

Application of Digital Transformation in Pet Accessories Market

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ABSTRACT

Pets as family members appear around more and more people, and pet accessories become more and more important. This article explains why the digital transformation of pet accessories will be accepted by more people. Firstly, several pet accessories in use or in concept and their combinations are introduced. Through the previous application of these pet accessories, the daily life and behavior of pets are monitored to help owners better understand their pets. The obtained Pet data can be analyzed and shared through the platform, so that more pet lovers can have a communication platform. Secondly, it analyzes the data of people's spending on pet accessories. According to the data, it is estimated that Americans spend on pet accessories from 2008 to 2020. Through data analysis, it is concluded that people's spending on pet accessories will continue to increase from 2020 to 2026. The pet accessories industry is still investable and profitable for commercial use, which shows the improvement of the competitiveness of the industry.

Keywords: Pet accessories, Digital transformation, Platform, Data analysis

1. INTRODUCTION

Pets are playing an important role in human's everyday life, as many pet owners grow up with their beloved pets [1]. Pets can even be the source of entertainment and psychological support for many people, such as dogs comforted the overstressed employees in hospital and accompanied lonely seniors during covid-19 pandemic [2]. At the same time, pets may also gain from their relationship with humans [3]. Bonds between humans and pets established from helping each other leads more and more people considering their pets as a part of family. According to Lue et al. [4], pet owners who are strongly bonded with their pets are more likely to seek preventive care. Thus, a pet accessory that provides health suggestions can be useful and demanding in the pet accessory market for pet owners. However, the vast majority of products in the current pet accessories market are not high technology [5]. Without technology, functions provided by pet accessories are limited. Some companies have started to add sensors in pet accessories to track pets' locations, and some of them are designed to train pets' habits and behaviors. For example, the GPS tracker provided by Tractive provides 24 hour live

tracking and 365 days of location history [6]. However, none of them focus on pets' health. Since pets can't talk like humans, when pets are experiencing pain or unfortableness, they can't talk to pet owners. Certain pain or uncomfortableness usually come with a change in behavior, especially chronic or mild diseases. For example, a dog may fight against nearby animals and get hurt, if a warning is informed, pet owners can arrive there on time and avoid the fight. Or sometimes wounds are hidden under furs and can be hard for owners to find out. This paper thinks a device that can detect and analyze real-time data from pets can help pet owners to provide better living conditions to pets and know their pets better. This digital transformation idea is to add value to pet accessory companies, change the traditional pet products and help them become more competitive in the pet accessory market. The aim of this article is to provide an idea of a pet accessory product and examine the possibility and feasibility. In order to achieve the aim, following task have been set and solved:

1. A review/survey has been done to see the demand of the possible idea.

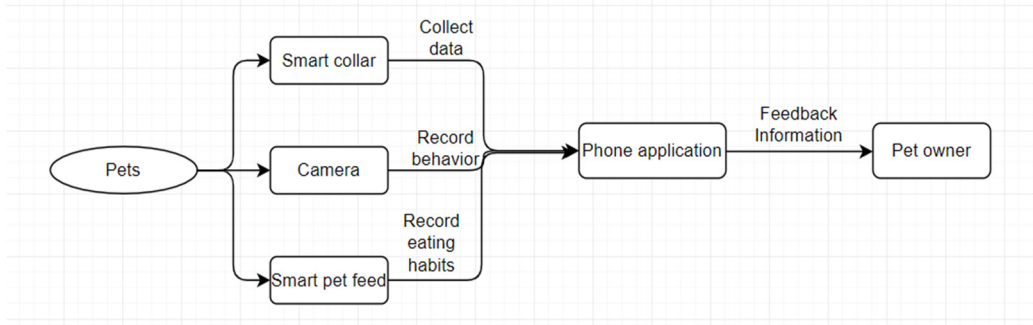


Figure 1. Functional flow diagram

2. A test has been examined to check the possibility and feasibility.

Digital transformation is the process of developing digital technology and related support capabilities to create a new dynamic digital business model. By implementing digital transformation, companies not only can realize more efficient resource management and better customer experience, but also can improve their productivity and agility to meet changing market requirements. This shift is global and therefore involves the adoption of digital technology in both internal and external operations process; Including manufacturing, marketing and customer services. In order to adopt digital transformation, merely applying IT (information technology) is not enough. Companies must also thoroughly redefine their method of business, which contains organizational activities, operation processes, business models and employee competencies etc..

On the basis of latest Harvard Business Review study [7], about \$1.3 trillion was spent on digital transformation in 2018. However, a large percentage of this expenditure was ultimately wasted. Because of inadequate preparation, lots of companies were not real ready to transform so finally they failed. In fact, apart from just investing on several technologies and devices, digital transformation also refers to the formulation of long-term strategies, the implementation of short-term tactics to quickly respond to the related challenges and grasp the opportunities. Today, almost all companies' strategic plans need to take digital transformation into consideration, which requires a lot of experience and skills.

There are many active pet accessories on the market right now, but they are all relatively simple, such as: food bowl, toilet, rope, etc [5]. They are only useful for facilitating pet care for pet owners. Through these accessories, owners can take better care of their pets, but they can't understand their pets. The functions of some accessories proposed in this paper, such as health, position detection, intelligent feeder, camera and APP platform, are all digital intelligent accessories that can help owners understand their pets' health status, food

intake changes and behaviors while taking care of their pets. By sharing information with other owners through the analysis of the platform, the system can help owners better understand their pets. This is the traditional pet accessories can not do, but also the inevitable development trend of the pet industry in the digital era.

2. METHOD

2.1. Overview

This smart pet system is constituted by several parts, they are smart collar, camera, smart pet feeder, and at last a phone application. Each part has its own functions and will gain different types of data from pets. Then the application will analyze all information and give a suggestive health report to pet owners.

Collars are designed to collect all kinds of data. When these data are collected, it will be uploaded and analyzed, and feedback will be sent to pet owners in the pet application. Cameras are designed to watch pets' behaviors and pet owners can see their pets at any time. Behaviors and habits will be learned by machine learning and will analyze them. If certain habits have high similarity with the model in big data, or other animals are detected by cameras, the phone application will notify pet owners. Pet feeders will be set by owners and automatically feed pets, it will learn from pets' eating habits, if there's a change in eating habits, it will be notified in the phone application. Relationships among these devices will be shown in the Figure 1.

2.2. Health monitoring

The wearable device is equipped with sensors that can monitor the pet's body temperature, pulse, breathing rate and other physical signs. These physical characteristics are sent to the owner from time to time, and when there is a dramatic change in these physical signs, an alert will be sent to pet owners. For example, if a dog barks suddenly because of fighting against other animals, falling or other scenarios, or the sensors detect a sudden change in temperature because of dog swimming in water, the sensors will detect these signals and alert pet

owners. This will give owners time to check what is happening and prevent further damage. A heartbeat monitor can indicate BPM of a dog in exercise or rest [8] and can be utilized by dog trainers to monitor BPM [9]. The owner can check the physical state of the beloved pet on the mobile device application at any time.

2.3. Position monitoring

The wearable device has a positioning function with built-in GPS. When the pet goes out alone to explore freely, the owner can locate the pet by positioning the wearable device. This function can be helpful when pet owners lose their pets in unleash areas, pets escape because of estrus period or pet theft, GPS can provide a hint for owners to find their lost pets.

The pet locator is a terminal that locates the GPS communication module, short-range communication module and mobile communication module. It will be transmitted to the background server through the mobile module (2G GPRS or 5G NB-IOT network), and realize the application on the computer or smartphone. The location or resume of the terminal (pet) is found to be out of order. Frequently walking for pets, pet positioning intelligent locator should come into play.

Main functions of position monitoring include:

(1) Double positioning

LBS base station positioning + satellite positioning + Baidu WiFi positioning, multiple positioning. LBS and satellite positioning are used outdoors, while WiFi positioning is used indoors.

(2) Movement monitoring

The device motion monitoring module can have a better understanding of the pet's state by monitoring the pet's motion state.

(3) Electronic fence

Set the safe range of pet activities, and out of the safe range, the mobile APP will receive an alarm message. Generally, multiple electronic fences can be set.

(4) Track playback

View pet historical footprints to clearly grasp the whereabouts of pets.

(5) Intelligent alarm

When the pet leaves the set safety range, the device is low in power, or the device is offline, the mobile APP will receive an alarm message and keep abreast of the device's operating status.

(6) LED lights to find dogs

The mobile phone can remotely control the LED lights of the device, even when night falls, users can always pay attention to their pets.

2.4. Smart Pet food feeder

This feeder is designed for pet owners to better monitor pet food. It was found by Horelu et al., as cited in Razali's work, that data processing and forecasting can help maintain pet food [10] and even provide more information to pet owners [11]. This device will work with cameras to record pets' eating habits to better understand pets' behaviors. When a pet changes its own eating habit, such as refusing to eat during feeding time, the feeder will report this to the pet owner, and this can be a hint that something is happening to the pet. Also pet owners can set a healthy feeding schedule based on the pet's weight and food nutrition.

A camera is embedded above the trough of the pet feeder to allow it to "see". After binding the video APP, the owner can remotely check the pet's home status and eating status through the mobile APP, so as to find out the abnormality of the pet at the first time. The APP also supports one-click to start the video, and real-time intercom can be achieved after connecting.

The smart pet feeder has built-in weighing sensors for accurate weighing and supports regular quantitative feeding. Use the video APP to customize the feeding time and quantity. The video APP also supports non-distance remote feeding, realizing one-click remote reward feeding.

The grain storage bucket of the pet feeder is made of food-grade ABS material, which can effectively prevent pet allergies. The structure adopts a detachable feeder, which can be quickly disassembled and washed in 10 seconds, making cleaning more convenient.

2.5. Camera

The camera is installed in pets' living areas to monitor pets' behaviors. Since humans cannot always watch cameras, we need AI and machine learning to monitor pets. For example, when a dog starts vocalizing and has a low head carriage, while remaining conscious and responsive, and would refuse to eat or drink, and sometimes show behavior suggestive of nausea, these behaviors could be a sign that the dog may have a headache [12]. Then an alarm can be sent to the phone application to alert pet owners that his/ her pets may have potential diseases. More behaviors can be learned from all kinds of known behaviors collected by big data and machine learning.

2.6. Pet application and pet social

The application on the phone is for pet owners to set automatic feeding time and amount, watch pet's behaviors at any time, track pet's location, and receive suggestive health alerts. Wearable devices can build a social platform for pets. There is a wireless sensor inside the device, which can sense similar devices and

communicate with the phone, so the owner can check the information of nearby pets through the mobile app and find people he might be interested in walking his dog with.

This will be a new companion that makes pet living easier and more fun. - Always locate and search for pets and owners around users, and make pet-raising partners who "smelt like" in real life; - More accurate and convenient to meet the needs of breeding, foster care, mutual assistance, etc. - Cute and cool photos, to gain popularity for pets; - The most fresh and hot pet-raising boutique recommendations and exclusive welfare coupons, from eating, drinking and playing to cutting, blowing, and washing, so that users can enjoy all aspects without dead ends! From the lonely planet to the cute universe, start from here!

(1) Foodies love to share, users can add what users are eating in the pet profile, and users can also see what everyone is eating.

(2) Set up a featured homepage, it is easier to find cute and second-hand goods.

(3) Search for pet store coupons and enjoy exclusive discounts !

(4) Built-in filters, be a master with aesthetic requirements!

(5) The new growth rate has a help function, helping each other to solve intractable diseases.

2.7. People spoil communication

Wearable devices can intelligently interpret what user’s pet is trying to say. The pet smart wearable is presented as a headset that scans the pet’s electroencephalogram (EEG), which is then analyzed to produce sounds through a speaker in human language.

3. EXPERIMENT

3.1 Market forecast

In this part we did some forecasting work for the pet products market via linear regression model. In order to predict the consumption of pet products for the next five years, we collected data on the figure of how much Americans spend annually on their pets within the last 12 years, from 2008 to 2020. All the statistics came from the American Pet Products Association (APPA). As figures after 2018 have been restated using APPA's new research methodology, we analyze the data separately. First, we did the linear regression analysis on data from 2008 to 2018 in Excel. The scatter plot is as followed (Figure 2). Although there seems no need to ‘forecast’ the past time, we still could prove the scientific and accuracy of the method by this way. In this case, the coefficient of determination was 0.99, very nearly close to 1, which

means our linear regression model was quite valid in the pet products industry.

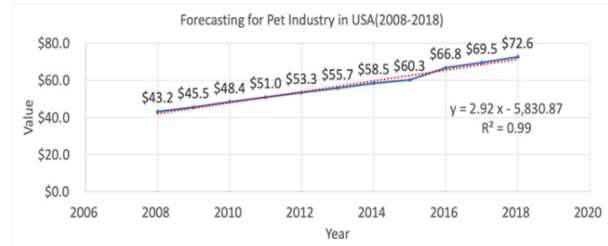


Figure 2. Forecasting for Pet Industry in USA(2008-2018)

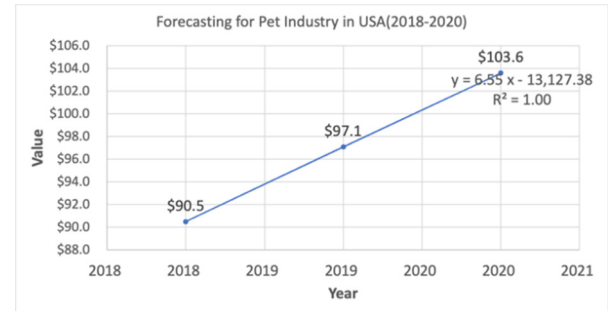


Figure 3. Forecasting for Pet Industry in USA(2018-2020)

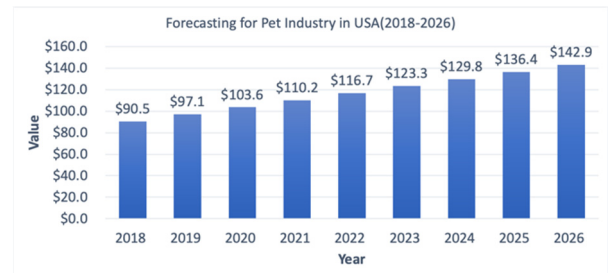


Figure 4. Forecasting for Pet Industry in USA(2020-2026)

Then, we used the same way as above to acquire the linear regression model after 2018. The scatter plot is shown in Figure 3.

Finally, we could forecast the expenditure of Americans on pet products for the next five years by using the linear regression formula in Figure 3. The outcome is shown as a bar graph in Figure 4. We suggested the figure would increase continually up to \$142.9 billion by 2026.

4. DISCUSSION

From the data of Americans' spending on pet products from 2008 to 2020, researchers can draw a reliable prediction. From 2018 to 2026, Americans will spend more and more on pet products in the next few years. This means that the pet products industry is still worth looking forward to in the future market. Because in people's life, the proportion of digital home is higher and higher. Researchers have reason to believe that the digital transformation pet accessories proposed in this paper will

also occupy an increasing proportion in the future pet products industry.

5. CONCLUSION

Although humans enjoy higher technology, they also hope that technology can change more things around them. The pet accessories combination concept proposed in this paper can better help pet owners detect the health status and daily behavior of pets in their daily life, judge through the analysis of big data on the platform and the sharing of other pet owners, and get the latest status of pets in time. Pets are playing a more and more important role in human life. More and more people are willing to treat pets as family members and expect to improve the quality of life of pets. This is also why this paper concludes through data analysis that the market of pet accessories industry will be better and better in the future. On this premise, pet accessories under the digital transformation can better meet the needs of people in the future and bring more high-tech life to pets and owners. Facing the increasing consumption of pet accessories year by year, there are enough reasons to conclude that people will pay more and more attention to high-tech pet accessories in the future.

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