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Exploring product collaborative design under big data architecture with user experience scenarios

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Exploring product collaborative design under big data architecture with user experience scenarios

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Abstract: In order to establish a user-oriented product design model, it is necessary to analyze existing user collaboration methods. By analyzing the existing user collaboration methods, the existing user collaboration methods are summarized. A sales store based on user experience scenarios and simulated design experiences is proposed. Through the tangible products and intangible experience, build a positive communication platform for users and designers. With face recognition, multi-channel camera, sensor technology, help users to participate in the design. Deeply explore the potential consumer needs of users under the big data architecture. It will help designers to better exert their own value in design research, and at the same time better assume responsibility in design research, so that design and manufacturing and consumer demand can reach full consistency and avoid waste of resources.

1.   Introduction

In a new era of rapidly changing consumer demand, consumer subjects, consumption patterns, consumption structures, and consumption concepts have undergone "subversive" changes. Today, while product design has been designed to meet the needs of the user experience, it is still difficult to achieve a personalized, customized design for a specific user or user group. Consumers as the most varied elements, different consumer groups, design entry points will be different, designers only through the existing research methods to collect design data designed products, which cannot meet the consumer aesthetics and consumption of consumption pursue. Therefore, how to effectively realize the communication between consumers and designers has become a hot topic in the field of design.

2. The development of user collaborative design in the design field

The concept of "Design Participation" was first proposed at the Design Research Society conference in 1971. The original intention was to bring users to the design field. The focus of the research was mainly on improving the aesthetics of users, with the aim of more users understand the designer's design ideas [1]. Churchman proposed the concept of user collaborative design in the 1970s, but it did not mention the specific implementation method and implementation steps [2]. In recent years, the British Design Association has defined the user collaborative design in more detail: building a design that engages more people. Therefore, it emphasizes the participation of users [4]. The current research on user collaborative design is mainly based on three aspects: business management, general design theory and engineering design decision. In the field of product design, the way users participate in

designing product collaborative design has not been effectively developed. Today, some brands have already deployed experience stores, such as MUJI, IKEA, Xiaomi House and so on. Although these brands built a user experience product scene, attracted a large amount of customer traffic, completed a certain amount of product sales, but did not play a role in the auxiliary product design and product upgrade. If you can build an experience scene with face recognition, multi-channel camera, sensor technology. Covering different consumer groups for comprehensive design, obtaining a large amount of feedback information, and transmitting this information to designers to help designers better complete product design, which will greatly improve design efficiency and bring greater economic benefits.

3. The way users design in the field of collaborative design

The ultimate goal of product design is to serve consumers. Consumer satisfaction is the market orientation and the design orientation [5]. Currently, an important part of designer designing a product is the research on the target user in advance, which can also be called "simple user collaborative participation design" in a certain extent. The existing research methods mainly include user interviews, questionnaires, scenario surveys, eye movement experiments, usability tests, A/B tests, and focus groups [6]. User interviews, questionnaires and scenario surveys are the three most commonly used survey methods. User interviews are the most direct and effective way to obtain real ideas and needs of users through long-term communication with users [7]. However, in the interview, it takes a long time for the user to communicate. Questionnaire survey is the most common survey method. Its advantage lies in the wide coverage of the survey and the ability to obtain more people's feedback for data statistics and analysis. However, the questionnaire will largely influence the user's answer [8]. Although the semi-closed and open-ended questions in the questionnaire can make the subjects more thinking, but the users usually complete the questions in a short period of time, lacking a lot of rational thinking and analysis, which will make the answer superficial. Scenario survey can help designers get some details that are ignored in the design process, but the construction of the scene has its own limitations. The scene experience can't cover a large number of users, and the collected information is still not perfect.

The research methods above, time, environment, population and other factors are all controllable factors. The participants have a certain degree of psychological pressure. The form of users participating in the research process is passive. Under such conditions, it is not fully feedback. The true feelings of the user. The research methods and the imperfect research content make the whole product design industry relatively weak in terms of innovation and insight, and are facing bottlenecks of continuous innovation.

4. User-designed product design new method

4.1. Experiential sales store design concept and development process

The main goal of design is to use the product as a bridge of communication between the designer and the user, and to exert the user's participation advantage through the construction of the communication platform [11]. In the new product design method of user collaboration, build a product experiential sales store, build a new social experience store platform centered on the user, and focus on the scene design of the experience store. Unlike existing traditional convenience stores, experiential sales stores record users as separate individuals. The positioning of the electronic number plate is issued to a typical user on the premise of giving the reward. Users who have received the electronic number plate will be the researched user. The whole research and development process mainly involve layout concept, competitive product research, market analysis, user research, computer virtual scene construction, shop location selection, related visual design, product selection, product procurement, product display, media promotion, testing stage, and official operation Stages.

4.2. Experiential sales store design
Simulate the design of an experience-based sales store based on user experience scenarios, and using big data and the internet, to upgrade the consumer experience, promote the reconstruction of people-goods-field, and explore how to better achieve user collaborative design. The layout of the experiential sales store breaks the previous category layout principle and changes to the lifestyle scene mode. The store is divided into several experience zones for different groups of people, including entertainment zone, health zone, kitchen zone and children zone, as shown in Figure 1. The store features face recognition, RFID tag recognition, multi-channel camera and sensor technology, target detection and tracking system technology. Through the scene design of product and leisure entertainment, the user research population covers a wider range, and the crowd category is more comprehensive. The product is used as a medium, and the store is used as a platform to complete the relationship between the designer and the wider user group. "Interactive communication", which is a good solution to the difficulty of finding the subject and the limitations of the subject in the user survey.
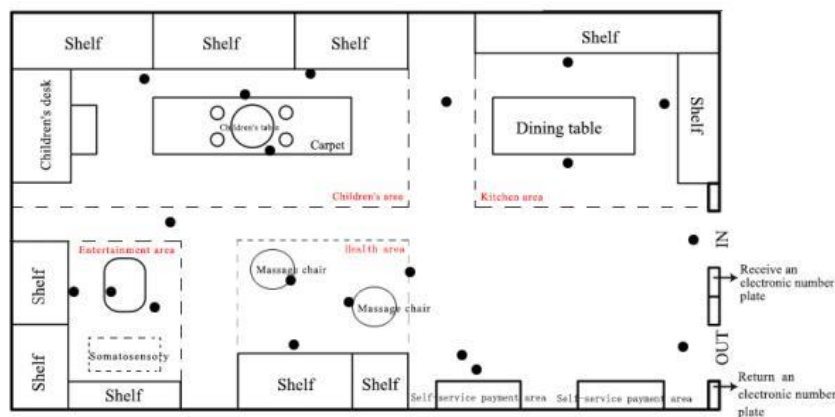

Figure 1. Experiential sales store layout design

The user experience process of the experiential sales store is: attracting consumers by rewards, participating in user collaboration, and participating consumers receiving the positioning electronic number plates when entering the store. The local user group in the store's inbound and outbound flow is issued with a positioning electronic number card (200 number plates per day). Return the electronic number plate when consumers leave the store.

4.3. Individual sample tracking analysis
Taking human flow analysis as an example, individual sample tracking analysis is performed. A qualitative user portrait is created by the persona method to derive a series of design insights. First, the user files are divided into two categories according to gender: male and female; according to age group: juvenile (7-17 years old), youth (under 45 years old), middle-aged (45-59 years old), old age (over 60 years old). Then select the typical consumer of conducts individual sample tracking analysis in four time periods (Morning: 8:00-10:00/10:00-12:00, Afternoon: 14:00-16:00/16:00-18:00) on Sunday (In the rest day consumers flow rate is large, the test data is more accurate), and the qualitative user portrait is shown in Figure 2. Then, the in-store camera, motion sensor, direction sensor, distance sensor and other devices are activated to perform individual sample tracking analysis. A stream of photos is taken every 5 seconds, and computer graphics are processed to form a density thermal map. The photo of the flow of people and the heat map of the flow density are shown in Figure 3. From the four time periods on Sunday, each unit took 20 minutes, and each representative time group selected six representative heat flux maps for analysis. The heat flux diagram of the flow density is shown in Figure 4, Figure 5, Figure 8, and Figure 9, and the peak pattern is formed by superimposing 6 layers of human thermal density layers, as shown in Figure 6, Figure 7, Figure 10, Figure 11.
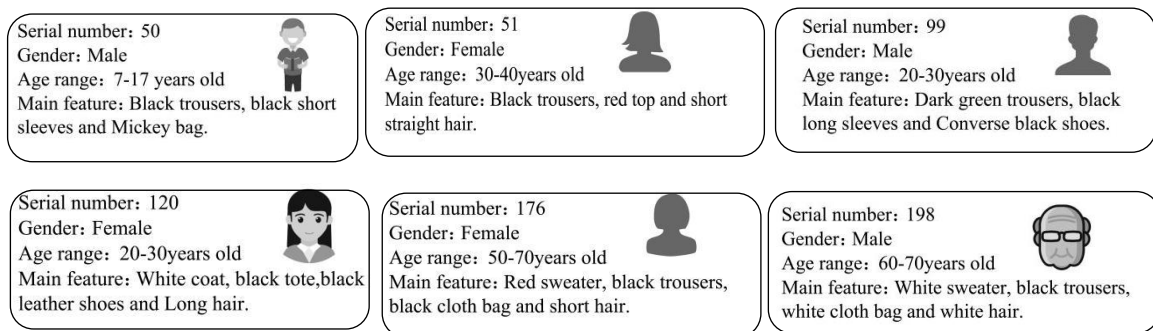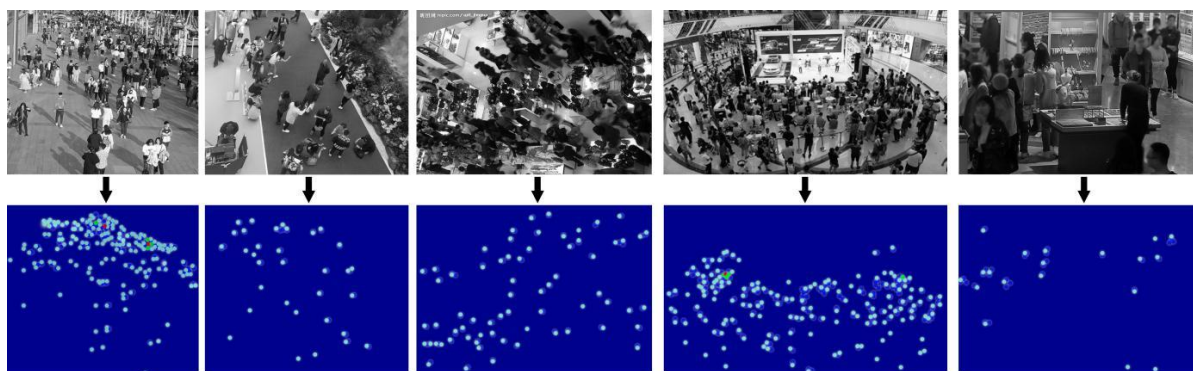
Figure 2. Qualitative User Portrait

Figure 3. Photo of human flow and heat map of human flow density

In the following flow density thermal map, the number 50 consumer is marked with a red square; the number 51 consumer is marked with a pink triangle; the number 99 consumer is marked with a blue rectangle; the number 120 consumer is marked with a sky blue semicircle The consumer numbered 176 is marked with a yellow heart; the consumer numbered 198 is marked with an orange petal shape.
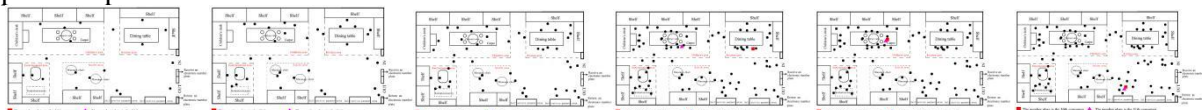

Figure 4. Morning: 8:00-10:00 People's flow density thermal map

Figure 5. Morning: 10:00-12:00 People's flow density thermal map

By selecting six typical human flow density thermal maps in the morning: 8:00-10:00, the peak density can be formed, as shown in Figure 6; in the morning: 6:00:00-12:00, 6 typical human flow density thermal maps, A peak density is formed, see Figure 7.
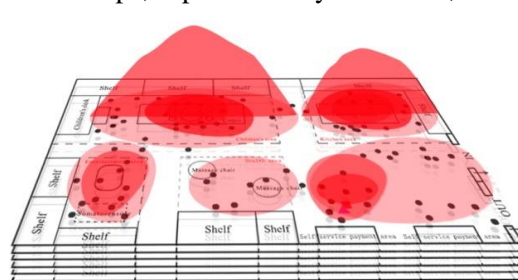

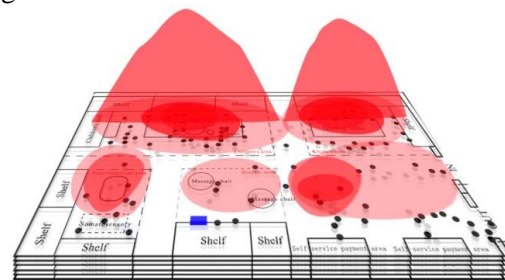Figure 6. AM: 8:00-10:00 density peak map

Figure 7. AM: 10:00-12:00 density peak map

Figure 8. Afternoon: 14:00-16:00 People's flow density thermal map

Figure 9. Afternoon: 16:00-18:00 People's flow density thermal map

By selecting the typical thermal flow pattern of 6 typical abortions in the afternoon: 14:00-16:00, the peak density can be formed, as shown in Figure 10; in the afternoon: 6 typical human flow density heat maps from 16:00-18:00, a peak density can be formed, see Figure 11.
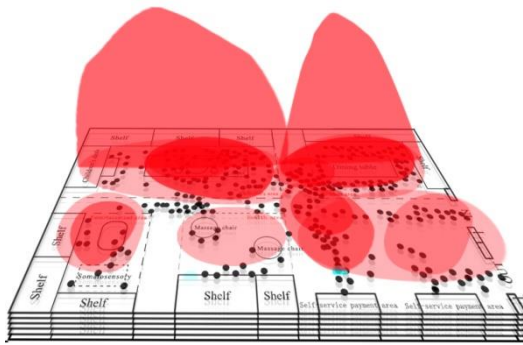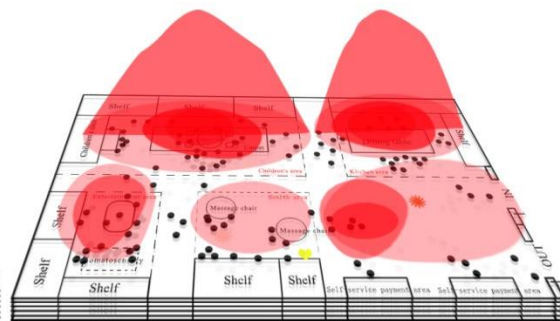

Figure 10. PM: 14:00-16:00 density peak map   Figure 11. PM: 16:00-18:00 density peak map

Put the four sets of peak maps together for comparative analysis, as shown in Figure 12.

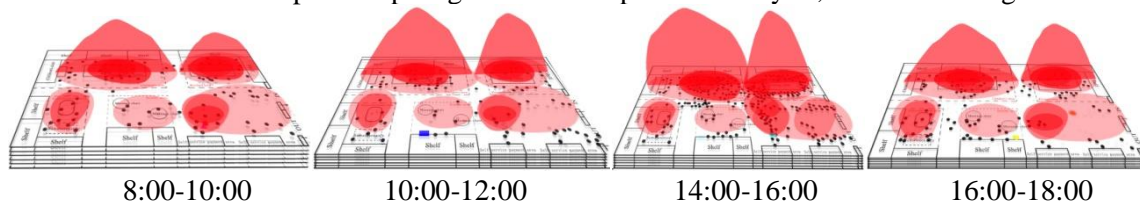| 8:00-10:00 | 10:00-12:00 | 14:00-16:00 | 16:00-18:00 |

Figure 12. Peak graph comparison analysis

Through the collection of people's current density in 4 time periods, the analysis shows that: (1) In the day of Sunday, 8:00-10:00, the customer in the store is the least, and the afternoon is 14:00-16:00. The consumer is the most. (2) Through the peak flow chart of the four periods of time, it can be analyzed that the population density of the children's area and the kitchen area is the most concentrated, and it can also be defined as the area most favored by consumers. (3) Analysis of the preferences of people of different age groups by the length of stay of 6 typical users in the area. Numbers 50 and 51 have the longest stay in the children's area. The number 99 consumer has the longest stay in the health zone. The number 120 consumer also stays in the health zone for the longest time and finally completes the payment. The number 176 consumer has the longest stay in the kitchen area.

4.4. Other sample tracking techniques

In the subsequent information collection, the direction sensor is used to record the movement trajectory of the consumers in each area, and the data is analyzed at which position the flow rate of people is the most, and the reason is analyzed to provide information for the change of the subsequent scene style. By recording the length of time that the consumer experiences the product through the distance sensor, the consumer's interest in the product can be obtained for different age groups, and the design direction is determined for the designer. The gravity sensor records the number of times the consumer experiences the product, analyzes the reason why purchase, and the reason why not purchase. Through face recognition, the expression changes in the consumer experience product are

recorded, and then the reasons why the consumer likes the product and the reasons for dislike are analyzed. Through face recognition, multi-channel camera, sensor technology, target detection and tracking system information collection, generate massive data information, transmission background processing, which help designers to explore user spending habits and consumption direction, combined with user needs to adjust and optimize the product.

5. Conclusion

This paper innovates a new approach to product design for user collaboration. Today, after the 80s, 90s, and 00s, as the core consumer of the market, they pursue psychological satisfaction and emotional needs, and pursue quality, diversification, individuation, and convenience. In order to meet the needs of the main consumer groups, build a product experiential sales store, through the way of product scene partitioning, with face recognition, multi-channel camera, sensor technology, target detection and tracking system, and the use of big data and Internet to help consumption Collaborate in the design phase of product design. This method can help designers to explore the potential needs of consumer entities and propose targeted product design solutions. Moreover, this method of user collaboration is not limited in the field of product design, but can also be applied to other design fields.

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