Interaction Design Methods and User Experience Optimization in Industrial Design

Zhuo Yali*, Liu Lan

College of Art and Design, Ningbo University of Finance and Economics, Ningbo, 315020, China

*Corresponding author

Abstract: This article mainly explores the interactive design methods in the field of industrial design, and studies how to optimize the user experience and improve the market competitiveness and user satisfaction of products through these methods. Based on the development and present situation of industrial design, the research emphasizes the importance of interactive design in modern product design, and clarifies the key role of optimizing user experience. Through the comprehensive use of various research methods, this article systematically combs the theoretical basis of interaction design, including user research and demand analysis, interaction design principles and strategies, design processes and tools. In the practical part, the research focuses on the optimization of interface design and interactive logic, and shows how to create a beautiful and practical product interface. The research results show that following the user-centered design concept, combined with scientific testing and assessment methods, can improve the user experience of products and enhance the market competitiveness of products. It is of great significance to the application of interactive design and user experience optimization in industrial design practice.

1. Introduction

Industrial design is a bridge between technology and market [1]. Since the industrial revolution, it has experienced the evolution from functional dominance to paying equal attention to aesthetics and function, and now paying great attention to user experience [2]. With the rapid development of science and technology, products are becoming more and more complicated, and users' expectations for products have far exceeded their basic functions, and they have turned to pursue more intuitive, convenient and personalized interactive experiences [3]. As the core driving force of this transformation, interactive design has gradually become the soul of modern product design [4]. It is not only about how the product is operated, but also about how to create a pleasant use process through design and establish an emotional connection between the product and the user [5-6]. Therefore, it is of great significance to deeply study the interaction design method and optimize the user experience, so as to enhance the product market competitiveness and meet the increasingly diversified user needs.

The purpose of this study is to explore the interactive design methods in the field of industrial design, and how to optimize the user experience through these methods, so as to design products that meet the market demand and deeply touch the hearts of users. The research will focus on the core concepts, processes, tools of interaction design and its application practice in various product designs, and discuss the assessment and optimization strategies of user experience in order to provide a systematic methodological framework for designers. The research framework revolves around the logic of "theory-practice-assessment-optimization". First, lay the theoretical foundation, then explore the practical application, then verify the design effect through assessment, and finally carry out iterative optimization according to the assessment results. This framework aims at forming a closed-loop research path, ensuring that the research has theoretical depth and can effectively guide practice. This provides a scientific basis and practical guide for interactive design and user experience optimization in industrial design field.

2. Interactive design methodology

2.1. User research and demand analysis

User research and demand analysis are the cornerstones of interactive design, which ensure that the design always revolves around the real needs of users. This process begins with a deep understanding of user groups-including their behavior habits, preferences, pain points and potential needs [7]. Through the comprehensive use of interviews, questionnaires, observation and other means, designers can collect rich user data and construct accurate user portraits. The user portrait describes the basic information of the user (such as age, gender, occupation, etc.), and reveals the user's psychological characteristics, usage scenarios and expected experience. It provides a powerful reference for design [8]. On this basis, the requirement analysis is further refined. By mining the hidden requirements in user data, the core problems that the product should solve are identified, which lays a solid foundation for the setting of design goals, as shown in Table 1:

Table 1 User Needs Analysis Result Table

User Group	Basic Information	Psychological Characteristics	Usage Scenarios	Expected Experience	Core Issues to Address
Young Professionals	Age: 25-35, Gender: All, Occupation: Various Corporate Employees	Pursue efficiency, value work-life balance, enjoy novelty	Office work environment, mobile work, working from home	Simple and easy-to-use interface, quick task completion features, personalization options	Improve work efficiency, reduce work stress, enhance work-life balance
Students	Age: 18-24, Gender: All, Occupation: Students	Focus on learning, budget-conscious, enjoy socializing and entertainment	Libraries, dormitories, studying at home	Affordable pricing, abundant learning resources, social features	Provide efficient learning tools, enhance learning interactivity, control learning costs
Senior Citizens	Age: 65+, Gender: All, Occupation: Retired	Lower technology acceptance, prioritize safety and ease of use	Home, community activity centers	Large fonts, simple operations, health monitoring features	Simplify operation processes, provide health monitoring and emergency assistance features, enhance security
Homemakers	Age: 35-55, Gender: All, Occupation: Household Management	Focus on convenience and practicality in family life, enjoy shopping	Kitchen, living room, online shopping	Convenient household management tools, push notifications for deals	Provide household management solutions, optimize shopping experiences, enhance the convenience of family life

Table 1 shows the results of user demand analysis. It includes the basic information, psychological characteristics, usage scenarios, expected experience of different user groups and the core problems that should be solved in design. This information provides an important reference for interactive design, ensuring that the design can closely focus on the real needs of users.

2.2. Interaction design principles and strategies

The core of interaction design is to create a smooth, intuitive and pleasant user experience [9]. To achieve this goal, designers need to follow a series of design principles, as shown in Figure 1:
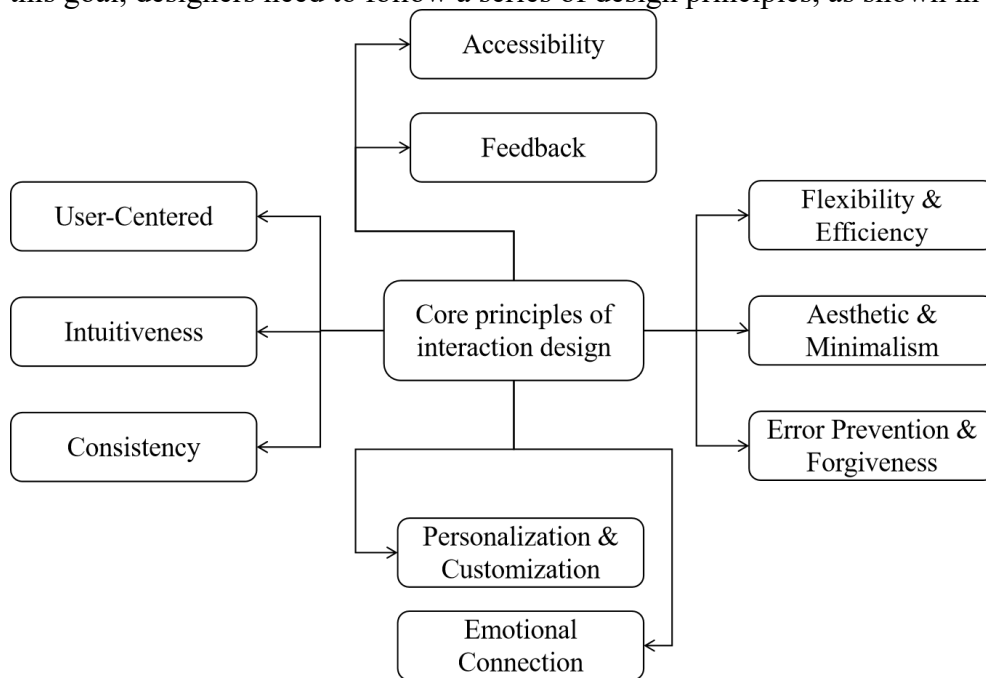

Figure 1 Core Principles of Interaction Design

In the design strategy, emotional design is particularly critical. It emphasizes stimulating users' positive emotions and enhancing the attractiveness of products through visual elements such as color, shape and animation, as well as personalized interaction. Adaptive design strategy is paid more and more attention. It requires that the design can flexibly adapt to different devices, screen sizes and usage scenarios and provide a seamless cross-platform experience.

2.3. Design process and tools

Interaction design is an iterative optimization process. The process includes four stages: conceptual design, prototyping, test assessment and iterative optimization [10]. In the conceptual design stage, designers conceive the core functions and interactive framework of products based on user research and demand analysis. Then, using prototyping tools (Sketch, Figma, Adobe XD, etc.), the design concept is transformed into a visual interactive prototype for early user testing and feedback collection. In the testing and assessment stage, designers collect users' feedback on the prototype through laboratory testing, on-site testing or remote testing, and evaluate the effectiveness of the design and user experience. Finally, according to the assessment results, the designer iteratively optimizes the prototype and constantly adjusts and improves the design until the best user experience is achieved. In the whole design process, it is very important to choose the appropriate tools and methods to improve the design efficiency and quality. Designers should flexibly use various design tools and resources according to the project requirements and personal preferences.

3. User experience optimization practice

3.1. Interface design and interactive logic

Interface design and interactive logic are the core links of user experience optimization. They directly determine the interaction mode and efficiency between users and products. In terms of interface design, designers need to carefully lay out interface elements to ensure that the information is clear and focused, so that users can quickly find the information they need. Through reasonable color matching, font selection and icon design, designers can create a visual style that conforms to product positioning and user preferences, and enhance the attractiveness of the

interface. In interactive logic, designers need to design an intuitive navigation structure to ensure that users can easily switch between different pages and functions. Designers also need to pay attention to the details of interaction. These details include the click feedback of buttons, the fluency of animation and the friendliness of error prompts. These can significantly improve the user's operating experience. The interface design and interactive logic are continuously optimized to create a beautiful and practical product interface, which makes users feel happy and convenient during use.

3.2. User experience testing and assessment

User experience testing and assessment is the key link to verify the design effect, find potential problems and guide the subsequent optimization. In the testing stage, designers can accurately control the testing environment in the laboratory and obtain detailed user behavior data. Field testing can observe the natural reaction of users in real use scenarios. Remote testing is convenient to cover a wider range of users and collect diverse feedback. In the assessment stage, according to the test data, the designer comprehensively assesses the design by combining multiple dimensions of user experience (satisfaction, efficiency, learnable habits, etc.). Through the combination of quantitative analysis and qualitative analysis, designers can accurately identify the advantages and disadvantages in the design, and provide strong data support for subsequent optimization.

3.3. Optimization strategy and implementation

Based on the results of user experience testing and assessment, designers need to formulate targeted optimization strategies and implement improvements. Table 2 shows the optimization strategy based on the results of user experience testing and assessment. Designers can take corresponding optimization measures according to the problems found in the actual test to improve the user experience of products or services.

Table 2 User Experience Optimization Strategies Table

Issues Identified through Testing & Assessment	Optimization Strategies
Users struggle with navigation, unable to find needed information	Optimize navigation structure, add search functionality, provide clear breadcrumb navigation
Slow page loading times lead to long user waiting periods	Optimize images and code, utilize caching techniques, enhance server response speeds
Complex interface design causes users to lose direction	Simplify interface design, reduce redundant elements, use clear layout and visual hierarchy
Insufficient font size and color contrast hinder readability	Adjust font sizes and color contrast for easy reading, comply with accessibility design standards
Unclear feedback channels make it difficult for users to seek help	Provide clear feedback channels, such as online customer service, help centers, or user forums
Cumbersome form filling process leads to user abandonment	Simplify form fields, use smart fill and automatic validation technologies to improve efficiency
Lack of personalized recommendations results in low user satisfaction	Introduce personalized recommendation algorithms, tailor content and services based on user behavior
Poor cross-device compatibility affects user experience	Optimize responsive design to ensure good display and performance across different devices and browsers
Insufficient understanding of features leads to low usage	Provide detailed feature introductions and tutorials, add guiding prompts and help documentation
Lack of user engagement and feedback mechanisms	Establish user engagement and feedback mechanisms, such as user surveys, satisfaction surveys, and opinion collection channels

In the implementation process, designers need to work closely with team members to ensure that the optimization scheme can be effectively implemented. Designers should also pay attention to the persistence and iteration of optimization, that is, according to user feedback and market changes, constantly adjust and optimize the design to adapt to changing user needs. Through continuous

optimization and implementation, designers can continuously improve the user experience of products, enhance the market competitiveness of products, and achieve a win-win situation for users and products.

4. Conclusions

After systematic research and analysis, this article deeply discusses the interactive design method and user experience optimization in industrial design. Based on user research and demand analysis, this article reveals that understanding users is the foundation of successful design. Through the fine polishing of interface design and interactive logic, the article shows how to create a beautiful and practical product interface. User experience testing and assessment provide us with a scientific way to verify the design and find problems; Optimization strategy and implementation ensure that the design can continue to iterate and improve the user experience.

This research enriches the theoretical system of interaction design and user experience, provides an operable methodological framework for designers, and shows the research value of combining theory with practice. Although there are some limitations in the research, it is these limitations that point out the direction of future research for us. We expect that in the future research, we can continue to deepen our understanding of interaction design and user experience, explore more innovative design methods and technologies, and contribute wisdom and strength to creating more humanized and intelligent products.

References

[1] Zhou Chengmin and Yu Mengnan. Research on the Design of Furniture Display Websites Based on User Experience [J]. Packaging Engineering, 2019, 40(22): 181-189.

[2] Xu Jianming, Gan Wanzheng, Zhang Wen'an, et al. Design of Human-Computer Interaction System for Industrial Robots Based on QT [J]. High Technology Letters, 2019, 29(06): 576-584.

[3] Hu Shan, Jiang Xu, Fu Kaijie, et al. Research on Experience Design of Interactive Public Navigation and Identification System Based on SEM [J]. Journal of Graphics, 2020, 41(02): 204-209.

[4] Yang Ling, Li Yang, Marcel Borgen. User Experience-Oriented Interactive Product Design Method and Its Application [J]. Manufacturing Automation, 2018, 40(008): 35-38.

[5] Yan Bao. Industrial Product Design Based on Virtual Reality Technology [J]. Modern Electronic Technology, 2019, 42(03): 184-186.

[6] Shang Xiaodong, Fan Luyuan. Design of Artistic Value Evaluation System for Industrial Products Under Human-Computer Interaction [J]. Modern Electronic Technology, 2020, 43(08): 125-127+131.

[7] Xu Dong. Design of Industrial Internet Test Data Interaction and Integration System Based on Web Interface [J]. Electronic Design Engineering, 2021, 29(17): 40-44.

[8] Li Jun, Ye Jinghui, Liao Lang. Research on Product Design Methods from the Perspective of User Cognition [J]. Packaging Engineering, 2024, 45(10): 78-86.

[9] Ding Xiong, Bai Xuejing. Research on Innovation and Design of Fresh Agricultural Products' New Retail Services Based on Scenario Building [J]. Packaging Engineering, 2019, 40(16): 92-100.

[10] Li Xiaoying, Huang Chu, Zhou Datao, et al. Research and Application of Product Innovation Design Method Based on User Experience Map [J]. Packaging Engineering, 2019, 40(10): 150-155.