

Emotional Design of Children's Intelligent Companion Products Based on User Experience

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Abstract: Driven by the development of artificial intelligence technology support, artificial intelligence technology has greatly improved the quality of people's lives, and the form of interaction between robots and people has become diversified. The field of service robotics has come into focus in relation to people. This is because preschool children are highly malleable in terms of their mental development, character formation, intellectual development and physical fitness. The knowledge, learning, communication and perception of smart technology in children's smart products are gradually entering everyday life and bringing a technological innovation to education. To enhance children's experience in using the product by making it intelligent for preschool children. We study the attitudes, habits, expectations, functional requirements and pain points in the process of using children's companion robots. Combining the research method of user experience, it elaborates the user experience design of children's intelligent products, considers its design direction, and discusses the necessity of emotional design for children's products. Based on the concept of emotional design, the emotional design principles for children's products are proposed; the importance of emotional design principles in children's product design is also demonstrated through specific examples. The design strategy with both practical value and reference value is proposed.


1 INTRODUCTION


In recent years, as the AI-enabled movement has brought innovation to various industries, cross-discipline smart hardware is constantly creating a market hotspot for products. Many internet companies have begun to focus on children's consumer groups and devote the majority of their company's market to children's companion smart products. However, due to the different capabilities of each company, the products they produce are uneven. These instrumental products are usually designed without taking into account the specificity of children's identities, and still cannot escape from logical loopholes, resulting in problems such as blurred user orientation, serious product similarity, and lack of novel function settings and interaction methods, leading to poor product


practicality. Nowadays, design is increasingly emphasising real communication between people and products during use. By combining intelligent and emotional design, we are exploring emotional design methods for intelligent companion products that meet the characteristics of children's users.

2 THE CURRENT STATE OF DEVELOPMENT OF CHILDREN'S COMPANION ROBOTS

The number of new marriages in China reached 13.469 million in 2013, which will likely usher in China's fourth 'baby boom'. With the opening of

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China's two- and three-child policy, this will further increase the number of infant boomers in China. Nowadays, children-related products are also their main concern in the market. They want these products to be more than just essentially functional, they should be emotionally charged, so that children and the products seem less alien to each other, thus promoting the healthy development of children's bodies and minds. This will inevitably lead to a boom in children's electronic educational products, with spending on children's education becoming a priority in household spending.

According to developmental psychology research, the formative years of infants and toddlers can be divided into two stages: 0-3 years old for infancy, and 3-7 years old for early childhood. The period of growth and development from infancy to early childhood is a period of initiation where children learn while playing, and therefore more companionship, interaction and quality education should be given to children to help them develop physically and mentally. In order to compensate for the time parents have to spend with their children due to work, companion robots may be the perfect product to neutralise the lack of parental companionship and the need for guidance.

According to a study published by the International Federation of Robotics, in 2017, the total number of robots using service categories in individuals or households increased by 25% compared to the overall figure for 2016, with the entertainment category of companion robots rising by 12% compared to 2016. August 2018 survey data statistics at the Big Data Research Centre indicated that children's companion robots were the most popular compared to other categories of robots the highest level of attention, at 35.4%. In 2018, sales of intelligent companion robots for preschoolers reached \$2.52 billion, up 55.5% compared to previous comparisons.

In 2016, scholar Zhu Hongxuan practiced modelling design for children's companion robots on the basis of emotional design theory and characterised existing robots on the market. It also carried out the innovative design of the head and facial expression of children's companion robots, which provided a theoretical and practical basis for the development and design of children's companion robots (Zhu HongXuan, 2009).

In 2017, scholar Zhang Yixin proposed that emotional companionship plays a crucial role in the process of children's growth. Secondly, it summarised

the relevant characteristics of children as well as analysed and summarised the characteristics of children's companion robots currently on the market, and finally, on the basis of the above research, it carried out innovative design and functional improvement of children's companion robots, filling the shortage of children's robots in terms of emotional expression design (Zhou TianCe, 2017).

The main problems with the current domestic children's electronic products in China are that they are not well targeted, do not have a strong selling point or a strong sales system, are behind in product development, and have a wide range of functions, among others. In terms of their functions, we have divided them into four main categories, namely learning-based entertainment; entertainment-based education; and pure education and learning, pure entertainment.

The rapid development of intelligent robots, many brands have emerged in the market, but few brands are doing well in this area, most of which are not well known to us, which on the one hand illustrates our shortcomings in intelligent robots, but also illustrates the opportunities contained in this area, while as high-tech products even few companies will invest. Some of the companies that produce intelligent children's companion robots are slightly more familiar, such as Fluorite, BUDDY, BUDDY and Amwell.

Based on research and market feedback, this article selects the four robots that are currently selling and popular, namely Ying Shi RK2pro, BUDDY Robot, BUDDY Robot and Amwell. The four robots are compared and analysed in terms of their appearance, materials and colours, interaction, expressions and interface styles.

(1) Appearance features. The BUDDY robot is designed to imitate the round and friendly shape of a cute bean, with fluid curves and a futuristic egg-shaped design, which makes the robot look round and cute, and has a simple shape and fewer decorative lines on its body. Cartoon fun. The head shape is round and simple, the body is cylindrical, rich in shape, etc.

(2) CMF (color, material&finishing) design. The research found that because ABS material is safe, strong and tough it is not easy to break, so the children's companion robots on the market are mainly made of ABS. The colour scheme is relatively simple, with white and grey as the main colours. The Pudding Doudou robot is green and blue in colour, while the Amwell robot is relatively rich in colour scheme, with white as the main colour, and grey and gold for the

face, tail and wheels, enriching the product's sense of hierarchy. Unlike the above three robots, the BUDDY robot is mainly made of environmentally friendly materials, and the overall colour scheme is mainly white, supplemented by black and grey; private custom colours. All are fixed and unchangeable.

(3) Form of interaction. This Fluorite RK2pro, BUDDY robot and Yingjia (Amwell) three robots mainly through the head display and limbs and wheel movements to interact with the user. The four BUDDY robots' interactive behaviours are mainly in the form of voice interaction and voice feedback functions, due to the lack of hands and limbs. The interactive behaviour of the BUDDY and BUDDY robots is manifested in autonomous interaction, which will actively talk and communicate with the user, and can sing and play games together, etc. Through these interactive behaviours to increase the emotional connection with the BUDDY robot. The interaction form of Yingbao RK2pro and Yingjia (Amwell robot) is relatively single and traditional, mainly voice interaction and visual feedback, which is not much different from the other two robots.

(4) Expression style. The robot's lively and interesting expressions can bring it closer to the user and increase the user's desire to communicate with it. Therefore, all four of these robots have their own expression style settings. Yingbao RK2pro and Yingjia (Amwell robot) have a simple expression level, a minimalist style and a single form of expression. The RK2pro and Amwell robots have a more uniform expression style and do not show many changes in emotion.

(5) Interface style. The interactive interface of children's companion robots is also an important way of expressing emotions, and the interactive interface styles of BUDDY and BUDDY robots are more typical. The interface of the BUDDY robot, on the other hand, has a more technological feel and is not suitable for preschoolers.

3 USER EXPERIENCE-CENTRED DESIGN

The concept of user experience first emerged in the field of human-computer interaction in the 1940s (Dong S H,WangJ, Dai G, 1999), based on usability and user-centred design (UCD) (Prentice Hall PTR, 2001). User experience encompasses the whole process of user interaction with a product throughout

its lifecycle(Luo Shijian, Zhu Shang Shang, Ying Fangtian, 2010). Enhancing the user experience can greatly increase the utility and satisfaction of the user when interacting with a product The combination of emotive design and child companion robots transforms.

User experience consists of two main components: the user and the experience; the user is the target group of the product design, and the user experience is how the target group feels about the product. The term 'experience' has been studied and elaborated by scholars around the world from ancient times to the present day. Richard Kluger first proposed the concept of user experience in his book *The Encyclopaedic Dictionary of Contemporary Literature and Philosophy*, in which he argued that experience is everything that a person perceives in person(Li Tiebin , 2011) , and that personal perception includes human sensation, memory and reflection. The experience of the perceptual system is the primary experience, and the memory and reflection of people about things will continue the primary experience obtained by the perceptual system. The sense of experience that users acquire is often continuous, and the sense of experience that users obtain when using a product is not only the visual attraction they see and the sense of functional operation, but also the emotional experience triggered by the product, and this continuous experience is more likely to form the user stickiness of the product. The term experience is also mentioned by B. Joseph Pine II and James H. Gilmore in *The Experience Economy*, where they give the following explanation: Experience is the sensory perception that arises from the consciousness of a person when he or she reaches a particular level of emotional, intellectual, physical and mental well-being(Tang Di, 2008). Experience means to experience and validate in person (Fan Fuyan,Qu Shuangwei,Gao Yun, 2016) , to experience with the body and to validate feelings mentally(Wang Yichuan, 1989) . Bill Moggridge (designer of the world's first laptop computer) of IDEO, the famous American design firm that first proposed user experience as the core of product design, once defined product experience as “the ritualistic, dramatic nature of the interaction between a person and a product and the sensations brought about through the senses of sight, sound and even taste (Mou Feng, 2006-Jodi Forlizzi.Scott Hudson, 2003) .

In addition to enhancing the usability and overall user experience of the product, there are other advantages for users and designers.

Dray identifies the advantages of implementing a user-centred approach (Dray, S., 1995), which include the following.

- Reducing faulty design
- reducing the cost of after-sales service for products
- Reducing initial training costs and avoiding re-occurring training.
- Reducing productivity loss and speeding up acceptance when introducing new systems.
- Focusing on the tasks that must be done, rather than how to use the system.
- Reducing user backlash and increasing satisfaction.
- Reducing the need to make subsequent amendments because user needs are not met.
- Reducing user learning difficulties and reducing the need for educational training.
- The system's functionality can be fully utilised
- Providing quality of service.
- Increasing user satisfaction.
- Increasing usability.
- Increasing user acceptance.
- early detection of design problems
- reducing documentation and product support requirements.
- Increased productivity.
- Reducing development costs.
- Increasing the sense of achievement of the development team.

4 DESIGN PRINCIPLES AND EMOTIONAL DESIGN OF CHILD COMPANION ROBOTS

The current children's companion robots need to be improved in terms of emotional design, and it is important to dig deeper into children's emotional needs and to study the shape and form and color matching of children's companion robots. Will use questionnaire research research means, questionnaire research on children aged 3-6 years old, the research population is concentrated in the new youth between the ages of 22-35 years old, in the form of appearance prefer round and lovely form, so that users use the affinity easy to accept the use, more manifest the inclusiveness of science and technology and sense of technology. In terms of color, bright and vivid colors can better attract children; in terms of functional requirements most people believe that the communication function of language is one of the most basic and necessary functions that such products should have.

4.1 Design Principles for Children's Companion Robots

After analysing children's behaviour and the factors that influence it, their psychological development and the psychological characteristics of their perception of form and colour, the principles and methods for designing children's companion robots are determined on the basis of safety, fun, ease of use, modularity and educational aspects, ensuring that the design methods and principles are in line with children's physiological, psychological and behavioural development.

The perspective of children, from the aesthetics of the product, functionality, comfort, social and cultural trends, and other factors, in the psychological desire to meet the user's emotional needs.

Children's companion robots play an important role in the growth and enlightenment of children, and are children's playmates. As a vulnerable group, children are more susceptible to harm caused by unreasonable product design, both physiological and psychological, with physiological harm being the most intuitive and visible. Safety design is the first factor to consider in the design process of children's companion robots, and the following principles are summarized for reference.

4.1.1 Fun Design

Children's products only have sufficient fun to win and attract the interest and attention of children, other functions of the product can play a role, and the fun of the children's companion robot is mainly reflected in the design of the function, mainly life companion function and education and fun. For the life companion function, the children's companion robot can accompany children to play, gossip and time and space dialogue with their parents; the fun and education function, the children's companion robot has an open source nature, according to the characteristics of children at different ages for the design of games, educational resources, fully ensure that children can happily interact with the children's companion robot for learning.

4.1.2 Easy-to-Use Design

Children's physiological cognition, psychological cognition, and behavioral style cognition are still immature, so there are limitations to the cognition of people, things, and behaviors. The easy-to-use design of the children's companion robot is mainly reflected

in the interaction and use of the way, in terms of button control interaction, a variety of functional buttons are designed in obvious locations, and has the characteristics of resistance to rough use, children often appear in the same button pressed multiple times, according to this situation, each button is designed using a cycle of different functions; In terms of voice interaction, there is no wakeup word design, so children can interact with the robot at any time. As for emotion sensing, the robot has a high-definition camera, and as long as it is on, it can record slight emotional changes in children and upload them to parents' cell phones in the form of emotional change charts. Parents can learn about their children's emotional changes after work and make the necessary companionship and education.

4.1.3 Modular Design

Modular design is the ability to put together some individual modules of a product and combine them into a subsystem that can accomplish a specific function. At the same time, this subsystem can also be combined with other module elements of the product in a variety of ways through some standardized module parts, and can constitute a new system to accomplish a broader range of functions, and different systems have a wide variety of functions. Modular design is also known as a design method in the category of green design, which implements the concept of low carbon and environmental protection and can meet the different needs of different markets. This design method requires high precision, stable performance compared to other products, and low cost, which can be recycled. Modular design has three main characteristics: (1) Each part can be a finished product and can perform specific functions. (2) Each module has a standardized interface and can be interchanged. (3) The modules of different functions can be common and can enrich the functions of the product to a certain extent.

4.1.4 Educational Design

The main feature of puzzle sex is to develop the intelligence of school-age children and cultivate their interest, which is the dual property of entertainment and learning. It allows children to learn through play, learning through play, to achieve true education and fun, can greatly enhance children's interest in learning, coordination, cognitive level, intellectual development, and improve the efficiency of children's

learning. School-age children are a key period of intellectual development, which can develop children's hands-on skills and stimulate creative thinking for brain development. It stimulates children's creative thinking and promotes brain development. An excellent educational electronic product can not only stimulate their awareness of the unknown, the desire to understand the outside world and themselves, so that they grow in knowledge, but also improve children's thinking, observation, memory skills, in the invisible growth of school-age children's wisdom. The educational nature of electronic products is not only in the product additional educational functions, but also through the product itself and the direct interaction of school-age children to achieve the educational effect of the brain and hands.

4.2 Emotional Design Factors for Children

With the progress of society, people have higher and higher requirements for products, which are no longer just a material form, but a medium of communication with people. Designers should treat products as "people" or "friends" and give life to them. Designers should learn to consider from the perspective of children, from the aesthetics of the product, functionality, comfort, social and cultural trends and other factors, psychologically seek to match the desires of users and meet their emotional needs.

(1) Aesthetics

Aesthetics belongs to the instinctive level of emotional design, is the user in the choice of electronic products, product appearance, color, material and other intuitive impression, it is the primary factor to determine whether the product can be accepted by children. Children due to psychological, physical and other factors, the choice of electronic products are relatively simple, often staying in the first sense.

(2) Comfort

The comfort of electronic products is mainly reflected in children's interface operation when using electronic products, whether the appearance design of the product is in line with ergonomics, color contrast, etc. It is also a subjective feeling of the user, which affects the behavioral development of children in the process of growth.

(3) Social and cultural trends

As children in the new century, they have good conditions and educational atmosphere, they pay

more attention to the spiritual freedom needs and open-mindedness. They follow the progress of the times, social and cultural trends, and pay more attention to the need for electronic products to meet their spiritual and emotional needs. They are open-minded, imaginative, easily disturbed by external factors, more sensitive to the change table of social and cultural trends, and good at following such fast-paced changes.

4.3 Emotional Entertainment Function Analysis

The relationship between art and life is described in the Introduction to Art as "art is the product of social life embodied in the minds of men. Although art is derived from social life, it is higher, more intense, more concentrated, more exemplary, more fanciful, and therefore more universal than the usual social life (Zheng Jinyan, 1999), which also confirms the psychological need of the ancestors to make toys and have fun even in the harsh conditions of production in ancient times. In the United States, one of the most important parts of education is that every child enjoys a joyful childhood and becomes a happy, productive person in the future, and there are many patterns of behaviour, emotional experiences and so on that are developed during childhood and have a profound impact on a person's life.

For the children's companion robot, the functions in the entertainment scene include: children's songs, fun quizzes, children's stories, tongue twisters, interactive games, recording functions, appreciation of dance, etc. But these entertainment functions are not only for children to play and entertain, in the process also contains a link to education in which, as the saying goes, is to teach and play, in the entertainment experience the fun of learning, to cultivate the child's work and play It is a fun and educational experience, and develops good thinking habits.

5 SUMMARY

Based on the user experience under the children's intelligent companion products emotional design research, analysis of school-age children user design needs, good design is always the pursuit of good demand, is will put the user first. This paper explores the real needs of children with user-centered design, applies user research methods to the field of children's

products, explores and analyzes the physiological, behavioral, and cognitive characteristics of children, fully considers the factors that affect children's experience, and makes the corresponding user needs of children's products the guide for product design in order to truly design intelligent interactive products that meet the real needs, habits, experiences, and expectations of children. Combining the design principles of emotional design with design methods to form an emotional design study of children's intelligent companion products based on user experience.

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