



Exploring Multisensory Experiences in Handicraft Design: A Study to Improving User Satisfaction

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Abstract

This article mainly studies traditional handicrafts in Shanxi Province. Against the backdrop of consumers' increasing pursuit of rich product experiences, this article delves into how to improve user satisfaction with handicrafts through multi sensory experience design strategies. This study first elucidated the concept of multisensory experience, analyzed its cognitive psychological basis, and emphasized the role of multidimensional sensory stimuli such as vision, hearing, smell, taste, and touch in improving product experience. By selecting representative traditional handicrafts from Shanxi Province as case studies, this paper elaborates on how to apply the concept of multi sensory experience in innovative design practice. The case analysis not only demonstrates how multi sensory elements are cleverly integrated into the selection, color matching, styling, and interactive experience of handicrafts, but also reveals the principles that should be followed in the design process, such as respecting traditional skills, strengthening cultural expression, and paying attention to users' emotional needs.

Keywords: Multisensory experience; handicraft design; user satisfaction; cognitive principle

1. Introduction

In the long history of the Chinese nation, Shanxi has nurtured a rich variety of traditional handicrafts with its profound cultural heritage and unique geographical environment. These works of art are not only treasures of Chinese culture, but also important carriers of Shanxi's regional culture. There are many kinds of traditional handicrafts in Shanxi, including but not limited to Pingyao Tuguang lacquer ware, Xinjiang cloud carving, Jiangzhou clay inkstone, Datong Laibao, Yangquan Pingding ware, as well as exquisite Paper Cuttings and embroidery. These handicrafts not only showcase the superb skills and creativity of the people of Shanxi, but also contain rich historical and cultural information and regional characteristics. For example, Pingyao Tugang lacquerware is famous for its bright and warm jade lacquer. Each process embodies the hard work and wisdom of craftsmen, and Xinjiang showcases the aesthetic taste and life philosophy of ancient literati with its unique carving techniques and pattern design. With the rapid development of the national economy and the increasing improvement of people's living standards, people's sense of identity and belonging to traditional culture continues to strengthen. The design and development of creative products in traditional handicraft culture have gradually become the focus of attention from all sectors of society. Especially in the context of multi sensory experience becoming a new trend in design, how to combine these ancient handicraft techniques with modern design concepts to create products that not only meet the aesthetic taste of the times but also contain profound cultural heritage has become a topic worthy of in-depth exploration (AyaTezuka, Hiroshima N, Suzuki M, et al, 2024).

As an important field that combines traditional culture with modern design, handicraft design has received widespread attention. However, with the intensification of market competition and the diversification of consumer demand, how to improve the user satisfaction of handicrafts has become an important issue faced by designers. In recent



years, the concept of multisensory experience has gradually been introduced into handicraft design (El-Sherif M. F, Rabia S I, El-Malek A H A, et al, 2024). By comprehensively considering various sensory experiences such as vision, hearing, smell, taste, and touch, we aim to provide users with a richer and more three-dimensional product experience. This article aims to explore the application of multi sensory experience in handicraft design, providing theoretical support and practical guidance for improving user satisfaction (Beza B, Globa A, 2023).

2. Background of Study

2.1 The Concept of Multi-Sensory Experience

Given the development of today's society, people are no longer just satisfied with their functional needs, but are stimulated with emotions through various sensory channels such as vision, hearing, touch, smell, and taste. This article will elaborate on the concept of multisensory experience from two aspects: the cognitive principles of sensory experience and the sensory expression in multisensory experience (McHugh R K, Fitzmaurice G M, Votaw V R, et al, 2024).

2.2 Cognitive Principles in Terms of Sensory Experience

Based on the cognitive principles of sensory experience, we can delve into its core role in the process of human perception of the world. Sensory experience is not only a simple acceptance of external things, but also a complex and delicate information processing process, divided into three stages: sensory, perceptual, and cognitive.

a) Sensory stage. When objective external things directly affect our sensory organs, the brain will reflect this information separately, forming feelings. Feeling is not just singular, the senses of the body are interrelated and interact with each other. For example, when we taste delicious food, vision tells us about the appearance and color of the food, smell makes us feel the aroma of the food, and taste is responsible for tasting the taste of the food. Meanwhile, touch also participates in this process, allowing us to feel the texture and temperature of the food. These different feelings are intertwined, together forming our comprehensive understanding of food.

b) Perception stage. Perception is the process of organizing and interpreting sensory information based on sensation. Through this process, we can better understand the occurrence of external objects and events. The construction of perception relies on rich sensory information, therefore, the richer our senses are, the more complete our perception system of things will be. Taking music as an example, we can not only hear the melody and rhythm of music, but also feel the emotions and atmosphere of music. This comprehensive perceptual experience is based on our integration and interpretation of sensory information at all levels of music.

c) Cognitive stage. Cognition is a psychological process that arises during the acquisition and application of knowledge, and is also an advanced stage of information processing. Unlike perception, cognition is generated by memory and processing. It is not only a simple reflection of external things, but also an element of personal experience and understanding. Through cognition, we can better understand the essence and laws of things, and form our own knowledge system. For example, when learning scientific knowledge, we not only need to remember various concepts and formulas, but also understand the principles and meanings behind them, and form our own scientific thinking.

2.3 Sensory Expression of Multi-Sensory Decency

For a dynamic structural system as a whole, in order to effectively play its role, a dominant force structure factor is needed to take the lead in implementation and effectively guide other forces to cooperate. The same applies to sensory expression in multisensory experiences. This article will also explain the sensory expression mode of multi sensory experience from several aspects:



a) Visual sensory expression - is the most easily noticeable type of expression. When evaluating a product, people often start from visual elements such as form, color, etc. For form, different forms of products give different experiences to people, and for color, different colors convey different psychological feelings to people. Therefore, the expression of visual senses needs to be combined with the form and color of the product, creating mutual emotions between people and the product.

b) Auditory sensory expression - From a psychological perspective, auditory perception not only effectively enhances people's understanding of products, but also provides certain emotional cues. Therefore, when designing traditional handicraft cultural creative products, relevant personnel need to add auditory elements to effectively enhance the uniqueness of the product and meet the needs of consumers.

c) The expression of touch mainly refers to the true sensation felt through physical contact. As the most sensitive sensation for people, touch needs to be added to the design of traditional handicraft cultural and creative products, in order to bring people delicate psychological feelings.

d) The expression of smell mainly refers to the unique scent emitted by things that attracts consumers and makes them have a certain good impression of them. However, there are few expressions of smell involved in traditional Chinese handicraft cultural and creative works, and relevant personnel must pay attention to this.

Table 1: Sensory Expression of Multi-sensory Experience

Sense	Expressions	Importance
Vision	Form and color	★★★★★
Hearing	Music, Sound	★★★★★
Tactile	Material and texture	★★★★★
Smell	aroma	★★★

Data source: compiled by the authors

2.4 The theoretical basis of multi-sensory experience and handicraft product design

2.4.1 Characteristics of the multisensory experience

Multisensory experience has four main characteristics: diversity, real-time sex, personalization, and emotion. Diversity refers to sensory diversity and comprehensiveness. Different sensory channels can produce different sensory effects, and various sensory stimuli can achieve more rich, profound, and intuitive experience effects. In the context of multisensory experience design, we need to pay attention to the differences and characteristics of different sensory channels in order to achieve diverse experience effects. Real-time refers to the need to carry out real-time stimulation in a specific scene. Through the capture and processing of real-time stimulation, the instantaneous nature and authenticity of user experience are realized. Real-time is one of the essential features of multi-sensory experience design, which can be realized through advanced technical means, such as virtual reality technology. Personalization refers to customized design according to the needs of different users to achieve the experience effect more suitable to user needs. Personalization is one of the important features of multi-sensory experience design. It can be conducted through user portrait, user research and other means, so as to achieve more

personalized experience effect. Affection refers to the emphasis on emotion and experience of feeling. Through the comprehensive stimulation of the senses, the transmission of emotion and the deepening of feeling are realized. Through the color, sound, touch and other means, to achieve a more rich and profound emotional experience effect.

2.4.2 Psychological mechanisms of multisensory experience

The psychological mechanisms of multisensory experience include two levels: perception and emotion, which interact and together constitute people's rich perception and emotional experience of the external environment (Figure 1). Perception refers to the individual perception and integration process of external stimuli, including the participation of senses such as vision, hearing, smell, touch, and taste. Information from different senses is passed to the brain, and integrated and interpreted in the brain, so as to form the overall cognition of things. This perceptual process is the basis of the multisensory experience, and through the stimulus input of multiple sensory channels, a more comprehensive, rich, and three-dimensional sensory experience can be obtained. What interacts with perception is the emotional experience, which is the individual's emotional response and experience of perceived information. Multisensory experiences can trigger different emotional experiences, such as happiness, surprise, tension, etc. The emotional experience can further enhance the effect of perception, making the perception more profound and memorable. In the design of handicraft products, by creating a strong visual, auditory, and olfactory experience, it can stimulate tourists' curiosity and interest, trigger a positive emotional experience, and thus increase their satisfaction and loyalty to the destination. In the psychological mechanism of multisensory experience, perception and emotion interact and cause each other, jointly constructing people's perception and experience of the environment. Perception provides rich sensory information and provides the basis for the generation of emotion, which in turn influences perceptual processing and memory. The mechanism of this interaction gives the multisensory experience with deeper and rich connotations.

A deep understanding of the psychological mechanism of multisensory experience helps to make better use of multisensory stimulation in product design and experience creation and improve users' perception and emotional experience. Through reasonable selection and combination of stimulation elements with different senses, designers can guide the users' attention, enhance their attention and participation in the product, and thus improve the user's experience satisfaction. At the same time, to understand the influence mechanism of emotional experience, designers can adjust and shape the user's emotional response, so that it is more in line with the positioning and goal of the product.

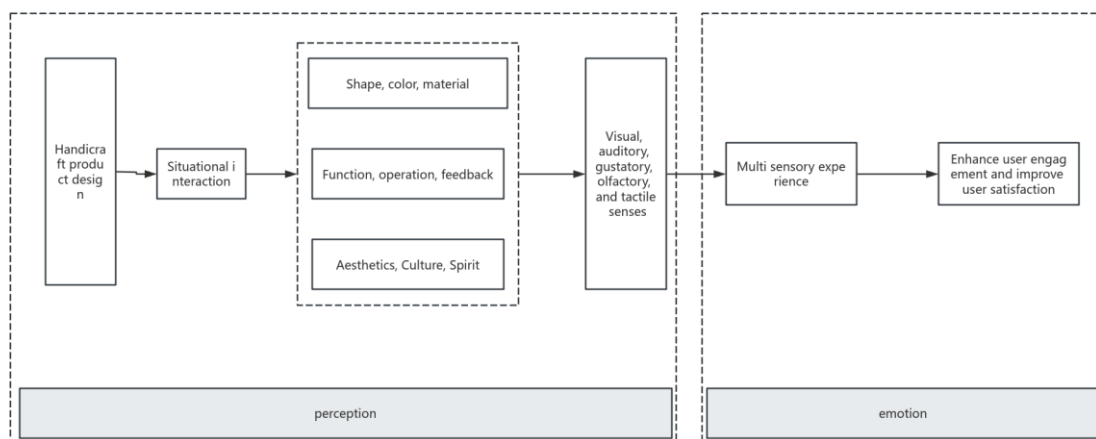


Figure 1 A psychological mechanism model of multisensory experience
Data source: compiled by the authors

2.4.3 Application principles of multisensory experience in the design of handicraft products

When applying the multisensory experience to the design of handicraft products, the design application principles need to be followed to ensure that the designed products can achieve the desired results. First, it needs to understand user needs and expectations, which can be achieved through market research, user feedback, user behavior data analysis and other ways. On this basis, the product design basic scheme and basic measures can be formulated to meet the user needs. Secondly, special emphasis is placed on regional cultural characteristics, and regional culture should be fully displayed in the design of cultural and creative products, so that tourists can feel the unique local cultural atmosphere and customs. Thirdly, it is necessary to design the scene, integrating the design of handicraft products into the scene of handicraft products, and the presentation of scene elements should be considered in the design, such as using the environment, sound, smell, etc., to create a multi-sensory experience in line with the scene. Finally, the theme should be unified to make the multi-sensory experience products more consistent and plastic. This can allow tourists to experience the information and cultural connotation more deeply to be conveyed by the cultural tourism creative products.

3. Material and Method

3.1 Case Analysis of Application of Handicraft Product Design Based on Multi-Sensory Experience

The innovative design methods of traditional handicrafts are single and narrow-minded, so it is necessary to change our thinking and examine the design object from a higher perspective. In addition, traditional handicrafts are closely related to people's daily lives, and products are closely related to people and the environment. Therefore, the design object should be dynamically studied in the context of "human product environment" (Hu J H, Hu H F, Fang X, 2017). To create a good user experience, on the one hand, it is necessary to optimize the design of product elements, and on the other hand, it is necessary to examine the level of interaction between people and the product environment. In the interactive relationship of usage context, clarify the functional and symbolic features of the product, establish the functional structure relationship of the product, and construct the product prototype design scheme. The basic steps are shown in Figure 2:

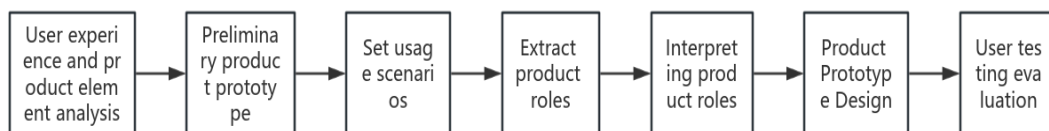


Figure 2 Design process model of traditional handicraft products based on the use situation

Data source: compiled by the authors

3.2 Detailed elaboration of Materials and methods

3.2.1 Material preparation

The stage of material preparation is crucial when conducting a case analysis of handicraft design based on multisensory experiences. First, a wide collection of cases around the world, covering a variety of types, styles and regional handicraft design cases (Lin Z H, Woo J C, Pan L G Q, 2013). These cases not only represent the diversity of handicrafts, but also show the unique charm of multisensory experience design. To ensure the representativeness of cases, special attention is paid to the screening and classification of cases to ensure that they can fully reflect the current situation and development trend of handicraft design. In addition to the case collection, but also for in-depth user research. Through online questionnaires, face-to-face interviews and field observations, users' preferences, needs and expectations of handicrafts are deeply understood. These survey results not only provide valuable user feedback, but also provide strong data support for



subsequent analysis. In the process of research, special attention was paid to users' attention and preferences for different sensory experiences, so as to better understand the psychological and behavioral characteristics of users when using handicrafts (Xie N, Xia Z, Zhou W, 2024).

3.2.2 Analysis method

Systematic literature review (SLR) is an important method in scientific research, which is used to comprehensively and systematically review and comprehensively analyze the literature in a specific field. The process mainly includes the following steps: first, make clear the purpose and scope of the research, and determine the keywords and databases to be searched; Secondly, through database retrieval and manual screening, the literature related to the subject is collected; Then, the quality of the collected literature is evaluated and screened to ensure the reliability and applicability of the literature; Then, read and code the screened documents in detail to extract key information and data; Finally, the extracted information is comprehensively analyzed to form a summary report, revealing the status quo, trends and existing problems in the research field. Results/outputs mainly include summary report, literature database and coding framework (Xie N , Xia Z , Zhou W, 2022).

Comparative analysis is a common method in scientific research, which is used to compare and analyze the similarities and differences between different objects, phenomena or cases. The process mainly includes the following steps: first, determine the object and scope of comparison, and clarify the purpose and significance of comparison; Secondly, collect information and data related to the comparison object to ensure the accuracy and integrity of the information; Then, the collected information is sorted and classified, and key features and indicators are extracted; Then, using appropriate comparison methods and tools, the extracted features and indicators are compared and analyzed one by one; Finally, according to the comparison results, a comparative analysis report is formed to reveal the similarities and differences and laws between different objects. Results/outputs mainly include comparative analysis reports, comparative charts and data analysis results.

In research, quantitative (Quant) and qualitative (Qual) methods are often used in combination to comprehensively and deeply understand the characteristics and laws of the research object. This combined method usually has two orders: Quant-Qual or Qual-Quant. Taking Quant-Qual as an example, firstly, a large number of data are collected and analyzed by quantitative methods (such as questionnaire survey and statistical analysis) to reveal the overall characteristics and trends of the research object; Then, through qualitative methods (such as interviews, case studies, etc.), the reasons, motivations and situations behind the data are deeply explored. This combined method is helpful to make up for the deficiency of single method and improve the accuracy and reliability of research. In the process of case analysis, variables and hypotheses can be generated through qualitative stage, and then verified and tested through quantitative stage. For example, understand the needs and expectations of users through interviews and generate design variables and assumptions; Then the correlation between these variables and assumptions and user experience is verified by statistical analysis and other methods.

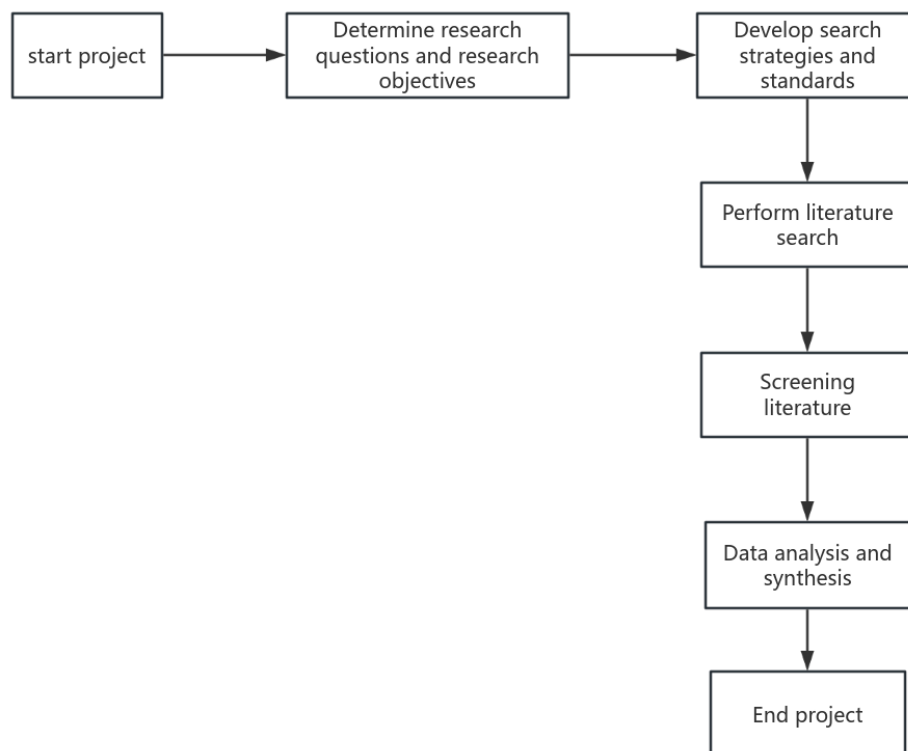


Figure 3 Literature Review (SLR) Process and steps
Data source: compiled by the authors

3.2.3 Sensory experience analysis

In the case analysis, special attention is paid to the design and implementation mode of multisensory experience. In-depth analysis of the visual, touch, auditory and other sensory dimensions of handicrafts, as well as the smell and taste experience that may be involved. In terms of visual experience, it analyzes the influence of visual elements such as color, shape, texture and handicrafts on user perception; in terms of tactile experience, pay attention to the influence of material and surface treatment on the touch of handicrafts; in the aspect of auditory experience, discuss the role of handicrafts on the user's emotional experience. Furthermore, the possibility of olfactory and taste experiences is considered and how these sensory experiences integrate with the overall design of the handicraft (Figueroa R B, Gil F A P , Taniguchi H, 2022).

3.2.4 User experience research

User experience is the core indicator to evaluate the success of handicraft design. In the case analysis, the interaction process between users and handicrafts and the experience of users in different use scenarios are deeply explored. Detailed analysis of user perceptual, cognitive, and emotional responses and how these responses affect user satisfaction and fidelity to artifacts. Through questionnaire survey, user interview and other methods, rich user feedback data is collected, and these data are in-depth analyzed and mined (Qi B, Zhang M, Zhu X, et al, 2024). The results of these user experience studies not only provide valuable reference information, but also provide strong support for subsequent design improvements. At the same time, I also realize that the user experience is a process of continuous optimization, which needs to constantly pay attention to the user feedback and demand changes during the design process, so as to adjust and optimize the design scheme in time.

4 Results and Discussion

Applying the above innovative design strategy, this project further verifies its feasibility and effectiveness through the case of "Static Series porcelain tea set Design". This case



takes the traditional Longquan porcelain tea set as the design object. The designer first conducts user research and product analysis, and the characteristics of user experience demand are positioned as: reflecting the artistic conception and characteristics of Jiangnan water town. After that, porcelain tea set products are deconstructed, and the product elements are defined according to the user experience requirements. Among them, the non-product elements are defined as the spiritual characteristics of "subtle and elegant, flashy but not vulgar" and the porcelain characteristics of "green and moist". The defining characteristics of emotional factors in productization factors are: quietness, elegance and the image of water town, and the perceptual characteristics are defined as: elegant shape and delicate texture; Functionalization elements are defined as ease of use, comfort and situational interaction (Vaz R, Freitas D, Coelho, António, 2022).

On this basis, the design object is put into the use situation to develop the idea, and then the product prototype is designed by extracting and interpreting the role (as shown in Figure 3). The prototype interprets the image of quietness and elegance in emotional experience through the image pair of "Impression of West Lake", and integrates the elements of West Lake, such as broken bridge, baokuo pagoda, three pools and moon, and boat, into the shape design of tea set, so that the product modeling creativity is no longer just a change in form, and the product is more connotative. In order to further enhance the situational experience of tea tasting, aromatherapy, vases and other instruments are introduced into the situation with the image of West Lake cultural elements to make it more story-telling and ritualized. Finally, product samples are made according to the product prototype (Yanagisawa H, Miyazaki C, 2019).

Table 2 Overview of User Survey Data

Research project	Number of samples	Average score (out of 5)	Main feedback
Emotional needs met	200	4.3	Users generally believe that tea sets have a serene and elegant temperament
Functional requirements are met	200	4.1	Tea set is easy to use, comfortable, and highly interactive
Non product factor evaluation	200	4.2	The tea set embodies the elegant characteristics of celadon, with exquisite craftsmanship
Evaluation of productization elements	200	4.4	The tea set has an elegant shape, delicate texture, and rich functions

Table 3 Overview Table of Questionnaire Collection Data

Questionnaire section	Recycling quantity	Effective questionnaire rate	Main findings
Essential information	300	95%	Diverse user groups, covering different age groups and professions
User experience evaluation	300	90%	Most users are satisfied with the tea set
Design Strategy Evaluation	300	88%	Users generally believe that the design strategy is effective
Openness suggestion	280	-	Received multiple valuable improvement suggestions

Table 4 Correlation Analysis between User Satisfaction and Design Strategies

design strategy	Average satisfaction score (out of 5)	Correlation coefficient
Differentiation strategy	4.2	0.75
Situational strategy	4.3	0.80

In the design process, in order to better inherit the non product elements of celadon, the spiritual characteristics of "elegance" of celadon were inherited by selecting elements with "static" connotations and meanings. At the same time, it also retains the characteristics of

"green and green" celadon craftsmanship, and traditional handmade drawing techniques are retained in the production process. In terms of product elements, it breaks through the functional combination relationship of traditional serialized tea sets, including functional modules such as fragrance and vase, enriches the product connotation, improves the user experience of "circular" shape, boldly uses circular shape, so there will be a certain technical bottleneck when using pure artificial raw materials. Therefore, based on the traditional manual raw material process, 3D printing technology is used as an auxiliary forming method. This process can be summarized as precise design and optimization of celadon artificial raw material prototype 3D scanning data, rapid prototyping 3D printing of gypsum mold grouting element blank, manual repair of blank material, glaze material firing of celadon products. In this way, not only is there a combination of traditional handicrafts and new crafts, but also an inheritance of the spirit of traditional handicraft products (Meixuan, Li, Yu-E, et al, 2018).



Figure 3 Prototype and renderings of the "static" celadon tea set products
Source by the authors

Through the above cases, we can find that product differentiation and design process situational strategies can effectively inherit the spiritual and process characteristics of traditional handicrafts, enhance innovation space, expand the breadth and depth of creativity, and showcase traditional cultural characteristics of traditional handicrafts, meeting the needs of modern consumer experience.

5.0 Conclusion

The purpose of this study is to explore the application and effect of multi-sensory experience design in the field of handicraft design, especially to verify its effectiveness through system review, multi-sensor user evaluation (quantitative part) and design generation part. The results show that multi-sensory experience design brings consumers a richer, more stereoscopic and more immersive product experience by integrating sensory elements such as vision, touch and hearing. The introduction of this design concept not only enables designers to break through the traditional design framework, but also urges them to create more attractive and interactive handicrafts. Through careful design of color matching, texture processing, material selection and integration of sound elements, the designer successfully touched many senses of consumers, thus triggering a deeper emotional resonance and memory connection. In addition, multi-sensory experience design technology also provides strong support for the uniqueness and personalized characteristics of handicrafts. In the fierce market competition, the phenomenon of product homogeneity is becoming more and more serious, and multi-sensory experience design is an effective way to realize product differentiation. The system overview part provides us with rich theoretical basis and previous research results, the multi-sensor user evaluation verifies the actual effect of the design through quantitative data, and the design generation part shows how to turn theory into practice and create handicrafts with market competitiveness.

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