

Design of Intelligent Pet Consignment System Based on the Current Situation of Pet Consignment in China

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Keywords: Interactive design, pet consignment, system design, intelligent tracking

Abstract: In recent years, pet consignment is growing rapidly in China, where it is regarded as a gray area. The death of pets occurs frequently due to improper handling in the process of consignment, which makes the safety of pet consignment a problem that attracts attention and needs to be solved urgently. After investigation and research by various channels and methods, the characteristics of pet consignment scene are summarized. Combined with interaction design, under the guidance of existing theories, this paper uses communication technology to construct an intelligent pet consignment system, including the design of pet owner module, consignment driver module, user information module, positioning module, monitoring module, early warning module and cloud server module. It aims to build an intelligent and efficient pet consignment system to provide users with the best consignment experience and help solve supervision and management issues in China's pet consignment industry.

1. Introduction

With the rapid growth of China's economy, the pet industry has developed rapidly. According to the 2018 China Pet Industry Development Trend Analysis and Market Size Forecast, the number of pets in China increased by nearly 900 percent in the 11 years from 2008 to 2019. The growth of pets is bound to drive the development of the pet industry, and one of the most important areas in the pet industry is pet consignment, which has developed for more than 100 years and has formed a relatively mature market in developed countries [1,2], while the domestic market has just started paying attention to it. As a new form of business, pet consignment gradually appear with pet becoming a part of life. At present, pet consignment refers to the long distance, medium distance and short distance escort transportation of pets in accordance with national laws and regulations, which mainly includes air consignment, China Railway express, pet tailored taxi consignment and bus consignment. Unlike ordinary express, pet consignment offer a special form of logistics consignment service that the pet owner entrusted the qualified pet consignment company to transport the pet to the designated place [3,4]. According to the Analysis Report of China's Pet Consignment Industry 2021, the domestic pet consignment market has more than doubled in only 6 years from 2014 to 2020, and is expected to reach a staggering 82.9 billion yuan in 2030. According to the White Paper of China's Pet Industry in 2021, the difficulty of traveling with pets is the second

pain point for pet owners in China after 2020, second only to the high cost of medical treatment for pets.

Whether traveling abroad or domestically, traveling with a pet will always face transportation obstacles. Self-driving travel is currently the easiest way to travel with pets, while public transportation such as trains, ships and planes have to go through a lot of checkpoints and procedures to carry pets with them, and even the safety and health of pets cannot be guaranteed in the process of transportation [5,6]. In addition, only the Wildlife Protection Law of the People's Republic of China currently exists in China, which cannot protect the rights and interests of common companion animals or pets [7]. Therefore, the humanized management level of domestic pet consignment companies for pets is generally low.

2. Risks of Consigned Pets

2.1. Suffocation

Once the breathing of animals in transport is not guaranteed and oxygen supply can not meet the basic requirements, suffocation will occur. Pets, as a special consignment commodity, are at risk of diseases and adverse stress reactions over time due to irregular transport mode, long transport time, inadequate diet, continuous turbulence, poor air circulation, excreta accumulation and other possible factors [8,9]. At the same time, due to human factors, overloading, placing containers too close, placing containers with the main vent not facing outward or forgetting to ventilate the cargo hold during stopover can also lead to animal suffocation and death [10].

2.2. Heatstroke

Pet dogs and cats have thick coats that keep them warm, but they don't get rid of their own heat. At the same time, pet dogs have almost no sweat glands throughout the body, and are prone to heat disorders and heat exhaustion in the summer. In addition, obese and elderly pets are more likely to put their health at risk during transportation. Obese pets are less likely to have a lower body temperature, and their narrow airways require more energy to breathe, while older cats and dogs or young cats and puppies are less able to regulate body temperature [11]. Therefore, in the hot and humid, closed, direct sun consignment environment pets are prone to heat stroke and dehydration. In severe cases, death may occur.

2.3. Stress Response

The causes of pet stress response include: psychological anxiety caused by a pet's inability to be independent after being pampered by the owner, psychological anxiety caused by pets not knowing what to do for a short time when separated from their owners and psychological anxiety caused by pets' strangeness to the environment in the case of sudden changes in space environment. Factors that are likely to cause stress reactions when pets are transported include toxic gases, excessive shock, noise, separation of pets, abuse, etc [10-12]. A pet that responds to stress will undergo a series of physiological changes, and its body will develop various defenses to adapt to the changed environment and avoid injury. But if it is allowed to continue, it can lead to shock and death.

3. Pet Consignment Process

3.1. Comparison of Common Pet Consignment Methods

(1) Air Consignment

Advantages: The fastest carrying speed, luggage compartment equipped with oxygen supply facilities and superior conditions. It is suitable for medium and long distance transportation.

Disadvantages: The handling of consignment procedures is very complicated and the cost is higher.

(2) China Railway Express

Advantages: high speed, low cost, high security and wide network distribution.

Disadvantages: the handling of the consignment formalities is relatively complex and it is only suitable for medium distance transportation.

(3) Car and Bus Consignment

Advantages: Flexible mobility. It can reach places that trains or aircraft can't.

Disadvantages: Slow speed and general loading conditions. It is not suitable for long-distance transportation.

(4) Summary

Land transport is cheap, flexible and convenient, which include railway, bus, car and other ways. It increasingly becomes the best choice for short distance pet consignment. But land transport can easily lead to physical disorders such as heat stroke, hypoxia and stress response [8-12]. Just as complaints to the pet consignment business on Black Cat Complaints Platform up to July 19, 2021, the death rate of pet transport by land is as high as 1/3.

3.2. Key Points of Pet Land Transport

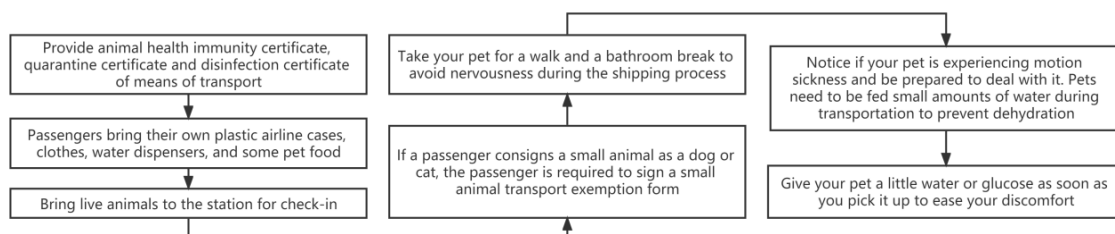


Figure 1: Pet transport flow chart.

The normal pet land transportation and consignment process is shown in Figure 1, which can be roughly divided into three stages: consignment preparation, consignment and Reception. The specific precautions are as follows:

(1) Consignment Preparation

A special plastic airline-approved carrier or a special cage is allowed. On the one hand, domestic airlines (train stations) have certain requirements for the packaging of live cargo. On the other hand, it is also for the safety of pets themselves [13]. And a small amount of water and pet favorite toys can be prepared in the cage before consignment to reduce the anxiety of the pet during the journey.

In addition, pet owners need to do a good job of pet fasting and urination in advance. If the pet is carsick/airsick, they should also consult the doctor and prepare the appropriate medicine [14]. If the transportation time is longer, the doctor should prescribe a sedative as well. Even for pets that are not carsick/airsick, pets should urinate 2-3 hours in advance before consignment to reduce gastrointestinal discomfort and burden during travel.

(2) Consignment

Warm clothes, a water dispenser and some dog food should be packed in the carrier for pets in a long trip. Because conditions of long-distance consignment are constantly changing, it is necessary to prevent pets from being cold and hungry. When shipping short distances, only warm items are placed [15,16]. And the consignment company is also willing to provide relevant services.

The jet stream and dust generated during the ride can cause discomfort to pets and may also pose a number of safety concerns. However, the air conditioning temperature should be also paid attention to when it is in the closed carriage. If the temperature difference between inside and outside the car may lead to pet cold.

According to the length of the journey, timely parking (such as: every 1-2 hours) can be arranged to rest. Let the pet get off the car to relax and defecate, and at the same time feed the pet a small amount of food to ensure the comfort of the pet during the journey [17,18].

(3) Pet Reception

Pet owners should not feed their pets food immediately after receiving them. It is better to feed them some water or glucose first to ease the discomfort of the body. When the pet has recovered for about three to four hours, it is time for the pet owner to feed them small amounts of food. In addition, some professional consignment companies in the pet transportation process will also feed glucose to the pet, on the one hand it can replenish energy, on the other hand it also prevent heat stroke.

4. User Research

4.1. Questionnaire Survey

The questionnaire was issued in the form of 121 questionnaires, which were effectively filled out by 121 people. The data obtained is shown in the Figure 2.

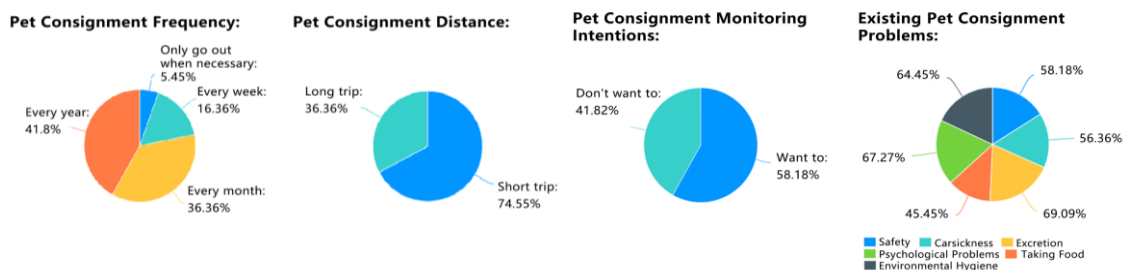


Figure 2: Questionnaire survey results.

Pet people more or less will have the possibility of consignment, and the frequency is high. Pet owners travel both short and long distances. And more than half of pet owners who check pets have a need to monitor their pets remotely. At the same time, they believe that the existing pet consignment problems cover safety, car sickness, excretion, anxiety and other aspects.

4.2. In-depth Interview

Ms. Liu is an employee of a company as well as a pet owner. Her pet has accompanied the owner's family for many years and they established a very deep emotional connection between them. She is also a travel enthusiast, hoping to travel around the world to see all the beautiful scenery in her lifetime, and loves to share the joy of travel with her family and friends.

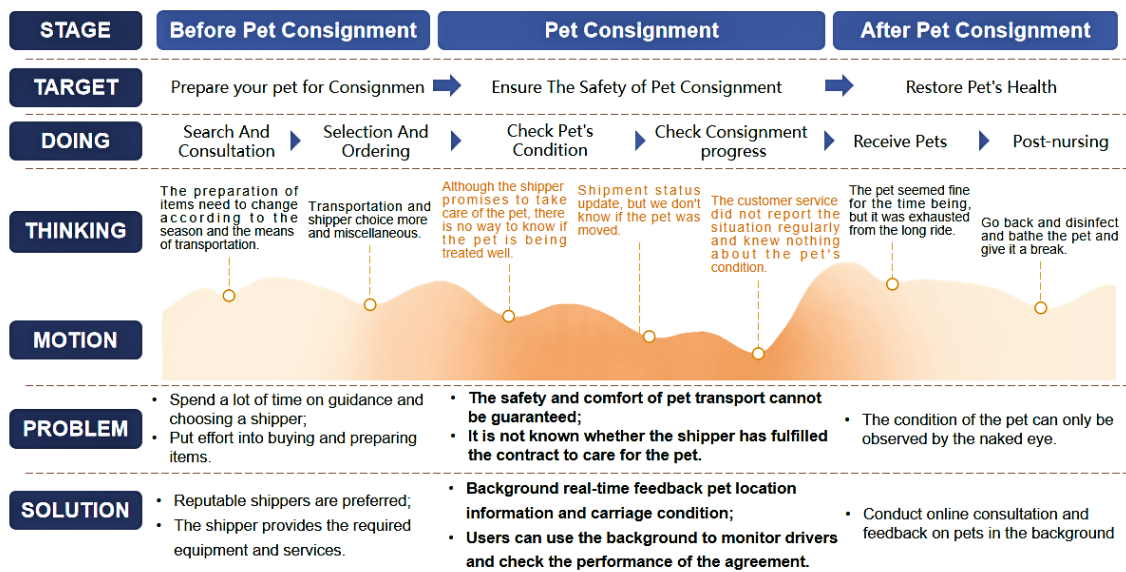


Figure 3: User journey chart.

As is shown in Figure 3, Ms. Liu believes that the main problem of consignment is unable to real-time monitoring and care for pets. She is most worried about the safety of pets, and also afraid that pets may have problems such as stress reaction or physiological discomfort, so that she cannot know the status of pets and take timely measures. Therefore, she hopes to launch an efficient pet travel system that can solve the pain points of traveling with pets. And the background of the pet travel system can help users supervise and guarantee the whole process of consignment. In the consignment of pets, the system can enable her to know the situation of pets in real time and take care of pets, to ensure the safety of pets consignment and obtain better consignment experience.

According to the insight results, the main pain points can be summarized as difficult to relieve the separation anxiety of pets, difficult for users to know the health status of pets in real time, unable to know whether the pets are transferred, unable to know whether the pets are treated well, etc. Based on this, the design of the function mainly focuses on three aspects: real-time environment monitoring, real-time positioning and tracking and remote abnormal alarm [19-21].

5. Design Output

5.1. System Positioning

(1) Target Consumer

Pet owners aged 25-35, who have a strong demand for pet travel, and attach importance to safety and health of pets. They mainly rely on pet consignment companies for the close and distant transfer of pets.

(2) Market Objectives

To meet the safety needs of pet consignment and the psychological needs of pet owners, solve pain points of users, build intelligent and efficient user consignment system and provide users with the best consignment experience.

(3) Core Value

To provide users with a high-end pet consignment platform, with "pet consignment" as the core, including remote monitoring, warning and other functions and open up a new pet economy field.

(4) System Features

- Remote linkage APP: Remotely viewing the environment of the carriage, monitoring the

transport status in the background, and realizing remote monitoring of consignment;

- Real-time monitoring and data memory: Real-time monitoring and uploading of all indicators of the carriage environment, and generating the change curve of each indicator.

5.2. System Design

The pet consignment enterprise purchases a smart pet consignment detector and installs it in the vehicle used for pet consignment. In the process of pet consignment, pet owners can be aware of the specific consignment status and supervise the appointed consignment driver by the PUPPYGO remote consignment monitoring APP. The system can eventually improve the user's consignment experience.

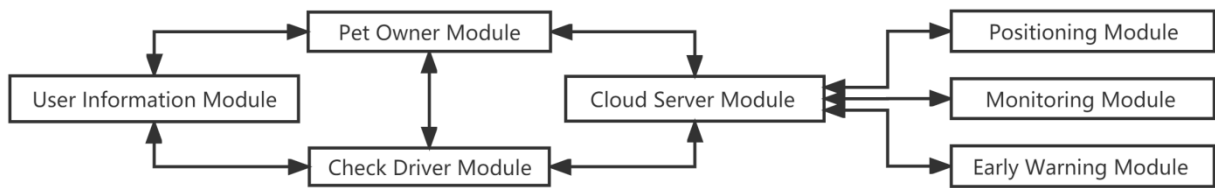


Figure 4: System module design.



Figure 5: Usage scenarios and product details.

Intelligent pet consignment system includes pet owner module, consignment driver module, user information module, positioning module, monitoring module, early warning module and cloud server module, as is shown in Figure 4. The user information module connects with the pet owner module and the consignment driver module and saves their user information. The cloud server module connects with five modules except the user information module. This system is designed according to the existing positioning, monitoring and warning functions, which can facilitate the pet owners to check the location of the monitored pet in real time and prevent pets from being replaced and transferred. In addition, once the pet owner finds any abnormal data in the checked carriage, it will immediately send out a remote warning signal and warn the driver by relying on physical contact points and online APP platform, so as to realize intelligent pet tracking.

(1) Smart Pet Transport Detector

The product adopts the adsorption suspension mode, with built-in monitoring device, wireless network device, positioning device and speaker. Figure 5 is the usage scenarios and product details

of the product. When in use, by pressing the switch, it can automatically monitor the environment of the consignment carriage and transmit data to the cloud server through wireless network. When the data transmitted from the cloud to the user end is abnormal, the pet owner can send a warning to the driver end through the remote linkage product, including flashing emergency alarm lights and sounding alarms.

(2) PUPPYGO Remote Pet Consignment Monitoring APP

The interactive interface design of APP linked with the smart pet consignment monitor is shown in Figure 6. The main features are real-time positioning and tracking, remote monitoring and danger warning.

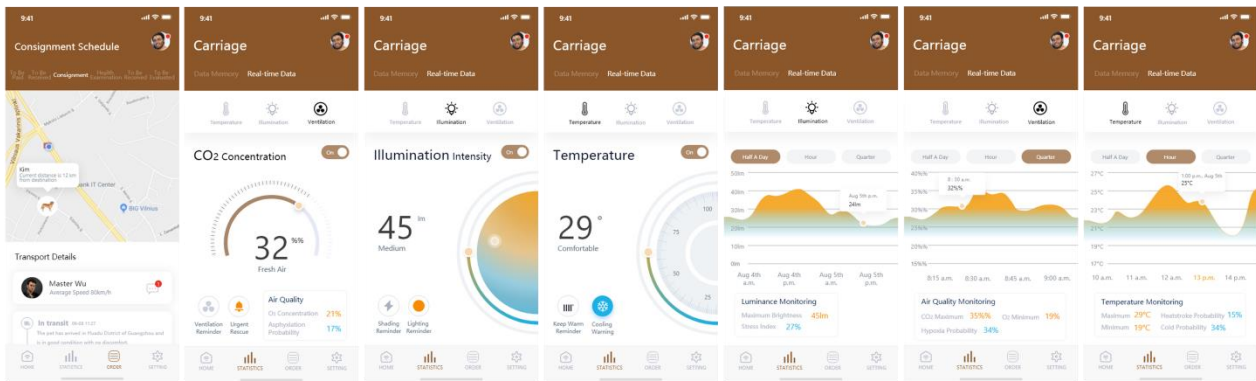


Figure 6: Interactive interface design.

- Real-time positioning and tracking: The user can view the real-time position of the pet in the consignment progress, and the background will update and display the arrival position and speed of the vehicle regularly.
- Intelligent remote monitoring: The product installed in the checked compartment monitors the environmental data in real time and generates a trend chart, showing the highest and lowest values at the same time. Users can check the temperature, illumination and ventilation conditions of the checked compartment and the probability of pet physiological discomfort in different unit periods (every half day, every hour, every quarter), so as to make a response.
- Threat Alerts: Users can visually monitor the pet consignment environment through real-time data. When abnormal conditions are found, click the reminder button (warm/cool reminder, shading reminder, ventilation reminder) or emergency rescue button on the interface. At this time, the products installed in the carriage will flash bright light (blue light for adjustment reminder, red light for emergency rescue) and issue a warning sound (corresponding to different warning contents). And an emergency call will be made to the driver.

6. Conclusion

The heat of pet consignment is now showing a continuous rise, especially at present we are in the social transition period. The increase of pet owners is also providing a driving force for the development of pet consignment. How to maintain core competitiveness in sales market and promote the healthy development trend of all pet consignment manufacturing industry is the key task to be carried out urgently. As a special form of consignment in logistics, from the preparation in advance at the beginning, to the details in the middle, and finally to the delivery of pets, the whole process needs to be planned in order to ensure the smooth progress of each step and improve work efficiency.

The development trend of the pet transportation in the future is car consignment platform. But pet consignment is still in the way of cargo escort or consignment. The risks during transportation

are not controllable, and the status of pets cannot be observed. Even if there are special circumstances, the first aid can not be timely implemented and the pet can not be sent to the pet hospital in time. In addition, the variety of pet, age, health and other factors determine that the consignment conditions need accurate statistics and timely feedback. Transport pet vehicles and environmental factors may threaten the health and safety of pets. Pet consignment companies who follow the trend of the times and seize the opportunity at the same time is also facing new challenges.

Based on the pet service, a new field at present, this paper actively seeks and explores the blue sea zone in this field, specially conceives and designs for this zone, which not only fills the vacancy in the market, but also gives its own infinite commercial value, and lays the foundation for the subsequent development of new markets. At the same time, the system combines itself with communication technology to realize the concept design of remote linkage and it eventually reach a goal that to meet the safety needs of pet consignment and pet owners' psychological needs, to build an intelligent and efficient user consignment system and to provide users with the best consignment experience.

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