Children's Luggage Design Based on Kano and Information Translation

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Abstract. In order to accurately obtain consumers' emotional demand and parents' functional demand for children's luggage design, to provide more safe, comfortable, and humanized children's luggage for children and parents to provide a better travel experience. Firstly, the Kano model is used to investigate and analyze consumers' demand for children's luggage. Secondly, the research results are classified according to basic need, expectation need, and charm need. Combined with the research results, an information translation model based on consumer demand is constructed. Based on the demand direction of children's luggage, the information translation design research of luggage is carried out to obtain a more suitable design direction for children's luggage. The results show that the consumer demand obtained from the Kano model can be applied to information translation and obtain the optimal results. Therefore, Kano and information translation model can be used for product design. This research method can obtain the emotional and functional needs of consumers, which has a guiding significance for product design.

Keywords: Children's luggage design; Kano; Information translation; Consumer demands

1 Introduction

With the continuous development of society, parents pay more to their children's living environment and growth conditions, and the proportion of children's products in household expenses is increasing. Data shows that 80% of Chinese families spend 30%-50% of the total family expenditure on children's products[1].In 2015, China began to fully implement the two-child policy, and launched the optimization of the three-child policy in 2021, further increasing the market potential of children's products. With the continuous improvement of people's living standards, more attention is paid to family education[2]. As a good channel to broaden children's horizons, travel has gradually become one of the main consumption of families. Luggage is one of the essential tools for traveling, and the design research for children's travel is of great significance. Safety, usability, positivity, and fun are essential elements for children when using products[3]. In the design and production of luggage, more attention is paid to the basic needs of storage but ignores the user's habits, feelings, and experiences. Enterprises may overlook the experience and safety issues when designing and producing children's luggage, as well as the problems when parents replace children in operation, Therefore, conducting innovative design research on children's luggage products has great significance and value.

2 Literature review

2.1 Children's luggage

In order to improve market competitiveness, the functional innovation design of the relevant enterprises has reached the extreme, and the design of the luggage has also become one of the methods for designers to compete for consumer attention. li and Zhang[4] proposed a space-adjustable luggage design by analyzing the needs of users of different age groups. By adjusting the internal space size of the travel box, the space utilization rate is improved to meet the different needs of users in different scenarios. Zhang[5] introduced TRIZ theory to analyze the safety issues generated during the use of luggage and improved the temporary parking and convenient operation of travel boxes by analyzing conflicts and contradictions. However, although there have been many studies on luggage design, there is little attention paid to children's users. This paper will study the perceptual needs of children for luggage design and the functional needs of parents for children's luggage design, to provide children with safer, more comfortable, and humanized children's luggage, and provide children and parents with a better travel experience.

2.2 The Kano model

The Kano model is currently widely used in the classification and prioritization of user needs for products. The Kano model mainly divides consumer demand attributes into five types, namely must-be attributes (M), one-dimensional attributes (O), attractive attributes (A), indifferent attributes (I), and reverse attributes (R)[6]. Kano has been widely applied in the field of product design user research. Avikal et al[7] integrated fuzzy Kano and QFD to transform users' emotional needs into product attribute expressions, and selected SUV vehicle samples for method validation, confirming its effectiveness. The Kano model can effectively differentiate and process user needs, thereby helping designers or related enterprises find opportunities to improve user satisfaction. Therefore, this article selects the Kano model to conduct research and analysis on the needs of luggage users, in order to accurately capture the emotional needs of users for children's luggage and the functional requirements of parents for luggage design.

2.3 Information translation

The application of translation in product design can be referred to as semantic information transmission. Usually, research on product design focuses on directly transforming user emotional needs into the external form of the product display. Pardo-Vicente et al [8]evaluated the semantic information conveyed by material textures between products and users through Haptic Hybrid Prototyping (HHP) in the early stages of design, quantified the clarity of user demand information, and efficiently guided product conceptual design. However, this type of research overlooks the distinction between explicit and implicit user needs, and excessive expression of explicit needs can easily lead to users' rebellious psychology. Therefore, this article will express the cultural information content that needs to be expressed on children's luggage. Through the designer's in-depth interpretation of the product connotation, consumer

needs will be regenerated in children's luggage design from both explicit and implicit perspectives, in order to establish a relationship between designers, consumers, and products.

3 Methodology

This article first collects users' needs for children's luggage based on questionnaire surveys, online comments, and other methods, and obtains clear demand points. Then, design the Kano model questionnaire and collect and analyze the data, locate the attributes of user needs, and obtain priority ranking. Finally, explicit or implicit semantic translation of the clear requirements attributes of user needs is performed, and the design optimization of children's luggage is carried out based on the obtained results, as shown in **Figure 1**.
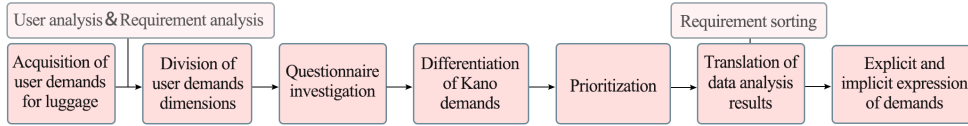
Figure 1. Overall framework diagram of the thesis

3.1 Kano questionnaire design

In this paper, we obtain users' explicit or potential needs through online shopping platform data crawling, interview methods and literature reading, etc. And the Kano questionnaire is designed from the three aspects of function, form, and interaction.Kano questionnaire design using the user needs to be obtained in stage 3.1, refer the obtained data to the Kano evaluation model to obtain the relationship between user needs and the quality characteristics of children's luggage. The specific calculation formula is as (1)(2):

$$S_i = \frac{A_i + O_i}{A_i + O_i + M_i + I_i} \tag{1}$$

$$D_i = \frac{M_i + O_i}{A_i + O_i + M_i + I_i} \tag{2}$$

S_i indicates the degree to which the presence of the attribute affects the consumer. D_i indicates the degree to which the absence of the attribute affects the consumer. A_i、O_i、M_i、I_i indicates the percentage of each quality attribute. i is the number of items demanded by the consumer.

3.2 Translation of information

By combining Maslow's theory of needs, user satisfaction is corresponding to human needs. The direct translation method, which expresses the must-be needs of consumers directly through design, can be understood. The explicit translation method combines the internal functions of a product with its external appearance, which can be visually processed and understood as the one-dimensional needs of consumers. The implicit translation method is used to express the implicit cultural connotations and interesting forms set by designers in product design, which can be understood as attractive needs of consumers.
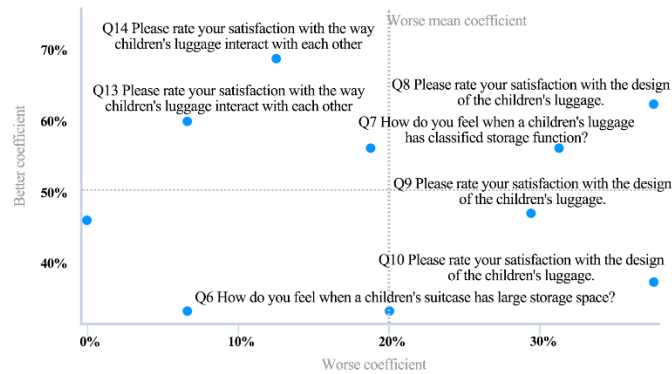
4 Results and children's luggage design

A total of 63 questionnaires were collected, and 55 valid questionnaires were obtained after excluding questionnaires with short or suspicious filling times, with a questionnaire recovery rate of 87%. To verify the feasibility of the sample, SPSS was used to conduct a reliability test on the collected Kano questionnaire survey indicators, with a positive questionnaire α The coefficient is 0.833 and the reverse is 0.791. A total of 13 needs are extracted and categorized.The level of demand of each evaluation index (M, O, A, I, R) are determined by the maximum demand frequency, as shown in **Table 1**.

Table 1. Importance of evaluation indicators

index	M	O	A	I	R	S_i	D_i	Needs
Dual-purpose toy and storage	24	12	3	8	8	0.46	0.00	M
Positioning function	28	8	16	3	0	0.56	-0.19	M
Large capacity storage	16	28	4	4	3	0.33	-0.20	O
Convenient mobility	36	8	11	0	0	0.42	-0.29	M
Classified storage	32	15	8	0	0	0.56	-0.31	M
Round appearance	32	16	7	0	0	0.63	-0.37	M
Simple design	24	24	7	0	0	0.47	-0.29	M、O
IP Collaboration	16	3	23	10	3	0.33	-0.07	A
Styling Cartoon	20	19	13	3	0	0.37	-0.37	M
Side door opening	13	6	30	6	0	0.30	-0.14	A
Open the door above	16	6	24	3	6	0.32	-0.17	A
DIY	32	10	6	4	3	0.60	-0.07	M
Seatable	40	6	6	3	0	0.069	-0.12	M

Based on the Kano model, combined with the Better Worse coefficient, and considering the demand attributes of each indicator comprehensively, it is beneficial for product designers to intuitively understand the potential needs of consumers in the early stages of design as shown in **Figure 2**.


Figure 2. Better-Worse coefficient analysis plot

From the specific analysis of data, indicators such as simple design and cartoon design belong to the must-be attribute, indicating that consumers hope that children's luggage design tends to be cartoonish and not too complex. From One-dimensional attribute, consumers set attributes

such as classified storage function and rounded shape as expected quadrants. For children's luggage, the rounded shape represents the external shape of the luggage, and classified storage represents the internal function of the luggage. Therefore, when designing children's luggage, attention should be paid to the organic unity of the internal function and external shape of the luggage. In children's luggage design, indicators such as positioning function, DIY function, and mount function are the attractive attribute for consumers. From the analysis results, consumers consider toys, dual-use storage, large capacity storage space, and cooperation with IP in children's luggage design optional. The storage space of children's luggage and cooperation with IP have no significant impact on consumer satisfaction.

In the design of children's luggage, direct translation, explicit translation, and implicit translation are used. The direct translation method, which refers to the basic structure of children's luggage, can be understood as the basic needs of consumers, expressed directly through design. The explicit translation method combines the internal functions of a product with its external appearance, which can be visually processed. Explicit expression in the design of children's luggage can be understood as the expected needs of consumers. The implicit translation method is used to express the implicit cultural connotations and interesting forms set by designers in children's luggage design, which can be understood as the charm needs of consumers. As shown in **Figure 3**.
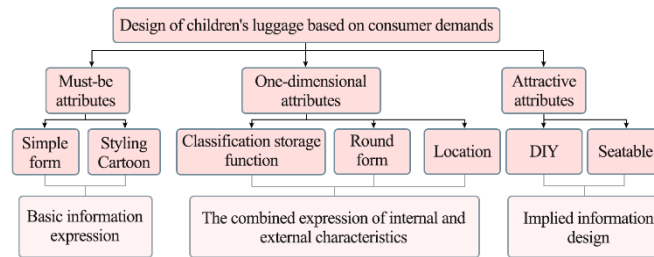
Figure 3. User explicit and implicit needs

Based on the previous design research results, the main design directions for children's travel luggage were determined, and these results were applied to the design of children's travel luggage. Apply the above requirements to the innovative design of children's travel boxes and carry out the design. The design renderings are shown in **Figure 4**.

Figure 4. Children's luggage design

5 Conclusions

This study applies the Kano model and information translation model to study the functional and styling design of children's luggage, using the Kano model to obtain consumers' perceptual demand for children's luggage design and parents' functional demand for luggage design, and combining the research results to construct an information translation model based on consumer demand. Through a series of analyses of consumers, it can be found that the current consumer demand for commodities continues to improve.This paper combines the Kano model with the information translation model and applies it to product design, which broadens the designer's thoughts on product design, and the final translation results also provide new problem-solving methods for the design of children's luggage and provide functional system analysis support for the redesign of children's luggage, which is of certain reference significance for related design work.However, the questionnaire data distributed in this paper is small, the age is mostly concentrated in 25-35 years old, and the proportion of owning children or older children is small, so the questionnaire questions may have errors, and the results obtained will be more biased towards adult thinking rather than children's thinking, and it is necessary to expand the questionnaire distribution group in the future research.

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