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# Applying the Kano Model to Optimize the Furniture in Rental Scenarios–An Application to China Case Study

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## ABSTRACT

With the price of commercial housing rising year by year and the increasing floating population, more and more people choose to rent housing to solve their housing problems in the transitional stage. In order to reduce rental costs, many furniture in rental houses has problems such as poor quality of supporting facilities, incomplete functions, and difficulty in carrying, often ignoring the functional and emotional needs of tenants for the use of furniture, so it is necessary to find new furniture forms to meet the material and spiritual needs of contemporary renters. In this paper, the strategic analysis tool stemming from the PEST (political, economic, social, and technological) has been adopted to explore the necessity of studying furniture for rental scenes. Among the relevant research and practical cases, the research on rental furniture mainly focuses on space-saving, multi-functional, and modular design, and puts a lot of practice into the structural design of furniture, and conducts in-depth research on the difficulty of furniture disassembly and assembly, the portability of furniture, etc. However, relevant studies have ignored the functional and emotional needs of tenants in the process of using furniture, so some products do not fit well with the actual rental group. In response to this problem, we carried out user research using user interviews and Kano models. The research process is divided into three parts: experimental design, experimental development, and experimental results. We want to obtain basic user information through user interviews, and then use the Kano model to analyze and classify user needs and prioritize demand. Combined with the two-factor theory, we analyze the relative satisfaction (SI) and relative dissatisfaction (DSI) of each demand for users, so as to finally evaluate the functional demand of users for rental furniture design, and show the data results of this study in the experimental results. Based on the above research, this paper summarizes the requirements of furniture in the rental scenario and proposes the optimization strategy for this type of furniture design from four dimensions: user targeting, furniture appearance, furniture structure, furniture function, and furniture experience.

**Keywords:** User experience, Kano model, Furniture design

## INTRODUCTION

With the development of urbanization, people's living needs and living concepts have undergone profound changes, the survey shows that China's housing rental rate is increasing year by year, and more and more young people will choose to rent to solve the housing problem in the transitional stage of

 

life. To pursue a higher quality of life, many people will choose to buy furniture to improve comfort and convenience in the process of renting. Therefore, furniture design for housing rental scenarios brings market opportunities and production power to enterprises, and can effectively meet the living needs of people and improve the housing experience.

## RELEVANT STUDIES

### Furniture User Experience

Person-centered design conception and ergonomics have been widely used in the field of design. Many researchers used ergonomics to evaluate and improve furniture products (Jeong, Park, 1990). Others conducted research on human scale (Panagiotopoulou, Christoulas, Papanckolaou et al., 2004) Suitable furniture size is conducive to improving learning and work efficiency (Žunjić A, Papić G, Bojović B, et al., 2015).

In recent years, user research on furniture products has combined previous research points and added aspects such as the industry development impact of furniture products. The physiological and psychological dynamic development of the crowd. H'ominous Furniture is a furniture design feasibility research project. The researchers in this project conducted question interviews with potential target markets and based on the interview result qualitatively summarized the key points that the respondents paid attention to when purchasing furniture, including the material preference for solid wood, attention to furniture quality, durability, and price. (Lachica, Condeno, Cruz, et al., 2019). Some researchers pointed out in the process of the innovative design of furniture for school scenes that in addition to user-centered design principles, researching on furniture and learning experience, user perception, and environmental interaction is also conducive to finding opportunities for furniture design (Imms, Morris, Grunseit, 2020).

Earlier researches show that ergonomics has a guiding role in furniture design, and we must pay full attention to the research on ergonomics to ensure that the furniture is in line with the needs of physical scale and function. However, these studies generally adopted the method which combined questionnaire survey and interview, and most of the data processing work is analyzed from a qualitative perspective, which makes the results less scientific.

### PEST Analysis

PEST is an acronym for four sources of change: political, economic, social, and technological. In the previous study, PEST analysis is widely used to understand strategic risk (Sammut-Bonnici, 2014). Later research shows that it can be used to propose strategies for the development of an industry, which is helpful for researchers to identify the changes and the effects of the macro environment on industrial development.

### Kano Model

The Kano model is an analytical model used to reflect the relationship between service quality and satisfaction. Its division of demand attributes is mainly divided into five items. Attractive requirements (A) have the greatest influence on improving satisfaction, if they are not fulfilled, however, it will not lead to satisfaction reduction. One-dimensional requirements (O) correspond to the desired user demand. The more these requirements are valued the higher user satisfaction. Must-be requirements (M) represent the necessary function, if they are not fulfilled, satisfaction with this product will drop significantly. Indifferent requirements (I) mean that it does not matter whether the function is there or not, which is a function that the user does not care about. Reverse requirements (R) represent that the existence of the function will reduce user satisfaction (Kano, 1984). Based on the Kano model, Charles Berger proposed the Better-Worse coefficient calculation method for auxiliary identification, also called satisfaction sensitivity calculation, which can help identify the importance of a function to affect user satisfaction on the basis of dividing demand categories (Berger, 1993). The calculation formula is as follows.

$$\text{Better/SI} = (A+O)/(A+O+M+I)$$

$$\text{Worse/DSI} = -1*(O+M)/(A+O+M+I).$$

## PEST ANALYSIS TO EXPLORE THE TARGET USER

### Political

In recent years, China's Ministry of Housing and Urban-Rural Development and other departments announced housing policies such as "the people who rent or buy houses can have equal rights." constantly changing the Chinese concept of house purchase. On the one hand, governments in various parts of China will strengthen the management of the leasing market and continuously regulate the order of the leasing market to protect the interests of the renters. On the other hand, various provinces of China have successively issued affordable rental housing development plans. Many provinces have actively developed affordable rental housing, gathering a large number of new housing for China's housing rental market (Anjuke Institute, 2022). Stricter market supervision measures and government-led construction of new affordable housing can generate more rental demand and increase rental housing. Both of these will open a new supply and demand gap for the furniture market and bring greater design opportunities for furniture development in the rental scenario.

### Economic

On the one hand, affected by China's housing prices, most people in the transition stage can hardly afford the high purchase expenses, while they have to choose to rent a house in other places, so the demand for rental housing has always existed. Relevant data show that China's rental market has developed steadily, rents are generally stable, and fluctuations have not exceeded the normal range. On the other hand, China's economy will gradually

resume orderly development after the COVID-19 pandemic, and the impact on economic operations will be reduced. Therefore, the macroeconomic situation and the real estate market will make the rental market develop better than the purchase market in the future.

### Social

Types of research show that the government in major cities will provide talent apartments in graduation season to attract highly educated young people to work locally. As a result, the main demand groups are the floating population and college graduates. Changes in the social environment and changes in the main population of housing rental mean that the demand for rental housing will be different, so carrying out user research on youth housing rental groups can help solve the problem of changes in the life needs of young people in the rental scenario.

### Technological

Since the rise of composite materials, furniture design had more development opportunities in material selection, structural innovation, and cost control. Many means of modern technology such as machine technology, CNC technology, and information processing transmission technology have been used to disrupt traditional furniture production. China's self-owned brands have skilled technology in furniture production and whole-house customization. They provide a more intelligent and comfortable furniture experience for users, which means the furniture design driven by technology development needs more scientific solutions.

## RESEARCH DESIGNS BASED ON THE KANO MODEL

Combined with the previous research background investigation, the relevant studies in furniture user experience, and the characteristics of research methods, the target user is identified as young people with rental experience. This study is intended to be carried out in three phases. Firstly, according to user interviews, and questionnaire, the current requirements of users for furniture in the rental scenario is collected, and a preliminary description and classification are carried out. Secondly, the Kano model questionnaire is designed according to the above demand points, and then the recovered data is analyzed, and the priority of user requirements is obtained through demand model classification and satisfaction sensitivity analysis. Finally, according to the experimental results, the author will propose a furniture design improvement strategy for rental users according to the high demand of important levels.

## EXPERIMENTAL DEVELOPMENT AND THE RESULTS

### User Interview

10 young people aged 18–35 participated in the user interviews, and all of them have normal language communication skills and have rental experience in China.

The interviews were structured and include personal information, rental situation, and interaction with furniture during the renting. Personal information of the user includes the user's age, education, occupation, and monthly income. The questions about the rental situation include the current renting situation, room area, the type of furniture, and other specific conditions. In terms of the interaction with furniture, the interviewee describes one-day life in a rental house in chronological order. Through the description, the furniture that the user participates in daily activities and the problems when interacting with the furniture can be refined. After summarizing and sorting out the information and original needs of the above ten respondents, the kinds of furniture design elements are initially classified and each user requirement has been coded, as shown in Table 1.

### User Experience Research in Kano Model

Kano questionnaire design and distribution. Based on the information collected in the user interviews, the Kano questionnaire has been designed with specific needs as a reference, and each user requirement is a function point. Each point has a functional question and a dysfunctional question. Questionnaire options are set to five items: Dislike, Live with, Indifferent, Must Be, and Like. Then we carried out the second round of user research. young people with rental experience are selected as the study object. For enlarging the sample size, this research was conducted online.

100 questionnaires were distributed and 79 were valid After processing the data in the valid questionnaire according to the Kano evaluation (Table 2), the customer survey responses are divided according to the five attributes of the Kano model. Then we obtain the result by taking the maximum value of the individual demand attribute (Table 3).

### Satisfactory Sensitivity Calculation

Demand classification is not enough to accurately illustrate the improvement order of these requirements, so the result of the customer survey also needs to be calculated by satisfaction sensitivity. The value of satisfaction (Better/SI) and the value of dissatisfaction (Worse/DSI) are calculated respectively. The obtained data is ranked in absolute value to finally evaluate the user's functional question for rental furniture design. The results are summarized with the function classification results which are shown in Table 3. The dissatisfaction has been taken as an absolute value.

A scatter plot is drawn. Satisfaction is the horizontal axis, and the absolute value of dissatisfaction is the vertical axis. A new coordinate axis is established by the average of the two values. The satisfaction portfolio shows the importance of young people's requirements for rental furniture (Figure 1).

## DISCUSSION

According to the quadrant characteristics of the satisfaction portfolio, the requirement points of the first quadrant are one-dimensional requirements, the second quadrant is the attractive requirement, the third quadrant is the

**Table 1.** Preliminary classification and the code of user requirements.

| Elements | Code | User Requirements |
|---|---|---|
| Appearance | A1 | The appearance of furniture can match the interior style. |
| | A2 | The appearance of furniture can make you feel warm. |
| Material | B1 | The furniture material has a good texture. |
| | B2 | The materials of the furniture are environmentally friendly and recyclable. |
| Structure | C1 | The structure of the furniture is stable and makes you feel safe. |
| | C2 | There is a clear division of labor between furniture and furniture. |
| | C3 | The combination relationship between furniture can be adjusted according to your needs. |
| | C4 | It can be folded. |
| | C5 | It can be easily disassembled and assembled. |
| | C6 | Less furniture disassembly and assembly loss |
| Function | D1 | It enables pets and owners to have fun together. |
| | D2 | The furniture for lying is comfortable. |
| | D3 | There is a space in front of the bed that can be used to store items. |
| | D4 | The bedroom is furnished so you can sit on the floor. |
| | D5 | It can help the owner and pet rest independently. |
| | D6 | The use area can be adjusted to adapt to the needs of users. |
| | D7 | Audio-visual entertainment equipment can be placed around the dining table. |
| | D8 | The tables and chairs are comfortable for work and study. |
| | D9 | The height of the table and chairs can be adjusted. |
| | D10 | Furniture gives you a dedicated space for greenery. |
| | D11 | You have enough space for storage. |
| | D12 | Well-planned storage supports you sort your items according to their type. |
| | D13 | Well-planned storage supports you sort your items according to how often they are used. |
| | D14 | It can help you distinguish worn or unworn clothing. |
| | D15 | The furniture for storage can have lighting functions. |
| | D16 | The furniture for storage can have disinfection functions. |
| Experience | E1 | You can clean it easily and quickly. |
| | E2 | The furniture is easy to maintain. |
| | E3 | The furniture is small in size, and it is easy to handle. |
| | E4 | The furniture is light, and it is easy to move. |

indifference requirement, and the fourth quadrant is the must-be requirements. The demand points in the fourth quadrant are greater than the first quadrant and greater than the second quadrant. According to the sensitivity calculation results of this study, the furniture design for Chinese renters must meet the functional points A1, C1, and D3, that is, the shape of the furniture does not match the style of the interior space, the furniture structure remains safe and stable, and the space for placing items is set at the bedside.

The function points A2, C6, D2, D5, D8, D11, D12, D14, E2, E3, and E4 have the characteristics of one-dimensional requirements, mainly reflecting

**Table 2.** Kano evaluation (Sauerwein, 1996).

| Customer Survey Responses | | Dysfunctional Question Answer | | | | |
|---|---|---|---|---|---|---|
| | | **Dislike** | **Live with** | **Indifferent** | **Must Be** | **Like** |
| **Functional Question Answer** | Dislike | Q | R | R | R | R |
| | Live with | M | I | I | I | R |
| | Indifferent | M | I | I | I | R |
| | Must be | M | I | I | I | R |
| | Like | O | A | A | A | Q |

A: Attractive requirements, O: One-dimensional requirements, M: Must-be requirements, I: Indifferent requirements, R: Reverse requirements

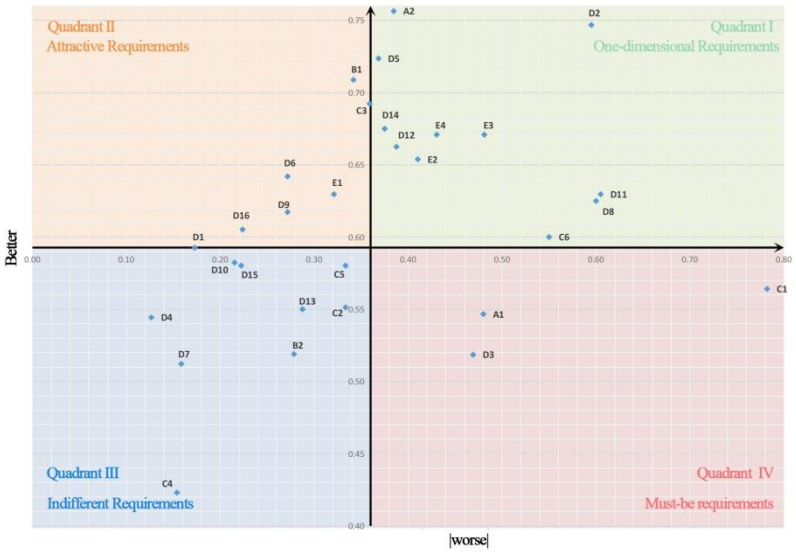


**Figure 1:** Satisfaction portfolio.

the user's requirements for furniture comfort, such as making people feel warm, helping the owner and pet rest independently and so on. At the same time, it also reflects the user's demand for storage space. Physically, it is necessary to provide sufficient storage space and help users classify items, such as sorting items according to the frequency of use and distinguishing worn or unworn clothing. The results also show the user's experience requirements for furniture, such as the furniture can be easily maintained, the furniture is stored in a small volume, and the weight is light so that it can be handled. The above requirements need to be met as much as possible, and if they are not met, user satisfaction will be greatly reduced.

The function points B1, C3, E1, D6, D9, D16 are satisfied. The above requirements have the attribute of attractive requirements. Therefore, designers should appropriately take the above functions into design consideration, which can become the functional highlights of furniture products. The

**Table 3.** Functional attribute classification and satisfaction sensitivity calculation results.

| Code | A | O | M | I | R | Category | Better | \|Worse\| |
|---|---|---|---|---|---|---|---|---|
| A1 | 0.22 | 0.28 | 0.16 | 0.26 | 0.07 | O | 0.55 | 0.48 |
| A2 | 0.38 | 0.34 | 0.02 | 0.21 | 0.02 | A | 0.76 | 0.38 |
| B1 | 0.43 | 0.26 | 0.07 | 0.21 | 0.04 | A | 0.71 | 0.34 |
| B2 | 0.37 | 0.13 | 0.13 | 0.33 | 0.01 | A | 0.52 | 0.28 |
| C1 | 0.09 | 0.45 | 0.29 | 0.12 | 0.01 | O | 0.56 | 0.78 |
| C2 | 0.34 | 0.18 | 0.13 | 0.29 | 0.02 | A | 0.55 | 0.33 |
| C3 | 0.38 | 0.28 | 0.06 | 0.23 | 0.02 | A | 0.69 | 0.36 |
| C4 | 0.29 | 0.11 | 0.04 | 0.39 | 0.04 | I | 0.42 | 0.15 |
| C5 | 0.34 | 0.23 | 0.10 | 0.17 | 0.01 | A | 0.58 | 0.33 |
| C6 | 0.20 | 0.39 | 0.15 | 0.30 | 0.01 | O | 0.60 | 0.55 |
| D1 | 0.43 | 0.16 | 0.01 | 0.40 | 0.01 | A | 0.59 | 0.17 |
| D2 | 0.22 | 0.50 | 0.07 | 0.18 | 0.02 | O | 0.75 | 0.59 |
| D3 | 0.22 | 0.29 | 0.17 | 0.32 | 0.01 | I | 0.52 | 0.47 |
| D4 | 0.44 | 0.09 | 0.04 | 0.46 | 0.02 | A | 0.54 | 0.13 |
| D5 | 0.40 | 0.27 | 0.07 | 0.18 | 0.04 | A | 0.72 | 0.37 |
| D6 | 0.40 | 0.23 | 0.04 | 0.29 | 0.00 | A | 0.64 | 0.27 |
| D7 | 0.38 | 0.13 | 0.02 | 0.33 | 0.00 | I | 0.51 | 0.16 |
| D8 | 0.21 | 0.40 | 0.18 | 0.20 | 0.02 | O | 0.63 | 0.60 |
| D9 | 0.43 | 0.18 | 0.09 | 0.28 | 0.01 | A | 0.62 | 0.27 |
| D10 | 0.44 | 0.13 | 0.09 | 0.32 | 0.00 | A | 0.58 | 0.22 |
| D11 | 0.20 | 0.43 | 0.17 | 0.21 | 0.01 | O | 0.63 | 0.60 |
| D12 | 0.32 | 0.33 | 0.05 | 0.35 | 0.01 | O | 0.66 | 0.39 |
| D13 | 0.38 | 0.16 | 0.12 | 0.32 | 0.02 | A | 0.55 | 0.29 |
| D14 | 0.40 | 0.26 | 0.11 | 0.30 | 0.02 | A | 0.68 | 0.38 |
| D15 | 0.40 | 0.16 | 0.05 | 0.28 | 0.01 | A | 0.58 | 0.22 |
| D16 | 0.40 | 0.16 | 0.05 | 0.51 | 0.07 | A | 0.61 | 0.22 |
| E1 | 0.37 | 0.26 | 0.06 | 0.32 | 0.00 | A | 0.63 | 0.32 |
| E2 | 0.28 | 0.34 | 0.05 | 0.24 | 0.05 | O | 0.65 | 0.41 |
| E3 | 0.28 | 0.37 | 0.10 | 0.22 | 0.04 | O | 0.67 | 0.48 |
| E4 | 0.33 | 0.32 | 0.10 | 0.22 | 0.04 | A | 0.67 | 0.43 |

A: Attractive requirements, O: One-dimensional requirements, M: Must-be requirements, I: Indifferent requirements, R: Reverse requirements

result mainly reflects the user's requirements for furniture autonomy, such as "the use area and the combination relationship between furniture can be adjusted adapting to the needs of users", "the height of tables and chairs can be adjusted" and so on. In terms of furniture cleaning, disinfection function, and simple furniture cleaning method can be used as extras for furniture design.

Function point D1 is judged as an attractive requirement with a small gap in the classification of requirements, which falls on the coordinate axis in the satisfaction sensitivity calculation. We believe that further research is needed, so we will not classify it as a functional attribute in this study. As for the function points B2, C4, C5, C2, D10, D13, D15, D4, and D7, the characteristics of indifferent attributes are presented in the research results, which can appropriately reduce the input of energy and cost.

## FURNITURE DESIGN IMPROVEMENT STRATEGIES

Combining background research, user interviews, and the results of the Kano model on user requirements, five strategies can be proposed for furniture design which is designed for young renters in China.

### User Targeting Strategy: Focus on Youth Characteristics

The furniture design is in line with the basic characteristics of the youth group. According to this study, the main population of housing rental in China is young people, so the furniture design in the rental scenario should start from the physiological and psychological characteristics and consumption habits of the youth, and continuously improve the cost performance of furniture while meeting the basic human engineering.

### Appearance Strategy: The Appearance of Furniture Should Avoid Visual Conflicts With the Interior Design

In this study, the people interviewed said they would like to buy furniture which is in harmony and unity avoiding conflict and confrontation in the interior design. Based on controlling costs, improving the gloss, touch, or furniture materials can become one of the highlights of furniture design. At the same time, the furniture design should be combined with the interior design so that the two can achieve visual harmony. Besides, the style of furniture should be simple and fashionable, and the color can be considered warm gray tones, which can meet most decoration styles.

### Structural Strategy: The Furniture Structure Should Be Safe and Easy

The stability of furniture structure is a must-be requirement in furniture design, and designers must ensure the structural stability of the furniture. In order to meet the moving demands, it is necessary to select the connection components that can be easily disassembled and assembled, and focus on reducing the loss caused by the disassembly and assembly of furniture in the design process.

### Functional Strategy: Satisfying Ergonomics Is the First Priority

In the relevant studies, the application of ergonomics in furniture design is always the first priority. We found that the furniture for sitting or lying needs to continuously improve comfort. Secondly, how to increase storage space is worth studying. The furniture for storage should conform to the usage habit as much as possible, which can help users classify scientifically classify daily necessities.

### Experience Strategy: Furniture Is Easy to Store, Move and Maintain

Renters sometimes have to move, which is a special need in the housing rental situation. Therefore, the furniture for the rental scene should have the function of convenient storage, and designers should try their best to control the weight of the furniture and volume of the furniture to make the furniture

move conveniently. Besides, the surface of the furniture should adopt wear dirt-resistant materials, which is convenient for users to clean and maintain.

## CONCLUSION

The target user of housing rental in China is young people between the ages of 18 and 35, and designing furniture in the rental scene for them is worth studying. Specifically, the design of furniture appearance can not be separated from the style of the interior design, and the structure of furniture must be stable. The human-machine interaction of furniture, the configuration and function of storage space, and the requirements of furniture volume and weight have a high degree of influence on user satisfaction, and designers should meet this demand in related design activities.

Furthermore, further research is needed to investigate the relationship between pet-feeding behavior and furniture use. It is expected to study whether users feed pets, the types of pets to feed, and their interaction with pets. This enlightens us that in addition to the factors of people themselves, user research on furniture design should also fully understand the physiological and psychological effects of the environment and things around people on behavioral activities.

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