A Study on Efficient Recycling Channels of Waste Electronic Products for Different Consumer Groups—A Case Study of College Student Consumers

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Abstract. The consumer participation as a direct source of used electronic products has a direct impact on the recycling rate, so it is particularly important to study recycling channels that meet the consumer’s needs. However, most researches in China neglect the influence of different consumer groups’ differences on the recycling behavior. To explore efficient and suitable recycling channels, we must pay attention to the differences of consumer groups, classify consumer groups and explore different recycling channels according to their recycling behavior. University student consumer groups occupy an important market share of electronic products, learning habits combined with different consumption habits to speed up the replacement of electronic products, resulting in a large number of waste electronic products. Therefore, it is of great significance to study the recycling channel of waste electronic products, which is the consumer group of college students, for the entire electronic product recycling pattern. This article takes college student consumer groups as an example, investigates and analyzes the main factors that hinder this consumer group from participating in the recycling of used electronic products, explores the main factors that undergraduates use when choosing the waste electronic products processing channels, and uses AHP to evaluate the importance of factors, so as to explore suitable consumers for consumer groups of reverse recovery of electronic products to achieve channels.

Introduction

At present, the consumption of electronic products in China reaches a new historical peak. However, the recycling rate and standardization of used electronic products are relatively low. Taking used mobile phones as an example, only 2% of old mobile phones are properly regulated through regular channels recycling. The state has recently promulgated a series of guidelines and policies that stipulate that producers in the electronics industry should extend their responsibilities. The report of the 19th National Congress of the Communist Party of China on "Lucid waters and lush mountains are invaluable assets" provides guidelines for the recycling of used electronic products.

Because different consumer groups have different attitudes and behavior characteristics about recycling of used electronic products, factors and importance related to their own interests or social environment are different in the process of recycling. Therefore, exploring recovery model which is universally applicable is relatively difficult, and the application efficiency of the same recovery model in different consumer groups will be different. Therefore, classifying the consumer groups and applying appropriate recycling channels respectively are essential to the overall recycling pattern.

Literature Review

The system of extension of producer responsibility can be traced back to the Swedish proposal on waste recycling in 1975. The concept of Extended Producer Responsibility (EPR) was developed in 1988 by Thomas, an environmental economist at Lund University in Sweden, Lindhquist for the first time in a report submitted to the Swedish Environment Agency, whose main thrust is the
reduction, recovery and reuse of waste. The essence of ERP is to shift the responsibility of management and disposal of products from the government to producers to internalize the external costs of waste management and disposal, and formally develop the 3R concept (Reduce, Recycle, Reuse) of recycling economy.

Wan Yu-liang and Wang Yan (2006) set forth an e-waste recycling system as an example, discussing several issues that are debatable in terms of the human environment, market positioning and core competitiveness, and explored the construction of recycling system of renewable resources. Xu Fangchao (2016) summarizes the characteristics and development of informal recycling channels, and empirically studies the influencing factors of consumers' intention to participate in recycling. Fu Xiaoyong (2012) based on systematic analysis of waste electronic products recycling management and combined with the current domestic manufacturers and processors dominate the recycling model, analyzed the constraints of manufacturers to implement the basic reason for recycling of waste electronic products: Lacking of effective government incentives and effective waste electronic product recycling system. And he also proposed for the government to formulate scientific incentive policies and manufacturers to establish an effective recovery system. Zeng Mingang and Zhou Yanting (2009) applied the game theory to discuss the selection of recycling channels for e-waste in China. Niu Xiaotong (2011) studied the construction of waste electronic products recycling system in China, and put forward producer compensation recovery mechanism under government subsidies. Webster (2007) compared the joint recovery system and separate recovery system entirely responsible for the manufacturer. Wang Yanyan (2012) studied the issue of closed-loop supply chain management of dual-channel recycling of waste products under government intervention and concluded that the cooperative decision-making model under government intervention is an ideal closed-loop supply chain management model. She also gave the corresponding realization of the path. The realization of such an ideal management mode requires the effective coordination mechanism and the effective government incentive mechanism. Manbir S (2003) constructed a mathematic programming model for recycling waste electronic equipment from the perspectives of producers, recyclers and material processors respectively. The model incorporates disassembly and material recycling decisions for the decision of the recycler and the handler. GT S (2008) pointed out that the factors influencing reverse logistics recycling are the financial, human resources, fixed assets and competition with other joint ventures etc. Felix (2012) investigated the mobile phone loyalty and operating cost Is the most important factor for mobile phone recycling. Michael (2002) studied the reverse logistics recycling channel from the aspects of raw material cost, the price of used electrical appliances, tax and recovery benefits, financial subsidies and technology. Ming-Lang Tseng (2009) evaluated urban solid waste management in Manila, the capital of the Philippines, by the method of ANP and DEMATEL. Wu Gang (2010) considered the factors affecting the recycling of used electrical appliances as economic benefits, convenience of recycling, and social responsibility of citizens. From the perspective of building a system of influencing factors of recycling channels, Chen Zhaofeng (2012) found that perceived behavioral control, economic costs, environmental awareness, recycling attitudes, recycling habits and information dissemination had significant impacts on the intent of e-waste recycling. Xie Guangying (2014) analyzed the factors influencing the recovery of waste electrical and electronic equipment from the perspectives of consumers, government, recyclers and manufacturers based on customer satisfaction.

The above-mentioned experts and scholars researched and analyzed the existing problems of waste electronic products recycling and give theoretically feasible suggestions based on their research from aspects of various stakeholders and various viable channels. To some extent, it provides feasible guidance for decision-making on the recycling of used electronic products. However, most researches in China neglect the differences of consumer groups and do not study the application of efficient recycling channels for different characteristics of consumer groups.

**Domestic Waste Electronic Products Production and Recycling Status**

At present, China has become the world's second largest emitter of e-waste. According to
incomplete statistics, in 2015, the output of e-waste in China has exceeded 6 million tons, second only to the United States as the world's second largest e-waste distribution center. In addition, a large amount of foreign e-waste is flowing into China, according to statistics, 80% of the world's e-waste generated each year is exported to Asia, while most of the American and British waste goes to China.

Since the mid and late 1980s, various kinds of electronic appliances have started to enter every household. Since 2003, China has entered the peak period of scrapped electronic products. According to the data from the National Bureau of Statistics of China, the number of e-waste reached 11.1 million tons in 2012, accounting for 22.7% of the global total. In 2013, 70 million mobile phones were phased out in our country. "Four machines and one brain (TV sets, refrigerators, air conditioners, Washing machines and computers)," the annual amount of discards reached 100 million units. In 2014, China ranked second after the United States (7.1 million tons) by discarding 6 million tons of e-waste, followed by Japan, Germany and India.

![Figure 1. Phone shipments and growth curve.](image)

Take the most commonly used mobile phones in electronic products as an example, In 2016, China's mobile phone market listed 1446 new models with 560 million shipments, making it a real "mobile phone country." With the rapid development of smart phones, cell phone update iterations are accelerating. A survey shows that in 2014, about 50% of users will replace machine every 18 months. From January to August 2017, China produced 1.26 billion cell phones, including 937 million smartphones. At present, there are about 1 billion used mobile phones in stock in our country.

Recycling of waste electronic products directly affects the level of recycling economy. China's waste electrical and electronic products recycling industry has experienced three stages of development. The first stage is the traditional recycling mode of individual recycling mainly under the system of market economy before 2009; the second stage is appliance trade-in recovery + government subsidies recovery model dominated by retailers and manufacturers under household appliances trade-in policy from 2009 to 2011. The third stage is the traditional recovery mode of recycling renewable resources, mainly to individual recycling, which is indirectly subsidized by the fund and recycling model contains coexistence of new and wasted electronic products with Internet technology as a means after 2012.

According to statistics, there are over 200 registered enterprises dealing with electronic waste disposal in the whole country, and more than 1,500 unregistered family workshops. And many of those companies that deal with e-waste simply regard the recycling of e-waste as part of their business. Data from China Recycling Resources Recycling Association shows that at present, the number of Chinese WEEE (Waste Electrical and Electronic Equipment) recycling personnel reaches 18 million, and this "recovery army" contains a large part of the poorer population and rural surplus labor force. At present, there is no separate WEEE recycling channel, and the traditional individual recycling channels are still mainly used. This method accounts for about 80% of the total recovered WEEE, the amount recovered in this way accounts for about 80% of the total WEEE recovery.

At the same time, the state intervened and guided the recovery of used electronic products. In 2016, the State Council promulgated the "Proposal to Extend the System of Producer
Responsibility" and defined the extension of producer responsibility in 4 categories of electrical and electronic products, automobiles, batteries and packaging. China's management of recycling of waste electrical and electronic products using the EPR fund system, that is, the producer pays the fund and subsidizes the qualified handling company. Waste Electrical and Electronic Product Recycling Management involves the design of green products, recycling, re-use and then manufacturing, processing and comprehensive utilization, disposal and other links. In 2016, the newly released national standard is "Guidance on Evaluation of Enterprise Resource Level of Waste Electrical and Electronic Equipment Processing" (GB / T 32885-2016), which requires that enterprises should try their best to separate high-value elemental materials, choose the best available technology. The evaluation system will be divided into three parts: management level, technical level and resource level, and quantitative indicators will be set respectively.

Domestic Waste Electronic Products Recycling Problems

Consumer Personal Awareness

Currently, an important factor affecting the recovery rate of mobile phones and other electronic products is the personal awareness of consumers. From an industry point of view, the electronic products used for disassembly after recycling can only be priced according to the raw materials, and the cost of common phone materials generally will not exceed 1,200 yuan. Therefore, it is normal for the scrapped electronic products to have a low recycling price. For example, For example, on Jingdong's "old for new" mobile phone platform, the average recall price for the iPhone7 is 3258 yuan, but buying and selling price differentials makes consumers psychologically difficult to accept. In addition, electronic products store large amounts of personal information during use, and personal privacy concerns make consumers generally choose to leave used electronic products at home.

Downstream Industry Development Reactionary Force

From the perspective of the industrial chain, the characteristics of different industries in different positions in the industrial chain of electronic products make the development of all links in the industrial chain unbalanced. At present, China's downstream electronics recycling industry - electronic products processing industry polarization is very serious. At the same time, the environmental protection enterprises with good technical conditions are involved, and there are also many underground factories.

Electronic products processing is such an industry that requires big investment and is slow to take effect. Whether precious metals extraction or environmental dismantling has high threshold requirements for technology, it is hard for companies without a certain strength to get involved. As a result, there are relatively few enterprises specialized in waste disposal in our country. The lack of reaction force of the follow-up industrial development led to the lack of corresponding power recovery of used electronic products.

Processing Channels are not Standardized

There are about 1 billion used mobile phones in the country now. However, only about 2% of such mobile phones are recycled through formal channels, while the vast majority are off track. They have been idle or rebuilt into the secondary market or influx of "alchemist" workshops. In order to extract the precious metal in the cell phone, these workshops use a very simple pickling method; that is, first with the fire circuit board, and then put together the molten metal block in aqua regia, gold and precious metals such as copper, silver and palladium are precipitated out. After getting what they want, the waste acid and other residues are directly discharged into the surrounding environment without any treatment, resulting in great waste of resources and environmental pollution.
Producers Lack of Motivation

As the current negative externalities in the electronics manufacturing industry far outweigh the positive externalities, the current implementation of the ERP fund system makes manufacturers tend to view the processing of electronic products as a cost to avoid, and thus does not tend to take the initiative to undertake the responsibility of the recycling of used electronic products. In addition, research and development of recycling technology brings the rate of return on investment far less than the development of new products, so companies are not willing to invest in research and development of environmental protection technology. If we do not consider the follow-up of pollution problems, as small workshops as "simple and crude" approach can indeed bring considerable profits. However, the original intention and purpose of recycling electronic products is far from the case.

Institutions are not Established, System is Imperfect

At present, China does not set up a special government agency responsible for recycling and management of used electronic products. At the same time, the imperfect policies of related industries are also a major obstacle to the recovery of electronic products. It is reported that in 2011 the "Waste Electrical and Electronic Product Recycling Management Ordinance", clearly pointed out the refrigerator, television, washing machines and computers and other electronic waste disposal subsidy policy, but mobile phones and other electronic products are not listed. In 2016, the new version of "Disposal of Waste Electrical and Electronic Products" although the phone is included, but the specific details have not yet been introduced.

Significance of Study

For the Economy and Industry

As one of the pillar industries of the national economy, the electronics industry in emerging science and technology industries needs to find a sustainable way to achieve green reverse logistics, open up the last ring of the industrial chain and improve the level of circular economy. According to foreign research, 1 ton of electronic board card can be separated 286 pounds of copper, 1 pound of gold, 44 pounds of tin, only 1 pound of gold worth 6,000 dollars. E-waste contains many recyclable material components and product components, and the economical value of resource recycling is great. CCTV recently has a program on mobile phones cause concern. Dr. Ma Dachao, a program of Guangxi University's Institute of Resources, Environment and Materials, said: “A ton of used mobile phones can extract about 150 grams of gold, which is several times more than the best gold in the world (a ton of high-quality gold mine can only extract 50 grams of gold). "Workers want good things, we must first sharpen." The establishment of channels is the primary condition of waste electronic products recycling, the choice of channels is the quality of the channel directly determines the efficiency of recycling. Choosing a formal recycling channel can effectively reduce the environmental pollution caused by the illegal dismantling of waste electronic products and increase the re-product rate of waste electrical and electronic products, which is of positive significance for the reutilization rate of resources after dismantling. Judging from the overall national economy, exploring and establishing a viable recycling channel will greatly enhance the utilization of social resources and the efficiency of circular economy.

In foreign countries, the end processing and management of electronic waste has formed a new rising sun industry, but the current development of our country has not reached the ideal level. The development of the recycling industry is an inevitable trend in the background of electronic product development and economic restructuring. At present, the state has promulgated relevant policies to encourage enterprises that are qualified to carry out recycling work and put forward a series of subsidy measures. With the support of policies, enterprises can gain the advantages of first entrants in the industry by establishing appropriate and regular channels.
For the Citizens

E-waste in the recycling process produces harmful pollutants complex composition, including heavy metals and long-lasting stability of organic matter. If improperly recycled, it will pose a great threat to human health. Such as television sets, refrigerators, cell phones and other metals contain nickel, arsenide, chromium, copper and mercury, which may lead to skin diseases, chronic respiratory diseases and eye symptoms such as itching, conjunctival congestion and so on. Long-lasting and stable organic compounds including polycyclic aromatic hydrocarbons (PAHs), polyandrybenzene, dioxaban and enantiomers, etc., are enriched in the human body through breathing, drinking water and food chain, resulting in signs of neurasthenia, such as dizziness, headache, insomnia and memory loss. Recycling of used electronic products is not "not a matter of myself" for the general public. At present, problems such as poor access to available recycling channels or poor practicability have increasingly become the major obstacle to public participation. Therefore, only research recycling channels that meet the public demand, in line with their habits of recycling channels can we remove obstacles that prevent the public from participating in the recycling of used electronic products.

For the Government

The government has introduced a series of guidelines on the recycling of used electronic products to guide and monitor the recycling of used electronic products, etc., demonstrating the government's ability to govern and the level of governance. It has established an image of responsible for citizens within the country and responsible for the overall ecological environment in the world as a power. To study the applicable recycling channels can provide valuable theoretical basis for government decision-making.

For Producer

Responsible for the entire product life cycle is the business ethics and social responsibility that electronics companies should fulfill. This is not only an extension of producer responsibility, but additional profits in the secondary treatment can be used as a new business profit growth model. The main driving force behind the green reverse logistics is: government supervision, product differentiation advantages, social image, cost savings and so on. Under the supervision of the government, enterprises take the initiative to establish appropriate waste electronic products processing channels such as "trade-in" will form a new differentiated competitive advantage in the market to establish a responsible brand image, not only can enhance the brand reputation but also win the consumers' preference and trust, so as to establish consumer brand loyalty.

The Research Object

College students selected by our study occupy an important proportion of consumer electronics market, the research found that college students have the following characteristics:

① Large demand for electronic products, frequent replacement. With the expansion of college enrollment and changes in consumer attitudes, there is a large number of waste electronic products every year and has the trend of continuous growth.
② The high proportion of hi-tech electronic products to be replaced accounts for a high proportion, resulting in large residual value of used electronic products such as old mobile phones, computers and slabs, and relatively high recycling value.
③ The recycling and utilization of waste electronic products is low, mostly idle, and the recycling prospect and the benefit space are large.
④ It performs the appropriate guidance to college students, develop their recycling awareness and encourage their active participation in recycling, college students after graduation are spread radiation into the society, will improve recycling consciousness and the promote recycling behavior of the whole society.
Source and Analysis of Data

College student consumer groups occupy an important market share of electronic product sales, especially, the opening semester after college entrance examination is the peak of electronic product sales. We designed questionnaires based on relevant issues and distributed questionnaires in Beijing-based colleges and universities. After screening, we obtained over 100 valid questionnaires. According to the results of the analysis, college students mainly buy electronic products such as mobile phones, computer tablets and digital computer accessories. Some of their students also buy video cameras, wristbands and electronic watches. Mobile phones, computers and electronic accessories almost become the necessities of college students. Use frequency and time makes electronic product replacement more frequent. According to the survey, half of college students replace the above electronic products because the original electronic product is lost or damaged, followed by the function does not meet the needs of use. This is related to the fact that most university students do not have an independent source of income. The main source of fees for purchasing electronic products is their parents. Therefore, the factors such as new listing, celebrity endorsements, and regular replacement only account for about 10-15% of the replacement motivation. It is concluded that the reasons for the replacement of electronic products in college students are mainly: life span; loss or damage to electronic product, such as broken screen; Limited functionality. In addition, a hidden reason is that manufacturers will design a limited life span to force consumers to buy their new products, which is the electronics industry's secretive "plan scrapped", especially in the mobile phone industry. For example, Google has done a statistics, every time Apple releases a new machine, the "iPhone slow" search index will soar. Although Apple's response is that the use of the phone after a long time will reduce the performance of the CPU to maintain the user's use. However, it is undeniable that after September 12, 2017, after the release of iPhone 8, the CPU performance of the iPhone 7 has been reduced after the iOS 11.2 system has been updated. Another example is that after Android's more powerful operating system is introduced, only new phones on the market can support it. The old electronic products can not be upgraded, can not find replaceable parts and many other factors together lead to faster replacement of electronic products. In summary, we conclude that "planning scrapped" is the main reason to promote the consumer groups to replace electronic products.

Such a large amount of electronic products will inevitably produce a large number of obsolete waste electronic products, then where did the replaced electronics go? Our survey found that the waste electronic products eliminated by university students have not been properly and sustainably used. 70% of the waste electronic products are idle and have not been processed through secondary channels. So what prevents college students from processing used electronics through reasonable channels? Through the questionnaire, more than 85 percent of college students do not know the processing channels of waste electronic products at all. The lack of understanding of the recycling channel, the distrust of the way of handling and many other factors make college students participate in the professional recycling channel almost zero. Obviously, the "channel" factor is the main factor that hinders college students from effectively participating in the recycling of electronic products.

An optimistic phenomenon is that more than 80% of the college students interviewed said they would "take the initiative to understand and participate actively" and "if there is an appropriate channel, they would participate in the recycling of waste electronic products."

The large number of idle waste electronic products coupled with the active support of the willingness to recycle makes the processing potential and prospect space of college students' waste electronic products very optimistic. In this situation, it is of great significance to guide college students to choose formal environmental protection channels and actively participate in the chain of recycling waste electronic products to open up the whole chain of responsibility for producers, and the premise of all work is to establish a recycling channel for college students to meet their demands and provide support and motivation for their continuous participation in recycling. In addition, this consumer group, with relatively concentrated geographical features in schools, determines that the exploration of university students' recycling channels of used electronic
products is different from the common forms of recycling of used electronic products in the society. Only through "making the best use of local conditions" can recycling efficiency achieve the desired level.

Methodologies: Analytic Hierarchy Process (AHP)

According to the results of the questionnaire, the following uses analytic hierarchy process to assess the factors and the degree of subjective importance that college students consider when choosing waste electronic product processing channels.

Analytic Hierarchy Process (AHP) combines quantitative analysis and qualitative analysis. Based on the deep analysis of the nature, influencing factors and intrinsic relations of complex decision-making problems, AHP uses less quantitative information to make the thinking process of decision-making mathematical. This provides simple decision-making methods for the multi-objective, multi-criteria or unstructured complex decision problems.

Evaluation Index

According to the questionnaire designed in advance, we set two first-level indicators and three second-level indicators respectively. From an indicator alone, the bigger the better indicator; from the feasibility, the simpler the better. Each level of indicators can be refined into a number of two indicators, the specific meaning does not go into details, please see Table 1 for details.

| First indicators          | Secondary indicators      | Specific meaning                                                                 |
|---------------------------|---------------------------|----------------------------------------------------------------------------------|
| Consumer personal         | Economic benefit          | College students consumers generally hope to gain suitable economic benefits from used electronic products. |
| considerations            | Privacy protection        | Used electronic products contain a lot of personal information, college students worried that improper selection of recycling channels may increase the risk of personal information disclosure that may cause trouble or loss for themselves. |
|                           | Personal emotion          | People tend to be emotional and have a certain degree of affection for the used electronic products, which also affects the choice of disposal channels for waste electronic products. |
| Environmental and external| Environmental friendliness| College students are increasingly aware of environmental protection. While protecting their own interests, they want to contribute to environmental protection. |
| considerations            | Channel convenience       | Convenient and easy recycling channels can promote college students' recycling behavior. |
|                           | Regeneration value        | Consumers prefer to regenerate their obsolete electronic products by selecting the appropriate recycling channels for greater economic value. |

Assessment Process

Note: The data used in the following evaluation process are simulated data, not real data as the project progresses.

(1) Decision Goal B1 Judgment Matrix and Weight Vector

| B1 | C1  | C2  | C3  | W  |
|----|-----|-----|-----|-----|
| C1 | 0.222| 0.217| 0.25| 0.230|
| C2 | 0.667| 0.652| 0.625| 0.648|
| C3 | 0.111| 0.130| 0.125| 0.122|

\[ \lambda_{\text{max}} = 3.00033 \]
\[ CI = \frac{\lambda_{\text{max}} - n}{n - 1} = 0.000165 \]  \hspace{1cm} (1)

\[ CR = \frac{CI}{RI} = \frac{0.000165}{0.58} = 0.000284 < 0.1 \]  \hspace{1cm} (2)

Pass the consistency test.

(2) Decision Goal B2 Judgment Matrix and Weight Vector

| B2  | C5   | C6   | C7   | W   |
|-----|------|------|------|-----|
| C5  | 0.222| 0.211| 0.286| 0.240|
| C6  | 0.667| 0.632| 0.571| 0.623|
| C7  | 0.111| 0.158| 0.143| 0.137|

\[ \lambda_{\text{max}} = 3.0193 \]

\[ CI = \frac{\lambda_{\text{max}} - n}{n - 1} = 0.00965 \]  \hspace{1cm} (3)

\[ CR = \frac{CI}{RI} = \frac{0.00965}{0.58} = 0.017 < 0.1 \]  \hspace{1cm} (4)

Pass the consistency test.

Result of AHP

| B1   | B2   | W    | Ranking |
|------|------|------|---------|
| 0.65 | 0.35 | 0.1495| 3       |
| C1   | 0.230|      |         |
| C2   | 0.648|      |         |
| C3   | 0.122| 0.4212| 1       |
| C4   |      | 0.0793| 5       |
| C5   | 0.240| 0.0840| 4       |
| C6   | 0.623| 0.2181| 2       |
|      | 0.137| 0.0480| 6       |

Thus, it can be concluded that the subjective importance of college students’ choice of treatment channels from high to low is as follows:

Privacy Protection → Channel Convenience → Economic Benefits → Environmental Benefits → Personal Emotions → Value Re-Realization

Suggestions and Solutions:

November 2017 Beijing Municipal Development and Reform Commission responsible person identified six kinds of waste electronic products recycling companies. Including the entity sales enterprise recycling pilot, diversified business pilot platform for the pilot, the Internet recycling business pilot recovery, sanitation enterprises rely on garbage collection network recycling pilot, production enterprises, “reverse flow” recycling pilot, other recycling pilot. The above six viable channels for recycling can be simplified according to the consumer-oriented recycling model of college students into the following four alternative channels:

① Regular door-to-door recovery
② Set up a special network of fixed-point recovery
③ Online booking recovery
④ Set up a special electronic products trash.

According to the questionnaire and willingness survey, a reference mode for establishing a proper channel to promote the formal recycling of college students’ electronic products is given:

(1) According to the school area to set up one or several special sites in the school for recycling, schools can take the approach of cooperating with companies or electronic product vendors with a recycling qualification. According to the different demands of students, ① according to the degree of waste return cash ② trade in (consumers make up the difference) ③ to content in content
(waste electronic products return for other value equivalent electronic products, such as used mobile phone in exchange for bracelet, etc.)

(2) Establish and improve the evaluation of discarded electrical and electronic products online, make an on-site service platform and provide professional support to enhance the reliability and trust of recycling organizations in the minds of university students and publicize their recovery directions so as to eliminate the concerns of university students in leaking their personal information.

(3) By means of demonstrative measures, undertake pilot and demonstration work in key areas." According to local conditions, make the best use" to gradually expand the coverage of suitable channels.

(4) Government and environmental protection organizations use microblog and other new media to launch advocacy to publicize the harm of used electronic products and accurately inform the public about the recycling channels. Using college students' strong participation in online activities, they can jointly launch online public service announcements with large-scale video websites such as Iqiyi and Youku. Please popular celebrities as propaganda ambassadors, the use of the appeal of public figures to mobilize the whole people involved in recycling of used electronic products. Environmental organizations or schools encourage universities to carry out regular related recycling activities or student associations. Inviting popular celebrities to act as advocacy ambassadors and using public figures to mobilize citizens to participate in the recycling of used electronic products. Environmental organizations or schools encourage universities to carry out regular related recycling activities or student associations.

(5) For manufacturers of electronic products, the government should promulgate policies or encourage producers to add the Recycling Process section when doing advertising campaign. Electronic products should be required to be sold with the recycling channel instructions or prompt documents.

(6) The government should coordinate the whole extended producer responsibility chain to ensure that the recovered used electronic products are properly disposed of, follow up the disposal and comprehensive utilization of multiple links and make sure that the waste electronic products are not inappropriately handled after recycling. The government should regularly release the environmental performance of the relevant handling results, give college students a sense of self-worth, and provide them with spiritual motivation for environmental protection.

Summary and Further Research

Recycling of waste electronic products requires that all stakeholders in the industrial chain cooperate with each other. The establishment of channels is the primary condition for the recycling of waste electronic products. The classification of different consumer groups and the selection of key consumer groups as pioneer pilots will further expand coverage and have great significance to the entire recovery pattern. It is hoped that the research in this article can provide reference for the relevant departments to make decisions, and hope that the follow-up research can continue to explore the recycling channels in line with China's national conditions and consumer behavior. The state has been trying its best to guide the establishment of recycling channels that are suitable for the development of our country. Many responsible electronic product manufacturers are also carrying out pilot recovery work. It is believed that with the long-term efforts of all parties and practical actions, waste electronic products in our country will achieve a positive and benign cycle, China's waste electronic products recycling industry will be standardized and industrialization forward.

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