

Research on Design of Aging Products Based on Kano Model

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ABSTRACT

In order to meet the goals of safety, comfort, efficiency and human-oriented usability for the elderly in the process of using products, an aging-appropriate product design research based on Kano model is proposed. This study firstly analyzes the characteristics of the elderly group, conducts user research, and explores the behavior characteristics and real needs of the elderly. Observing the daily behaviors and activities of the elderly, to obtain the pain points in the behavior of the target user, then mapping the behavioral pain points and needs, and summarizing the appropriate aging for the elderly. Product design opportunities. Finally, the Kano model is used to analyze the requirement attributes and importance calculation, and the hierarchical order of each requirement is obtained to guide the subsequent design. Apply the Kano model to the research on product aging-appropriate design, and focus on analyzing the behavioral characteristics of the elderly to obtain the actual needs of the elderly, effectively avoiding the subjective factors in the design of aging-appropriate products, and ensuring that the design requirements of aging-appropriate products are derived from behavior. It provides new methods and ideas for the follow-up research on aging-appropriate product design.

Keywords: Age-appropriate design; product design; Kano model; behavioral characteristics; care for the elderly

1. INTRODUCTION

According to the results of the seventh census in 2020, the proportion of my country's population over the age of 65 accounted for 13.5% of the total population. According to the international standard that 14% of the population over 65 years old will enter a deeply aging society, it is expected that China will enter a deeply aging society in 2021. At present, domestic research on aging-friendly design mainly focuses on product design, service design and living space design. Product design for aging mainly includes product design of rehabilitation aids, packaging design of medicines and health care products, design of wearable devices, design of public products and design of household products. The society needs to speed up the pace of adapting to aging, improve the experience of using elderly products based on the needs of elderly users, and reduce the physical and mental burden of the elderly. After individuals enter old age, cognitive function will decline, such as perception, memory and so on. Different degrees of degenerative changes will occur in the physiological characteristics and cognitive abilities

of the elderly, which will affect the quality of life. In addition, some household products are not fully considered for elderly users when they are designed, which brings them troubles and frustrations of poor user experience. Therefore, according to the cognitive characteristics of the elderly group, this paper discusses the design process of aging-appropriate products for the elderly through the Kano model, so as to achieve the purpose of the elderly at home in the process of using the product. Safe, comfortable and efficient.

2. CHARACTERISTICS OF THE ELDERLY GROUP

2.1 Physiological characteristics

As hormone levels in the human body continue to decline, bones change, and the posture of the elderly also changes. Studies have found that after the age of 30, the height of the human body decreases by 1 cm every ten years. At the age of 40, the height will decrease by 1%-2% compared with the age of 20^[1]. This is because in the physiological process of human aging, the calcium

metabolism in the body is disordered, and the continuous loss of calcium causes the bones to shrink, which eventually leads to a decrease in height. In addition to the irresistible causes of normal human aging, pathological changes caused by diseases such as intervertebral disc aging, dehydration, and compression can also reduce the height of the elderly. At the same time, the reduction of basal metabolism can also lead to problems such as memory loss, hair loss, and lack of energy. The aging of the body of the elderly group brings about physical dysfunction. With the passage of time, the capabilities of various systems, organs and tissues of the human body will decline^[2]. The aging of the human body will have a negative impact on the bones, muscles and joints, and the elasticity of the bones will decrease.

2.2 Psychological characteristics

Along with the physiological changes, the elderly's psychology also undergoes profound changes, mainly manifesting psychological problems such as loneliness, low self-esteem, and dependence. The decline of various physiological functions of the body makes the elderly often feel powerless, the learning speed of new things decreases. Facing execution difficulties or inability to execute behaviors can lead to anxiety, depression, and inferiority in the elderly. Some elderly people have changed their social status and reduced social communication due to objective reasons such as the narrowing of their retirement circles, living alone without children, and the death of friends.

2.3 Behavioral characteristics

Studying the behavioral habits of the elderly is helpful to understand various problems related to the daily life of the elderly, and has positive significance for obtaining information on the living habits, life satisfaction, and daily consumption of the elderly. Through literature research, it is concluded that the elderly generally have daily behaviors such as repeated confirmation, external help, and self-learning. As the elderly grow older, the conservative and cautious habitual thinking and the decline of memory become more and more prominent, and they repeatedly confirm things. Repeated confirmation behavior is the old people's compensation for physical decline, but also a psychological suggestion. In terms of learning behavior, in the face of new knowledge, it is necessary to repeatedly learn and memorize to master it. As the elderly enter the stage of old age, their ability to learn independently decreases. In the face of new things, the same learning task requires double the learning cost such as time and energy, and there is a risk of forgetting at any time. Older people habitually turn to younger people for help when they encounter learning tasks that are difficult or impossible to perform. It can be seen that the elderly are more dependent on the outside world to learn help-seeking

behavior. At the same time, the elderly with educational background have a certain degree of education and good study habits, and they have maintained a state of continuous learning even when they enter the old age.

3. KANO MODEL

3.1 Kano Model Theory and Process

The Kano model was first proposed by Professor Noriaki Kano of Tokyo Institute of Technology in his article "Quality Hygiene Factors and Motivating Factors" published in October 1979^[3]. After that, the paper was officially published in the journal "Quality" of the Japan Society for Quality Management in 1984, and the Kano model theory was formally established. Satisfaction with the product, the higher the user's satisfaction with the product, the stronger the user's demand for this product, and the relationship between the quality characteristics of the product itself can also be obtained through the relationship between the user's satisfaction with the product. User needs are divided into five categories, including exciting needs, expected needs, irrelevant needs, basic needs and reverse needs. The Kano model requirement diagram is shown in Figure 1.

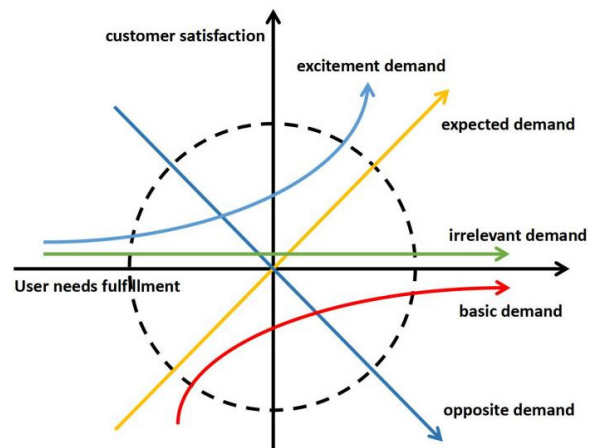


Figure 1 Kano model requirement diagram

The abscissa in the demand graph of the Kano model represents the realization rate of the user's demand, that is, the degree to which the product has a certain demand, the right side represents the high degree of fulfillment of the demand, and the ordinate represents the user's satisfaction with the product, that is, the user's subjective perception of the product. Perceived, upwards indicate high user satisfaction with the product. Excited demand refers to a product that exceeds user expectations and is the potential demand of target users. Expected requirements refer to users' expectation that the product have this function. Basic requirements refer to the basic attributes that a product must have under normal conditions. Opposite demand refer to attributes that users do not want a product to have. Most of these attributes are negative attributes, and the source of their functional

attributes is mainly designed by designers based on subjective assumptions or without in-depth research and practical application. Irrelevant demand means that a certain attribute of a product will not affect the user's judgment of its satisfaction^[4].

3.2 Kano Questionnaire & Kano Assessment Needs Form

Since the evaluation results of users in the Kano model are highly personalized, it is necessary to introduce the method of hypothesis verification for research to ensure the objectivity of the research. There are three main evaluation tools for constructing Kano models, including Kano questionnaires, Kano evaluation forms and Kano survey results^[5]. The Kano questionnaire is aimed at the user's evaluation of the product or demand. This evaluation is generally divided into positive and negative perspectives. The necessity of the demand element can be clearly reflected through the positive and negative evaluation of the same element. Five satisfaction levels are generally set for the same question, which are

very satisfied, must exist, neutral, acceptable, and dissatisfied.

According to the Kano survey results, the Kano evaluation form evaluates the specific classification of a certain element attribute, and the satisfaction level of the classification is the same as that of the Kano questionnaire. The assessment results are divided into six categories, namely, exciting needs, expected needs, basic needs, opposite needs, irrelevant needs and problem needs. According to the Kano evaluation table, the corresponding relationship between various needs and satisfaction can be specified. When the positive problem is very satisfied and the negative problem is very satisfied, then the requirement is contradictory and needs further analysis and evaluation, then the design element is the problem requirement. The question demand indicates that there is a certain contradiction between the question and the user demand, and this result generally does not appear in the user's demand answer. If this result appears, it indicates that the question setting is unreasonable or the user does not understand the question. The Kano model evaluation requirements table is shown in Table 1.

Table 1 Kano Model Evaluation Request Form

User needs		product does not have design elements				
		satisfy	existing	neutrality	acceptable	dissatisfied
product has design elements	satisfy	Q	A	A	A	O
	existing	R	I	I	I	M
	neutrality	R	I	I	I	M
	acceptable	R	I	I	I	M
	dissatisfied	R	R	R	R	Q

4. CALCULATION OF THE NEEDS OF THE ELDERLY BASED ON THE KANO MODEL

The object of this questionnaire survey is the elderly group, the main purpose is to understand the selection of product design functions and the order of needs of elderly users. The questionnaire is divided into two parts^[6]. The first part is to investigate the basic information of users, so as to conduct effective questionnaire screening. The second part is to investigate the user's demand for smart home functions. The functional requirements of the elderly users obtained from the survey are sorted and numbered, and the KANO questionnaire survey mode is used, as shown in Table 2.

Table 2 Kano questionnaire survey

number	Functional Requirements
01	emergency call
02	Door and window safety reminder

03	prevent intrusion
04	Medicine reminder
05	Health check reminder
06	Health report generation
07	report data analysis
08	companion robot
09	social entertainment
10	elderly education
11	voice control
12	One-key multi-control
13	scene preset
14	automatic induction
15	Increase product intelligence

The target users of this paper are the elderly aged 60-70. Among the 180 questionnaires collected in this questionnaire survey, 134 were valid, including 73 males and 61 females. The functional characteristics of the requirements based on the Kano model are classified in Table 3.

Table 3 The functional characteristics of the requirements based on the Kano

number	M	O	A	I	R	Q	category
01	65.3	13.7	12.6	5.2	1.7	1.2	M
02	57.8	15.6	18.1	4.7	2.7	0.8	M
03	13.2	14.8	46.7	12.5	11.6	0.9	A
04	33.2	52.9	7.3	3.8	1.2	1.3	O
05	44.7	21.6	29.8	1.9	0.9	0.7	M
06	25.7	36.4	11.5	16.3	8.7	1.1	O
07	51.6	21.7	11.3	10.3	3.6	1.2	M
08	17.3	19.2	33.2	23.1	6.2	0.8	A
09	16.9	16.9	42.6	17.5	4.9	0.9	A
10	10.6	21.3	5.6	49.1	11.3	1.4	I
11	9.7	12.4	3.1	58.1	15.6	0.8	I
12	10.7	6.0	8.3	57.9	15.0	1.1	I
13	19.2	35.2	17.8	17.2	9.6	0.6	O
14	23.4	42.6	16.3	6.2	0.9	0.9	O
15	7.2	3.3	6.3	10.3	71.8	0.8	R

In the aging-friendly design for the elderly, safety protection is an essential requirement, that is, these requirements must be met, otherwise users will be dissatisfied; interactive entertainment belongs to indifferent needs, that is, elderly users lack interest in such needs; life intelligence is a mixed demand of expectation and reverse, and the elderly do not pursue high intelligence I do not want the complex functions of the product, there should not be too much independent operation. The final KANO attribute is in Table 3.

Table 3 The final KANO attribute

requirement	KANO attribute
Security	M (01) 、 M (02) 、 A (03) 、 O (04) 、 M (05)
health management	O (06) 、 M (07) 、 A (08) 、 A (09)
Interactive entertainment	I (10) 、 I (11) 、 I (12) 、 O (13)
life intelligence	I (14) 、 R (15)

5. CONCLUSION

This study proposes a research on the design of aging-appropriate products based on the Kano model, and takes the elderly group as the research object to mine the behavioral characteristics and real needs of the elderly, and then map the behavioral pain points and needs summarize. The Kano model is used to analyze the requirement attributes and importance calculation, and the hierarchical order of each requirement is obtained to guide the subsequent design. This study has completed the research on the design of aging-friendly products

based on the Kano model at the theoretical level, but the method is only a preliminary exploration. In the follow-up research, according to the type of household aging-friendly products, methods such as analytic hierarchy process, gray system theory, and fuzzy comprehensive evaluation can be considered. , to improve, perfect, optimize and expand it to form a systematic research paradigm of product aging-friendly design, and apply it to other product design and development to achieve the goal of safety, health, efficiency and comfort in aging-friendly product design.

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