Research on the Design of Children's Stroller Based on User Experience

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Abstract: With the improvement of people's living standard, people put forward higher requirements for children's stroller. The children's stroller only with strong functionality and high safety can no longer meet the standard of good experience for users. This paper takes the user demand as the guide, finds the pain points and design opportunities of the children's stroller by establishing the user behavior map. Combined with the hierarchy of user experience needs, this paper makes a design and research on children's stroller, and finally puts forward a set of design scheme, which is expected to provide reference for the improvement of the user experience of children's stroller.

1. Introduction

In today's society, with the development of information revolution and digital technology, people's economic level and material needs have been greatly changed. Consumers are no longer satisfied with the using function of products. Their expectations for children's stroller products have changed from the low-level needs of basic functions and performance to the high-level of good user experience. Taking user experience as the focus of the design, through the analysis of user behavior and user demand, this paper discusses the design of children's stroller from the perspective of users. It helps to improve the development quality, market competitiveness, users' purchase desire and experience satisfaction of children's stroller, and also provides a reference design path for the development and design of children's stroller.

2. Overview of the Development of Children's Stroller and User Experience

2.1. The Development of Children's Stroller

In 1733, the world's first documented children's stroller was born in England. William Kent designed a stroller with wheels and a basket[1]. The child could sit in the basket, and the stroller was pulled by a pony or a goat, as depicted in Figure 1. In 1848, American Charles Burton added a handrail to the stroller, thus the world's first real stroller pushed by hand for children was created, as shown in Figure 2. In 1889, William H. Richardson improved the cabin part and the wheel part of the stroller, which could realize the cabin reversing and the four wheels travel independently,

resulting in the birth of the independent four-wheel stroller, as shown in Figure 3. In 1920, the children's stroller almost became a household staple. At this time, strollers were mostly made of plastic or rubber instead of wood, which reduced the manufacturing cost. As the wheel of the stroller became larger, foot brakes were set, the height of the cabin was reduced and the depth was increased, so the safety performance of the children's stroller was further improved. In 1965, Owen Maclaren, an aviation mechanic, built the first portable stroller, which used aluminum as the frame and could be folded like an umbrella, as depicted in Figure 4.

Figure 1: The world's firstdocumented children's stroller.

Figure 2: The world's first realstroller pushed by hand.

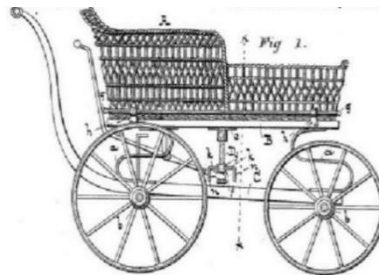Figure 3: The stroller designed byWilliam H. Richardson.

Figure 4: The umbrella strollerdesigned by Owen Maclaren.

With the development of science and technology, the maturity of manufacturing technology, there are a variety of children's strollers on the market today. But when we compare carefully, we can find that these children's strollers are similar in function and shape. So how can a children's stroller stand out in the strollers market and effectively give users a good sense of use have become

an urgent problem for children's stroller enterprises to solve.

2.2. Introduction to User Experience

The concept of "user experience" discussed in the design community was first put forward in the mid-1990s by Donald Norman, an American cognitive psychologist[2]. User experience design includes many factors, such as product design, service, activity, environment and so on[3]. It is a user-centered design method and a design aimed at user needs. All factors are related to users' needs, emotions, opinions, skills and so on. Its essence is to design products that satisfy users' needs and preferences[4]. Abraham Maslow, a famous humanistic social psychologist in the United States, creatively put forward the hierarchy of human needs theory in his paper "Human Motivation Theory" in 1943. He divided various human needs into five levels, ascending in sequence, as shown in Figure 5. On the basis of Maslow's demand hierarchy theory, Shijian Luo, Shangshang Zhu[5] proposed five hierarchy of needs for human user experience, as depicted in Figure 6. In the current era of experience economy, users are no longer passively waiting for and enjoying the design, but will directly participate in and influence the design, inspire designers' ideas, and provide designers with design inspiration and materials.
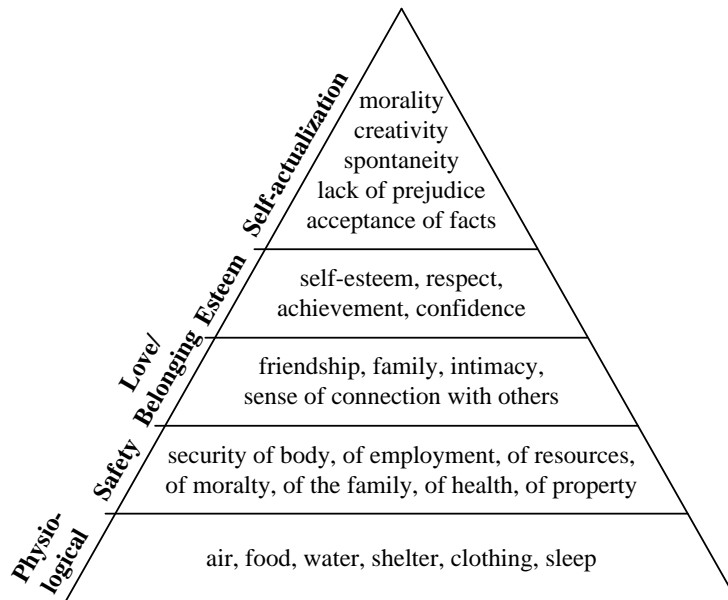

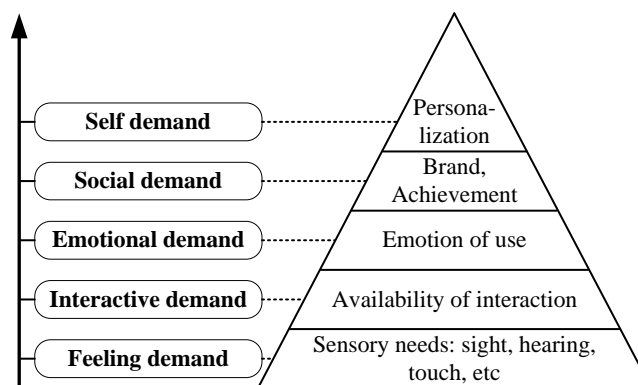Figure 5: Maslow's demand hierarchy theory.

Figure 6: Five hierarchy of needs for human user experience.

In view of the existing problems of the children's stroller, some scholars have made a design improvement of the stroller from the perspective of users. Xiaoli Wu[6] and others proposed a design method for strollers oriented by user needs and centered on finding the best combination of functions. They set up the connection between user requirements and the stroller functions, and used a simplified design process to design the stroller. Xin Rong[7] analyzed the changes in children's demand for children's stroller and found the connection between children's strollers and swing bikes. Through the innovation of the structure of the stroller, the function of the swing bike was combined to the stroller, and the "growth" stroller was obtained, which effectively extended the use time of the product. Qiang Sha and Meixia Zhou[8] carried out humanized design research and practice for children's stroller according to the use demand, studied the problems existing in the design of children's stroller, and solved them from the perspective of humanized design.

People's living standard has been greatly improved, and now parents' demand for children's stroller is not only satisfied with the function of strollers, but also pay more attention to the experience brought by the process of using strollers. This experience may come from the first impression of the product on the user, or from the positive or negative impact that the user has felt for a long time. User experience design centered on user experience and characterized by user participation and interaction can effectively grasp user needs and improve the user experience of children's strollers.

3. Design Research

3.1. Technical Route

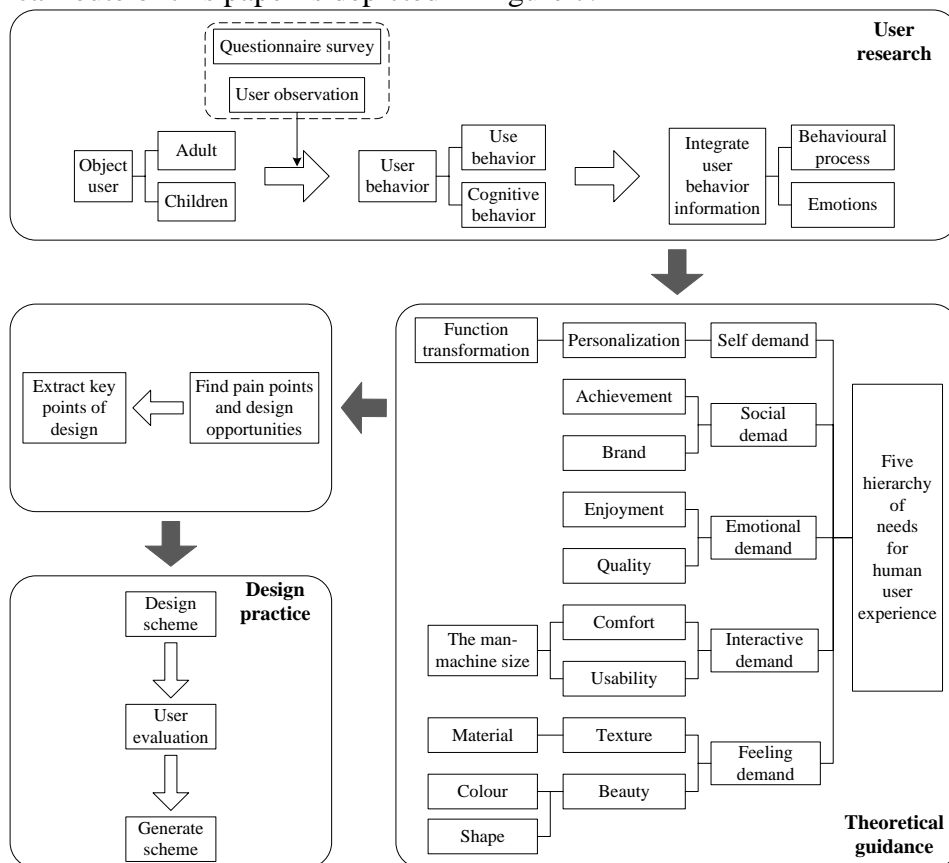The technical route of this paper is depicted in Figure 7.

Figure 7: Technical rout.

3.2. User Research

The user group of children's stroller can be divided into two categories: children and adults. Among them, adults are the decision makers of children's stroller purchase. Therefore, in this paper, we mainly start from the perspective of adult user groups, take the whole process of buying, using and reviewing children's strollers as the theme, and collect user information by questionnaire survey and user observation. Then, according to the survey results, we sort out the user behavior and emotion in each stage, summarize the pain points of the existing children's stroller, find the opportunities for design improvement. The integrated information is shown in Table 1.

Table 1: User behavior map of children's stroller.

		User behavior	User emotion
Buy		Browse shopping websites or shop in physical stores.	Tangle Strollers are similar, making it difficult to choose.
Use	Prepare	Assemble the stroller according to the instructions and experience.	Misgiving Whether the stroller has safety hazards and is simple and convenient to operate.
	Set out	Put the child in the seat and put the travel articles into the storage basket.	
	Underway	Park stroller temporarily.	
	Arrive	Store and shelve items.	
Review		Evaluate the use of stroller.	Reflection Whether satisfied with the stroller purchased.

According to the user behavior map and the analysis of the five hierarchy of needs for human user experience, we can conclude that in the use stage, users mainly consider the safety of the stroller. But the safety of the vast majority of strollers sold in the market is guaranteed after tested layer by layer. So, at present, in-depth thinking should be carried out in the buy and review stage to find product pain points and design opportunities. The product pain points and design opportunities in the buy and review stage are shown in Table 2.

Table 2: Product pain points and design opportunities in the buy and review stage.

	Buy	Review
Pain points	Strollers lack character and personality	When children grow up, strollers are left idle, resulting in a waste of resources.
Design opportunities	Innovate stroller, highlight its uniqueness.	Prolong the service life of strollers and reuse resources.

3.3. Design Analysis

Further analysis of the product pain points and design opportunities points in the two stages of buy and review shows that, in the buy stage, the children's stroller lacks character and personality, which is difficult to catch the users' eye and get users' attention. At this stage, the product appearance can be improved to attract users' attention and then establish the next contact between users and strollers, which corresponds to the feeling demand layer in the hierarchy of user needs. In the review stage, users will take into account the rapid growth of children, with the passage of time, the frequency and duration of the stroller will be extremely reduced, resulting in the strollers in

good condition and functional, but also have been abandoned, causing the waste of resources. At this stage, the service life of children's stroller can be extended by reasonably increasing the function of children's stroller, which corresponds to the self demand layer in the hierarchy of user needs.

The feeling demand layer mainly includes three design elements: shape, color and material. Product shape can be an improvement of product appearance or a new creation[9]. The shape design of children's stroller should not only conform to the aesthetic principle and structural design principle of general product design, but also focus on the particularity of the user group. Children have a weak sense of self-protection and are vulnerable. Hence, the shape design of the stroller should be based on the rounded form, so that the overall look of the stroller is softer and smoother, so as to avoid the harm caused by the sharp right-angle structure to children. Product color is the first impression of the product to the user, it gives users the most intuitive visual feeling. According to a survey conducted by the American popular Color Research Center, people only need 7s to determine whether they are interested in the products when they are shopping for a variety of products. In this short period of 7s, color effect reached 67%[10]. Color stimulation can not only promote the development of children's visual system, but also help children's intellectual development. Children like high-purity colors with bright colors and strong contrast, so most children's products use simple, lively and bright warm colors, which can easily arouse children's interest and curiosity. Most adults are calm, full of life experience, introverted, solemn, they like quiet and elegant colors, so medium bright tones are often used by this consumer group. Different materials have different physical and chemical characteristics, so they show different texture, touch, color and other factors, which will affect consumers' choice of products. The reasonable choice of product material can better realize the function of the product, enrich the content and personality of the product, and make the product produce new charm. Children are a special group, their bodies are still immature, self-protection awareness is weak, so the material selection of children's products should pay more attention to its safety and environmental protection.

The self demand layer can be reflected in the functional transformation of the stroller. Users can change the function of the stroller according to their own needs. In the process of hands-on operation, they can get a sense of achievement and realize their self-value. In addition, compared with the single-function children's stroller, the multi-functional children's stroller has higher use value and longer service life, which reduces the waste of resources to a certain extent and realizes the social value of children's stroller.

3.4. Extraction of Design Elements

The design elements of shape, color and material in the feeling demand layer can be extracted with the help of Kansei engineering. According to the needs of users, use the semantic difference method to determine perceptual adjectives and product samples, and then conduct perceptual measurement experiments. Process the experimental data to establish the corresponding relationship between design needs and design elements, and then extract design elements according to the experimental data and design needs.

The design element of functional transformation of self demand layer can be extracted by means of modular design method. Deconstruct the functions of children's stroller and similar products, find the similarities between them, integrate different functional modules reasonably and effectively. And the function module can be appropriately extended to explore the possibility of other functions, so as to extract the design element of functional transformation.

4. Design Practice

From the above, we can know that if a children's stroller wants to stand out among many similar products, it needs to highlight its own uniqueness to attract the attention of users and meet the needs of users. In this article, we focus on the design of the stroller from the point of meeting the users' self demand. The design scheme is shown in Figure 8.

The design focuses on the functional transformation of the children's stroller, and the stroller is combined with the elderly auxiliary cart to meet the personalized needs of the users' self demand layer experience. By using the modular design method, the seat and part of the skeleton structure of the children's stroller are designed into independent modules and an independent rest module for the elderly is added. As a result, users can change the functions of the products according to their own needs. At the same time, the shape of part of the skeleton is adjusted to enhance the inclusiveness of the corresponding modules to the different functions of children's stroller.
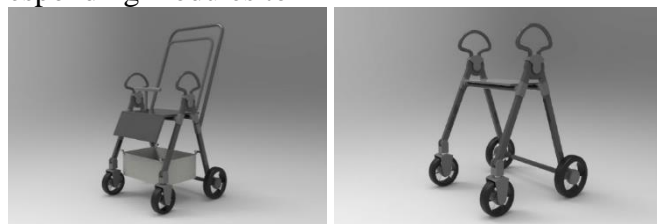
(a) State of children's stroller (b) State of elderly auxiliary

Figure 8: Design scheme.

5. Conclusions

In the era of experience economy, user demand and user experience have a significant impact on product development. From the perspective of user experience, this paper discusses the pain points and innovation opportunities of children's stroller through user behavior map. At the same time, the user experience needs hierarchy theory is used to guide the innovative design of the children's stroller, which enhances the users' memory, favorability and related resonance of the children's stroller, and also improves the user experience.

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