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Research on the Selection of Iterative Improvement Point for Internet Products Based on user Satisfaction Experience under the Iterative Innovation Mode

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Abstract: In the Internet product iteration process aimed at improving user satisfaction, facing the massive user experience feedback, it is urgent to analyze the user satisfaction experience scientifically, and construct the method steps of the product iterative improvement point selection, thus serving for the effectively implementing the iterative improvement of the product. First, by three steps of constructing the user experience index system of the Internet products, analysing the user satisfaction and Kano attribute of the experience index, the user satisfaction experience process in the product iteration process was scientifically analyzed. Then, by three steps of the selection, improvement sorting and improvement quantity determination for the iterative indexes, the iterative improvement point of the product was selected. The methods and steps adopted in the article were verified to be practically operable by an actual cases, and can be used to support the implementation of iterative improvement for Internet products.
Keywords: Iterative innovation, user satisfaction experience, iterative improvement point selection,

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1. 1INTRODUCTION

With the rapid development of the Internet era, the user-centered experience economy has received extensive attention, and has changed the thinking mode of many enterprises to carry out innovative and entrepreneurial activities. Especially in the Internet and software industry, the "iterative innovation mode" with the combination of "iterative thinking" and "innovation" has gradually developed into one of the important guiding ideas of Internet product development, affecting the survival and development of Internet products [1]. The iterative innovation is different from the traditional time-consuming and high-cost waterfall development model. The enterprise needs to develop the product according to the detailed

project plan under the condition of full market investigation, but to meet the user's needs as the core, quickly change into the product according to the continuous feedback of user experience. However, in the process of practice, because of the large number of users, in the face of the feedback of massive users, enterprises usually just roughly select the feedback information of user experience relying on subjective experience or data, so it easily leads to enterprises that cannot select the iterative improvement point of products according to the valuable user feedback, and thus it is impossible to achieve better product improvement and improve customer satisfaction.

Based on the above research background, this paper, under the guiding ideology of iterative innovation and the ambition of improving the user satisfaction, studies how to select the iterative improvement point of the product according to the mass feedback from the user experience in the iterative process of the Internet products, so as to provide a clear method for the implementation of the iterative improvement of the product.

2. LITERATURE REVIEW

In the background of the Internet era, the uncertainty of the market greatly increases the complexity and risk of innovation. Schlesinger believes that enterprises need to adopt the strategy of iterative innovation [2]. As a scientific and effective management method for guiding enterprise innovation and entrepreneurship activities, iterative innovation thought has been widely recognized and studied by many scholars in recent years. It is concentrated on concepts, characteristics, mechanism of action and practical application, and there is still a lack of in-depth study on how to select product iterative improvement points.

The concept of iterative innovation is a brilliant summary of the product innovation mode under the background of the network era. Fitzgerald pointed out that iterative innovation is the process of achieving the goal of enterprise creative marketing by using iterative cycle [3]. Dong believes that iterative innovation is a process of continuous improvement, and strive to achieve the spiral of product function through efficient multiple iteration cycles [4]. The domestic scholars Huang Yan and Tao Qiu Yan defined the iterative innovation as the innovation model, which aims at speeding up the speed of innovation, and guided by continuous innovation [5]. Through the construction of the fully authorized small innovation team, the innovative mode of innovation is carried out by multiple iterations at the minimum cost and minimum risk.

On the characteristic study of iterative innovation, Li Kai Fu, the founder of the innovation field, believes that Chinese entrepreneurs are more adaptable to the iterative innovation model, because the innovation model is more focused on users and efficiency, can develop products faster with smaller investment, and seize market [6]. Zhang Teng and Wang Ying Jun suggest that the iterative innovation process is different from the traditional linear model, which includes user participation, rapid trial and error, and multiple iterations [7]. Xi Tao and Zheng Xian Qiang believe that the characteristics of iterative innovation of Internet products include two aspects of micro innovation and rapid iteration. The new emphasis is on the user's thinking as the premise and the purpose is to improve the user experience; the rapid change is the pointer

to the user feedback to adjust at the fastest speed [8]. The concept of "user creation" as the core has become a new trend of product innovation in the Internet era. Mahr and others believe that in the process of product development, the leading users with professional knowledge not only put forward their own needs, but also participate in the improvement of products, so as to implement effective product development [9].

On the role mechanism of iterative innovation, Zhu Xiao Hong and Chen Han Song studied the mechanism of how the market oriented enterprise can achieve its innovation performance through the iterative innovation model under the internet background [10]. Zhang Teng and Zhang Yu Li, based on the multi-case study of Haier "small micro", summed up the three key mechanisms of iterative innovation, including user interaction, rapid response and cross-border integration [11]. Wang Yu Rong etc proposed that the innovation mechanism of iterative cycle under the background of mobile Internet is to break the operation mode of traditional industry through technological change, and gradually improve the user experience and enterprise operating efficiency through technological evolution [12]. Based on the internal and external knowledge of enterprises, Xu Xin explored how to integrate the internal and external knowledge to achieve the product iterative innovation mechanism [13].

The iterative innovation mode has been effectively implemented in many enterprises at home and abroad. For example, Google's iteration strategy is "forever beta (beta) version". Products are not perfect, they can always be better. WeChat's iterative innovation can be summed up as "independent, simple, agile and open". Through this model, the core function of the early version of the product has been rapidly developed, and in the short term it has reached the of billions of users [14]. Based on the idea of iterative innovation, millet has adopted a product iteration model of "single point breakthrough - trial and error - user feedback negative word of mouth - re iteration - and then trial and error - until positive word of mouth - and then down the trend". This model is user centered, based on the estimated 80% of the problem in Millet software to the user's discovery [15].

Table 1. Multi-element analysis of ore

element	Pb	As	Cu	S	Fe
content	0.022	1.36	2.21	0.38	7.54
element	Al_2O_3	MgO	CaO	Au	SiO_2
content	10.50	0.87	1.23	0.93	35.78

3. RESEARCH DESIGN

In the process of developing Internet products, in the face of the uncertainty of the market, the process of product development with the core idea of iterative innovation is to put a minimalist prototype into the market first, after the several user experience, iteratively improving the product through user feedback. Therefore, the iterative process of Internet product development can be summarized as three stages: prototype product development, user experience and iterative improvement (as shown in Figure1). The prototype product is the initial condition tool for rapid test and error. The user experience is the method of finding the problem, and the

iterative improvement is the strategy of making the goal process to further optimize the promotion. In order to enhance customer satisfaction, this paper analyzes user satisfaction experience to achieve effective iterative improvement.

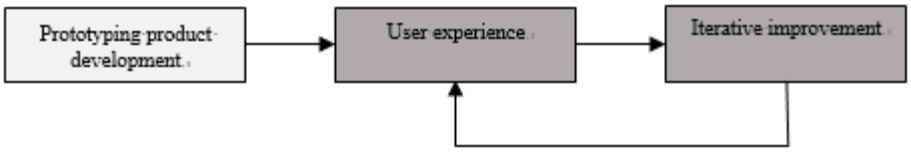

Fig.1 iterative process for Internet products

3.1 The analysis of user satisfaction experience

The analysis of user satisfaction experience is an important prerequisite for the implementation of iterative improvement. In view of the factors affected by the user satisfaction, this article from the perspective of user experience, based on the product experience index, analyzes from two aspects. First, analyze the user satisfaction of experience indicators; secondly, analyze the Kano attribute of experience indicators affecting user satisfaction; the specific steps are as follows:

1 The construction of the product experience index: using the literature analysis method, taking the Internet product user experience as the theme, consulting, collecting, inducing and sorting the related literature, refining, inducing and classifying the content of the influence factors of the Internet product user experience in the literature, and constructing the user experience index of the Internet products.

2 The user satisfaction analysis of the product experience index: Taking the college students as the object, it conducts the questionnaire survey on the user satisfaction of the product experience index, by the statistical analysis of the questionnaire data, calculating the user satisfaction of the product experience index.

3 The Kano attribute analysis of the product experience index: Taking the college students as the object, it makes a Kano questionnaire investigation for the product experience index which affects the user satisfaction, through the statistical analysis of the questionnaire data, calculating the Kano attribute of each experience index.

3.2 Iterative improvement point selection

According to the analysis result of product experience index, the iteration improvement point selection is divided into three steps. The first step is to select the iterative index category which can improve the product conditions; the second step is to establish the iterative priority order of each index; the third step is to determine the number of indexes that are finally used for the iterative improvement.

1 Iterative index selection: first of all, through the setting of the satisfaction standard, the index of the user's dissatisfaction is first selected, then, based on the Kano attribute analysis of index, the index is reselected by the satisfaction sensitivity matrix analysis, as to select the iterative index category that meeting the product improvement conditions.

2 The improvement of the iterative index: Synthetically considering the dissatisfaction degree and satisfaction sensitivity of the index, and then constructing the iterative priority calculation

formula of the index, which as the main basis for the iterative index's improvement priority order.

3 Determining the number of the iterative index: in view of the variability of the number of iterative index, the number of iterative index can be determined by setting the Quantitative parameter value, to determine the specific index for the final iteration improvement.

4. ANALYSIS OF USER SATISFACTION EXPERIENCE IN PRODUCT ITERATIVE PROCESS

4.1 The construction of user experience index system for Internet products

4.1.1 The theoretical foundation of user experience index system for Internet products

Internet products are the general term of the software system that provides users with value and services based on the Internet. In the experience economy era, in the face of fierce market competition and the higher quality of product experience required by consumers, the excellent user experience of Internet products is an important means to maintain customer loyalty and gain more commercial interests. The concept of user experience was first proposed and promoted by cognitive psychologist Donald A Donald (Donald A. Norman). In the 210th part of the ISO 9241-210:2010 human-computer interaction project, the Swiss International Standardization Organization defines the user experience as a user's full experience before, during and after use of a product or system, including feelings, beliefs, preferences, cognitive impressions, physiological and psychological reactions, behavior, and achievement[16].

In this paper, the paper database of Chinese academic journals was selected. The key words were "Internet product & user experience", "user experience index system construction" and "user experience evaluation" as the key words, and 178 papers were retrieved for 2001~2018 years. Through the further reading, induction and analysis of the literature, it found that the relevant research on the user experience index system of Internet products at home and abroad is mainly discussed from several aspects of the user experience theory model, the user experience elements and the content structure of the user experience. Next, this article will comb out the representative documents from the above aspects.

4.1.1.1 The theoretical model of user experience

The research on the theoretical model of user experience. Morville proposed a user experience cellular model, which consists of seven aspects: availability, usability, usefulness, reliability, availability, satisfactions, satisfaction, and value [17]. This model has been widely recognized as the pursuit of application value. "Father of Ajax" James Garrett has established a top-down user experience model from the point of view of product design and development, which is divided into five levels: strategic layer, scope layer, structure layer, framework layer and presentation layer, including product function, content, information availability, brand specificity and other aspects of experience[18]. Based on the general experience of Norman, Li Xiao Qing built a user psychological experience model for web product design, including visual experience, browsing experience, brand experience, functional experience, content experience, interactive experience and emotional experience, such as [19]. From six aspects of

brand, visual design, interactive feedback, information construction, security protection and personalized service, Zhang Jie constructs a system of B2C e-commerce website user experience evaluation model, which believes that the user experience is one of the core factors of the B2C e-commerce operation [20].

4.1.1.2 User experience elements

The research on the elements of user experience. Rubinoff divides the user experience elements of Internet products into four aspects: brand, usability, functionality and content, as a comprehensive index for evaluating the user experience design of Internet products [21]. Law believes that user experience assessment factors include user perceived hedonic quality, usability quality, visual aesthetics and product comprehensive quality [22]. Mahlke has proposed the technical and non-technical elements of human-computer interaction experience, in which the technical elements include system usefulness and ease of use; non-technical elements include enjoyment, visual beauty and content attraction. Hu Chang Ping and others believe that the experience of digital information should include, which is easy to find, usability, usefulness, expectation, easy access and credibility [23]. Pei Yi Lei and others combine the user experience with the search engine evaluation effectively, and build the evaluation index of the search engine user experience from four experience factors of usefulness, availability, reliability and satisfaction [24].

4.1.1.3 The content structure of user experience

The research on the content structure of user experience. Firstly, the well-known cognitive psychologist Donald A Norman, from the perspective of emotional design, considering the user experience can be divided into the instinct layer, the behavior layer and the reflection layer, which reflects the universal law of human cognition and feeling the things [25]. From the perspective of strategic marketing experience, Bernd H. Schmitt put forward the five kinds of customer experience content, which were composed by sensory experience, emotional experience, thinking experience, action experience and associated experience, and pointed out that a variety of experiences applied into practice could improve the experience infection power of the product or service [26]. From the relationship between information construction and user experience, Wang XiaoYan constructed the content of user experience in the field of information services, including functional experience (useful and usable), technical experience (time-saving, labor saving, saving money) and aesthetic experience (visually attractive, audible, and rational) [27]. Wang Yue Feng believed the auditory feedback could be an effective way to improve the user experience, Internet products usually need to express some certain meaning by various sound effects. The strong and weak voice, the clarity of communication and the immersion brought to people and etc are all the important factors to strengthen the experience [28]. From the perspective of Internet product interface design, Wang Juan divided the user experience of Internet products into sensory experience (visual and hearing), interactive experience (efficiency, fault tolerance, fluency,) and emotional experience (pleasing, interesting and humanized)[29].

4.1.2 The construction of the index system

Based on the literature analysis and combing of the model, elements and content structure of the user experience of Internet products, this paper constructs an Internet product user experience index system consisting of "3 index levels, 8 index sublayers and 20 experience indicators" (Table 1), and the specific division process is as follows.

1 The division of the experience index. Using the bibliometric method, we summarize the experience indexes of three aspects of the user experience model, elements and content structure, and extract the high frequency and representative experience indexes, which are summarized into 20 indexes, such as visual beauty, visual clarity, brand attraction, visual guidance, rational layout and so on.

2 The subdivision of index sublayers. The index sublayer is the result of further induction of experience indicators. The visual beauty, visual clarity, visual guidance, brand attraction and the rationality of the interface layout are classified as visual experience, and the user's first impression of the product is expressed through the vision of the user. The authenticity of voice, the diversity of sound effects and the immersion of voice are classified into auditory experience content, which indicates the user's first impression of the product through hearing. Functional usefulness and functional usability are classified as functional experience, which indicates that users can accomplish basic tasks by using products. Interactivity, operation fluency and operational ease of use are classified as operating experience content, indicating that the user can promote the user's performance properties of the basic task during the process of operating the product. Content enrichment, content accessibility and content reliability are categorized as content experience, representing the attributes of product quality to user attraction.

3 The division of index levels. The index level is based on the result of the index sub level, and further summarizes the experience level with similar meaning expression. First, visual experience and auditory experience can be summed up as sensory experience, representing the user's first impression of products through intuition. Then, the functional experience, the operation experience and the content experience are summed up as the behavior experience, which represents the intuitive feelings produced by the user in the process of interactive operation of the function or content of the product through personal behavior. Emotional experience, as an emotional experience, refers to the emotional feeling that the user experiences in the overall experience of the product after experiencing the product.

Table 1. User experience index system for Internet products

Index hierarchy	Index sublayer	Experience index	Basic meaning
Sensory layer experience	Visual experience	Visual beauty	The overall design of the product interface, the style is pleasing to the eye, good-looking.
		Visual clarity	The pictures, words, multimedia and other information displayed on the product interface are clearly visible.
		visual clarity	The product's brand Logo and pattern design make users feel good, sympathetic or even desire to buy.
		Rationality of interface layout	The image, text and other information modules of the product interface are reasonably arranged.
		Visual guidance	Promote users' natural accessibility during page usage, assist users to find key information quickly and help them accomplish their goals and tasks.

	Auditory experience	Sound fidelity	Sound, low distortion (voice)
		Sound diversity	Sound effects are rich and diverse(quasi physical sound, anthropomorphic sound, prompting sound)
		Sound immersion	Easy to attract users into it (Multimedia software products, VR products).
Behavioral layer experience	Functional experience	Functional usefulness	All the functions of the product can meet the needs of users and be of value to users.
		Functional availability	All functions of the product can be realized to help users achieve their goals smoothly.
	Operating experience	Interactivity	In the process of operation, products can feedback information.
		Operation fluency	Users experience fast and smooth operation of products.
		Operational ease of use	The operation of products is easy to understand and easy to use.
	Content experience	Content richness	The product has abundant information and many kinds of information.
		Content accessibility	Users can easily get the information they need
		Content reliability	The information content presented in the product is authentic and believable
Emotional experience	Emotional experience	Pleasure and enjoyment	The whole experience of the product enables the user to feel pleasure and enjoyment from the bottom of his heart.
		Individualization	Personalization of product design
		Safety	The protection of personal privacy of the product is good
		Social identity	Good social recognition of products

4.2 User satisfaction analysis of product experience index

4.2.1 Design of user satisfaction questionnaire

User satisfaction questionnaire design is an important prerequisite for measuring user satisfaction. In the course of this research, the design of the questionnaire consists of two parts. The first part is to investigate the basic information of users, including four basic information of users' gender, age, grade and profession. The second part is the main content of the user survey. Drawing on the 20 user experience indicators of Internet products in table1, setting up the questionnaire survey problem, using the Li Kete's scoring method (1 to 5 points, representing extreme experience, worse, more general experience, better experience and great experience), evaluate each problem.

4.2.2 Measurement of user satisfaction based on questionnaire data

The degree of evaluation of each survey problem in the design of the questionnaire ("extreme experience", "worse", "experience general", "better", "great experience") were divided by 1-5 scores to indicate the satisfaction of the user. In order to facilitate the calculation, this paper divides the evaluation of 1 points, 2 points, 3 points, 4 points and 5 points into five, 20%, 40%, 60%, 80% and 100% respectively. The total number of experiential users in the questionnaire is "n (n > 1)", and each experience index is Si, then the 20 experience indicators can be expressed as $S=\{s_i | 1 \le i \le 20, i \in N\}$. The evaluation score of the user's product experience index is g_i（$1 \le g_i \le 5$）.The number of experience indicators is 20, and the formula for calculating the satisfaction degree of the product's experience indicators is P_i($0<P_i \leqq 1$，$1 \le i \le 20$, which can be expressed as:

$$P_i=\frac{\sum_{i=1}^{n} g_i}{5n}*100\% \tag{4.1}$$

4.3 Analysis of Kano attribute of product experience index

The Kano model theory was a dual dimensional cognitive model[30] (as shown in Figure 2), which was inspired by the dual factor theory of Hertz Berg by Noriaki Kano, who was the Professor of the University of science and Technology, and was established in 1984. According to the objective performance of product or service and the subjective feeling of user experience, the theory classifies the quality characteristics of the product, which is embodied in five categories of Kano attributes, which are the charismatic quality characteristic A(the ability to create surprises for users will greatly improve customer satisfaction when this feature is met, but users will not feel dissatisfied when they are lacking)., the expected quality characteristic O(the more satisfying the user expects, the more satisfied the feature is and the more satisfied the user is)., the basic quality characteristic M(the characteristic that the product must satisfy, when this characteristic does not have, the user will feel very dissatisfied, when does not have the enhancement user satisfaction)., the indifference quality I(the characteristics that users do not care about, whether or not the feature is available can not affect users' satisfaction or dissatisfaction with the product)., and the reverse quality characteristic R (the characteristic that causes user dissatisfaction, the existence of this feature reduces user experience satisfaction).

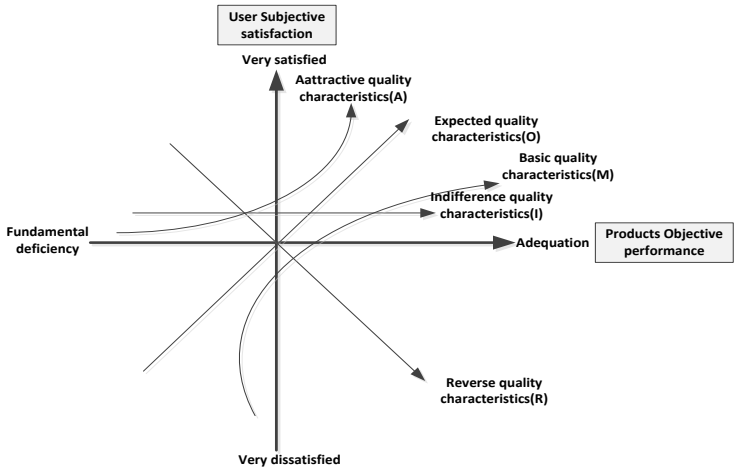

Fig. 2 Kano model

4.3.1 Design of Kano attribute questionnaire for experience index

The user survey information and experience index of the Kano questionnaire are the same as the user experience satisfaction questionnaire, but different from the traditional questionnaire, each problem level is only one way to ask the user. The design principle of the Kano questionnaire is aimed at each problem level and needs to ask the user from the positive and negative two angles. The positive problem is to investigate how the user is satisfied with the product when the product has the characteristics of the product, and the reverse is how the user is satisfied with the product when the product does not have the feature. The specific Kano questionnaire is shown in table2 as follows.

Table 2. Kano questionnaire item

Feeling / Problems	Dissatisfied	Less satisfied	Indifferent	More satisfactory	Very satisfied
If the product has this feature, your feelings are	1	2	3	4	5
If the product does not have this feature, your feelings are	1	2	3	4	5

4.3.2 Estimation of Kano attribute of experience index

The Kano attribute calculation process of the experience index is based on the survey data of the Kano questionnaire, and classifies the quality characteristics of the product experience index according to the Kano evaluation rule (see Table 3), and investigates which category of each user's classification of each characteristic belong to the five characteristics of A, O, M, I and R.

When the user is satisfied with the positive evaluation of a product experience index, and the reverse evaluation is satisfactory, it is easy to conclude that the experience index is expected to be a desired quality characteristic for the user according to the Kano evaluation table. In this way, the frequency of each experience index in the results of different characteristics are counted, and the maximum frequency number is used as the basis for judging the characteristics of the index.

Table 3. Kano questionnaire evaluation

Positive problem	Reverse problem				
	perfect contentment	More satisfactory	Indifferen t	Tolerabl e	Dissatisfie d
perfect contentmen	Q	A	A	A	O
More satisfactory	R	I	I	I	M
Indifferent	R	I	I	I	M
Tolerable	R	I	I	I	M
Dissatisfied	R	R	R	R	Q

5. PRODUCT ITERATIVE IMPROVEMENT POINT SELECTION

5.1 Selecting of iterative indexes

5.1.1 Initial selecting of iterative indexes based on user's dissatisfaction

5.1.1.1 The setting of the standard of satisfaction evaluation

The standard of satisfaction evaluation is the level of user satisfaction evaluation, which is divided by different enterprises according to the comprehensive consideration of their respective product strategic vision, market operation and so on. In the measurement of user experience satisfaction, "20% of satisfaction indicates extreme experience", "satisfaction 40% means experience is bad", "satisfaction level 60% means experience general", "satisfaction 80%

means experience is better", "satisfaction degree 100% means experience is good". In view of the 0-1 percentile satisfaction evaluation, the satisfactory ideal baseline of the enterprise is a (0 < a < 1). It indicates that when the user's satisfaction with a certain experience index of the product is less than a, the user's experience evaluation of the index is dissatisfied. When the user satisfaction degree of Pi is greater than or equal to a, it is considered that the user's experience of the index is satisfactory.

According to the above analysis, the satisfaction evaluation criteria for the product experience index can be divided into two levels, that is, the unsatisfactory evaluation standard and the ideal satisfaction evaluation standard, as shown in table 4 as follows.

Table 4. Criteria for evaluating the satisfaction of experience indicators

Serial number	Standard of satisfaction evaluation	Meaning
1	Unsatisfactory evaluation criteria	$0 < P_i < a$
2	Ideal satisfaction evaluation standard	$a \le P_i \le 1$

5.1.1.2 Iterative index selection for unsatisfactory evaluation

It's known that product experience index set $S=\{s_i | 1 \le i \le 20, i \in N\}$, the satisfaction of each experience index was Pi. According to the satisfaction evaluation standard in the table 4, the user dissatisfied iterative index category is the experience index which satisfaction degree Pi belong to the interval (0, a), which can be expressed as the iterative index set A of unsatisfactory evaluation, and $A=\{s_i | 0<P_i<a, s_i \in S\}(i \in [1,20] 且 i \in N)$.

5.1.2 Iterative index reselection based on Kano attribute

The index of unsatisfactory evaluation is the primary selecting category of iterative index, but in order to consider whether the iterative index is beneficial to improve the satisfaction of users, it needs to combine the Kano attribute of the index to further analyze the satisfaction sensitivity of the index to the index of the dissatisfied evaluation, and reselect the iterative index which is beneficial to the improvement of the user satisfaction.

The satisfaction sensitivity analysis is based on the Kano attribute classification of various indexes, analyzes the satisfactory influence and unsatisfactory influence of various index characteristics, and forms a satisfactory sensitivity comparison matrix, thus judging the process of the satisfactory sensitivity of these indexes [31].

(1) Satisfactory influence and dissatisfaction influence. Satisfaction influence (SI) is a reflection of the effect on user satisfaction when the characteristic of a product is more prominent; the dissatisfaction influence (dissatisfaction influence, DSI) is a reflection of the effect on user satisfaction when a certain product of a product is less prominent. The two functions reflect the sensitivity of index characteristics to users' satisfaction. Satisfaction / dissatisfaction, the higher the influence value, the better the user satisfaction index is.

$$SI_i = \frac{A+O}{A+O+M+I} \tag{5.1}$$

$$DSI_i = \frac{(-1)\times(O+M)}{A+O+M+\mathrm{I}} \tag{5.2}$$

A, O, M and I respectively represent the frequency of each index in various quality characteristics, and are easily drawn from the results of the questionnaire survey in Kano.

(2) the satisfaction sensitivity comparison matrix. Satisfactory sensitivity matrix is a comprehensive reflection of users' sensitivity to satisfaction of various indicators. It is based on the SI value of each index as the abscissa and the DSI value as the ordinate. The specific process is a point (0.5,0) as a straight line perpendicular to the axis, the point (0, -0,5) is a straight line perpendicular to the longitudinal axis, two straight lines are compared to P, and the original point O is a round point, and the 1/4 arc with the radius of OP will cut different index characteristics, as shown in Figure 3. The dotted line arcs represent the selection line of the index characteristics. The index on the right side of the line is regarded as an iterative selecting index to improve the satisfaction of the user. The farther the index position is from the round point, the more sensitive the user is to the index, the more important it needs to be improved; and the index on the left side is less sensitive to satisfaction. It may not be considered for for a while [32].

Therefore, this paper, aiming at the unsatisfactory iterative index set A, selects the index which belongs to the right of the selection line again, and sets it to the iterative index set B, which can be expressed as $B=\{s_y | s_y \in S, y \in [1,20] 且 y \in N\}$, and Y indicates the number of the indexes on the right side of the selection line.

（3）iterative index reselection. The distance between the location of each index and the original point O can be expressed as $\sqrt{SI_i^2+DSI_i^2}$, the radius of the 1/4 arc can be calculated as $\frac{\sqrt{2}}{2}$, so for the dissatisfied iterative index set A, this paper selects the index on the right of the selection line again, and sets it as the iterative index set B, which can be expressed as

$$B=\left\{s_i \middle| \sqrt{SI_i^2+DSI_i^2} \geq \frac{\sqrt{2}}{2}, s_i \in A\right\} (i \in [1,20] 且 i \in N)$$

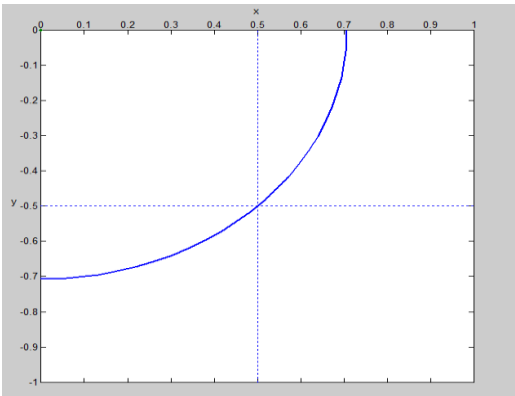

Fig. 3 Sensitivity comparison matrix

5.2 Improved ranking of iterative indexes

5.2.1 Calculation of the degree of dissatisfaction of iterative indexes

The dissatisfaction degree of the iterative index is opposite to the degree of satisfaction. According to the calculation process of the satisfaction degree Pi in the formula 4.1, the

calculation formula of the dissatisfaction of each index can be easily obtained, which can be expressed as the DPi.

$$DP_i = 1 - \left(\frac{\sum_{i=1}^{n} g_i}{5n} \right) * 100\% \qquad (5.3)$$

gi（1≤gi≤5） represents the user's evaluation score on the experience index of the product. n（n≥1）indicates the total number of experienced users in the survey. The higher the degree of dissatisfaction is, the higher the user's satisfaction with the product experience index, the more need to be improved by the iteration.

5.2.2 Calculation of satisfactory sensitivity of iterative index

The satisfaction sensitivity of the iteration index is measured by the distance between the position of the index and the origin, which can be expressed as $\sqrt{SI_i^2+DSI_i^2}$.The higher the satisfaction sensitivity is, the more the improvement of the index is good for improving the user satisfaction. This paper set the satisfaction sensitivity as SSi, and the formula for calculating the satisfaction sensitivity can be expressed as

$$SS_i = \sqrt{SI_i^2 + DSI_i^2} \qquad (5.4)$$

5.2.3 Improved priority ranking of iterative indexes

The improvement order of the iterative index needs to consider the degree of dissatisfaction DPi and the satisfaction sensitivity SSi synthetically. This paper multiplies the value of the dissatisfaction degree with the satisfaction sensitivity value, and takes it as the improvement priority of the index, and names it as "iterative priority", which is expressed with IP (Iterative priority). The calculation formula of iterative priority is shown in the following formula 5.5. The larger the IPi value, the more priority should be given to improving the index.

$$IP_i = DP_i \times SS_i \qquad (5.5)$$

5.3 The determination of improvement numberfor iterative index

In order to select the final iteration improvement points of the product, the enterprise needs to further determine the number of iterative indicators for product improvement in the definition of the index category of product iteration improvement and the improvement of each iteration index. The iterative path of product development is to meet the needs of the user as the core and the process of circulation. The variability of the user's demand is bound to be accompanied by the uncertainty of the product iteration. Therefore, the improved quantity of iterative indicators requires enterprises to comprehensively judge the actual situation based on market demand feedback, product operation status and so on. In the selected index category that meets the iterative improvement of the product, the enterprise can select the improved part of the iterative index according to the iterative priority of each index, and it can be all. For example, the iteration improvement points of the Android 6.5.3 version of the Tencent WeChat include

two aspects of album and voice, and the iteration improvement points of the 6.5.4 version include three aspects of red packets, photos and information browsing.

In this study, the number of iterative improvement indexes of enterprise selecting is set to arbitrary parameter value z（z∈N), according to the iterative priority of each index from large to small order, the final product iteration improvement point can be expressed as the former Z iterative index in the iterative index set B according to the iterative priority, and the set C is expressed as$C=\{s_z|s_z\in B,z\in[1,20]且z\in N\}$.

6. CASE STUDY

As an example of a "WeChat public platform" product developed by an enterprise, the core function of the product is to provide students with rich experience knowledge of job hunting, thus helping students to deal with job interviews better. In this paper, the "WeChat public platform of school and recruitment consulting service" is referred to as A product for short. In view of the 2 version of the product, how to filter the iterative improvement points in the next iteration process of the A product is studied.

6.1 Analysis of user satisfaction experience in a product iterative process

6.1.1 User satisfaction analysis of a product experience index

6.1.1.1 Survey and test of user satisfaction questionnaire

This article selects the C college students as the main user investigation object, first invites 300 students to experience the A product, and then uses the questionnaire on the questionnaire on the web site. The questionnaire was released for 2 weeks. A total of 251 questionnaires were collected, and 36 questionable questionnaires were excluded. Finally, 215 valid questionnaires were obtained.

The reliability and validity of the overall scale were tested. In terms of reliability, the tested Cronbach alpha value is 0.917, indicating that the overall measurement results of the questionnaire are quite believable. In terms of validity, first of all, the item of this questionnaire is completed on the basis of scientific logic structure and expert verification. Therefore, the questionnaire has good content validity; the structure validity, the tested KMO measurement value is 0.906, indicating that it is suitable for factor analysis; the significant probability of the Bartley spheroid test ^2 statistical value is 0. 000, less than 0.01, indicates that the data has relevance, and the principal component analysis is used to coordinate the orthogonal axis with the maximum variation method. The cumulative explanatory variation of most extraction factors is 66.420%, indicating that the questionnaire has good structural validity.

6.1.1.2 Household experience satisfaction measurement of A products

The reclaimed user satisfaction questionnaire data are counted, and the user satisfaction degree of the experience index is calculated according to formula 4.1 Pi, and the user satisfaction degree of each experience index is obtained. The results are shown in Table 5 as shown below.

Table5 user satisfaction of experience indicators

Table 5. User satisfaction of experience indicators

Serial number	Product experience index	The satisfaction of the experience index P_i
s_1	Visual beauty	72.00%
s_2	Visual clarity	83.00%
s_3	Brand attractiveness	69.00%
s_4	Rationality of interface layout	78.00%
s_5	Visual guidance	75.00%
s_6	Sound fidelity	72.00%
s_7	Sound diversity	68.00%
s_8	Sound immersion	64.00%
s_9	Functional usefulness	73.00%
s_{10}	Functional availability	80.00%
s_{11}	Interactivity	83.00%
s_{12}	Operation fluency	75.00%
s_{13}	Operational ease of use	82.00%
s_{14}	Content richness	71.00%
s_{15}	Content accessibility	73.00%
s_{16}	Content reliability	82.00%
s_{17}	Pleasure and enjoyment	67.00%
s_{18}	Individualization	68.00%
s_{19}	Safety	81.00%
s_{20}	Social identity	70.00%

6.1.2 Analysis of Kano attribute of experience index

6.1.2.1 Kano questionnaire survey and test of experience index

The Kano questionnaire survey of the experience index also takes 300 C university students as the subjects. According to the students' cognition of A products, the questionnaire is used to carry out the questionnaire survey. The questionnaire was released for 10 days, and 205 valid questionnaires were collected.

According to the spss.20 statistical software, the reliability and validity of the questionnaire were analyzed from two aspects. The results all reached good reliability and validity, and the results of the analysis were shown in table 6.

Table 6. Analysis of reliability and validity of Kano questionnaire

Analysis / Problems	Reliability Analysis	Validity Analysis		
	Cronbach α	KMO	Sig.	cumulative interpretation Variability
Positive problem	0.959	0.936	0.000	0.71823
Reverse problem	0.931	0.908	0.000	0.65046

6.1.2.2 Estimation of Kano attribute of experience index

According to the Kano evaluation table, the results of each user's questionnaire are analyzed, and each experience index is divided into different quality characteristics, and the maximum frequency is used as the basis to judge the quality characteristics of each index, thus the classification results of the quality characteristics of the product experience indexes are calculated, as shown in table 7 as follows.

Table 7. Classification of quality characteristics of experience indicators

Serial number	Experiential characteristics	A	O	M	I	R	Q	Classification of characteristics
s_1	Visual beauty	63	27	27	26	0	2	A
s_2	Visual clarity	18	24	79	28	0	2	M
s_3	Brand attractiveness	42	45	4	51	0	1	I
s_4	Rationality of interface layout	51	53	7	31	0	1	O
s_5	Visual guidance	46	59	7	28	1	2	O
s_6	Sound fidelity	48	33	9	51	0	2	I
s_7	Sound diversity	50	15	6	69	1	2	I
s_8	Sound immersion	56	14	1	66	3	3	I
s_9	Functional usefulness	14	73	23	33	0	0	0
s_{10}	Functional availability	16	20	80	24	0	3	M
s_{11}	Interactivity	3	32	59	57	1	0	M
s_{12}	Operation fluency	31	71	5	34	1	1	O
s_{13}	Operational ease of use	31	71	10	30	0	1	O

s_{14}	Content richness	30	70	12	29	0	2	O
s_{15}	Content accessibility	31	76	7	27	0	2	O
s_{16}	Content reliability	19	85	9	26	4	0	O
s_{17}	Pleasure and enjoyment	59	36	14	31	0	3	A
s_{18}	Individualization	55	36	6	43	1	2	A
s_{19}	Safety	10	14	97	21	0	1	M
s_{20}	Social identity	41	56	8	35	1	2	O

6.2 Iterative improvement point selecting for a products

6.2.1 A product iterative index selection

6.2.1.1 Initial selecting of iterative indexes based on user's dissatisfaction

The user satisfaction ideal base line parameter a set by a company is 80%. According to table 5.1, the unsatisfactory evaluation standard of the product experience index of A company is "0<" "P" "I" "<80%", then the initial iterative index set A as the satisfaction degree Pi belongs to the experience index of (0, 80%) interval. A={s_1,s_3,s_4,s_5,s_6,s_7,s_8,s_9,s_{12},s_{14},s_{15},s_{17},s_{18},s_{20},}, as shown in table 8 below.

Table 8. Iterative index set A

Serial number	Product experience index	Index satisfaction degreeP_i
s_1	Visual beauty	0.72
s_3	Brand attractiveness	0.69
s_4	Rationality of interface layout	0.78
s_5	Visual guidance	0.75
s_6	Sound fidelity	0.72
s_7	Sound diversity	0.68
s_8	Sound immersion	0.64
s_9	Functional usefulness	0.73
s_{12}	Operation fluency	0.75
s_{14}	Content richness	0.72
s_{15}	Content accessibility	0.73
s_{17}	Pleasure and enjoyment	0.67
s_{18}	Individualization	0.68
s_{20}	Social identity	0.7

6.2.1.2 Iterative index reselecting based on Kano attribute

(1) The satisfaction influence SI of product experience indicators and the calculation of dissatisfied influence DSI.

According to formula 6.1 and 6.2, the satisfactory influence and dissatisfaction influence of experience indicators can be calculated. The results are shown in table 9 below.

Table9 Satisfaction and dissatisfaction influence of product experience indicators

Serial number	Experience index	SI	DSI
s_1	Visual beauty	0.629	-0.378
s_2	Visual clarity	0.282	-0.691
s_3	Brand attractiveness	0.613	-0.345
s_4	Rationality of interface layout	0.732	-0.423
s_5	Visual guidance	0.750	-0.471
s_6	Sound fidelity	0.574	-0.298
s_7	Sound diversity	0.464	-0.150
s_8	Sound immersion	0.511	-0.109
s_9	Functional usefulness	0.608	-0.671
s_{10}	Functional availability	0.257	-0.714
s_{11}	Interactivity	0.232	-0.603
s_{12}	Operation fluency	0.723	-0.539
s_{13}	Operational ease of use	0.718	-0.570
s_{14}	Content richness	0.709	-0.582
s_{15}	Content accessibility	0.759	-0.589
s_{16}	Content reliability	0.748	-0.676
s_{17}	Pleasure and enjoyment	0.679	-0.357
s_{18}	Individualization	0.650	-0.300
s_{19}	Safety	0.169	-0.782
s_{20}	Social identity	0.693	-0.457

(2) Sensitivity analysis matrix

With the satisfactory influence SI as the abscissa and DSI as the ordinate, the sensitivity comparison matrix can be obtained, as shown in Figure4 below.

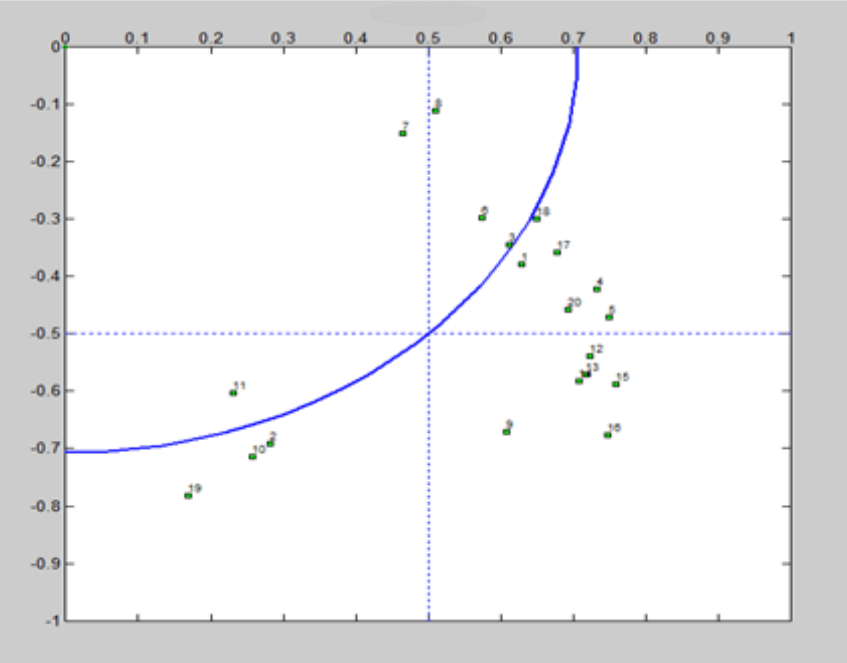

Fig.4 The sensitivity matrix analysis of the product experience index

(3) Iterative index reselection

On the basis of selecting the index set A which is not satisfied with the users, we further select indicators that are conducive to improving user satisfaction. From the sensitivity comparison matrix diagram, we can see that the unsatisfactory evaluation index on the right side of the selection line is the final iteration index set B, B={s_1,s_4,s_5,s_9,s_{12},s_{14},s_{15},s_{17},s_{18},s_{20},}, and the results are shown in table 10.

Table 10. Product iterative index set B

Serial number	Iterative index
s_1	Visual beauty
s_4	Rationality of interface layout
s_5	Visual guidance
s_9	Functional usefulness
s_{12}	Operation fluency
s_{14}	Content richness
s_{15}	Content accessibility
s_{17}	Pleasure and enjoyment
s_{18}	Individualization
s_{20}	Social identity

6.2.2 Improved sequencing of a product iterative index

First, according to the calculation of the user's dissatisfaction DPi of each experience index by formula 5.3, the DPi value of the unsatisfactory degree of the indexes in the iterative index set B is obtained. Then the satisfaction sensitivity SS of each index is obtained according to the formula 5.4 technology; finally, the formula 5.5, according to the DPi value of discontent degree DPi, is satisfied with the SS value of sensitivity. The iterative priority IPi calculation results of index (as shown in table 11), the iteration priority of iteration index is arranged from high to low.s14＞s15＞s17＞s20＞s9＞s18＞s12＞s5＞s1＞s4.

Table 11. The result of iterative priority calculation of the index

Serial number	Iterative index	DP_i	SS_i	IP_i
s_1	Visual beauty	0.28	0.734	0.206
s_4	Rationality of interface layout	0.22	0.846	0.186
s_5	Visual guidance	0.25	0.886	0.222
s_9	Functional usefulness	0.27	0.906	0.245
s_{12}	Operation fluency	0.25	0.902	0.226
s_{14}	Content richness	0.29	0.917	0.266
s_{15}	Content accessibility	0.27	0.96	0.259
s_{17}	Pleasure and enjoyment	0.33	0.767	0.253
s_{18}	Individualization	0.32	0.716	0.229
s_{20}	Social identity	0.3	0.83	0.249

6.2.3 Determination of the improved quantity of a product iterative index

According to the analysis of the market demand and the operation status of the product, the number of iterations of the product Z is set to 3, then the product iterative improvement point can be expressed as the collection of$Z=\{s_{14},s_{15},s_{17}\}$. According to the iterative priority of each index, the index order of the next iteration of the product is s14＞s15＞s17, that is, the enterprise should give priority to the content richness of the product, the second is the accessibility of the content, and the last is pleasure enjoyment.

7. RESEARCH CONCLUSION

Based on the idea of iterative innovation and the goal of improving user satisfaction, this paper proposes a product iteration improvement point selection method based on user satisfaction experience.

In view of the process of user satisfaction experience analysis, three steps are put forward, which are the construction of the experience index of the Internet products, the user satisfaction analysis of the experience index and the analysis of the Kano attribute. Firstly, the literature analysis method is used to dig, analyze and classify the relevant theories of the Internet product user experience, and construct an Internet product experience index composed of three levels. Then, based on the three level index of the user experience of the Internet products, the user satisfaction of the product experience index is analyzed by the questionnaire survey method. The user satisfaction of each index is calculated, and finally, based on the three level index of user experience, the Kano questionnaire is used to analyze the Kano attribute of the experience index, and the quality characteristics of each index are calculated.

Aiming at the improvement process of product iteration, three steps are proposed, namely, iterative index selection, iteration index ranking and iterative index improvement. First of all, according to the user satisfaction analysis and the result of the Kano attribute analysis, the initial selecting and reselecting of the user's dissatisfaction index and the index which is beneficial to the improvement of the user satisfaction are made, and the iterative index set for the improvement of the product is $B=\left\{s_i \middle| \sqrt{SI_i^2+DSI_i^2} \geq \frac{\sqrt{2}}{2}, s_i \in A\right\}$ $(i\in[1,20]$且$i\in N)$. Then, according to the degree of dissatisfaction and satisfaction sensitivity of the iterative index, the iterative priority is built. The greater the value, the more need to be improved. The improved number of iterative indexes of the product is Z of arbitrary parameter value, and the final iteration improvement point of the product is determined, which is expressed as the set $C=\{s_z | s_z \in B, z\in[1,20] \text{ and } z\in N\}$.

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