

Investigation and Research on the Selection of Environmentally Friendly and Recyclable Intelligent Express Delivery Boxes

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Abstract. With the rapid development of e-commerce, the express delivery industry is also increasing day by day. At the same time, the waste of resources and environmental pollution caused by express packaging have also appeared. Therefore, in the current era, environmental protection and intelligence are the subject of research, which will also be an inevitable trend of future development. For people to use the courier box that integrates environmental protection and intelligence, the article is applied through pre-investigation in the questionnaire. The relevant analysis in SPSS obtained the user's attitude towards recyclable and intelligent express packaging; secondly, using the questionnaire survey data for factor analysis, four main factors were used to characterize the main characteristics of the user and the order of importance of each factor. According to the four important factors derived from the data, the express packaging can be recycled and intelligent.

Keywords: SPSS; pre-investigation; recycled and intelligent.; environmental protection.

1. Introduction

According to the statistics of the State Post Bureau, the volume of express delivery services completed in 2017 was 40.1 billion, an increase of 28% year-on-year. The business volume of China's express delivery has ranked first in the world for four consecutive years, contributing more than 50% to world growth. With the rapid development of express delivery business, the supply of express delivery has also increased dramatically. Various carton tapes were severely consumed, which imposes a great burden on the environment. At the same time, along with the rapid development of living conditions and technology, the convenience of express packaging and information security are also people's concerns.

2. Reality

2.1 Current Problem

2.1.1 The Carton can not be Recycled.

Most of the existing courier boxes are cardboard boxes, and they are sealed with tape. These cartons cannot be reused, but are torn, and then thrown into the garbage bin as waste disposal. Not only does it cause a lot of waste of resources, but it also seriously pollutes the environment.

2.1.2 Express Box Security Protection is not in Place.

The paper box is not hard enough, and is often damaged by the "violent sorting" of the logistics staff and the non-standard transportation process, which causes the damage of the goods in the carton, and brings unnecessary trouble and cost waste to both the buyer and the seller.

2.1.3 User Information Security cannot be Guaranteed.

The current customer information is directly exposed on the face sheet of the carton, which easily leads to the leakage of user information, and it is used by some lawless elements. Not only the real-time tracking of the express package is more dependent on the sharing of the information of the transit node of the logistics platform, but not the physical location of the package itself, because it is not applied to the intelligent device on the express package.

2.2 Degree of Improvement

2.2.1 Jing Dong.

At the end of 2017, JingDong Logistics officially put into use the “green box” that can be recycled and reused – Qing liu Box, the first batch of 100,000 in the country. The “Green Box” is made of the latest thermoplastic resin material. It adopts a hollow plate structure and can be packaged in 5 seconds. It is resistant to impact, high temperature and humidity, and is lighter, stronger and stronger than traditional cartons. According to rigorous experimental tests, the average cost per use of a “green box” blue flow box can be reduced by more than 30% compared to the carton, and can be recycled more than 20 times under normal conditions. In every “green box” recycling, the staff will carry out comprehensive professional cleaning and disinfection to ensure the user experience for each use.

2.2.2 Su Ning.

Su ning Logistics' "box buckle" is used for environmentally friendly materials because its life span is one-off. Once the box is opened, it will damage the "box buckle" and ensure the safety of the delivered items. In addition, there is a confidential order at the top of the carton, and the recipient's phone number is hidden in the middle of the four. When the recipient receives the goods, the corresponding order is easily torn off. According to reports, each environmental express delivery box can be recycled 2,000 times. Compared with paper express, plastic express is more expensive, but according to suning logistics, environmental express can be recycled 17 times to recover the cost. At present, the environmental courier box is not suitable for all goods, mainly used for 3C, maternal and child, supermarket and other categories of goods. For other categories of goods, consumers in the receipt, the courier box can also be returned to the courier for reuse, and consumers can receive the corresponding bonus points.

2.2.3 Cai Niao.

After two months of testing, the first batch of express courier boxes took the lead in Hangzhou. From the Cai niao warehouse to the national retail store, the recycling box will replace the traditional carton. According to the calculation, the cost of the circulating courier box is reduced by 30% compared with the traditional carton, which can greatly reduce the logistics cost. In addition, the service life of a revolving courier box is about two months. After it is promoted, it can save about 80% of the original paper express box usage in one year. This courier box features a "plug-in" ring lock design that does not require tape packaging. This eliminates the use of tape and ensures that the goods are not opened by others. And it's a foldable design that can be molded without any auxiliary tools.

2.2.4 Other.

ZerOBox, an environmentally friendly black technology achievement, has been developed by the grayscale technology team for more than two years and has obtained a number of national patents. It adopts environmentally-friendly high-tech materials, light weight, non-toxic and harmless, durable and durable. It can be recycled 100%. ZerOBox adopts green PP material. It can be molded and sealed without glue and sealing tape. It is non-toxic and tasteless. Waterproof, corrosion resistant, acid and alkali resistant, can be packaged directly. At the same time, ZerOBox does not emit any toxic gases and does not discharge sewage during the production process, which is environmentally friendly and safe. The structural design of the ZerOBox box has complete independent intellectual property rights, and it has obtained a number of national invention patents, practical patents and appearance patents. It has the advantages of small density, light and easy to use, high surface stiffness, scratch resistance, good flexibility and no easy cracking. It has high heat resistance and can be used up to 110-120 °C. Compared with traditional wet and breakable traditional cartons, it is more durable and shock-resistant. It is not only easy to recycle, but also provides better protection in logistics and transportation. It also facilitates stacking of products in warehouses and transportation. It can effectively improve logistics transportation efficiency, save warehouse capacity and improve logistics turnover rate.



Figure 1. ZerO Box.

3. Research Data Analysis

The problems existing in the existing express packaging are increasingly disclosed. People are aware of the environmental protection and safety issues of express delivery, but they can only do little by relying on the strength of individuals. It is necessary to change the express industry to integrate innovation with existing new technologies. It also requires the joint efforts of social producers and merchants. Through in-depth interview analysis of users, the author obtained 10 indicators related to express delivery, and presented 10 indicators related to express delivery in the questionnaire according to existing express delivery problems, and then defined variables according to the statement, and analyzed factors of these 10 indicators.

3.1 Defining Variables

- X₁: Value the price/performance ratio of the courier box;
- X₂: Pay attention to the environmental protection and recyclability of the courier box;
- X₃: Care about whether the courier box is intelligent;
- X₄: Pay attention to the confidentiality of the courier box to the user information;
- X₅: Value the protection function of the courier box;
- X₆: It is necessary to install GPS on the courier box;
- X₇: Care about the price of the courier box;
- X₈: One-time courier packaging is a waste of resources;
- X₉: Your age;
- X₁₀: Your gender.

3.2 SPSS Factor Analysis Output

Through the SPSS factor analysis operation, the SPSS output results have a common table of variables, a total variance table explained, a matrix of component score coefficients, etc., and three key charts that can express the analysis results are listed (Table 1, Table 2, Table 3).

Table 1. Variable commonality.

	Extraction
X ₁ : Value the price/performance ratio of the courier box.	0.698
X ₂ : Pay attention to the environmental protection and recyclability of the courier box.	0.574
X ₃ : Care about whether the courier box is intelligent.	0.591
X ₄ : Pay attention to the confidentiality of the courier box to the user information.	0.721
X ₅ : Value the protection function of the courier box.	0.835
X ₆ : It is necessary to install GPS on the courier box.	0.624
X ₇ : Care about the price of the courier box.	0.786
X ₈ : One-time courier packaging is a waste of resources.	0.653
X ₉ : Your age.	0.745
X ₁₀ : Your gender.	0.839

Table 2. Explains the total variance.

Component	Extraction Sums of Squared Loadings	Rotation Sums of Squared Loadings		
	Cumulative %	Total	%of Variance	Cumulative %
1	32.824	2.614	24.624	24.624
2	49.673	2.172	21.821	46.445
3	64.276	1.647	17.513	63.958
4	79.035	1.435	15.077	79.035

Table 3. Component score coefficient.

	Component			
	1	2	3	4
X ₁ : Value the price/performance ratio of the courier box.	0.342	0.017	-	-
X ₂ : Pay attention to the environmental protection and recyclability of the courier box.	0.062	0.361	0.126	0.182
X ₃ : Care about whether the courier box is intelligent.	0.082	0.182	0.422	0.093
X ₄ : Pay attention to the confidentiality of the courier box to the user information.	0.063	0.109	0.082	0.357
X ₅ : Value the protection function of the courier box.	-	-	0.173	0.512
X ₆ : It is necessary to install GPS on the courier box.	0.263	0.071	0.312	0.067
X ₇ : Care about the price of the courier box.	0.172	0.066	-	-
X ₈ : One-time courier packaging is a waste of resources.	0.457	0.172	0.092	0.025
X ₉ : Your age.	-	0.271	0.072	-
X ₁₀ : Your gender.	0.183	0.076	0.081	0.221
	-	0.095	-	0.054
	0.251	0.623	0.043	0.061

The upper table extraction method is a principal component analysis method, and the rotation method constitutes a score for the orthogonal rotation method with Kaiser normalization. The analysis of the results of the operations (such as Table 1, Table 2, and Table 3) is as follows:

3.2.1 As Shown in Table 1.

The commonality of each variable reflected can be seen: 10 variables are well explained by 4 factors (principal components), because the factor commonality of these 10 variables is 0.5 or more, greater than 0.4, no factor needs to be removed.

3.2.2 As Shown in Table 2.

It shows the characteristic values of the 10 variable performance factors associated with the express package. The eigenvalues of the factors represent the variances that each factor can interpret. The larger the variance of a factor is explained, the more the amount of information containing the original variable is. In the initial eigenvalues, the eigenvalues of the first four factors are all above 1, and their cumulative contribution rate is 79.035%. It can be considered that these four factors contain most of the information of all variables. Therefore, four common factors, that is, the main component variables, are extracted from the 10 variables.

3.2.3 As Shown in Table 3.

The relationship between the first principal component, the second principal component, the third principal component, and the fourth principal component and the original variable can be expressed by the following linear combination:

$$Y_1 = 0.342X_1 + 0.062X_2 + 0.082X_3 + 0.063X_4 - 0.263X_5 + 0.172X_6 + 0.457X_7 - 0.183X_8 + 0.076X_9 - 0.251X_{10}$$

(1) The two variables with the largest coefficient in Y_1 above are X_1 named "Value the price/performance ratio of the courier box". The coefficient is 0.342 and X_7 named "Care about the price of the courier box". The coefficient is 0.457. We can name this factor as "price-performance factor", which accounts for 24.624% of the total amount of information, and is the largest group of survey clients.

$$Y_2 = 0.017X_1 + 0.361X_2 + 0.182X_3 + 0.109X_4 - 0.071X_5 + 0.066X_6 - 0.172X_7 + 0.271X_8 - 0.095X_9 + 0.623X_{10}$$

(2) The two variables with the highest coefficient in Y_2 above are the environmental protection and recyclability of X_2 named "Pay attention to the environmental protection and recyclability of the courier box". The coefficient is 0.361 and X_8 named "one-time express packaging is a waste of resources". The coefficient is 0.271. We can name this factor as "Recycling Factor", which accounts for 21.821% of the total information, and is the second largest group of survey clients.

$$Y_3 = -0.123X_1 + 0.126X_2 + 0.422X_3 + 0.082X_4 + 0.173X_5 + 0.312X_6 - 0.092X_7 + 0.072X_8 - 0.081X_9 + 0.043X_{10}$$

(3) The two variables with the highest Y_3 coefficient are X_3 named "Care about whether the courier box is intelligent", the coefficient is 0.422 and X_6 named "It is necessary to install GPS on the courier box". The coefficient is 0.312. We can name this factor as "intelligent factor", which accounts for 17.513% of the total information amount and is the third group of survey clients.

$$Y_4 = -0.084X_1 + 0.182X_2 + 0.093X_3 + 0.357X_4 + 0.512X_5 + 0.067X_6 - 0.025X_7 - 0.221X_8 + 0.054X_9 + 0.061X_{10}$$

(4) The two variables with the highest Y_4 coefficient above are X_4 named "Pay attention to the confidentiality of the courier box to the user information". The coefficient is 0.357 and the X_5 named "Value the protection function of the courier box". The coefficient is 0.512. We can name this factor as "information security factor", which accounts for 15.077% of the total information amount and is the fourth group of survey clients.

3.3 Analysis of Results

The above-mentioned target groups of the survey were obtained, and the questions of the questionnaire were defined into 10 variables for market research. The results of the 10 variables were analyzed by SPSS 17.0 statistical software package. The conclusions are as follows:

(1) The people who showed their attitude towards the courier box were mainly women and had online shopping experience. Therefore, the target of the survey was determined as: female, aged 20-50 years old with online shopping experience. They have many experience in express packaging, and the attitude of express packaging can represent the attitude of express customers.

(2) 10 variables of express packaging can be reduced into four factors into “price-performance factor”, “recycling factor”, “intelligent factor” and “information security factor”. Their cumulative contribution rate of variance is 79.035%, these four factors can be considered to contain most of the information for all variables. That is to say, through the questionnaire survey data analysis, it can verify the correctness of the initial interview and the proposed design indicators, and provide a theoretical basis for the later design practice.

4. Suggestion

With the popularity of online shopping to thousands of households, the express delivery industry is booming, and at the same time, due to packaging problems, it has brought about irresistible environmental problems and information security issues. However, to solve these problems, we need to start from its source: intelligent delivery of express delivery, digitization of express delivery information, real-time logistics information, and unified logistics management. Integrate intelligence into the express cycle to further adapt to the express delivery industry and market demand. At the same time, the next upgrade of the express delivery box should start to consider its cost performance, environmental protection function, intellectualization and information security factors, so as to make the satisfactory experience of the express delivery box become the booster of the express industry.

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