

Study on Recovery Mechanism of Express Packaging in Game Model

Ping Li

School of Economics and Management, Yibin University, Yibin 644000. China;

Abstract

In recent years, the rapid development of e-commerce and online shopping has promoted the rapid development of the express industry. And the rapid growth of the express business also brought the abuse of express packaging, environmental pollution, increased logistics costs, and many other negative effects. In order to solve the series of problems brought by the express packaging to the social environment, this paper analyzes the problems existing in the aspects of packaging recycling and recycling, and synthesizes the theoretical knowledge of reverse logistics. It is proposed to establish a recovery scheme based on the incentive mechanism under the game model, so that the recovery problem of express packaging can be solved smoothly, making the electricity business courier industry green, and low-carbon operation, for the sustainable development of the national economy to provide strong support. At the same time, this article also provides the theoretical reference for the country to make the reverse logistics laws and regulations.

Keywords

game model; express packaging; incentive mechanism.

CLC number: F252 Document code: A Article ID: 2016-0634

1. Introduction

With the development of the Internet and the improvement of people's living standards, online shopping is becoming more and more popular. Online shopping because of low prices, variety, easy to trade, and many people's favorite. The rapid growth of online shopping is driven by a substantial increase in the amount of express delivery business, but in the rapid development of the express delivery industry behind, is brought about by the great consumption of express packaging materials. Express packaging materials are not environmentally friendly, waste, polluting the environment and other issues caused widespread concern in the community. Usually, the express industry used in the packaging materials are divided into tranches, envelopes, cartons, plastic bags, woven bags, tape and buffer seven categories. To cartons and plastic bags, for example, carton usage accounted for about 50% of the total traffic volume, plastic bags accounted for about 40%. In the transparent tape, the average amount of each courier in China is 0.8 meters, transparent tape not only itself as non-degradable materials, but also an objective to cause the carton and plastic is difficult to separate and improve the recovery costs [1].

2. The Literature Review

According to statistics, 2015 is a slowdown in China's economic growth year, but the courier industry is still maintained more than 30% of the high growth rate. In 2015, China's express delivery industry business volume of about 20.67 billion pieces, express delivery revenue reached 276.66 billion Yuan, an increase of 35.4%, became the world's first [1]. At present, China's express industry in the cardboard, plastic cardboard and plastic recycling rate of less than 10%, most of these packaging are directly sent to the landfill, to the city environment to bring a lot of pressure. It can be said that the overall recovery of packaging in China is less than 20%. In some developed countries, cardboard packaging recycling rate of about 45%, and plastic packaging recovery rate of about 25% [2]. According to the State Post Bureau released the 2016 "China Express field green packaging development status and trend report" shows that in 2015, China's express delivery industry consumed

a total of about 20.7 billion express delivery orders, woven bags of about 3.1 billion, about 8.268 billion plastic bags, There are about 1.105 billion envelopes, about 9,292 million in boxes, about 16.985 billion meters in tape, and about 2.97 billion in internal buffers [3]. Many university campus daily delivery amounted to thousands of pieces, was discarded express packaging in the campus of the trash and corridors everywhere, plastic bags, tapes and other difficult to degrade the packaging of the most prominent problem, the most serious pollution, of the recycling and recycling rate is low, resulting in waste of resources, industry green transition is imperative [4].

In foreign countries, the German government issued the "Packaging Ordinance", "Circular Economy and Waste Management Act" and other laws and regulations, requiring manufacturers, distributors must be fully responsible for product packaging, the local government to each family issued a special "garbage classification And the "garbage clean-up schedule", these are standardized enterprises, industry, individual behavior of the legal system [5]; Japan has established a very harsh garbage classification system, so that fine management, the garbage is divided into four categories: general resources garbage, combustible resources garbage, incombustible resource garbage, broken large pieces of garbage, different waste disposal methods have clear practices and requirements; Canada, although the population is small, but per capita resources are very rich, every day The output of the garbage and industrial waste is very large, the government bear all the waste disposal work, waste disposal funds from the national property tax, waste disposal personnel are national civil servants, specialized processing and recycling work [6].

In short, foreign experience is worth learning and reference. Recently, the State Post Bureau promulgated the "Promote the implementation of green packaging work package", proposed express packaging to be standardized, green, reduced, and recyclable and other aspects of the obvious effect [7]. However, China's green packaging on the express delivery of laws and regulations are still very imperfect, as the design and research of recycling programs is the lack of theoretical reference.

3. The Courier Packaging Recovery Mechanism of the Game Model Analysis

Express packaging recycling is also the focus of the industry in recent years to discuss the discussion, but has been stuck in the name, or made a bold attempt without being maintained, indicating that the development of obstacles. This paper attempts to establish a game model to explain [8], trying to get the game equilibrium through analysis and demonstrate the feasibility of recycling, to make the final solution. In fact, in the courier packaging recycling problem, the electricity business platform, express delivery industry, consumers are essentially in a game state: electricity business platform is the "O2O" in the most profitable party, they are not in this field Smoke environment "pollution war" is vested interests, no "online" stores will not have consumers to place orders, but will not have "offline" express logistics support. Needless to say, the electricity business platform is the best promoter of express delivery, they are in the cusp on the courier industry has always been to fight the "price war" was born, starting from the whole, certainly to the most profit maximization, cost minimization, So the express packaging "selection" is a "saving" performance, and now they cannot get off the environmental pollution problems intensified, in order to achieve the sustainable development of the logistics industry, express delivery industry is undoubtedly a direct driver of express packaging recycling, they are cautious observation; in this game, the consumer is undoubtedly the weakest side, but it is also a crucial party, it is because of the consumer's drive makes the whole business platform and the entire express business live more and more moisture, but they are standing on the pollution of the "front", the surface is that they packed the packaging packed everywhere, messing up to lead to litter, so they are "victims" and "victims." Consumers must play express packaging "Terminator" role, packaging and recycling are likely to eventually "landing" and the implementation. It can be seen that the three parties in this courier packaging recycling game are looking for the most conducive to their own development strategies. We blame the consumer, logistics courier companies, electricity business enterprises in any one side is one-sided, is not conducive to the solution of the problem. In addition, the imperfect laws and regulations, the lack of education and supervision and supervision and management, the government should be responsible; those who produce pollution of the

packaging of raw materials, enterprises are also responsible. However, the game model established in this paper only involves direct participation, not involving the national government and production enterprises.

In summary, in this game model involves three participants: the first is the business platform business; the second is the logistics and express delivery industry; the third is the end consumer.

Assuming that the goal of the business platform is to ensure that the logistics courier and the normal interests of consumers are not compromised, the express package recycling program can be run. There are two decision-making companies: to speed up the implementation of the implementation of express delivery (hereinafter referred to as "recycling"), to maintain the current situation is not recycled courier packaging (hereinafter referred to as "maintenance"). Logistics Express and consumers also have two decisions: to actively participate in express packaging recycling (hereinafter referred to as "active participation"), to maintain the status quo (hereinafter referred to as "maintenance").

Then, use the following equation to represent the utility of the packaging recycling program:

$$U = U_a + U_b = \max f_a(x_1y_1, x_2y_2, x_3y_3) + \min f_b(R_1, R_2, R_3) \quad (3-1)$$

Where: U for the electricity business platform, logistics enterprises, consumers in the packaging recycling process of the total utility;

U_a for the electricity business platform, logistics enterprises and consumers in the express packaging recycling is the positive effect;

U_b for the electricity business platform, logistics enterprises and consumers in the express packaging recycling in the negative effect;

f_a for the electricity business platform, logistics enterprises and consumers of the normal income function;

x, y respectively, for the electricity business platform, logistics enterprises and consumer behavior variables;

f_b for the electricity business platform, logistics enterprises and consumers do not recycle the waste of resources function;

$\min f_b$ is equivalent to $\max lg$ (lg-electricity business platform, logistics enterprises and consumers actively support the delivery of express delivery after the return value), R_1, R_2, R_3 , respectively, for the electricity business platform, logistics enterprises, consumers do not produce waste of resources. If the less waste of resources, the greater the value of income, that is, $\min f_b = \max lg$.

Formula (3-1) can be converted to:

$$U = U_a + U_b = \max f_a(x_1y_1, x_2y_2, x_3y_3) + \max lg \quad (3-2)$$

Under the packaging recycling, the business platform, logistics enterprises and consumers' objectives are:

$$U_i = lg_i \cdot k_i + R_i \cdot r_i - C_i, i = 1, 2 \quad (3-3)$$

Where: k_i for the electricity business platform, logistics enterprises and consumers from the recovery of the income accounted for the proportion of lg ;

R_i for the electricity business platform, logistics companies and consumers do not recycle the waste of resources, including envelopes, corrugated boxes, biodegradable plastic bags, woven bags, and convertible points of the vouchers, credit rating, the profit and loss value.

r_i is not recovered that part of the waste of resources is used to bring the yield;

C_i is the sum of the costs, including the cost of wasting resources.

Take the recycling program, the electricity business platform, logistics enterprises and consumers can be expressed as:

$$U' = U'_a + U'_b = \max f'_a(x_1y_1, x_2y_2, x_3y_3) + \max lg' \quad (3-4)$$

Logistics companies and consumers can be expressed as:

$$U'_i = a_i \lg_i' \tag{3-5}$$

Where: a_i for the logistics enterprises and consumers in the implementation of express delivery after the recovery of the proceeds from the proportion of the total income. According to the above assumptions, we can draw the game tree (which is the order of decision A, B, C) for the participation of the three parties A (electronic business platform), B (logistics enterprise), C (consumer) participation game.

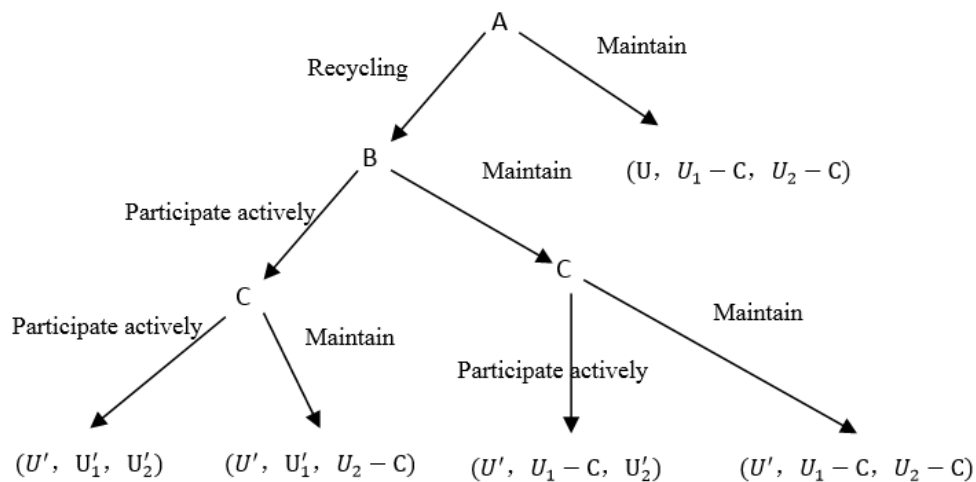


Figure.1 Decision Game Tree

Whether this dynamic game has a balanced solution depends on the benefits of the parties after recycling. If B and C want to choose not to participate, it means that B and C will lose their part of the proceeds from the recovery, and A will let B, C knows the benefits of active participation in recycling. If A does not participate in the initiative is his utility is the lowest, to the last power platform may have to bear all the losses, the price is huge, and even the entire industry may face collapse. We try to use the following two ways to interpret the dynamic game of the balance.

First, $U'_i > U_i - C$. That is, the business platform, logistics enterprises and consumers to actively participate in the effectiveness of more than before the effectiveness of participation, A's optimal decision must be recycled (because the express package after recycling, you can reduce the logistics industry logistics costs, reduce the electricity provider platform to pay to the logistics The cost of the company, and express the packaging after the recovery of the incentive mechanism can stimulate the consumer's desire to buy, the rapid increase in the number of orders for electricity providers also increased the express business volume, so $\lg' > \lg$). From the game tree, we can see that the optimal decision of C is active participation. It can be seen from C that the optimal decision of B is also actively involved in the recovery of packaging, and the equilibrium solution of the game is (recovery, participation, and participation). The balance of this statement is as follows: When A, B, C involved in the recovery of courier packaging when the total income is greater than not participate in the total income, then B and C there is no reason to refuse to recover the courier package program.

Second, $U'_i < U_i - C$. That is, after the recovery of express packaging, A, B, C, the overall effect is less than not participate in the total efficiency of express packaging recycling. Then C's decision is to maintain the status quo, the same decision-making B is to maintain the status quo, that is, B and C did not participate in the recovery of the initiative. Whether this equilibrium is stable depends on the next choice of A, let A make a reasonable decision, B and C must take a certain way so that A believe that courier packaging has been fully utilized and will not affect the environment, so that A to abandon the recovery strategy, this time the equilibrium solution is (maintenance, maintenance, maintenance), the cost of each is $(U, U_1 - c, U_2 - c)$.

In summary, A is willing to do the best promoter of express delivery and recycling, it is necessary to get B, C's active participation, need to ensure that logistics enterprises, consumers after the total effect is more than not participate in the utility and opportunity benefits, otherwise B, C will not participate in the recovery of the initiative. On the contrary, in order to make A abandon the recycling strategy, B, C must take some measures, so that A, B, C has been fully utilized express packaging resources and will not cause environmental pollution. However, the actual situation is B, C is not the best promoter, and they are just downstream of the chain of stakeholders. Therefore, A, B, C tripartite only choose to recycle and actively participate in their respective interests will be maximized. Otherwise, the sales platform of the electricity business horizon from the inflection point, logistics and express also affected by its performance and decline, and ultimately difficult to survive; consumers cannot easily shopping, experiential entertainment consumption will be difficult to maintain, shopping will also be back to the traditional model.

4. Based on the Game Model Under the Express Packaging Recycling Mechanism

The choice of recycling will deal with the environmental pollution caused by express packaging, which requires the design of a system optimization of the recycling program, so that electricity providers platform, logistics enterprises, consumers involved in the recovery of the total cost of packaging after delivery is greater than not participate in the total efficiency of recycling, So as to maximize the interests of the three parties to achieve the purpose of protecting the environment. With the masses of the awareness of environmental protection, coupled with the development of the country's green economy cannot be changed, power providers platform, logistics enterprises, consumers feel more and more social responsibility. So, the three parties have to deal with the demands of express packaging, from the above game model shows that the three parties only work together to maximize their effectiveness, although the short-term local costs may rise, but the long-term gains are increasing, which is consistent with the "two law against ", as shown below, based on the game model under the express packaging recycling mechanism design.

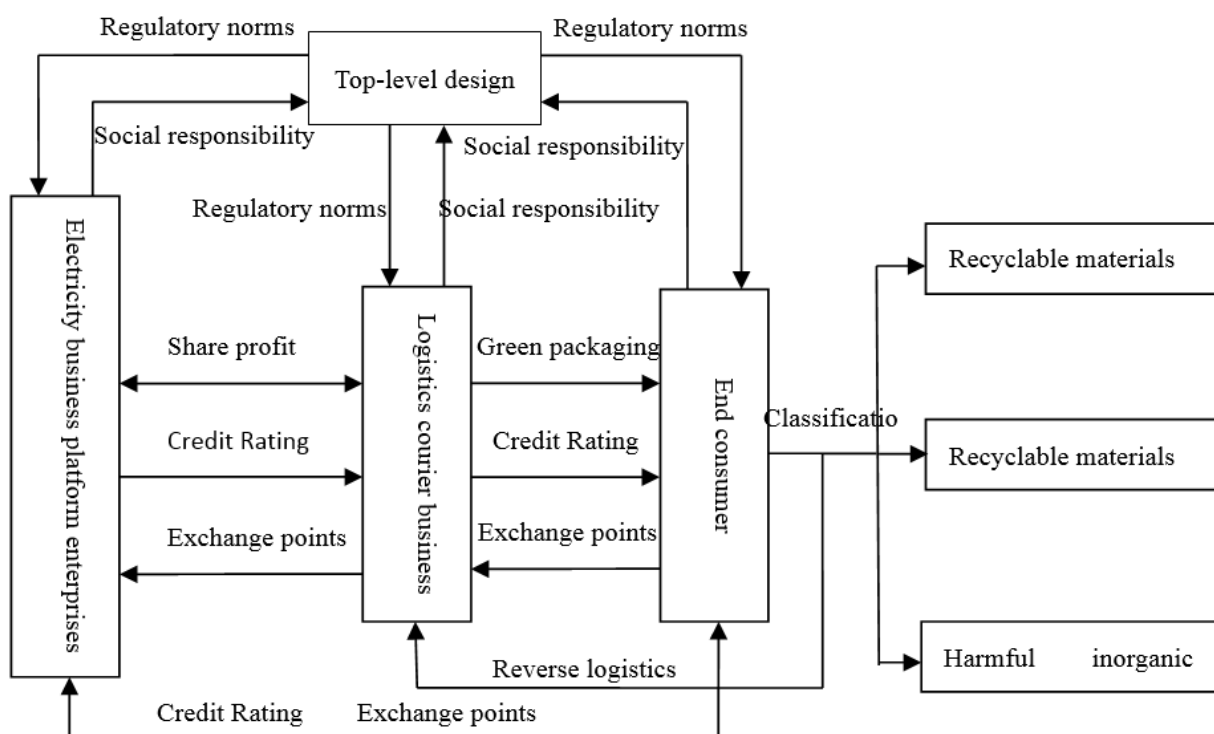


Figure.2 Express packaging recycling mechanism diagrams

4.1 National Top Design

As the electricity business platform, logistics enterprises, consumers are directly involved in the three parties, and the national level does not require more intervention, just do a good job supervision and management, and regulate the behavior of the top design. There are two kinds of supervision and management practices: First, the development of the relevant legal basis, so that there are laws and regulations, law enforcement must be strict. Such as the state should be issued storage and transportation of polluting materials ban, product packaging pollution ban, packaging materials classification and implementation methods, etc., clearly standardize the logistics express industry behavior, consumer classification express delivery packaging behavior; second, market guidance, education, so that only see the "hand" really play a macro-control role. Such as the correct guide to the business platform, logistics enterprises to improve the storage and transportation packaging, packaging and other standardized business process management, while strengthening the end consumer education and awareness, enhance environmental protection awareness, and establish the classification of packaging materials to develop habits. Through the national level of the top design, so that the relevant rules and regulations of dust landing, so that publicity and education enjoys popular support; in turn, electricity business platform, logistics and delivery business, consumers will recognize their own three social responsibility, and thus do express packaging recycling the real "master".

4.2 Establish A Secondary Incentive Agency

(1) Electricity business platform: an incentive agency. As the best driver of the express packaging recycling, electricity business platform is an incentive agency, first of all to establish a comprehensive and sustainable incentive mechanism, and constantly encourage logistics enterprises and consumers to implement the classification and recycling of express packaging. Electricity business enterprises can use the "reward + punishment" means of measures, the logistics enterprises, consumers credit rating: When the logistics enterprises to use environmentally friendly materials, give them points reward or discount logistics costs; when the logistics enterprises in order to "save" the cost The use of contaminated materials or to prevent damage to the goods and "excessive" packaging will give them a certain punishment, such as deducting points, reduce the credit rating, or even cancel the cooperation contract and so on. After the establishment of incentive mechanism, the logistics platform to assess the logistics company becomes simple.

(2) Logistics enterprises: two incentive agencies. As a direct driver of express packaging recycling, logistics and express delivery business is the second-level incentive agencies, in addition to green packaging to do, but also to establish a comprehensive incentive mechanism, and constantly encourage the behavior of end consumers. To this end, the logistics business for consumers can also establish a credit rating: for those who do a good job of express packaging classification of consumers to give points reward and good credit, consumers can exchange points in the APP terminal, such as points can be directly converted coupons, consumers can buy more online products, redemption points can also be deducted to pay the logistics freight, greatly mobilize the enthusiasm of consumers to deal with express packaging. So, how do logistics companies and consumers operate? Can be achieved through technical means, in the packaging recycling station to install things networking equipment, such as: RF (radio frequency) can automatically read the consumer after the use of express packaging information; in storage and packaging or product packaging marked QRC (two-dimensional code), BC (bar code) and other identification systems, consumers use the mobile terminal APP on the "sweep" function, but also to read their own packaging information. In short, as long as consumers of their own express packaging immediately classified processing, recycling and reuse, system devices (such as APP) will automatically record consumer behavior and upstream logistics and business enterprises, real business platform to share data, consumers credit rating is valid at the same time as the credit registration.

4.3 Consumer Behavior Analysis

From the rational thinking of consumers, they are by the upstream business platform, logistics and express delivery industry supervision and management, their consumer network products in the words and deeds of the Internet of things in the "eyes" under the constraints of behavior, not throw , chaos rejection of packaging recycling, packaging must be carefully sorted in order to obtain electricity business platform, the logistics business credit rating and access to the corresponding exchange points. Of course, for the recycling and reuse of packaging materials, consumers, more points, higher rating; From the consumer emotional thinking, they are also eager to get the upstream business praise and strive for more redemption points, so as to enjoy more shopping benefits. In addition, the consumer can also be through the terminal APP evaluation of business platform and logistics courier business behavior, such as service, speed, quality, this incentive mechanism has long been implemented. As a result, the electricity business platform, logistics enterprises, consumers eventually tied together, they supervise each other, encourage each other, promote each other, and become a stakeholder. Therefore, the consumer as a courier packaging recycling terminal, on the one hand to accept the electricity business platform, logistics enterprises of the two incentive agencies supervision, on the other hand, the strong social responsibility of environmental protection and the country's strong propaganda and education, they from the "victims, victims" gorgeous turned into a courier packaging classification "Terminator", which is inevitable and not accidental. Figure.3 Schematic diagram of two-way excitation

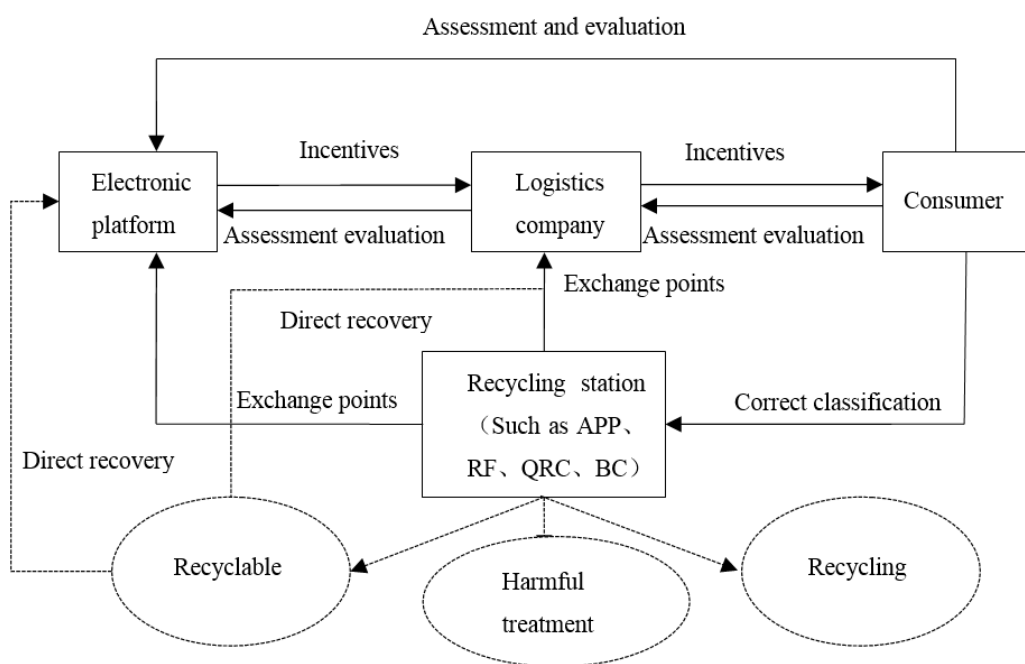


Figure.3 Schematic diagram of bidirectional excitation

4.4 Recycling Of Packaging Materials And Its Technology

In general, the packaging materials used in the express delivery industry are divided into three categories: bills of lading, envelopes, cartons, plastic bags, woven bags, tapes and buffers. We will organize these seven categories of materials into three categories: recyclable materials (re-use), recyclable materials (recycling), hazardous materials (destroyed). Which is good cardboard boxes, intact plastic bags, good woven bags for the recyclable materials, such materials as long as the consumer to deal with the appropriate and restore the original, can be twice, three re-use, greatly reducing the number of packaging materials; Damaged cartons, damaged woven bags, damaged plastic bags for the recyclable materials, for such materials can be recycled through the enterprise recycling technology; tape, buffer (filler) was harmful materials, the need for destruction, burial, burning and other treatment.

The state can take the lead business platform, logistics enterprises in the community, campus, units to establish express packaging recycling processing station, processing station to introduce advanced recycling, and processing technology. Such as the installation of RF and other Internet of things in the processing station, the use of packaging on the BC (bar code) technology, QRC (two-dimensional code) technology, APP (mobile client) technology [9], packaging to achieve the full traceability, can be monitored. Consumers in the processing station can be handled through the correct classification, recycling packaging and access to electricity business, logistics companies credit and credit rating; encourage consumers to re-use cartons, plastic bags, woven bags, individuals can be a few times free of charge shopping coupons or relief of logistics and other incentives.

5. Conclusion

Through the electricity business platform, logistics enterprises, consumers tripartite game process shows that the delivery of courier packaging is a solution to the solution, that is, in the context of the top of the country design, electricity business platform is the best promoter of the recycling program, logistics companies are direct promoters, and consumers are terminators; other social organizations, such as recycling companies are assistants. If the service chain from the upstream, the upstream business platform, and the middle reaches of the logistics business, the downstream consumer is undoubtedly the key link in the entire service chain, their sense of behavior determines the success of the express packaging recycling program. In this paper, through the game model to establish the rapid recovery mechanism of express packaging, that is, electricity business platform, logistics enterprises, consumers form a ring of interdependence supervision, assessment, evaluation, and promote the incentive mechanism; Moreover, the national level of education, guide and recycling the company's technical means, and ultimately make the courier packaging recycling problem has been completely resolved. This is for China's electricity business courier industry's healthy, sustained, green development plays a vital role.

Acknowledgments

Fund Project: Sichuan Provincial Department of Education Project (NO.14SB0200)

Author: Li Ping (1975-), male, Sichuan Luzhou people, logistics engineering graduate, Yibin Institute of Economics and Management lecturer, the main research direction for the logistics and supply chain, eco-economy, port economy.

References

- [1] China Industry Information Website: <http://www.chyxx.com/>
- [2] 199IT - Internet Data Center Website: <http://www.199it.com/>
- [3] State Post Office. China's express delivery of green packaging development status and trends report [J]. Green packaging, 2016, (9): 9-10
- [4] Chen Hui. Express packaging: how to deal with massive garbage [J]. Eco-economy, 2016,32 (6): 9-13
- [5] Zhao Baoyuan, Shi Kaijian, Sun Bo. Comparative Analysis and Revelation of Foreign Packaging Waste Recycling System [J]. Eco-Economy, 2009, (3): 102-105
- [6] Liu Guoqiu, Huang Xiaoyong, JiaYanglei. Study on Reverse Logistics Recycling Model of Packaging under Circulating Symbiosis Economy [J]. Enterprise Economy, 2014, (4): 23-28
- [7] Zhang Yingchuan. Express green packaging solutions in the field [J]. Logistics Technology and Application, 2016, (4): 104-105
- [8] Wang Changjiang, Yang Meili. Ningbo - Zhoushan Port integration construction development obstacles and countermeasures [J]. Comparison of economic and social system, 2008, (1): 172-176
- [9] Zhang Yi, Liang. Study on the application of APP in the online shopping of university students [J]. Value engineering, 2016, (184-185)