Investigation on Residents' Attitudes and Methods of Express Packaging Recycling in Tangshan, Hebei Province

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Abstract

With the rapid development of the Internet, online shopping has become the trend of a new generation. In this wave, a new focus - Express packaging has been born. This paper makes an in-depth investigation and Research on the express packaging recycling market, understands the operation and existing problems of the express packaging recycling market through the data obtained from the design questionnaire and field survey, and then analyzes its optimization ways to solve the problem of express packaging pollution and improve residents' satisfaction. In the data analysis stage, based on the principle of SVM-KNN, this paper establishes a model to segment the market population of express packaging recycling market, classify customers, and deeply analyze the source and development trend of current express packaging recycling problems; Then, based on the principle of relm, a model is established to predict the market potential, tap the potential market and provide direction for market development.

Keywords

Green Packaging; K-nearest Neighbor Queries; Regularized Extreme Learning Machine.

1. Introduction

With the national two sessions in 2021, "promote green development, promote the harmonious coexistence of man and nature", "promote the green transformation of express packaging" become the "14th Five-Year plan" work goals and one of the main work direction this year. The government work report of the national two sessions this year proposed to promote the green transformation of express packaging. Relevant data show that in the past five years, China's express delivery industry has maintained an average annual growth rate of more than 30%, the total number of express delivery in 2020 will reach 83.4 billion pieces, and the volume of express delivery business is expected to reach 95.5 billion pieces in 2021. The volume of express business has been increasing year by year, and the amount of express packaging waste has also increased year by year[1]. With the rapid increase in the number of express packages, packaging pollution cannot be ignored.

2. Basic Information of the Respondents

With the development of the Internet era, the rapid rise of e-commerce and express industry, the amount of express packaging in Tangshan also shows a skyrocketing trend. Express, as an important part of modern service industry, plays a non-negligible role in tangshan's economic and social

development and improvement of people's livelihood. This survey takes the residents of Tangshan city as the survey object, and uses stratified sampling method and street survey method to obtain a total of 873 valid samples. After analysis, the sample characteristics are as follows.

1) Gender distribution: 391 valid samples were male, accounting for 44.79% of the total, and 482 valid samples were female, accounting for 5.21% of the total.

2) Age distribution: Most of the respondents are young and middle-aged. The age group of the respondents mainly concentrated in 21-30 years old, 301 people in total, accounting for 34.48% of the total, 226 people under 20 years old, accounting for 25.89% of the total, 151 people between 31 and 40 years old, accounting for 17.30% of the total, 195 people over 41 years old, accounting for 22.34% of the total.

3) Occupation type: In the occupation type distribution of the respondents, students are the most (313 persons, accounting for 35.85% of the total), followed by office workers (215 persons, accounting for 24.63%); 141 freelancers, accounting for 16.15%; 97 individuals accounted for 11.11%; 54 were housewives, accounting for 6.19%; 53 people are temporarily without workers, accounting for 6.07%.

4.Income distribution: among the respondents, the per capita monthly income is mainly below 3000 yuan, accounting for 51.78%; The second is the population with a monthly income of 3000-5000 yuan, accounting for 22.11%; The proportion of people with a monthly income of 5000 to 7000 yuan accounted for 14.78%; Groups with a per capita monthly income of more than 7000 yuan accounted for 11.34%.

3. Market Segmentation based on KNN

3.1 Basic Principle of K-nearest Neighbor

K-nearestneibghor classification algorithm is one of the classical algorithms in the field of machine learning. It was originally a statistical learning method based on sample instances proposed by fix and Hodges in the 1950s[4]. Li Xiangjun believes that this is a nonparametric statistical method widely used in various fields. KNN can solve classification problems or regression problems. The basic idea of KNN discriminant analysis method is that the samples of the same category gather together as much as possible in the feature space. The basic principle is to investigate the K samples with the most similar samples in the training set, and judge the category of the samples to be classified according to the attribute category of the K samples with the most similar samples[5].

3.2 Market Segmentation of Express Packaging Recycling Customer

Market segmentation needs to be carried out according to the corresponding segmentation factors. These factors generally include the basic information of customers, such as gender, age, family income, occupation and other demographic data, as well as the risk preference information of customers, transaction information of customers and so on. Customer segmentation based on different levels and aspects of these information materials, such as segmentation based on customer value, risk tolerance type and customer transaction behavior, can distinguish different types of customer groups and judge the needs of customer groups according to the situation of different customer groups, so as to provide decision support for the formulation of differentiated marketing strategies.

This paper selects three segmentation variables to divide the market of express packaging recycling customers into three levels: recycling price affordability, recycling efficiency demand and environmental protection awareness. The specific treatment methods are as follows:

3.2.1 Level Division of Respondents' Affordability of Recycling Price

For the four types of income in Q5 average monthly income in the questionnaire, if the respondent answered "more than 7000", it will be recorded as 4 points; if the respondent answered "5000-7000", it will be recorded as 3 points; if the respondent answered "3000-5000", it will be recorded as 2 points; if the respondent answered "less than 3000", it will be recorded as 1 point.

3.2.2 Hierarchy of Demand for Recycling Efficiency of Respondents.

Q6 in questionnaire respondents in charge delivery frequency, if respondents answer is: "almost no express", the record for 1 minute, if respondents answer is: "six times a week or more," is written down for 5 minutes, if respondents answer is: "3 ~ 5 times a week", is down to four points, if respondents answer is: Once or twice a week was three points, and once or three times a month was two points.

3.2.3 Classification of Respondents' Environmental Awareness Levels.

Q8 environmental protection intention in the questionnaire survey is divided into three Richter scales. For different Richter scales, we score according to the degree of selection. For example, the respondents' answer is: I understand the relevant knowledge of environmental protection: 2, I know environmental problems, such as global warming, climate anomalies, etc.; 4, I will recycle furniture waste, such as furniture Household appliances: 2, then the final score of the respondent is 2 + 2 + 4 = 8, and so on.

For each subdivision variable, the score of each subdivision variable is averaged. The score greater than the average is marked as 1, and the score less than the average is marked as 0.

Theoretically, we divide the express packaging recycling market into eight parts:

1) High recycling price affordability, high demand for express recycling efficiency and high awareness of environmental protection.

2) High recovery price affordability, high demand for express recovery efficiency and low awareness of environmental protection.

3) High recycling price tolerance, low demand for express recycling efficiency and high awareness of environmental protection.

4) High recovery price affordability, low demand for express recovery efficiency and low awareness of environmental protection.

5) Low recycling price affordability, low demand for express recycling efficiency and low awareness of environmental protection.

6) Low recycling price tolerance, high demand for express recycling efficiency and high awareness of environmental protection.

7) Low recycling price affordability, high demand for express recycling efficiency and low awareness of environmental protection.

8) Low recycling price affordability, low demand for express recycling efficiency and high awareness of environmental protection.

According to these eight categories, we divide the consumers of express packaging recycling into three categories according to the actual situation: the first category: time sensitive. For this category of consumers, they are more concerned about the efficiency and time saving of express recycling than the price of express recycling. Compared with the income of express packaging recycling, Fast and convenient recycling is their choice.

The second category of consumers: price sensitive. For this category of consumers, their monthly income is about the average level. They pay more attention to the income from the recycling of express packaging and pay more attention to the income brought by express packaging.

The third kind of consumers: low environmental awareness. For this kind of consumers, regardless of their monthly income and time requirements, due to the lack of environmental awareness, such users often choose recycling methods that are not conducive to environmental protection.

3.3 Output Result

The results of one-way ANOVA among various samples formed after rapid cluster analysis. For the affordability of recycling price, the sum of squares between groups is 148.149, the sum of squares within groups is 0.246, the F statistic is 456.7, and the correlation probability of F statistic is 0.00,

which is less than the significance level of 0.05. Therefore, there are significant differences among the three types of consumers for the affordability of recycling price. The same conclusion is reached for express recycling efficiency and environmental awareness. Therefore, K-means cluster analysis divided into three categories is successful, and the effect of cluster analysis is very ideal.

Table 1. Results of one-way ANOVA among various sample

Iteration	Cluster		Error		F	Sig.
	MeanSquare	df	MeanSquare	df		
Recovery price tolerance score	148.149	3	0.246	1234	456.7	0.00
Express delivery recycling efficiency score	110.130	3	0.115	1234	8521	0.00
Environmental Awareness Score	45.777	3	0.782	1234	44.231	0.00

3.4 Result Analysis

Table 2. Classification results

Cluster Number of case	Price affordability score	Express recovery efficiency score	Quality demand score
1 N Valid	141	141	141
Missing	0	0	0
Mean	2.4589	3.0000	1.2254
Median	1.0000	2.0000	3.0000
Mode	3.0000	1.0000	2.0000
Std.Deviation	0.78954	0.00000	0.45698
2 N Valid	623	623	623
Missing	0	0	0
Mean	3.1547	3.0000	2.5897
Median	3.0000	3.0000	3.0000
Mode	3.00	3.00	1.00
Std.Deviation	0.7895	0.00000	0.7488
3 N Valid	53	53	53
Missing	0	0	0
Mean	3.1458	2.3664	1.5247
Median	3.0000	3.0000	3.0000
Mode	2.00	2.00	1.00
Std.Deviation	0.54221	0.56997	0.74889

In this way, the respondents were divided into three categories, including time-sensitive consumers, recycling-sensitive consumers and consumers with low environmental awareness. Among them, 141 are time-sensitive consumers (who care most about the experience and feelings they get when consuming), accounting for 17.3% of the total number of respondents. The number of consumers who are sensitive to the recovery price of express packaging is 623, accounting for 76.3% of the total number of respondents. Consumers with low awareness of environmental protection (lack of basic awareness of environmental protection, unable to actively carry out environmental protection behavior) accounted for 53 people, accounting for 6.5% of the total number. Rising living standards

in recent years, the Internet rapid development, but the environmental protection consciousness of people is stagnant, people's impression of pollution still stays in the "pipe", "chemical plant", such as stereotypes, to express packaging pollution know enough don't even know, only know that you can exchange for economic benefits, but China's recycling industry revenue decline, People are also less interested in recycling, believing that it is not worth wasting time to exchange for a few cents. Therefore, price-sensitive consumers account for the most, accounting for more than half, while those with low environmental awareness account for only about 7%. Time-sensitive consumers make up the second largest group, approaching 30 percent. According to the survey results, 24.95% of people have never heard of express packaging recycling. When they hear that express packaging is available, most people are curious and have the idea of taking the initiative to recycle. However, whether these people can become "regular customers" of express packaging depends on their consumption experience.

4. Market Potential Prediction based on Relm

Taking several measurable variables in personal information (age, income and times of receiving express delivery per week) as independent variables and "whether to carry out express packaging recycling" as dependent variables, the regularized limit learning machine regression model is used to estimate the potential market of express packaging recycling in Tangshan.

4.1 Basic Principle of Regularized Limit Learning Machine

Extreme learning machine is a kind of machine learning system or method based on feedforward neuron network. It was proposed by Guang binhuang, Qin Yuzhu and Chee kheongsiew of Nanyang University of technology in 2004[7]. The network structure of extreme learning machine is composed of three parts: input layer, single hidden layer and output layer. The input weight and bias can be initialized randomly and the corresponding output weight can be obtained. The network structure is shown in Figure 1.
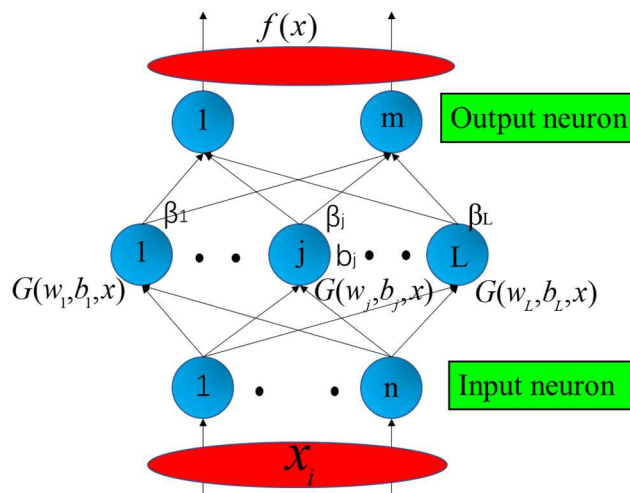

Figure 1. Network structure of extreme learning machine

4.2 Selection of Variables

We take the consumer's age, disposable income and the number of express deliveries received per week as input variables. In this paper, the consumer's age, disposable income and the number of express deliveries received per week are abstracted as input, and whether the respondent will recover the express packaging is taken as the dependent variable. In this paper, the potential of the express packaging recycling market is abstracted as whether the respondent will recover the express packaging, The most important thing in the market is resources, so whether users can recycle express packaging largely determines the market of express packaging recycling. Therefore, this paper abstracts the market potential as whether the respondents recycle express packaging.

In this paper, the dependent variables age, disposable income and the number of express deliveries received per week are selected as discrete variables. In order to ensure the generalization performance of the model, the three dependent variables are min max normalized. The formula is as follows:

$$x* = \frac{x - \min}{\max - \min}$$

Whether the respondents will recycle express packaging is taken as the dependent variable, and the dependent variable is normalized in the same way.

4.3 Result Analysis of Regularized Limit Learning Machine

After scoring the respondents' age, monthly income and times of receiving express delivery, we normalize them, and then input them as the dependent variable of the model. We take whether the respondents receive express delivery recovery as the dependent variable, train the model, and then draw the regression curve.
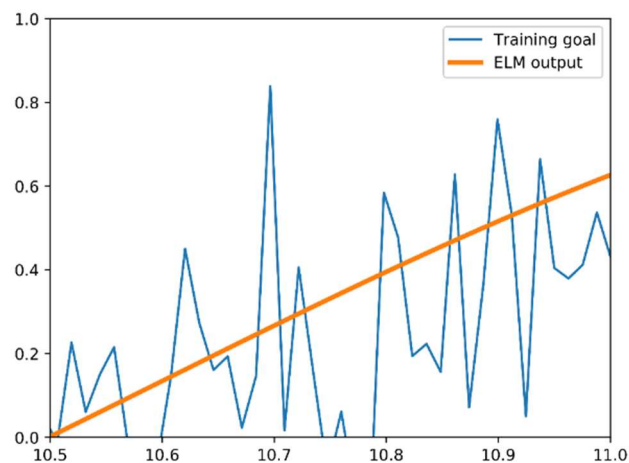

Figure 2. Analysis of market potential prediction results

As can be seen from Figure 2, the fitting curve is roughly in an upward state, so users will be more and more willing to recover express packaging, and with the fluctuation of independent variables, the increasing range of dependent variables is also larger and larger. Therefore, the image shows that the market potential of express packaging recovery is very huge.

5. Summary

For time sensitive consumers, they are more concerned about the efficiency and time saving of express recycling than the price of express recycling. Compared with the income of express packaging recycling, fast and convenient recycling is their choice. It is suggested that relevant enterprises can improve express cabinets, such as Fengchao and nearest neighbor Bao, increase the function of recycling, and develop express packaging recycling applet.

For price sensitive consumers, their monthly income is below the average income. They pay more attention to the income of express packaging recycling and whether express packaging recycling can bring benefits to themselves. For price sensitive consumers, their income is lower than that of the first category, but they are more familiar with mobile devices and care more about the benefits of express packaging. Actual prize incentives can be combined with online activities. For example, the e-

commerce platform can establish an "environmental protection member" system, and consumers can recycle a certain amount of packaging every month. Accumulated points can be exchanged for commodities on the platform, such as household products or cosmetics.

For consumers with low environmental awareness, regardless of their monthly income and time requirements, due to the lack of environmental awareness, such users often choose recycling methods that are not conducive to environmental protection, accompanied by the problem of low resource recovery and utilization rate. The government should publicize and educate consumers, vigorously publicize the concept of green environmental protection, advocate the recycling of resources, call on everyone to participate, mobilize people's enthusiasm and enhance the corresponding awareness of environmental protection.To develop green express, all parties are taking positive actions and trying to form a joint force. The green development of express packaging is an inevitable trend. We should follow the requirements of green development theory and realize the green transformation of express packaging production mode as soon as possible under the guidance of green development theory.

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