Research on Reverse Supply Chain under O2O Classified Recovery Mode

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Abstract. In recent years, due to the continuous growth of social needs and the continuous innovation of science and technology, the demand for various products has grown rapidly. Fierce market competition has accelerated the upgrading of various products, resulting in a shortened product life cycle and a large number of obsolete products. At the same time, the development of the Internet has brought a new path for recycling-the O2O classification recycling model, which simplifies the product recycling path from consumers to manufacturers. Therefore, research based on the O2O classification recovery model has become the key to solving the waste product recovery.

1. Introduction
As we all know, the quality of the living environment is determined by the quality of the living environment. With the increase of people's awareness of environmental protection, classified recycling has become a general trend. At this stage, China's classified recovery is still in a state of pilot and gradual promotion, and most of the classified recovery models are mainly offline, which is very limited. When a small number of pioneers linked the Internet with classification and recycling, Chinese scholars also noticed the O2O classification and recycling model, and the research on the reverse supply chain under the O2O classification and recycling model has some prospects and guidance. Product recycling is the beginning of the reverse supply chain. Only when the beginning is done, can the entire reverse supply chain be stable. This article constructs a reverse supply chain under the O2O classification recovery model, analyzes the existing problems and solutions of the reverse supply chain under the O2O classification recovery model.

2. Construction of reverse supply chain under O2O classified recovery mode
According to the report on the development of China's renewable resources recycling industry (2019), the total amount of recycled renewable resources in China's ten major categories, including waste steel, nonferrous metals and plastics, totaled 322.82 billion tons in 2018, up 14.2 percent year on year. The scope of recovery of renewable resources has risen with some good results. However, due to the large base of total output, there is still a large gap in the recovery of renewable resources relative to output that needs to be filled. Facing the environmental pollution caused by waste products and the destruction of ecosystems and the huge harm to human health, the state has promulgated corresponding laws and regulations to strengthen the management of this aspect. As early as 2009, China issued the "Regulations on the Management of the Recycling and Disposal of Waste Electrical
and Electronic Products.” With the support of the policy, different types of separation and recovery models have begun to emerge in China. The O2O classification and recovery model is one of the more advanced and feasible ones. The O2O model makes the classification and recycling a feasible model that can be operated online and offline by building a bridge between consumers and manufacturers. Product recycling is the primary link of the reverse supply chain. The entire recycling link involved in the recycling process has a greater impact on the manufacturer's product remanufacturing and profitability. This is both the importance of recycling and the sustainable development of enterprises.

O2O is a brand-new business model that comes with the rapid development of mobile Internet. It realizes the connection between the real economy and the Internet platform in a unique way, and accelerates the pace of mobile e-commerce model development. O2O classification and recycling mode is to apply the online to offline operation model to the process of classification and recycling. Compared with the manufacturer's self-recycling model (the manufacturer sets up a recycling department for recycling) and the third-party recycling model (the manufacturer hires a third party for recycling), this model has cost savings, time savings, greater operability, and greater focus Customer willingness and other advantages.

2.1. Classification of traditional recycling models

Traditional recycling models are mainly divided into manufacturer self-recycling models and third-party recycling models.

2.1.1. Manufacturer self-recycling model. The manufacturer's self-recycling mode refers to a recycling mode in which the manufacturer performs recycling alone. The logistics-related elements of the reverse supply chain system are designed and implemented by the company alone, and its model is shown in Figure 1.

As an agent recycling enterprise closest to consumers, retailers are the most efficient recyclers of waste products. Since their sales outlets are closest to consumers and they can use new car storage warehouses to reduce inventory costs, retailers have the most advantages and lowest costs in the recycling process. Manufacturers have professional technical talents and strong capital in the remanufacturing and reuse links. However, as a manufacturer, its core competitiveness is the research and development and manufacturing of new products, which is not conducive to dispersing corporate funds and personnel to independently build a recycling network.
2.1.2. Third-party recycling model. The third-party recycling mode refers to a recycling mode in which the manufacturer transfers the recycling work to the third-party logistics enterprise for implementation, as shown in figure 2.

![Third-party recycling mode](image)

Figure 2. Third-party recycling mode.

Third party logistics enterprises are professional logistics companies with their own logistics network and a certain scale. The third party model can achieve a good degree of professionalism and form scale benefits in a short term. The competitive advantage of third-party logistics enterprises lies in the service fields such as transportation and distribution, which have the lowest cost compared with other recycling main enterprises. However, they are relatively unfamiliar with product disassembly, function testing and value recovery, and do not have processing technology advantages.

2.2. Construction of O2O classified recovery model

With the development of information technology and modern trade way, the Internet thinking by industry more and more attention and used in practice, "Internet +" action plan are included in the government work report, even including the mobile Internet, cloud computing, big data, combined with modern manufacturing industries such as the Internet of things, and to promote e-commerce, Internet industry and the healthy development of the Internet financial. O2O namely Online To Offline, in recent years the rise of an Offline trade together with the Internet business model, through the Internet into Offline trading platform, Online publishing information about products and services To attract users, users after get related information can be done Online order, payment and other processes, with orders for certificates is Offline for a product or service. In this process, the information flow and capital flow involved are carried out online, while the logistics and business flow are completed offline. Therefore, based on the O2O mode, the Internet is used for classification and recycling, information and communication technology and Internet platform are used to further integrate the Internet and classified industries, promote the Internet to the green and sustainable development field, and enhance the innovation capacity of the recycling industry.

Based on the basic idea of "combining online and offline", the reverse supply chain of classified recycling is constructed by referring to the EPR system and establishing a new recycling system led by manufacturers, with the participation of government, retailers, consumers, third-party payment platforms and logistics service providers. Among them, the government provides certain preferential policies (subsidies, taxes, etc.) for manufacturers to construct and implement reverse supply chain. The manufacturer is responsible for the construction and implementation of the reverse supply chain, the construction of the recycling website and the recycling processing center, the completion of the payment and logistics process with the help of the third-party payment platform and logistics service
providers, the completion of the online evaluation, payment confirmation, recycling and other processes, and the improvement of the construction of the corresponding capital flow and information flow; When consumers have the demand for recycling, they should log in the website and input relevant information of recycling materials. Cooperating with manufacturers, express delivery enterprises are logistics service providers for recycling of recyclables. Relying on widely distributed service outlets, express delivery enterprises collect recyclables from consumers and send them to the recycling processing center of manufacturers to complete the logistics process of reverse supply chain. The electronic payment platform is undertaken by the third party to support the transaction payment and credit guarantee in the implementation of the reverse supply chain. In this way, consumers can return recycled materials to manufacturers without leaving their homes, and complete the relevant electronic payment process.

The construction of the recovery system of the reverse supply chain based on O2O is shown in figure 3.

![Figure 3. O2O classified recovery model.](image)

3. Analysis on the advantages of reverse supply chain under O2O classified recovery mode

O2O classified recovery model is a great step forward in the development of traditional recovery model. Compared with the traditional recovery model, it has many advantages.

3.1. Offline information online, information is the value

For manufacturers, the on-line information of recyclables and services is the advertised value with low cost and great effect. For consumers, they can dispose of their waste products with the least amount of time and the highest efficiency, and they can find the most suitable path without searching for the merchants and sites to recycle the products. Typical O2O classified recycling apps for information value mining are recycling brother, recycling treasure, love recycling, etc. It helps consumers to choose without leaving home, and meets the needs of both manufacturers and consumers.

3.2. Save time and cost for manufacturers

A manufacturer's primary task is to produce products that are affordable and meet demand. To achieve this, manufacturers must invest a lot of time and energy in developing new products and understanding the real needs of customers. In the traditional mode of manufacturer self-recovery, it must spend part of the time and energy to build the enterprise's reverse supply chain, and construct recycling sites and arrange recycling personnel in a large scale at home or even abroad. Due to the scattered distribution of recycled goods, manufacturers need to spend a lot of manpower and material resources to recover, plus the inventory cost, the recovery cost is too high, recycling activities are often unable to carry out effectively. In addition, because the reverse supplies chain and the external connection of the
enterprise, there are some operational risks. Therefore, the manufacturer self-recovery model is only suitable for the development of very stable, with a certain foundation of large enterprises. In contrast, the improvement of the third party recycling mode is to contract the reverse supply chain outside the enterprise to the third party, so that the enterprise can spare energy to focus on production. However, it is the advantage of the third-party recycling mode that leads to its lack of professional degree in recycling and lack of in-depth understanding of the classification of recyclables. In addition, the third-party recycling mode still uses offline information for recycling, and the collection, collation and utilization of information are limited to some extent.

Although there are still some problems in the O2O classified recovery model established in this paper, it has made great improvements in saving time and cost. In terms of saving time, manufacturers put the process of product recycling on the Internet platform, eliminating the step of setting up recycling sites and arranging professional recyclers in China or even abroad, and reducing the process of laborious information collection. In terms of cost saving, it saves a lot of expenses such as material cost and labor cost by eliminating the step of setting up recycling sites and arranging professional recycling personnel. Enterprises only need to pay a small intermediary fee, according to the corresponding rate of recycling waste products can be.

3.3. Increased consumer willingness to recycle
In the traditional recycling mode, the recycling site is fixed, and consumers have a single way to find the recycling site, which is time-consuming and laborious. At the same time, the recycling price is not satisfactory because it has not formed a certain scale of recycling. This reduces consumers' willingness to recycle. And O2O recycling mode to carry out the "Internet + recycling", comprehensively promote the reform of China's army of image and way of working, using mobile phone APP, WeChat and site for residents, O2O platform, the government, the circulation of the enterprise's share common way of life, the construction of domestic the most advanced, most ground "Internet + recycling of municipal waste recycling system. Using APP and recycling on the Internet will become a new mode and new business form of urban garbage classification, so as to realize the convenient connection between thousands of households and recycling channels. O2O platforms are directly targeted at all recyclable waste products in residents' lives, realizing the deep integration of residents' online recycling and offline recycling. As long as people tap their mobile phones, they can make an appointment for safe and reliable door-to-door service of recycling. The price is transparent, the operation is convenient, and the problem of waste classification can be solved in minutes. Such a convenient and profitable model will certainly increase consumers' willingness to recycle.

3.4. Protect the ecological environment and promote green development
With the rapid development of modern commercial economy and the diversification of consumer demand, a large number of resources are consumed and wastes are discarded at will, resulting in increasingly serious resource shortage and environmental pollution. Take plastic packaging as an example. According to the statistics of China plastic union packaging federation, in 2015, the sales volume of plastic film, packing boxes and containers reached 450.704 billion yuan, but the recycling volume of these resources was very little. Taking the express industry as an example, the actual recovery rate of cardboard and plastic in China's express industry is less than 10%, and the overall recovery rate of express packaging is less than 20%. After the introduction of O2O classified recycling model, consumers' enthusiasm for recycling has been enhanced, and the recycling efficiency has been greatly improved, which has greatly reduced the pressure on the ecological environment and promoted the green development of enterprises.

4. Conclusion
O2O classified recycling model is the product of the combination of traditional recycling industry and Internet. Its emergence is undoubtedly the progress of reverse supply chain. On the one hand, the contemporary classification recycling emphasizes the effect on the environment; on the other hand, the
fine remanufacturing of waste materials in the reverse supply chain is also a relatively advanced means of waste materials treatment. Its process is more complicated than simple dismantling, with more designed procedures and higher technical means. However, in terms of economic benefits and reuse of waste materials, simple dismantling is required. This is also the modern development of the classification of higher requirements for recycling. Therefore, we must speed up the construction of this area, constantly revise the shortcomings in the development, and let it provide us with better services.

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