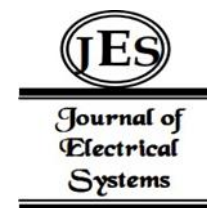


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## Exploration on Service Design of Integrated Online and Offline for the Food Nearing Its Expiration Date from the Perspective of Opposing Food Waste



**Abstract:** - Combining online digital application systems with offline physical design is currently a relatively complete service design system. In view of the increasingly prominent problem of waste caused by the food nearing its expiration date at present, the application of a combination of online and offline design methods can provide users and businesses with a comfortable user experience and commercial value. This paper investigated the consumers' consumption view of the food nearing its expiration date, understood their attitude and consumption motivation, conducted user log and behavior insight research on convenience store consumers, explored service design opportunities and experience contacts, and reconstructed a systematic and rational service system that combines online and offline services, from food production, sales to recycling and reuse. Give full play to the advantages of offline entity and online transparency and openness, and saving from the source of food, and maximize the promotion of sales and recycling of the food nearing its expiration date. It provides consumers with a comfortable user experience and ensuring the maximization of the interests of the food industry in order to save food.

**Keywords:** Opposing food waste, the food nearing its expiration date, Incentives psychological needs, User experience, Service design, Online and Offline

### I. ANALYSIS ON THE DEVELOPMENT BACKGROUND OF THE FOOD NEARING ITS EXPIRATION DATE

In April, 2021, the Anti-food Waste Law of the People's Republic of China was promulgated and implemented, and the fight against food waste became the consensus orientation of the whole society. Every citizen has the responsibility and obligation to protect the environment, save resources, prevent food waste, and promote the sustainable development of social economy. In today's extremely rich material culture, the excess capacity of the food industry, coupled with the encouragement of consumerism, has led to a large number of food overstocks and discards in many countries, resulting in great waste. According to statistics, the value of food wasted in the world every year was as high as trillions of dollars, of which the food nearing its expiration date accounts for a large part. Therefore, the reasonable treatment of the food nearing its expiration date was great practical significance to prevent food waste, protect the earth's resources and carry forward the traditional virtues of the Chinese nation. In the digital age, the seamless integration of online and offline modes also provides users and businesses with a more comfortable and convenient user experience and commercial value. In addition to advocating against food waste in terms of policy provisions and ideology, we should also reconstruct the treatment process of the food nearing its expiration date through service design, fully utilize the combination of online and offline methods, improve its sales efficiency, promote the rationality of the recycling process, reduce the abandonment of the food nearing its expiration date, and effectively achieve the goal of reducing food waste. The service ecosystem in the digital era is a combination of software and hardware, both online and offline, and through digital engines to create an intelligent service system. Based on online big data services, through reasonable planning and user experience design, combined with the scenario of offline physical end, we aim to achieve mutual benefits for users, merchants, and the whole society.

### II. BASED ON DYNAMIC PROBABILISTIC NETWORKS TO ACHIEVE "COMPREHENSIVE INTEGRATION" THEORY AND METHODOLOGY

#### A. Definition and Safety of the Food Nearing its Expiration Date

The food nearing its expiration date is about to reach the quality guarantee period, but is still within the quality guarantee period. It belongs to the scope of safe food. [1] When the food nearing its expiration date is well packaged and properly stored, so its flavor, taste and safety are guaranteed, and it can be safely eaten. In 2012, the State

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Administration for Industry and Commerce defined the level 6 standard of "the critical quality guarantee period", and the critical standards for food with different length are different. [2] The food nearing its expiration date meets the sales conditions, but the State Administration for Industry and Commerce also clearly stipulates that food operators should make eye-catching prompts to consumers for food that is about to expire. Article 12 of the Anti-food Waste Law of the People's Republic of China clearly requires that the food nearing its expiration date should classify and manage, and make special signs or display them for sale. Therefore, under the premise of food safety, promoting the sales and utilization rate of the food nearing its expiration date and advocating a healthy food consumption concept have practical positive significance in combating food waste.

#### *B. Development Status of the Food Nearing its Expiration Date Industry*

##### *1) Rapid development of the foreign food nearing its expiration date industry.*

As early as the 1990s, people abroad have positively recognized and accepted or even loved to buy the food nearing its expiration date. For consumers, the food nearing its expiration date was mainly based on the price advantage. It was the consumption habit of many foreign ordinary people to buy cheap and safe food nearing its expiration date before the supermarket off duty. Of course, this was also because the foreign supervision and regulations on food safety were very strict, which makes consumers trust and feel at ease. In addition to the normal sale of the food nearing its expiration date, developed countries such as the United States, Canada, Germany and the United Kingdom also have perfect relief mechanisms. They could donate the food nearing its expiration date to charities or distribute to low-income people to provide them with the most basic food security. They also cooperate with animal farms to solve a large number of "leftovers" that have not expired. In France, businesses face huge fines if they were found to have discarded donated food. For expired food, it can be used to make feed and fertilizer. Germany uses expired food waste to generate electricity and heat, which were good methods for resource recycling[3].

##### *2) Current market situation of China's food nearing its expiration date industry.*

The development of China's food nearing its expiration date was relatively late, and it officially started around 2012. But in fact, from the perspective of low-cost consumption behavior, buying the remaining cheap vegetables and meat before the closing of the evening market was also the food nearing its expiration date. But when the large supermarkets, 24-hour convenience stores and a large number of imported food poured into the Chinese market that people realized that this was not a new concept of "the food nearing its expiration date". Therefore, a large part of China's huge "the food nearing its expiration date" was imported snacks, imported milk, beverages, meat, fruits, etc. Figure 1, the development of China's food nearing its expiration date industry has gone through four generations. [4] From the initial discount sales of the food nearing its expiration date through small-scale ground stalls to the emergence of offline direct-sale stores, community group buying, and live commerce in 2020 also brought the food nearing its expiration date from offline to online. At present, the food nearing its expiration date was sold on large e-commerce platforms such as Taobao, jd.com and Suning, etc. There were also special apps for the segmentation of the food nearing its expiration date market, such as "Good Food" and "Sale" and so on. In September 2020, Douban set up a group called "I love the food nearing its expiration date". Now the group has rapidly expanded to more than 70000 people. The Internet has expanded the purchasing group of the food nearing its expiration date. [5] The potential of China's food nearing its expiration date market was enormous. According to the "2020 China's Food Nearing its Expiration Date Industry Market Analysis and Consumer Research Report" released by AI media consulting, the total output value of China's snack industry in 2020 exceed Rmb3 trillion. Even if calculated by 1% of the inventory precipitation, the market size of the food nearing its expiration date industry exceed Rmb30 billion, and it was expected to grow in the future [6]. With the change of consumer concept, the support of policies and commercial capital and other macro factors, the demand side of the food nearing its expiration date will continue to grow, with broad development prospects.

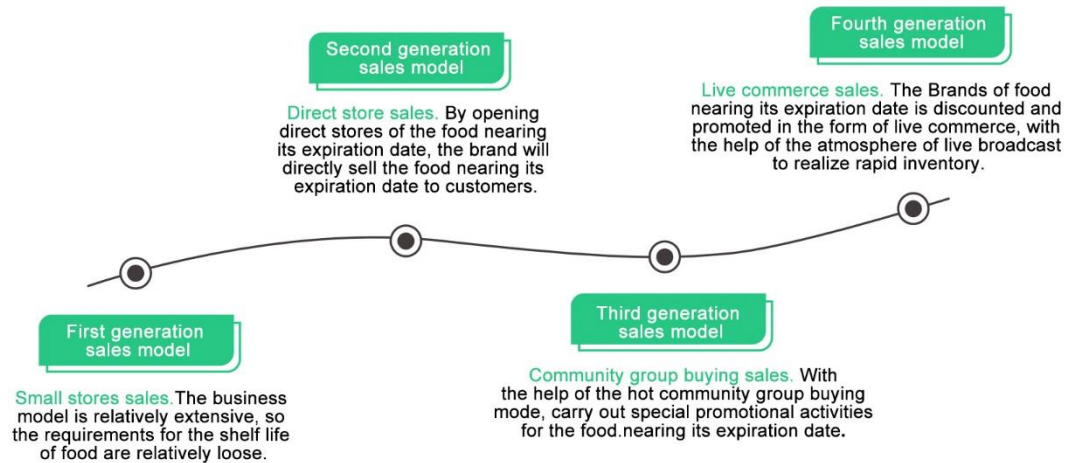


Figure 1 Schematic diagram of four stages of the development for China's food nearing its expiration date industry

### C. SPET Analysis of the Food Nearing its Expiration Date Industry

#### 1) Social attribute

Overcapacity in the food market is the main reason for the emergence of the food nearing its expiration date. China's food nearing its expiration date industry chain is divided into three parts: upstream, middle and downstream. The upstream is in charge of food suppliers. The midstream is in charge of commodity sales, and it is divided into online and offline channels. Offline stores are mainly physical stores, while online is mainly online stores and live commerce. The downstream is the individual consumers and enterprise organization and so on. Both the upstream and midstream are businessmen, who pursue interests from the market of food nearing its expiration date. And downstream consumers look for the pleasure of buying cheap and beautiful things in the food nearing its expiration date. Both of these, catalyzed by the social environment, encourage the food nearing its expiration date industry to have more and more commercial value and consumer significance.

#### 2) Policy guidance

The food nearing its expiration date industry in foreign countries is relatively mature, and the laws and regulations are relatively perfect. There are regulations on the sales of the food nearing its expiration date and the treatment methods after the food expires. For example, in 2016, France enacts laws against food waste, which stipulates that supermarkets are prohibited from throwing away or destroying unsold food and must donate it to charities or food banks. If they destroy food that is about to expire, they may face a fine of up to \$4500 [7]. At present, all countries in the world have enacted laws against food waste. In 2020, China issued the Anti-food waste law of the People's Republic of China, which stipulates that food operators can discount or donate food approaching its quality guarantee period on the premise of ensuring food safety. At this stage, China is promoting "Supply-side reform" and "Eliminating waste" [8]. The food nearing its expiration date industry will grow on a larger scale under the guidance of national policies.

#### 3) Economic benefit

Global inflation, coupled with the sudden trade war and epidemic, the increase of consumption costs has led to the degradation of consumption. People tend to "low price, good quality and low price" consumption behavior, and the low price advantage of the food nearing its expiration date is favored by consumers. For businesses, selling the food nearing its expiration date at a low price can quickly recover funds. Huge commercial profits have led to the emergence of many franchised stores, online e-commerce and live broadcasting for the food nearing its expiration date in the past two years. The food nearing its expiration date is supporting a market of 10 billion yuan, which turns the waste of "surplus" into commercial value.

#### 4) Technical factors

In the arrival of the intelligent era, with the development of various artificial intelligence technologies and sensors, new technologies have also joined the food industry. For example, smart tags based on IoT technologies can detect the freshness and edible safety of food through color and odor change. In Europe and America, they have been widely used in the detection of baking, low-temperature dairy products, meat products, fresh fruits, vegetables and other food. In addition, by scanning the bar code on the food package, we can check the safety degree of the food from the source to the sales at the software end [9]. With the help of artificial intelligence

technology, the food nearing its expiration date can achieve transparency of process, rationalization of system and information security in the service design process, so that the food nearing its expiration date can occupy more market share and consumer trust in the sales process.

### III. RESEARCH ON CONSUMER EXPERIENCE MOTIVATION OF THE FOOD NEARING ITS EXPIRATION DATE

#### A. Consumption Influencing Factors

With the global economic downturn, consumption downgrade has become a reality, and appropriate low-cost consumption has become the choice of more people. According to statistics, 52.5% of consumers are willing to buy low-cost goods, which promotes the rapid development of the food nearing its expiration date industry [10]. Pursuing of high cost performance is the goal of the vast majority of consumers, which is also the reason for the popularity of consumption patterns such as community group buying, online sales promotion and so on. As shown in Figure 2, the unconventional low price of the food nearing its expiration date is the motivation factor that accounts for the highest proportion in Chinese consumers' attitude towards purchasing the food nearing its expiration date. As long as the food safety is more strictly regulated and consumers have confidence in the safety of food nearing its expiration date, there is still growing space for the development of the food nearing its expiration date industry.

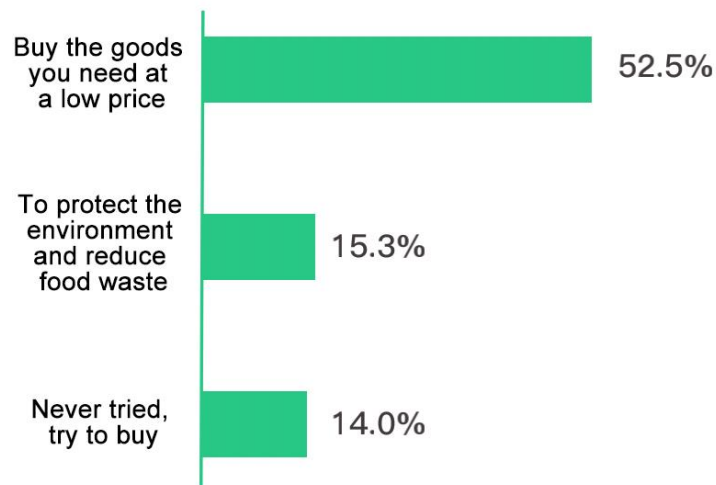


Figure 2 Main driver of Chinese consumers to buy the food nearing its expiration date in 2020.

#### B. Consumers' Willingness Factors

According to "The Market Analysis and Consumer Research Report of China's food nearing its expiration date industry in 2020", more than 40% of consumers expressed their willingness to buy and recommend the food nearing its expiration date to people around them, while 26.8% of consumers clearly expressed their unwillingness. The primary factor indicating unwillingness to buy is still worrying about the safety of the food nearing its expiration date. The second is that the food nearing its expiration date tastes bad and is not healthy enough. According to the survey, the buyers of food nearing its expiration date in China are mainly divided into two parts: the young people who love to buy snacks and the families who buy daily necessities [11]. In addition to buying food with obvious personal preferences, young people have prominent motivations for impulsive consumption, such as obtaining pleasure from consumption frequency, and their own hobby of stocking up, etc. For the household consumer groups, on the one hand, they buy daily necessities mainly focus on the types of food with high-frequency repurchase. On the other hand, they also have the characteristics of irrational consumption willingness, which is temporarily triggered by the attraction of ultra-low prices.

#### C. Consumption Behavior Factors

At present, young people mainly purchase the food nearing its expiration date through the Internet platform or in convenience stores randomly. Young people tend to look for low-cost purchase channels, group purchases, cash back and so on, in pursuit of lower consumption costs from various online e-commerce, franchises apps of the food nearing its expiration date or live commerce, including the "I love the food nearing its expiration date" group in Douban [12]. The proportion of young users who have bought the food nearing its expiration date for many times is as high as 65%. While the older family members who buy daily necessities, have clear purchasing habits in offline stores, and these consumers will go to the stores early or late to look for the food nearing its expiration date

sold at ultra-low prices. In addition, the current community group purchase mode is also an important channel for merchants to promote the food nearing its expiration date. Social sales are formed through neighborhood groups in the community, which has a positive publicity effect on the promotion of the food nearing its expiration date, and the consumption drive is obvious. At present, about 50% of the young consumers have a fixed consumption habit of purchasing the food nearing its expiration date. In comparison, the elderly people's consumption behavior of the food nearing its expiration date is relatively random, which means that they will consider buying when they meet the right one. Therefore, there is no relatively fixed consumption group and no obvious consumption inertia.

#### IV. FIELD INVESTIGATION ABOUT THE CONSUMPTION OF FOOD NEARING ITS EXPIRATION DATE IN CONVENIENCE STORES

##### A. *Research Background*

In the general environment of opposing waste and advocating economy, and the public's awareness of the food nearing its expiration date continues to improve, the sales of food nearing its expiration date are becoming increasingly hot. In addition to the emerging large-scale food nearing its expiration date sales, the scattered convenience stores are becoming the main force of food nearing its expiration date sales. Firstly, fresh food is a commodity category that needs to be regularly checked for quality guarantee period in convenience stores, and there is a long-term "daily throw" type of food waste. Secondly, it can give full play to the location advantages of convenience stores in the community social sales model. Thirdly, the young group is the main body of high-frequency customers of convenience stores, and has a high acceptance of the sales model for food nearing its expiration date. Therefore, the research group takes a 7-11 convenience store in Daxing District of Beijing as an example, with the help of the sales data of the convenience store, optimized the user experience, reasonably allocated resources, improved the sales and recycling efficiency of the food nearing its expiration date, and realized the good interaction between people, goods and the market. The research is divided into three parts: preliminary user research, data analysis and service design and construction. The preliminary user research is to track and observe the target users, and conduct field investigation and interview on the 7-11 convenience store. Obtain the behavior path and user demand points of target users through user research. Understand the process and methods of the food nearing its expiration date from sales to post-processing through the survey of convenience stores, and explore the problems in the sales and post-processing of the food nearing its expiration date to seek design opportunities. By analyzing conclusion through the service contacts, visualized and processed the presentation of the user experience map, quantifies the user needs, explores the user pain points, and conceives a complete set of service design solution for the food nearing its expiration date in combination with the service blueprint.

##### B. *Field Visit of Convenience Store*

Through the field visit to the 7-11 convenience store, it is found that due to the site limitations, there is no special sales area for the food nearing its expiration date. The main audience of convenience stores is young people, so there are more fresh food and convenient processed food on sale. The quality guarantee period of these foods is often short, mostly 2-7 days, which makes convenience stores have a certain amount of the food nearing its expiration date more or less every day. However, the current disposal method for the food nearing its expiration date is to directly discard it. The expiration time of food is checked at about 9:00 a.m. and 12:15 p.m. every day. Fresh food and convenient processed food are 4 hours ahead of expiration time, and bread is 9 hours. The staff collects these food and discards them as kitchen waste (as shown in Figure 3) at 12:00 p.m. This is a serious waste of food. It is urgent to solve the problem of food waste.

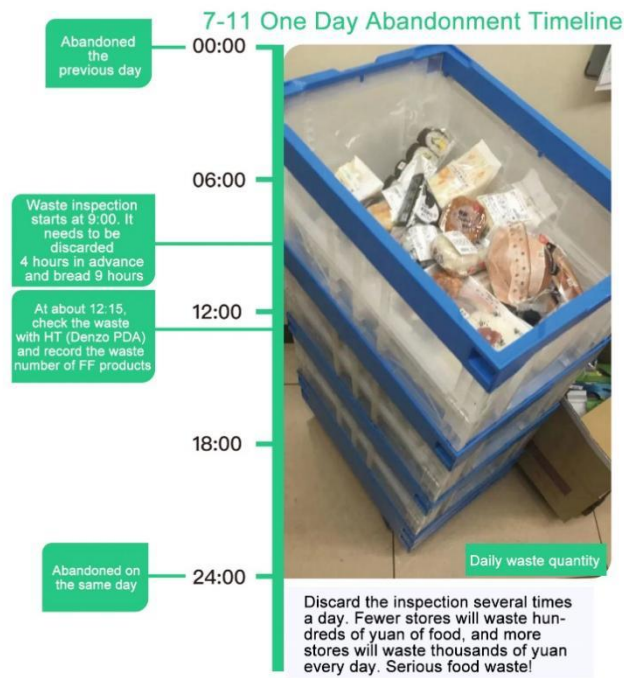


Figure 3 The abandonment time line of the food nearing its expiration date in 7-11 convenience store

C. The Processing flow of the Food Nearing its Wxpiration Date in Convenience Store

According to the interview with the sales staff of the convenience store, the convenience store will directly destroy the food nearing its expiration date and dispose the garbage for the sake of operation compliance. The implementation of the food nearing its expiration date in convenience stores faces many practical considerations. Firstly, if the convenience store adopts the method of sustainable treatment for the food nearing its expiration date, it is high risk and small income. Secondly, the government has not issued relevant detailed policies to guide convenience stores to handle the food nearing its expiration date. Thirdly, the public's cognition of the food nearing its expiration date is still biased, and the special input-output ratio of the food nearing its expiration date sales may not be ideal. As shown in Figure 4, the research group presented the process of 7-11 convenience stores' handling of the food nearing its expiration date in combination with the sales cycle of food in the store.

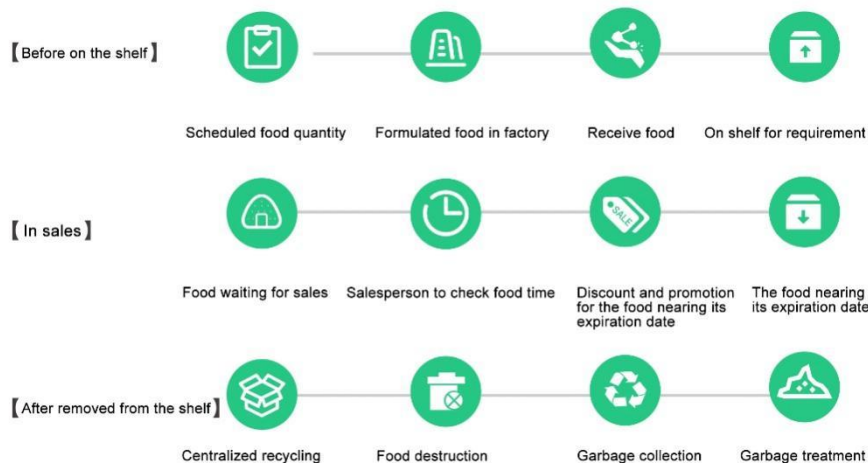


Figure 4 The processing flow of the food nearing its expiration date in 7-11 convenience store

D. The Behavior log of Typical User's Food Consumption

The research group takes one day as the observation timeline and records the life track of the people who intersect with the convenience store. The main consumers of convenience stores are college students and office workers. These two groups are classified according to their living and working conditions, as shown in Figure 5, mainly recording their consumption time, consumption content and frequency. At the same time, it also records the behavior tracks of other users after entering the store except online shopping users (as shown in Figure 6). The priority of users' consumption content can be found through logging: the first is the food in the chilled-food cabinet,

such as rice balls and bento, etc. The second is refreshments, desserts and drinks. The third is snacks, and the fourth is heated fresh food. Typical users of convenience stores are young office workers and college students who have a fast pace of work and life. They need to use fast food and convenience food to quickly solve their three meals. They also like drinks and snacks to fill their happiness. Therefore, fast food, convenience food and heated fresh food in convenience stores are the main types of food nearing its expiration date. At the same time, the survey found that these audience groups come to the convenience store to quickly solve the food problem, so their shopping habits are divided into two categories: firstly, they shop purposefully and go straight to the food they need as soon as they enter the store. Secondly, there are no special dietary requirements, but they will also quickly decide what kind of food, and will not spend time shopping and selecting carefully. These shopping habits of users provide a design opportunity to explore creativity for the service design of the food nearing its expiration date.

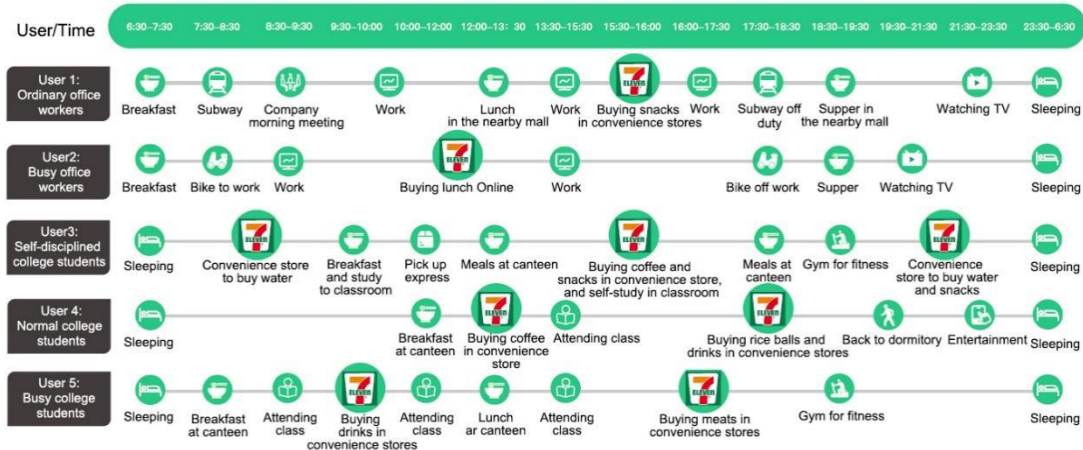


Figure 5 The behavior log of typical user's food consumption

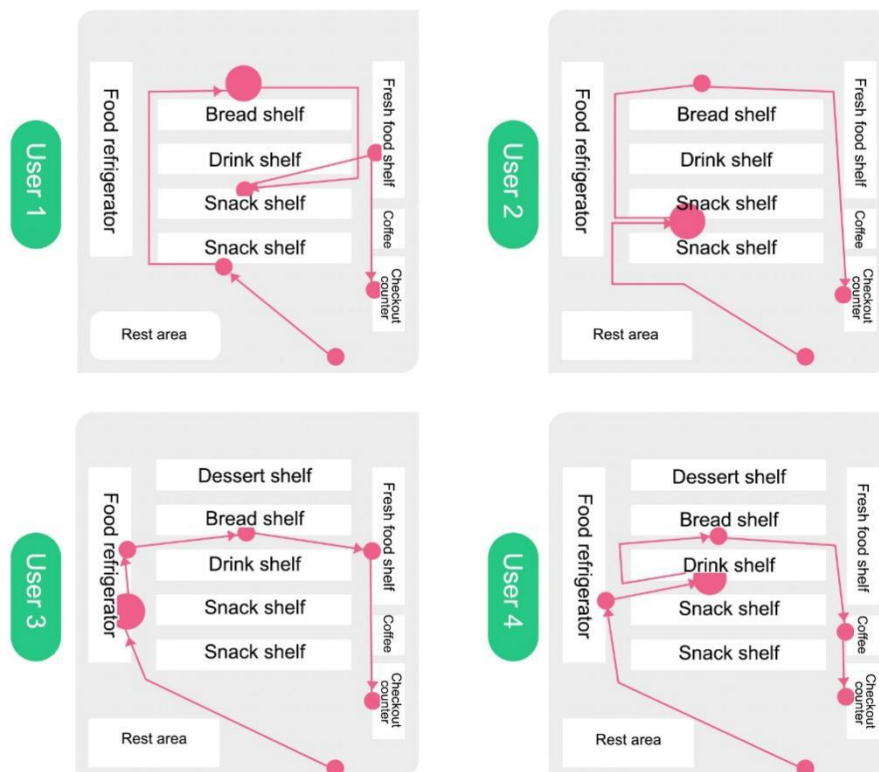


Figure 6 User behavior track

## V. CONSTRUCTION OF SERVICE DESIGN SYSTEM FOR THE FOOD NEARING ITS EXPIRATION DATE

Based on the service design process to solve the problem of the food nearing its expiration date sales and subsequent treatment in convenience stores, it will require to work together from the government, businesses, users, recycling agencies and other parties. For users, it is to optimize the shopping experience. For businesses, it can

improve the profit maximization of the food nearing its expiration date. For recycling agencies, it is the reuse of resources, green environmental protection, and make contributions to the sustainable development of society.

A. Service Design Criteria for the Food Nearing its Expiration Date

The essence of service design is to take the "touchpoint" in the service system as the clue. Examine the relationship among the five elements of people, things, behavior, environment and society from a systematic perspective, in order to create better experience and value for the recipient through service. Therefore, when constructing the service design system of the food nearing its expiration date, it always takes the user as the center to guide the design and emphasizes the user experience. In order to realize the user centered design idea, it is necessary to go through a rigorous design process, find user needs from user research, and then realize and evaluate the design scheme through design conception. The process of service design should consider not only consumers, but also all participants, businesses, service providers, consumers, society, etc. To achieve win-win situation and meet the demands of all parties, so as to operate the service system well. Service design is an orderly process. Only by processing and visualizing the process and path of user experience, exploring the behavior and feeling of each contact, and effectively quantifying user needs, can be targeted to solve problems. So this is the role of user experience map. In the process of user experience, services should be materialized, and invisible services can be made visible, which can be perceptual, experienced and measured by users. These are reflected through specific behaviors and products in the process of service design. Service design is an integrated process, which requires systematic and overall consideration, no entanglement at a certain point, reasonable experience process, and smooth user experience at each contact point, so as to build a comfortable service system.

B. Exploring Service Gaps and Opportunities

Through the investigation in Section III above, we have learned about the sales status of the food nearing its expiration date from the perspective of typical users and businesses, and affirmed the fact that there are a large number of the food nearing its expiration date in the market. At present, the focus is to improve the purchase experience of users and solve the post-processing problems of the food nearing its expiration date. The research group has reset a more reasonable process for the food nearing its expiration date (as shown in Figure 7). Based on the behavior of the commodity sellers for the food nearing its expiration date, looks for service contacts and explore service gaps. The food nearing its expiration date has a service gap at the user, business and industry levels. It is conceived from the user level, transformed and opened up various sales platforms, presenting a diversified state. Apply digital technology to make the whole process of food production, sales and delivery transparent. Also track and continue follow-up services, including food safety after sales. From the perspective of merchants, reduce food inventory based on big data, and avoid profit loss. Establish a complete online and offline sales mechanism for the food nearing its expiration date, such as the exclusive zone for the food nearing its expiration date in physical space, sales tracking on the digital end, and stimulate sales again by means of composite discounts and reward mechanisms such as points. From the perspective of the industry, cooperate with the government, voluntary organizations and public welfare institutions to complete the sales, distribution, recycling and reuse of the food nearing its expiration date, especially the recycling in the later stage, so as to avoid wasting food and make the best of its material.

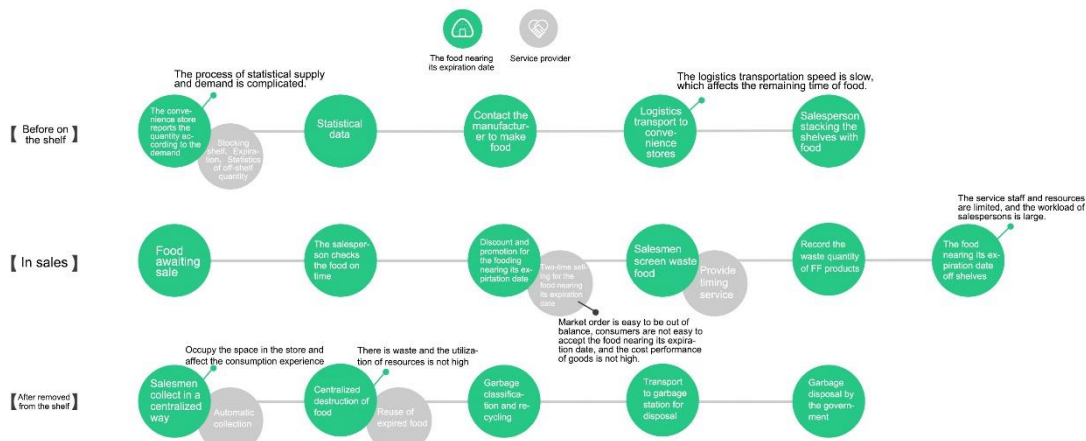


Figure 7 Re-plan the treatment process of the food nearing its expiration date



C. Service Design Scheme Planning

Based on the above design opportunities, taking advantage of the openness and flow of online digital platforms, combined with the comfort of offline physical services [13], we aim to build a sales and after-sales service system that combines online and offline services (as shown in Figure 8). With the combination of online and offline mode, businesses can more effectively and transparently release the information of food nearing its expiration date, so that target users can buy the required food in a timely, assured and preferential manner. On line, you can track the food nearing its expiration date for post-service, including digital platform points reward, reputation value improvement, more preferential policies, public welfare information, etc. In offline physical stores, blind box shopping machines are used as the counters of food nearing its expiration date. Blind box is deeply loved by young people, and its unknowability brings novelty and infinite expectations to users. However, not all the food nearing its expiration date is sold in the form of blind boxes. It is a blind box combination of some temporary fresh foods in convenience stores, which can meet the "casual" and "fast" psychology of young people. Other food nearing its expiration date is marked with dates, sorted and placed in the blind box shopping machine, and can also be purchased by users alone. This is the sales mode service design for users. For the unsold food nearing its expiration date is about to expire, we will cooperate with feed factories and livestock farms to recycle and reuse, turn waste into treasure, and effectively and reasonably arrange the food nearing its expiration date at various time stages. Users, merchants and subsequent recyclers should be involved in the whole interim food service process, especially in the later recycling stage. In order to make it more convenient and active for merchants to participate, volunteer service personnel should be designed to connect, communicate and help the three parties, so as to more effectively complete the whole process from sales to recycling of interim food.

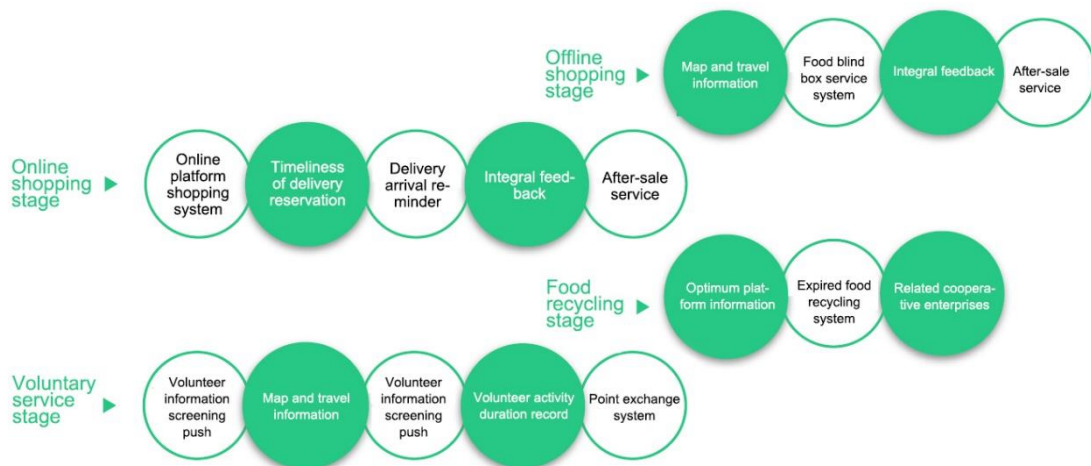


Figure 8 Design and planning for service system of the food nearing its expiration date

First of all, the volunteer service personnel are in the form of voluntary participation. Volunteers can see the volunteer project of food nearing its expiration date from the official public service website of the government or the digital platform of the convenience store. During their work in the convenience store, volunteers help users to select the food nearing its expiration date in time, and help users get familiar with the online platform and learn more about preferential policies, points reward system, reputation improvement, etc. At the same time, volunteers themselves will also exchange the food nearing its expiration date by labor points for free; In the later stage, volunteers help coordinate transportation companies to transport the unsold food nearing its expiration date to livestock farms and feed factories to complete the recycling of food (as shown in Figure 9). In the early stage, volunteers help users and businesses clarify the sales model, and in the later stage, they contact businesses, recycling and other social institutions for the recycling of food nearing its expiration date. Livestock farms and feed mills get free food raw materials. Convenience stores do not waste food to a certain extent, so they can enjoy the preferential tax policies of the government that is the cost of food transportation is jointly borne by convenience stores, livestock farms and feed mills, and subsidized by the government (as shown in Figure 10).

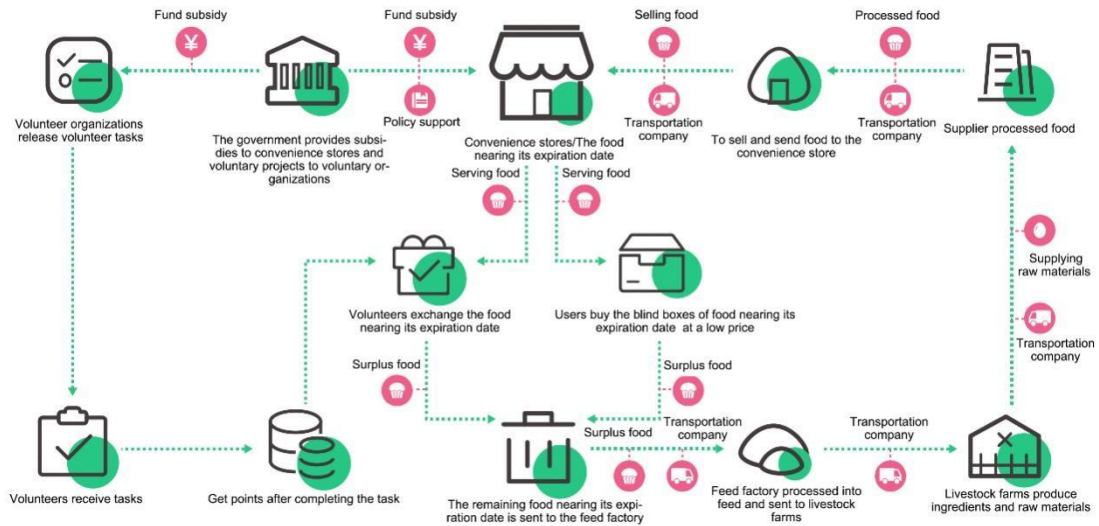


Figure 9 Interest relationship among volunteers, convenience stores, users, government and recyclers

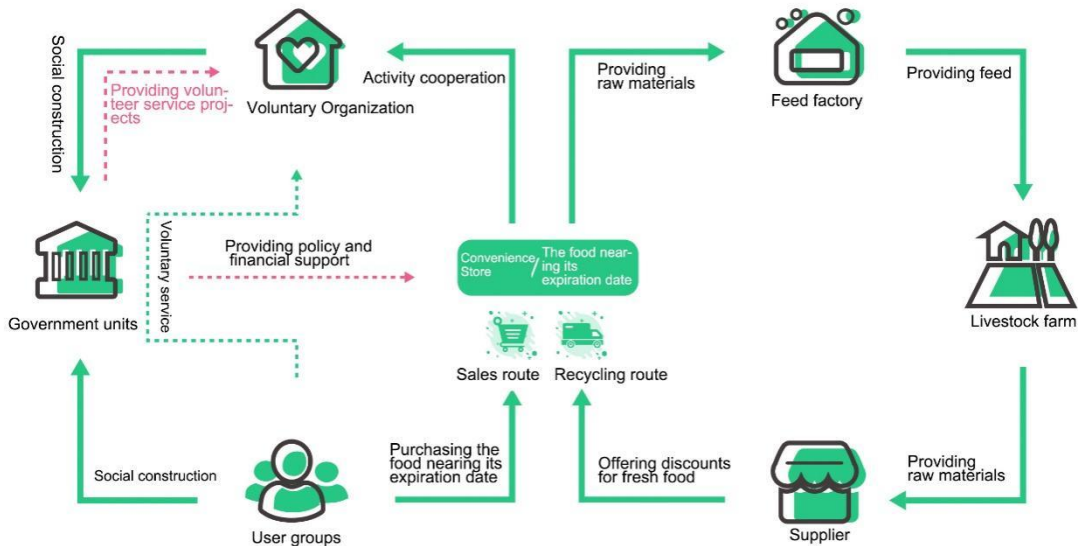


Figure 10 Service relationship among volunteers, convenience stores, users, government and recyclers

#### D. User Experience Map

In this service design system of the food nearing its expiration date, users' shopping experience and volunteers' service behavior are the core content. Therefore, the user experience map is applied to processing and visualizing present the user shopping and volunteer service process (as shown in figures 11 and 12). Specify each behavior contact and corresponding experience, quantify user needs and pain points, and conceive solutions for each pain point. This is the best method to measure the user experience of this service system, and also provides a basis for the visual expression of service design in the later stage [14]. For example, when users buy blind box products of the food nearing its expiration date offline (as shown in Figure 11), users' psychological feelings include not only surprise and novelty, but also worry and confusion. The user experience map shows these details in emotional curves and icons. Smiling faces are satisfied, and mourning faces show psychological feelings of uncertainty and doubt, to conceive solutions to these dissatisfactions, this is the process of user experience map quantifying user needs, exploring pain points, and looking for design opportunities.

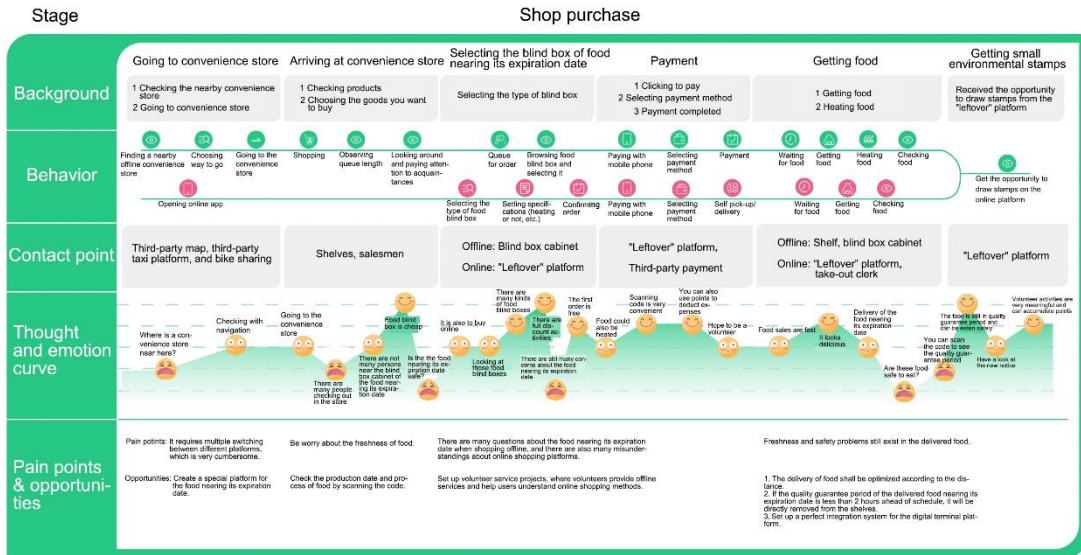


Figure 11 User purchase experience map

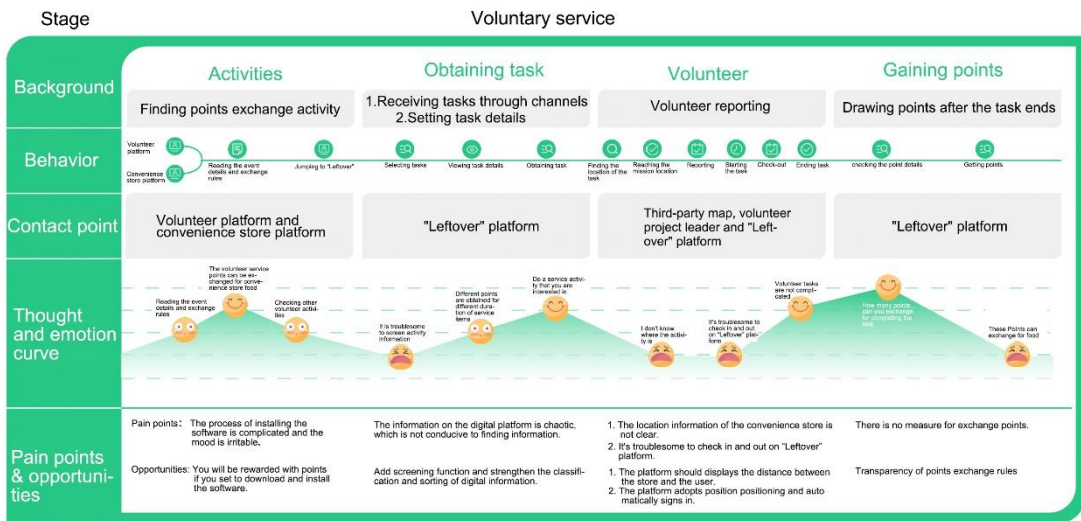


Figure 12 Experience map of volunteer service user

E. Building a Service Blueprint

The food nearing its expiration date needs to complete the whole process from sales to recycling under the joint action of the government, businesses, users, volunteers and recycling agencies. In this process, it involves the individual processes of all parties and the interactive processes of mutual cooperation. There are visible services and invisible services in the background, which is a very complex process. The service blueprint visualizes the behaviors of all parties and clearly shows the interaction points and intersections between all parties from a global perspective, which not only describes the service behavior of the whole process, but also comprehensively reflects the user experience process in the whole process [15] (as shown in Figure 13). Users enjoy online and offline service experience under the guidance of volunteers. Merchants get sales benefits, and play a role in protecting resources and saving food for the society. Volunteers have served the society and users, and they have also received returns. The government positively guides the public to know about the food nearing its expiration date, helps businesses recycle food, and promotes the sustainable development of society.

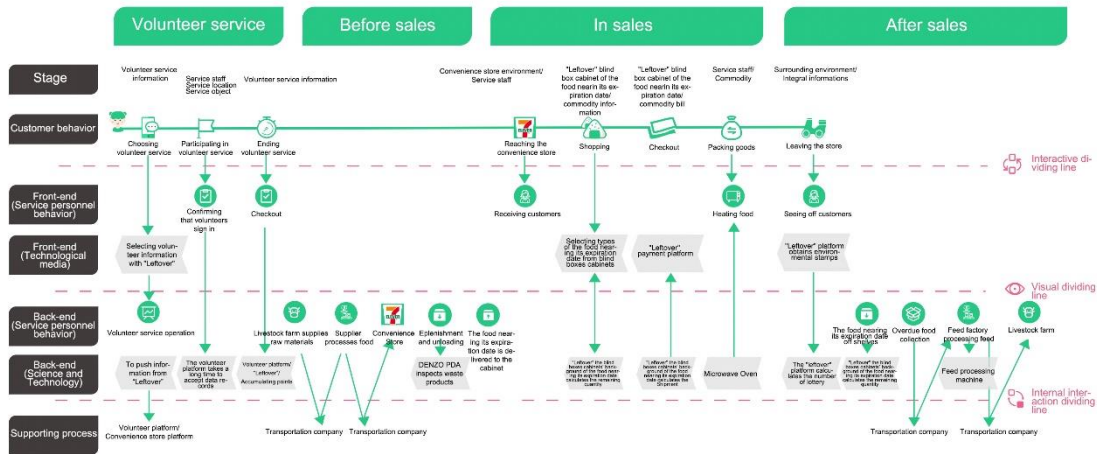


Figure 13 Service blueprint of the food nearing its expiration date

F. Thoughts on the Service Design of the Food Nearing its Expiration Date

Facing the huge waste of the food nearing its expiration date in the world every year, there is an urgent need to solve the problem of sales and post-treatment for the food nearing its expiration date. This problem can be effectively solved by reconstructing the processing flow of food nearing its expiration date through service design. In the interim food service system, from the perspective of user experience, on the one hand, with the help of modern technology and management, improve the interim food service level, reasonably control food production with big data support, and reduce food from the source. On the other hand, in the process of circulation and sales, set up a scientific and perfect service system for the food nearing its expiration date, and plan a reasonable and smooth service system for merchants, users and later recycling institutions. With the help and coordination of volunteer service providers, consumers can enjoy the shopping experience and follow-up services more smoothly and conveniently, maximize the interests of businesses, enable recycling agencies to obtain the required resources, and get corresponding rewards with the support of the government. Such a good service system for sustainable development is a good way to truly solve the problem of "resource conservation and rational distribution" and achieve good interaction with the ecological environment.

VI. CONCLUSIONS

With the popularization of food safety knowledge, more and more consumers have changed their negative perceptions of "expired" and "deteriorated" of the food nearing its expiration date, and gradually tend to consume rationally and choose and eat the food nearing its expiration date correctly. Especially since the promulgation and implementation of China's Anti-food Waste Law, opposing food waste has increasingly become the consensus of the whole society. The warming market of the food nearing its expiration date is a concrete embodiment of opposing waste and practicing economy. The food nearing its expiration date is a safe food, which can be safely eaten within the shelf-life. Even if it exceeds the shelf life, it can be put into animal husbandry and feed farms for recycling. As the sales' principle of the food nearing its expiration date advocates, "Food should not have the products nearing its expiration date. The products nearing its expiration date are just resource mismatches, and no one suitable for them has been found". Therefore, planning the whole process of food nearing its expiration date from sales to recycling based on the concept of service design is helpful to ensure national food security, carry forward the traditional virtues of the Chinese nation, make users feel at ease and happy to shop, and allow businesses to obtain more commercial benefits. It is also a very effective method for mankind to eliminate food waste, save resources, protect the environment, and promote the sustainable development of economy and society. It also has very important practical significance.

REFERENCES

- [1] Zhong Kai. Scientific Interpretation of the Food Nearing Its Expiration Date. Beijing: China Food, 2020(18):132-133.
- [2] Tian Xiaoxuan. Beijing Defines the Critical Time of Food Shelf Life for the First Time. China Daily, 2012.2.3.
- [3] Luo Jincheng, Zhang Qing. Experience of Domestic Waste Charge Management in Germany and Its Enlightenment to China. Beijing: World Environment, 2021(05):76-78.
- [4] AI Media Consulting. Market Analysis of China's Food Nearing Its Expiration Date and Consumer Research Report Industry in 2020. Guangzhou: AI Media Report Center, 2020.
- [5] Li Jian. The Food Nearing Its Expiration Date Attracts Young Consumers. Beijing: Food Industry, 2021(11):27-29.

- [6] AI Media Consulting. Market Analysis of China's Food Nearing Its Expiration Date and Consumer Research Report Industry in 2020. Guangzhou: AI Media Report Center, 2020.
- [7] Yang Dongxia, Han Jie. International Experience in Reducing Food Loss And Combating Food Waste And Its Enlightenment to China. Beijing: World Agriculture, 2021(06):62-71.
- [8] Zeng Kanglin. On the Structural Reform of Financial Supply Side. Zhengzhou: Credit Reference, 2022,40(01) : 7-16.
- [9] Chen Cheng. Can Young People's "Snack Freedom" Support a New Business. Nanjing: Xinhua Daily, 2021-8-23(002).
- [10] Li Fanglu. "The Food Nearing Its Expiration Date Two Fold up" Is Not As Cheap As Young People Think. Vista See The World, 2021.7.
- [11] Bo Bao. This year's Relatives, Secretly Buying the Food Nearing Its Expiration Date. Changchun: Yilin, 2021(15): 68-69.
- [12] Zhang Lengzhu. Analysis on Consumers' Cognition and Choice Behavior of the Food Nearing Its Expiration Date. Hubei: Contemporary Economy, 2021(11): 75-79.
- [13] Ye Caixian. Design and Implementation of User Experience for New Media Art Based on Computer Technology. Harbin: Technology Innovation and Application, 2023,13(02): 32-35.
- [14] Li Sida. Interaction and Service Design (20 Courses of Innovative Practice). Beijing: Tsinghua University Press, 2017, 2: 209.
- [15] Li Sida. Introduction of Service Design. Beijing: Tsinghua University Press, 2018, 10: 96