

Demand Analysis of Traditional Chinese Medicine Diet Recommendation App Based on AHP-KANO Model

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Abstract. As an important part of traditional health concepts, traditional Chinese medicine diet has gradually attracted attention among modern young people. However, most of the existing diet apps focus on nutritional matching and calorie management, and lack accurate recommendations for the efficacy of traditional Chinese medicine ingredients, functional drinks and personalized conditioning needs, making it difficult to meet the diversified health expectations of users. Therefore, this paper proposes a demand analysis method based on the AHP-KANO model to construct the design framework of TCM diet recommendation app to improve product experience and user satisfaction. Firstly, the KANO model was used to identify and classify users' demand attributes for ingredient selection, ingredient function, functional beverages and beauty meal replacements, and refined the core user expectations. Secondly, the analytic hierarchy process (AHP) is used to rank the weights of different requirements and determine the key functions. Finally, the results are transformed into interactive design elements and system function modules to provide a basis for subsequent interfaces and interaction schemes. Through the survey and demand modeling of target users, a set of functional frameworks covering ingredient recommendation, efficacy query, personalized diet plan and interesting interaction was obtained, and an actionable priority distribution was formed. Demand analysis based on AHP-KANO model can effectively allow users to obtain multi-level needs in traditional Chinese medicine diet apps, solve the problems of single function and insufficient interaction in traditional diet applications, provide a scientific reference path for subsequent interaction design and system optimization, and also provide reference for the development of similar health apps.

Keywords: Interaction design, traditional Chinese medicine diet, health APP, AHP, KANO

1. Introduction

In recent years, with the acceleration of the pace of life and the increase of work pressure, the sub-health problems of young people have become increasingly prominent. A survey of 1,333 Chinese youths conducted by the "Joint Questionnaire Network of the Social Survey Center of China Youth Daily" showed that 63.0% of the interviewed young people felt that their bodies were in a sub-healthy state; The proportion of office workers in Central Asia is 64.4%, and the proportion of college students is 59.5%. In the context of the gradual shift in health concepts to prevention, TCM dietary conditioning has received renewed attention due to its emphasis on individual differences

and overall balance. However, most of the dietary apps on the market currently focus on the perspective of Western nutrition, and their functions are concentrated in calorie calculation, nutrient matching and fat loss and shaping, which is difficult to reflect the characteristics of traditional Chinese medicine diet "tailored to individual conditions", and there is also a lack of systematic recommendations for the efficacy of common ingredients (such as red dates, wolfberry, yams, etc.). At the same time, some applications have homogeneity problems in interaction design, with complex functions but lack of personalized recommendations, resulting in insufficient user experience and difficulty in truly meeting the needs of young people for daily conditioning and health preservation. Therefore, carrying out demand analysis and research on TCM diet recommendation apps not only helps to explore the combination of traditional health concepts and modern interactive design, but also provides new ideas and tools for improving the health management of young people.

At present, many scholars have conducted research on the application of AHP and Kano models separately or in two. For example, Zheng Zhenhua et al. [1] proposed a product improvement design method based on the Kano-FAST-FBS model to improve the satisfaction of smart home products, systematically solve the matching problem between user needs and functional structure modules, and obtain a design scheme that is more in line with user functional expectations. Zhao Xiang et al. [2] constructed a hierarchical model based on the AHP method, and obtained three design schemes according to the weight value priority results to meet the functional needs and aesthetic demands of hemiplegic patients in upper limb rehabilitation training, and improve the rehabilitation experience of patients. Li Xiaoyu et al. [3] enriched the experience design elements of virtual museums from the perspective of user needs by using the Kano model, which provided a certain reference and theoretical basis for the subsequent construction and innovation of digital museums. Wang et al. [4] used the research method of combining KANO, AHP model and flow theory to discuss the interactive design strategy to promote the immersive experience of users' shopping. The interactive experience optimization provides a certain design reference and theoretical basis; Lu Yihua et al. [5] used the combination of KANO and AHP models to explore how to adapt the interaction design strategy to the child's developmental stage and put it into practice, which provided a certain design reference for the interaction design of children's intellectual support apps in the future.

At the level of books and literature, Hu Sihui's book "Drinking and Eating" in the Yuan Dynasty systematically sorts out the taste and efficacy of grains, fruits and vegetables, livestock, beverages and other ingredients, emphasizes the relationship between diet and physique, four seasons, and causes, and is an important foundational work on the theory of traditional Chinese medicine dietary therapy. Modern publications such as "The Complete Diet and Therapy of All Diseases" are aimed at the public, taking common diseases or physical discomfort as the starting point, combined with the concept of traditional Chinese medicine health preservation, to provide actionable dietary plans, reflecting the application and popularization of traditional theories in contemporary life scenarios. At the application level, existing websites and mobile applications have tried to combine TCM dietary knowledge with digitalization. For example, the Foodmula platform provides users with dietary therapy plans and food library information through physical fitness tests, focusing on the combination of personalization and popular science functions; The "Dietary Therapy Quick Check HealthMe" App focuses on two-way query of ingredients and efficacy, making it easy for users to quickly find dietary combinations that meet specific health needs. The "Health Pass" App is more comprehensive in terms of functional expansion, covering modules such as physical fitness testing, diet records, nutrition tips for three meals, and traditional Chinese medicine knowledge push, building a relatively complete health management ecosystem for users.

These books and applications demonstrate the diverse forms of the TCM diet in contemporary times: ancient books and modern publications provide a theoretical and practical basis, while existing applications are digitally addressed to health needs. However, in terms of interaction design and user experience, there are still problems such as complex content, single recommendation, and insufficient personalization. This highlights the need for further research. This paper proposes a demand analysis based on the AHP-Kano model to identify and meet the core needs of users more scientifically. This not only helps to improve the application experience and health guidance value, but also provides new ideas and references for the design methods of health products.

2. Product innovation design process based on the AHP-Kano model

2.1. AHP-based user demand weight identification

AHP (Analytic Hierarchy Process) analytic hierarchy process is a method of decomposing complex problems into multi-level structures and performing quantitative weight calculations. The core of this is to establish a hierarchical structure such as goals, guidelines, and solutions, compare user needs one by one, and finally rank the importance of each factor. This method can effectively deal with multi-objective and multi-criterion decision-making problems, especially suitable for product design scenarios that weigh the diverse needs of users.

Studies have shown that AHP is widely used in user demand analysis and interaction design optimization. For example, Zhao et al. [2] constructed a hierarchical model based on the AHP method, and obtained three design schemes based on the weight value priority results to meet the functional needs and aesthetic demands of hemiplegic patients in upper limb rehabilitation training, and improve the rehabilitation experience of patients. Zhu Zhengjie et al. [6] used AHP analytic hierarchy process to design and optimize the smart bracelet for the elderly, and constructed a multi-dimensional evaluation framework through strategic design questionnaires, synthesizing professional standards and user needs, to ensure that the design scheme is both professional and meets the expectations of the elderly and their families for the safety functions, user experience and social networking of the smart bracelet. These cases demonstrate the practical value of AHP in complex product designs.

In this study, AHP was mainly used to identify the importance of the needs of users of TCM dietary recommendation apps. Through questionnaire surveys and expert scores, the weight values of each requirement are calculated, and the final results will help this paper clarify which functions are the priority modules that users pay the most attention to, so as to provide a scientific basis for subsequent interaction design and system optimization.

2.2. Based on KANO's demand type classification

The KANO model is mainly used to analyze the relationship between product characteristics and user satisfaction. The model divides user needs into five categories: basic, expectant, excited, undifferentiated and reversed. Among them, basic requirements are the default functions of users, which will significantly reduce satisfaction once they are missing. Expectation-based demand is positively correlated with satisfaction, and the more sufficient the satisfaction, the more satisfied the user. Excited demands are often unexpected and can significantly increase satisfaction. By differentiating between different types of requirements, designers can allocate resources more targetedly.

In existing research, the KANO model has been widely used in product design and service optimization. For example, Zhou et al. [7] used the Kano model tool as a design method to explore the needs of elderly hypertensive patients for hypertensive disease prevention, control, and distress in daily life. They used questionnaire surveys to obtain the satisfaction and dissatisfaction of elderly patients with the functions of wearable products, and at the same time used four quadrants to rank the importance of user needs to guide the design practice of wearable products. Deng Yipeng et al. [8] used the Kano model to classify the demand attributes of products, intuitively reflecting the demand of target users for various functional elements, so as to create lunch box products that adapt to the lifestyle of the new era and improve the user's eating experience. These studies show that the KANO model can effectively help designers understand the hierarchy and differences of user needs.

In this paper, the KANO model is applied to the demand division of TCM dietary recommendation apps. The specific method is to collect users' satisfaction and expectations for different functions through questionnaire surveys. At the same time, combined with the weight results obtained by AHP, a set of user demand frameworks with both priority and type division is formed to provide scientific guidance for subsequent interaction design.

2.3. Product design process that integrates the AHP-Kano model

This paper is based on user needs and comprehensively uses AHP and Kano models to build a product design process. Through the combination of the two methods, a systematic product research path can be formed on the basis of identifying the weight of user needs.

Firstly, based on the AHP analytic hierarchy process, the importance of user requirements is decomposed and quantitatively analyzed, and the weight of each requirement in the whole is clarified, which provides a basis for subsequent design decisions. Subsequently, the Kano model is utilized to categorize the identified requirements, allowing for clearer prioritization of product features. By combining the analysis results of the two models, a closed-loop idea from demand identification, weight analysis to type classification is formed, which provides a scientific basis for subsequent research. This process can effectively improve the pertinence and rationality of design, make up for the limitations of a single model in the requirements analysis stage, and lay the foundation for product innovation and user satisfaction.

3. User needs analysis based on Kano-AHP

3.1. User demand mining

In the design process of TCM diet recommendation apps, accurately mining user needs is the key to optimizing the interactive experience. Firstly, based on network data and industry analysis reports, this paper studies the current market status of traditional Chinese medicine diet and health management applications, and understands the main demands of young users in terms of dietary conditioning, health management and user experience. Secondly, in order to ensure the authenticity and diversity of demand information, the research team adopts diversified research methods to collect user needs.

Method 1: Online data research. By analyzing the functional modules, user ratings and comment feedback of similar types of apps such as "Living a Life" and "Lemon Light Fasting", this paper summarizes the advantages and disadvantages of existing products in terms of recommendation mechanism, interface interaction and content presentation, and collects users' real evaluations of ingredient efficacy, dietary therapy compatibility and personalized plans.

Method 2: Literature research method. This paper reviews academic literature and research results related to TCM diet and intelligent health management at home and abroad, summarizes the hot directions of existing TCM diet therapy digital and interactive research, and clarifies the key elements of App design from the theoretical level. Method 3: in-depth interview method. 20 users (aged 22~45, 9 males, 11 females) who have health needs or long-term use of dietary apps were invited to conduct interviews to discuss their actual pain points, usage preferences and acceptance of TCM concepts in dietary conditioning.

Through the collation and comparison of multi-channel survey results, it is found that users generally pay attention to the authority and practicality of food efficacy information, and expect the system to provide accurate dietary recommendations according to individual physique. At the same time, at the level of function use, users hope that the App interface is simple, the interaction is natural, and the data feedback is intuitive, which can provide interesting experiences in addition to health guidance, such as diet check-in, ingredient story push, etc. Based on the preliminary collected demand information, the research team summarized and determined the final 14 core user needs after screening and merging, and the functions that this APP should have are shown in Table 1 below.

Table 1. User requirements table

NO,	User needs	Description of requirements
1	Ingredient efficacy query	Quickly review the TCM attributes of common ingredients and ensure that the source of information is professional and reliable.
2	Personalized physical fitness assessment	Conduct tests based on the nine physical models of traditional Chinese medicine, and carry out follow-up accurate push according to the test results
3	Personalized dietary therapy recommendations	Personalized dietary recommendations are provided according to each person's constitution, season, symptoms, etc.
4	Functional drink recommendation	For example, matching recommendations for drinks such as refreshing and improving sleep
5	Beauty and meal replacement plan recommendation	Provide corresponding meal replacements or programs for slimming, whitening, toning, etc.
6	Ingredients are compatible with taboo tips	The degree to which the ingredients are suitable for matching, whether the same food will clash with each other to avoid misuse.
7	Simple user interface	Existing apps have complex functions, and expect simple processes, clear information, and hierarchical UI design.
8	Dietary records and health feedback	Record three meals and get health feedback and trend analysis based on the perspective of traditional Chinese medicine.
9	Popularization of traditional Chinese medicine knowledge	Users are more receptive to interesting and easy-to-read knowledge
10	Seasonal health reminders	Push dietary precautions and appropriate dietary therapy plans according to solar terms and weather changes.
11	Platform interactive features	Record diet check-ins, share experiences, etc., to enhance the fun and sense of participation in the health care process.
12	Health risk warnings and malfitness warnings	For example, "those with cold stomachs should use cold drinks with caution" and other tips to ensure safe use.
13	Multi-platform synchronization and data retention	Dietary records, physical fitness assessments, etc. can be synchronized across platforms and devices, which is convenient for long-term health management.
14	Personalized push frequency settings	Users don't want to be overly disturbed, and can adjust the reminder frequency independently.

3.2. Kano model questionnaire collection and analysis

Based on the concept of the KANO model, this study designed a set of user demand questionnaires for this set of TCM diet recommendation apps. The questionnaire contains all 14 factors, each with two sides of the question, and each question needs to be selected from 5 options. Through this two-dimensional questionnaire design, this study can comprehensively and accurately analyze users' needs for TCM dietary opinion apps, and then prioritize these needs through the Kano model to help guide the subsequent optimization of interaction design. The results of kano analysis are shown in Table 2:

Table 2. Analysis of KANO model results

NO	A	O	M	I	R	Q	Classification	Better	Worse
1	28.95%	17.76%	10.53%	39.47%	0.66%	2.63%	I	48.30%	29.25%
2	27.63%	32.24%	3.95%	32.24%	1.32%	2.63%	I	62.33%	37.67%
3	34.87%	25.00%	9.87%	25.00%	1.32%	3.95	A	63.19%	36.81%
4	23.68%	13.16%	4.61%	50.66%	3.29%	4.61%	I	40.00%	19.29%
5	27.63%	23.03%	3.95%	38.82%	3.29%	3.29%	I	54.23%	28.87%
6	24.34%	34.87%	10.53%	25.00%	1.97%	3.29%	O	62.50%	47.92%
7	25.66%	31.58%	13.16%	23.03%	4.61%	1.97%	O	61.27%	47.89%
8	24.34%	28.29%	12.50%	25.66%	4.61%	4.61%	O	57.97%	44.93%
9	26.32%	17.11%	9.21%	42.76%	1.32%	3.29%	I	45.52%	27.59%
10	30.26%	29.61%	7.89%	26.97%	1.32%	3.95%	A	63.19%	-39.58%
11	15.13%	14.47%	5.26%	58.55%	3.95%	2.63%	I	31.69%	21.13%
12	21.71%	36.84%	9.21%	25.66%	2.63%	3.95%	O	62.68%	-49.30%
13	2.63%	0.66%	1.32%	46.71%	46.05%	2.63%	I	6.41%	-3.85%
14	25.66%	13.16%	4.61%	47.37%	5.26%	3.95%	I	42.75%	-19.57%

3.3. KANO questionnaire results

A total of 152 questionnaires were collected, and each function was carefully classified and divided into five categories according to the KANO model: essential attribute (M), desired attribute (O), charm attribute (A), reverse attribute (R) and undifferentiated attribute (I). The level of user preference for each feature is quantified through the KANO Quality Assessment Table, as shown in the table above. In the process of user demand and satisfaction analysis, the quantitative index of "Better-Worse coefficient" is introduced to evaluate the positive and negative effects of various functions of this TCM diet recommendation app on user satisfaction. When the Better coefficient value is close to 1, it indicates that the functional feature has a significant positive effect on improving user satisfaction, and users have a high degree of recognition of it, which is crucial to the improvement of overall satisfaction. Conversely, when the value of the Worse coefficient is close to -1, it indicates that the lack or deficiency of this feature significantly exacerbates user dissatisfaction. This means that this feature plays a key role in meeting the basic needs of users, and its optimization and improvement are important to reduce user dissatisfaction. Through in-depth analysis of the Better-Worse coefficient, the functional characteristics that have the most significant

impact on user satisfaction can be identified, which provides a scientific basis for the design and optimization of TCM diet recommendation apps.

At the same time, the application of this method is conducive to prioritizing elements that contribute to improving user satisfaction and reducing dissatisfaction in the product development process, calculated by the following formula:

Better Coefficient (SI) Formula:

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

Worse Coefficient (DSI) Formula:

$$DSI = \frac{O+M}{(A+O+M+I)} \times (-1) \quad (2)$$

Judging from the analysis results, food compatibility and taboo prompts, simple operation interface, dietary records and health feedback, health risk tips and discomfort warnings are expected needs. Personalized dietary therapy recommendations and seasonal health reminders are charming needs. Therefore, when it comes to the personalization of the product, it can be used as a major consideration.

3.4. Weight division of user demand based on AHP

3.4.1. AHP analytic hierarchy process to construct an evaluation system

Based on the results of the KANO questionnaire, the ones that had no significant impact on user satisfaction were excluded first

Differentiated requirements, retain 6 core requirements. Map requirements to based on KANO classification results

The criterion layer of the AHP model, the target layer of this model is the product demand hierarchy analysis of the TCM diet recommendation APP, the decision layer includes 2 decisions of expectation attributes and charm attributes, and the index layer has a total of 6 indicators. Among them, it includes 4 indicators under the expected demand, including food compatibility and taboo tips, simple operation interface, dietary records and health feedback, health risk warnings and discomfort warnings, and 2 indicators under the charm demand, including personalized dietary therapy recommendations and seasonal health reminders. Set the criterion layer judgment matrix to $X = (XO, XA)$; The judgment matrix of the sub-criterion layer is $XO = (O1, O2, O3, O4)$, $XA = (A1, A2)$, and 6 experts are selected for analytic hierarchy process scoring.

3.4.2. Consistency test of TCM diet recommendation APP demand indicators

Through the data analysis of the AHP questionnaire, the eigenvectors and weight values of each requirement are obtained, the maximum $\lambda_{\max}$ and the consistency ratio CR are calculated, and the consistency test is carried out on the array results ≤ 0.1

3.4.3. Comprehensive weight calculation and final ranking of indicators

Multiply the weight of the sub-criterion layer with the weight of the criterion layer to obtain the comprehensive target right, and divide the weight

The results are sorted, and the summary results are shown in Table 3 below, where the top ranked indicators will be prioritized in subsequent design practices.

Table 3. Analytic hierarchy process results

First-level indicators	The weight of the first-level indicator	Secondary indicators	Secondary indicator weight	The comprehensive weight of the secondary demand indicators	Comprehensive weight sorting
Desired Attribute (O)	0.6763	O1	0.4130	0.2793	1
		O2	0.2700	0.1826	3
		O3	0.1892	0.1280	4
		O4	0.1278	0.0860	5
Charm attribute (A)	0.3237	A1	0.7955	0.2575	2
		A2	0.2045	0.0660	6

3.5. Design suggestions

In order to improve the user's efficiency and experience in the TCM diet recommendation app, this design optimizes the interface structure and information presentation based on the Kano model and AHP analysis results. After users enter the application, the homepage will focus on "food compatibility taboo tips" and "personalized dietary therapy recommendations". Among them, taboo prompts strengthen risk perception through high-contrast color labels and pop-up windows to help users avoid unreasonable dietary combinations; personalized recommendations combine physical fitness information and eating habits to intuitively present list-style content to improve decision-making efficiency.

In terms of interaction design, the interface as a whole adopts a simple hierarchical structure to reduce the operation path. The "Diet Records and Health Feedback" module supports users to record their daily diets and display changing trends in the form of charts to enhance users' perception of their own health status. At the same time, the "Health Risk Reminder" is embedded in key nodes in the form of light reminders to avoid information interference, while the "Seasonal Health Reminder" can be presented through the homepage rotation and reminder cards to enhance the situational sense of traditional Chinese medicine health preservation.

The overall interface ensures that the information is clearly conveyed while taking into account professionalism and practicality, so that users can gradually establish scientific dietary cognition in daily use.

4. Conclusion

This paper takes the TCM diet recommendation app as the research object, and systematically sorts out and quantitatively analyzes user needs based on the Kano model and AHP analytic hierarchy process. With the support of the Kano model, the differences in user satisfaction of different needs are clarified, and the functions are divided into categories such as expectation and charm. Then, combined with the AHP method, the key needs are weighted and sorted, and six core requirements such as "food compatibility and taboo tips", "personalized dietary therapy recommendations" and

"simple operation interface" are screened out, which provides a clear priority basis for the subsequent interface design.

At the design practice level, this paper transforms the abstract requirements analysis results into specific interface function strategies, and makes the product both easy to use and guiding while ensuring professionalism by strengthening the information level, optimizing the interaction path and improving the visual expression. Especially in terms of dietary safety tips and personalized recommendations, through intuitive design methods, it effectively improves the user's decision-making efficiency and user experience. This study not only makes up for the shortcomings of existing dietary apps in TCM dietary therapy expression and personalized services, but also verifies the application value of the AHP-Kano model in health product design. In the future, we can still combine user long-term behavior data and dynamic feedback to continuously optimize the system and interactive experience, so as to build a more intelligent and personalized TCM catering service system.

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