

Research on Design of Pet Interactive Entertainment System Based on Design Science of Affairs

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Abstract—Pets are not only loyal partners of people, but also family members who relieve the pressure of life and work and increase the joy of life, and have many positive effects on human physical and mental health. This article takes pet cats as an example, analyzes the life style of office workers and pet cats, taps out potential needs for human-pet interaction, and translates user's needs into design solutions. The authors conduct qualitative and quantitative analysis of pet owners through observation, survey, and interview methods, and in-depth study of cat behavior, psychology, and living habits. In terms of theory, design science of affairs is used as a thinking tool to analyze the product's affair relationship. Based on the user's needs, based on the three aspects of human, environment, and pets, the system analysis provides solutions to enhance the interaction between people and pets. The design of the pet interactive entertainment system can not only increase the frequency of human-cat interaction and timely understand the cats' living conditions, but also enrich the pet cats' entertainment activities, improve the cats' physical fitness, and maintain mental health.

Keywords: *pet interactive entertainment system, design science of affairs, lifestyle, pet cats, user's needs*

I. INTRODUCTION

In modern society, due to high social pressures, severe aging of the population, reduced fertility, and independence of urban residents' families, interpersonal communication is decreasing and interpersonal relationships are cold. Pets have gradually become the sustenance of many people's emotions. According to Ainsworth's unfamiliar situation experiments, the relationship between people and pets is similar to the relationship between mothers and babies [1], which means that taking care of pets gives people comfort in spirit and satisfaction on caring for the weak. However, due to people's busy work, the communication between people and pets has gradually decreased, and pets lack companionship and care. At present, there are relatively few related literatures on pets. Vitale Shreve Kristyn R. [2] and other researchers have

studied the effects of human social interaction, food, toys, and odors on cats. It is concluded that interaction with human society is the most stimulating factor, followed by food. In terms of emotion, Wang Jiaqi [3] analyzed the relationship between humans and pets based on the symbiosis methodology, and put forward the integration of pets and human emotions into product design. In terms of social psychology, Wang Jiashun [4] surveyed 2059 users and studied the relationship between pet ownership and individual physical and mental health. The results showed that people who own pets are more confident and have higher mental health. Shi Haiyan et al., [5] studied the basic conditions of the diagnosis and treatment disputes and the psychological factors, and proposed relevant countermeasures from the macro and micro aspects.

II. OVERVIEW ON THE DESIGN SCIENCE OF AFFAIRS

Design science of affairs is a design methodology proposed by Professor Liu Guanzhong. Its main point is that people's different using behaviors and using conditions to establish a target system under different environmental and time constraints [6]. The design problem can be divided into two parts: one is to find the problem and define the problem, that is, the actual "thing"; the other is to solve the problem, that is, to seek the "yes". When designing, it is a must to first clarify the relationship between affairs, and based on the user's needs, to consider the environment, to integrate the existing technology and material resources, and to creatively propose solutions. At present, there is very little research on the design of pet interactive systems from a methodological level. Establishing an ideological system based on design science of affairs can not only balance and integrate many factors, but also extract key external factors to establish internal factors and determine core ideas.

III. DESIGN OF PET INTERACTIVE ENTERTAINMENT SYSTEM BASED ON DESIGN SCIENCE OF AFFAIRS

When designing a product, the designer must consider not only the user's intentions and goals, but also the environment in which the user and the object stay. When developing the product, the user's needs are the goal, the function and appearance of the product need to be reasonably structured, and integrate in the appropriate way to achieve product innovation. The objective positioning system of design science of affairs provides a complete method for organizing requirements. It considers the influencing factors

of the product in an all-round way, that is, "human — environment — product — event — design integration". First, it is necessary to analyze the life patterns of pet cats and office workers to understand the target user's values and real needs, and understand the users themselves. Then it will also be necessary to analyze the pet cats' living spaces, living habits, psychological state, behavior and other insights, determine the basic functions of the product, analyze the situation, business model, time and place, etc., develop other functions of the product, and finally integrate the functions, to get the opportunity point of the product, as shown in "Fig. 1".

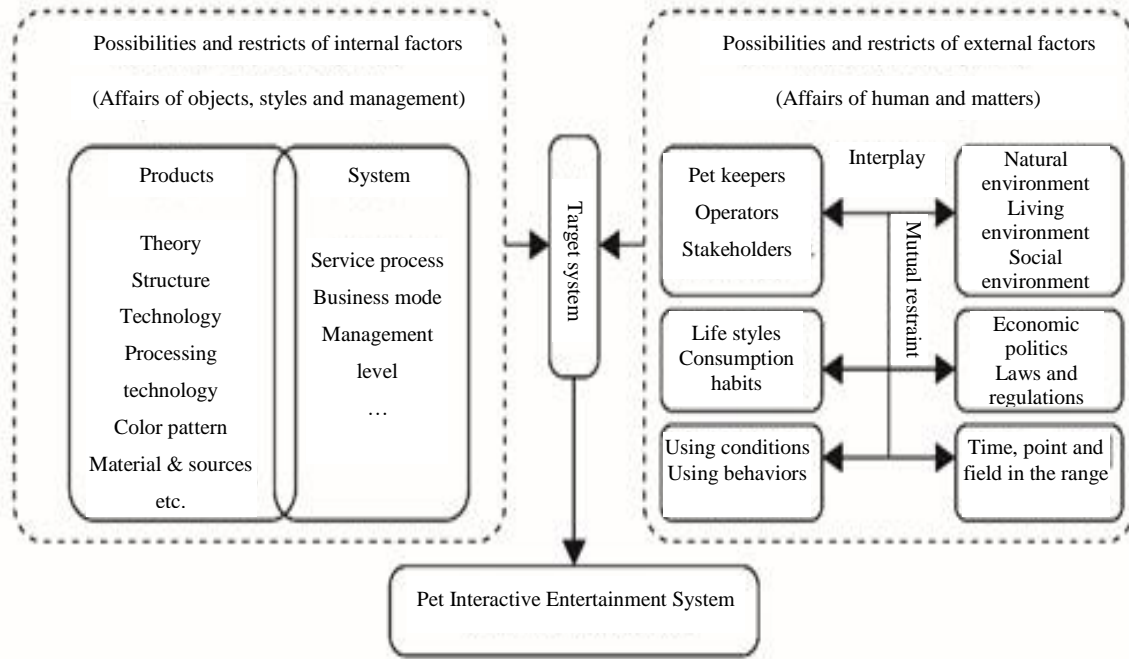


Fig. 1. Analysis chart of pet interactive entertainment system.

At present, most pet apps on the market take social networking as the entrance, and then develop e-commerce and on-site services. The model is relatively single and the homogenization between products is serious. Although there are many kinds of pet software, there are no unicorn companies for pet services, and there is still huge room for development in the pet app market [7]. Based on the previous research, this paper conducts the research on cat monitoring, companionship, hygiene, cost, etc., and finally summarizes the demand points based on the user, the pet cats' psychology and behavior, and product use, as shown in "Fig. 2".



Fig. 2. Literature research & survey interview statistics.

A. Analysis on users

The target users are mainly urban office workers with pet cats between the ages of 20 and 35. Most of the office workers at this stage are well-educated and of high quality. Through user interviews, the life style of users who own pet cats can be learnt. First, for cat lovers, cats are not just pets, but important members of the family, so cat owners will provide cats with a good living environment and living conditions according to their own values and economic affordability. For them, if they can see cute cats jumping around at home during work breaks, it can not only relieve work pressure, but also bring joy to boring life. Second, the family concept of young people has changed. The concepts of "single aristocracy" and "Dink family" have become some of the choices of the public. People are more seeking to enjoy life, which makes pets become the sustenance of spirit and emotion, and cat-fondling has become a new kind of fun. Third, young people have a strong desire to share. Cat owners hope that their friends and family can also feel the happiness that cats bring to themselves, and they are eager to exchange experiences with people who love cats.

B. Psychological and behavioral analysis of pet cats

From the perspective of the pet cats, when the owners go out to work and the pet cats are at home alone, they need to spend a lot of time in a closed space. Studies have found that if pets are not used to being alone, being separated from their owners for a long period of time will make them be prone to developing "pet separation anxiety" or depression. If a pet cat does not exercise for a long time, it is easy to become obese, leading to reduced heat resistance, causing disease and reducing lifespan. Therefore, giving enough care to pets is a necessary condition to ensure the physical and mental health of pets. Existing pet-related products only address the physiological needs of pets, but do not meet the

psychological requirements of interacting with pets, helping pets to spend boring time, and enriching the spiritual life of pets. (See "Table I")

TABLE I. ANALYSIS OF CATS' PSYCHOLOGICAL AND BEHAVIORAL PERFORMANCE

Cat psychology	Behavior
Anxiety	Crouching, panting, hair removal, muscle tension, dilated pupils
Bored	Attack, scratch furniture, bite clothing
Curious	Drilling, climbing

C. Analysis of product using requirements

Guided by user's needs, it will be important to excavate the difficulties and actual needs encountered in the process of use, and analyze the requirements in depth, transforming the deep understanding of user's needs into feasible insights and ideas that can determine product attributes [8]. After being separated from pets, users often worry about pets, worrying about whether the pets are healthy at home, whether they are eating on time, whether they feel lonely, and so on. When pets encounter problems, users want help and guidance from others, such as how to deal with pets when it comes to medical treatment, while pet stores being far away from home. Pet stores are oversupplied in large cities such as Shanghai and Beijing, while supply is in short supply in third- and fourth-tier cities. In terms of hygiene, people will buy some pet toys for pets out of love. However, due to busy work, users do not clean frequently, which is prone to breed bacteria and threaten pet health. In terms of pet sports, most people do not do enough exercise for pet cats, resulting in poor physical fitness of pet cats. In terms of entertainment, pets have almost no entertainment after being separated from their owners. By translating the pain points encountered by

users into user's needs, this search for opportunity points is translated into specific pet interactive entertainment system designs, as shown in "Table II".

TABLE II. PROBLEMATIC PAIN POINTS AND TRANSFORMATION OF DESIGN REQUIREMENTS

Pain points	Demand points
Health and regularity of the diet	Feeding control; remind pets to eat (feeding reminders)
How to deal with pets' unnormal behavior	Need help and guidance from others (community function)
Pets' sickness	Contact a pet doctor, (expert consultation, pet monitoring)
Pet hygiene issues	Contact a pet hygienist (cleaning appointment)
Pets' poor health	Strengthen pets' exercise (interaction)
Pets' life is boring and lacks companionship	Improve communication with pets (gaming)

D. Design of pet interactive entertainment system

Based on the theory of design ethics, by analyzing the affair relationship of pet interactive products, it is understood that consumer needs are monitoring pets, interacting with pets, and social sharing between "cat slaves". The researchers will propose appropriate solutions based on the user's inner expectations of interaction with cats, based on the needs for reasonable use, taking into account the behavioral and psychological characteristics of pet cats and the living environment, and through the integration of related technologies, materials and other resources.

The researchers will also conduct research on users' life forms and behaviors, explore the actual needs of users,

discover new product opportunities, and create product concepts and corresponding development mechanisms that meet consumer needs [9]. According to the above analysis of users, more user-oriented pet interactive entertainment system designs should consider office workers. Such users usually work hard and have no time to look at pet cats at home, but they are worried that pets are boring at home alone and eating irregular. Therefore, it is necessary to increase the communication between people and pets through the pet interactive intelligent system, and to remind pets to eat on time. In addition, the camera can be controlled by a mobile phone, and some small games can be set to attract the pet's attention. At the same time, the pets' physical fitness is also improved while the pets are playing. DM Go, a hardware product of "playing with cats" system, combines the functions of a camera and a projector. DM Go can be controlled and communicate with cats through small programs. DM Go adopts a sleek and smooth overall appearance. The angle rotation also highlights the cute and agile shape, which is conducive to recording the life of pet cats in all directions and achieving the function of remote interactive entertainment. The design of "playing with cats" hardware product DM Go is shown in "Fig. 3", and the internal structure design is shown in "Fig. 4".



Fig. 3. "Paying with cats" robot design.

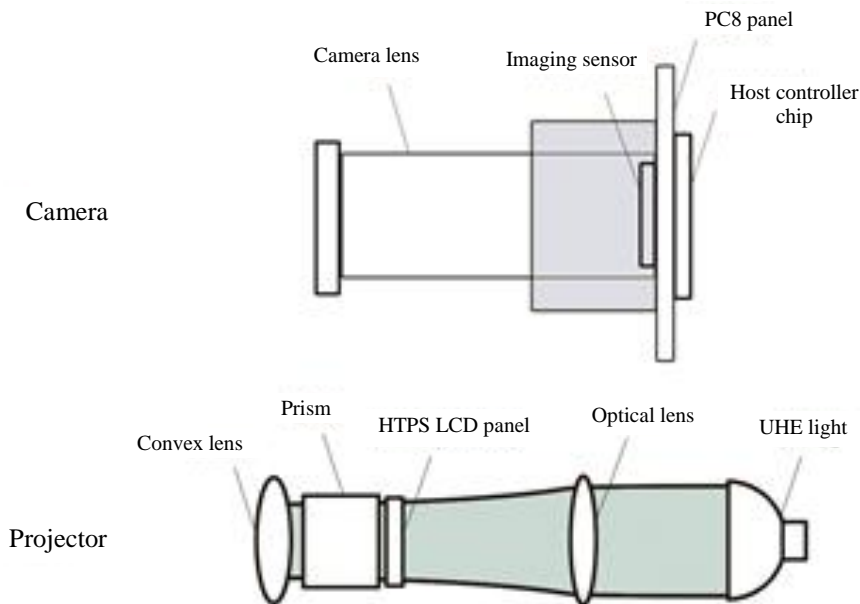


Fig. 4. Internal structure design of "playing with cats" robot.

The users can control the movement, zooming, rotation, etc. of the projection through "playing with cats" applet, which integrates various basic movements, combines a series of complex movements, and reminds the user and inspires the user during the movement [10]. Considering that users will encounter some difficulties when raising cats, they can set up forums and expert Q&A functions in the "playing with cats" applet. Some pet-seniors can share their experiences and users can also share videos of cute pets. In the meantime, they can also learn some common sense of life through the topic. The BENYON study points out that when users have

their own thoughts on the relevant prompt information, which shows that they do not want the forced-push messages [11], which requires the "playing with cats" applet to fully consider users' habits and preferences during the interaction design process. In order to facilitate users to buy daily supplies about cats, a cat market is set up in the applet. Users can see the latest cat breeding artifacts developed in the cat market, which can satisfy people's desire for interaction and socialization in many aspects. The "playing with cats" applet prototype design is shown in "Fig. 5".



Fig. 5. Display of the main interface.

IV. CONCLUSION

First, in the future design of pet interactive systems, it is necessary to establish a unified design standard for users, pets, and the environment, and use this as a starting point to implement the design plan. Second, the nature of pet interactive entertainment system design requires designers to take home environment, space size, pet behavior and psychology into consideration when designing. Finally, when enhancing the communication between humans and pets, it will be important to control the funny cat robot through mobile phone mini programs to project mini-games, enhance the pet cat's physical fitness, and enhance life fun. This article uses design science of affairs as a thinking tool, analyzes the relationship between humans and pets along the "human — environment — product — event — design integration" research path, sorts out the user needs, and provides users with solution on enhancing human-pet interaction based on their life forms. The pet interactive entertainment system design can also reflect the market segmentation trend in the future, providing a reference for smart products in the pet industry.

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