered, and the direction was not clear, and it needed to cooperate with a certain data analysis model. The NPL thinking logic level proposed and developed by Gregory Bateson was gradually applied to characters after continuous induction and analysis. data analysis. After the character information is collected, it is divided into six levels through sorting: environment, behavior, ability, values, identity, and vision. When faced with a large amount of fragmented information, through the collection and analysis of information on the lower three layers, namely: environment, behavior and ability, the personal characteristic information of the upper three layers, namely values, identity, and vision, can be reversed, as shown in Figure 11.

In the process of analyzing the user group, this paper adds the information layering method in the logical level of NPL and collects user information into three levels: personal characteristics, nearby member characteristics and economic foundation.

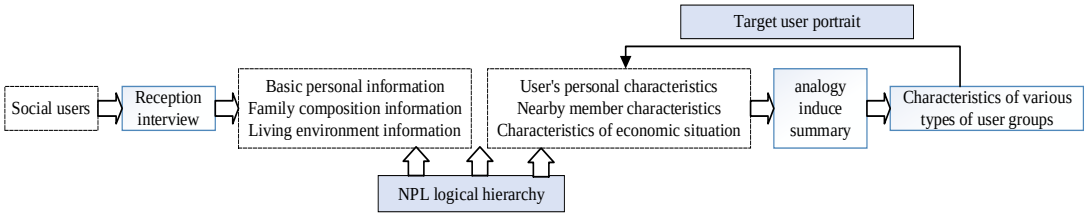

Fig. 11 User portrait creation process

A. Ranking of the importance of user behavior demand points

Convert the collected user pain points to design points, and then use the KANO model to allow users to put forward their own opinions on the design points. The KANO model is often used in multi-point and multi-direction survey research. By quantifying the degree of questions in the questionnaire, people's biased choices can be obtained. The sample content of the questionnaire is shown in Table 1.

Table 1 example of the questionnaire on property placement function

Storage function	love it	taken for granted	indifferent	accept reluctantly	I don't like it
It has this function	○	○	○	○	○
No function	○	○	○	○	○

The collected attributes are classified into attributes, and the effective number of people who fill in the questionnaire and their selection ratios are classified.

B. Prioritization of Furniture Functional Requirements

Follow the mock questionnaire above, see Figure 12 for details.

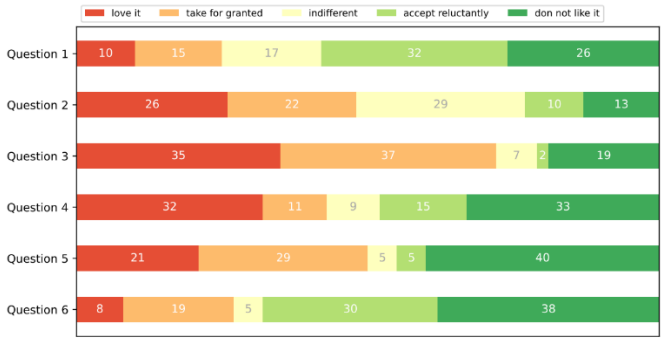

Fig. 12 User survey results

Statistically classify the data obtained in the table, in which the indifference attribute accounts for the highest percentage of the total survey results. The percentage calculation method in each table: the number of all cells is added as the denominator, the number in each cell is used as the numerator, and the result of dividing the numerator by the denominator is converted into a percentage to obtain the percentage of each grid, and then Add up the percentages of the same color and correspond to the different color attributes on the right side of the attribute classification table, as shown in Table 2.

Table 2 Classification diagram of KANO model

Storage function of sofa					
Yes \ no	love it	taken for granted	indifferent	accept reluctantly	I don't like it
love it	3%	7%	15%	2%	2%
taken for granted	5%	5%	9%	9%	0%
indifferent	1%	5%	23%	5%	0%
accept reluctantly	3%	3%	10%	0%	0%
I don't like it	1%	1%	4%	0%	Q

C. Demand Assessment Based on Better-Worse Coefficient

The Better-Worse (better-worse) coefficient will divide the obtained attributes into four categories: attractive attributes, desired attributes, necessary attributes, and indifference attributes. After each attribute is obtained, the degree of influence of the function can be obtained. The coefficient can indicate the degree to which the addition of this function affects the product.

The value of the better coefficient is positively correlated with user satisfaction, and the larger the obtained value, the higher the user satisfaction. The value of the worse coefficient is the negative correlation of user satisfaction, the smaller the value obtained, the lower the user satisfaction. The resulting coefficients can represent the hierarchical importance of functions, and better coefficients can be developed after grading.

Calculated as follows:

$$\text{Better} = \frac{A+O}{A+O+M+I} \quad (1)$$

$$\text{Worse} = -\frac{O+M}{A+O+M+I} \quad (2)$$

A - charm attribute /%.

O - expected attribute /%.

M - mandatory attribute /%.

I - no difference attribute /%.

According to the different attribute values obtained in the second step, the data in Table 3 and Figure 13 are obtained by applying the formula. To make the subsequent data easier to identify. Converted to a percentage within the quadrant table, the different functions are prioritized.

Table 3 Evaluation results of function coefficient

Characteristic index	Massage	Door mat	Property	Receive	Surrounding layout	Enclosure	Capacity expansion	Replace	Wireless charging	Disassemble	Temperature control
Better/SI	0.506	0.133	0.267	0.488	0.438	0.075	0.307	0.285	0.516	0.394	0.178
Worse/DSI	-0.394	-0.458	-0.289	-0.465	-0.238	-0.256	-0.347	-0.264	-0.176	-0.576	-0.156

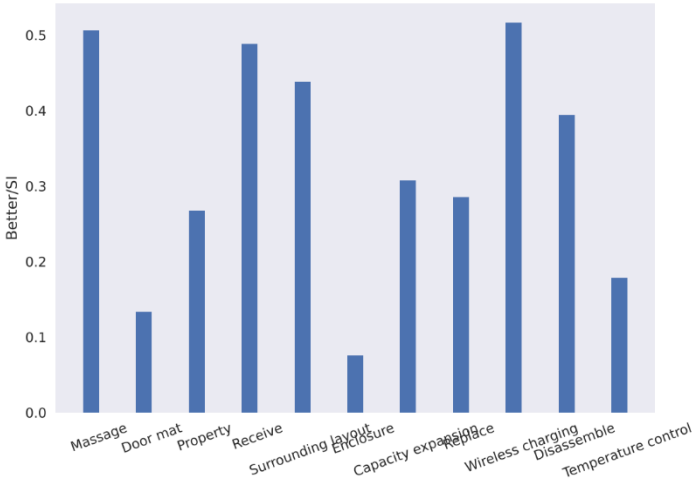

Fig. 13 Evaluation results of function coefficient for better/SI

To make the data more identifiable, the results are converted into percentages, and the system values are placed into prepared four-quadrants to derive a prioritization of the different functions. In the above chart, take the better and the worse as the horizontal and vertical axes, substitute the corresponding values into the coordinate system, and then bisect the quadrants to obtain four different intervals, and then the corresponding functional properties can be obtained. Coordinate points can visualize the importance of functional attributes.

Based on the above coefficient evaluation, the attributes under each function are obvious, as shown in Table 4:

Table 4 evaluation results of functional attributes

function	Massage	Door mat	Property	Receive	Surrounding layout	Enclosure	Capacity expansion	Replace	Wireless charging	Disassemble	Temperature control
Attribute	O	M	O	O	A	I	O	I	A	M	I

We further investigated the customers' real use experience of furniture products. The specific results are shown in Figure 14. It can be seen that up to 92% of users are satisfied with the product and think that comfort is the most important factor in the experience.

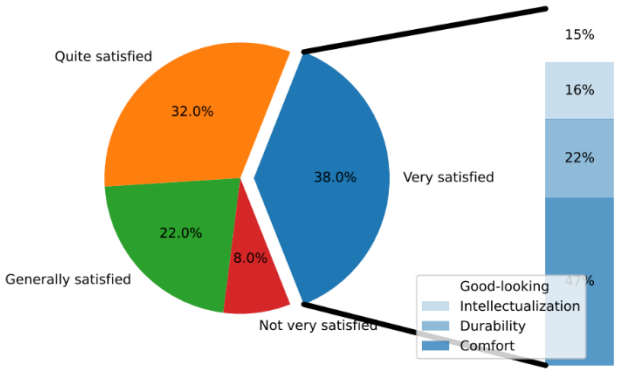

Fig. 14 Customer's experience of using furniture products

D. The main concepts of innovative design of Chinese furniture

(1) The principle of subtraction

In the traditional aesthetic philosophy of China for thousands of years, the most artistic conception is often not the picture full of brush and ink, but the blank. Just as "less is more", "less" is not blank but lean, "more" is not crowded but perfect.

In the processing method of innovative design of Chinese furniture, the principle of subtractive design can also be reasonably adopted. Modern people advocate minimalism, and the concise and refined design style is also the mainstream aesthetic model of contemporary society. Fully consider the use of functions, and at the same time simplify the cumbersome decoration and structure and discard those dispensable components and elements. It is not limited to simple lines to tell the modeling language of Chinese furniture and interprets the most elegant and temperamental Chinese Dynasty aesthetics with the least embellishment. The design follows the principle of subtraction, which not only meets modern aesthetics, but also saves materials and reduces costs, and meets the requirements of mechanization and standardization in modern furniture production.

(2) Eco-design

In contemporary society, the construction of ecology and green civilization is an important core concept to achieve the harmonious and healthy development of man and nature. However, in the past of furniture design and manufacture, the popularization and use of various materials seldom considered human health and natural environment. Factors, more and more furniture products that do not meet safety standards and affect human health flood the market, causing hidden safety hazards and more serious pollution problems. Therefore, in the development process of modern furniture, green ecology has gradually become the focus of attention.

The design of furniture products under the guidance of modern lifestyles should follow the concept of ecological design, and all links from production to use can reach the standards of low energy consumption and low consumption. Of course, if a designer can comprehensively consider the source of furniture design, enrich, and improve the practical and spiritual functions of furniture products as much as possible, and extend the life cycle of furniture, it can also be said that the concept of ecological design has been integrated into furniture from another perspective. in design.

(3) Emotional design

Any product from the perspective of emotional design can provide users with a good sense of experience and comfort to the greatest extent, and almost fully cater to human behavior patterns, so that users can get more emotional belonging and identity. In the long evolution from sitting on the knees to sitting on the feet, the high-end furniture in the Chinese Dynasty has continuously revealed the principle of emotional design in the gradual improvement of scale, structure, and material. Therefore, of course, this has become the primary goal to be achieved in the innovative design of Chinese furniture. In view of the existence of various home styles in contemporary society, in this practice of Chinese furniture design, we will comprehensively consider different modeling forms,

color trends, material textures, and decorative techniques, and interpret different emotional appeals in different combinations. , not only will it have a high degree of spatial integration, but also the external manifestations of differentiated furniture design will produce different spatial styles such as thick, light, elegant, or brisk. While providing the experience of using the senses at the basic material level, it pays more attention to the feeling at the spiritual level to achieve the unity of material and spirit. The innovative design process of Chinese furniture will fully explore the emotional experience that the product can bring to people, strictly follow the principles of emotional design, and highlight the sensory experience that its comprehensive material properties can give users.

(4) Integrate innovation

Whether it is the modernism that respects the principle of minimalism in the west, or the aesthetics of the interpreted by oriental Chinese furniture, it has a profound impact on the development of the entire modern design. The emergence of various styles and the coexistence of multiple cultures provide us with cultural theoretical support, while the continuous development of new techniques and materials also provides strong technical support for design. The process of integration and innovation is not an overnight process, but a continuous process that requires continuous adjustment and integration. New thinking on the integration of innovative design methods of Chinese furniture design elements and finding the most suitable integration method for re-innovation can better interpretation of the design essence and cultural connotation of furniture.

V. CONCLUSION

"Big data" is both a challenge and an opportunity for the traditional furniture industry. If the furniture industry wants to grow rapidly, it needs to use big data continuously. It needs to apply the accurate analysis ability of big data and massive information database to grasp the direction of market demand. To carry out design innovation and design optimization with data thinking, it is necessary to use big data thinking to lead the healthy, orderly, and steady development of the industry.

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