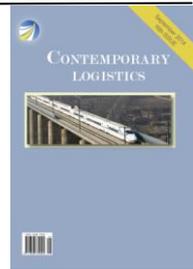




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Study on Recycling Channel of Waste Electronic Products in China

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KEYWORDS

Waste electronic,
Recycling channels,
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system

ABSTRACT

The production and consumption of electronics each year is enormous in China, resulting in severely environmental pollution. The developed countries have established effective and unimpeded recycling channels, based on the extended producer responsibility system. Enterprises give top priority to economic benefit without any environmental responsibility concept in the early period of large-scale development in China now. They always think that upfront inputs on environmental will affect business performance, reducing the profits. Manufacturers should be in the first place when we design the recovery channels for its high efficiency. There are three options: firstly, manufacturers reclaim directly from the customer; secondly, manufacturers provide appropriate incentives to existing retailers to promote its recovery; thirdly, manufacturers subcontract recycling activities to a third party.

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1 Introduction

Electronic wastes contain large amounts of heavy metals and other toxic, harmful ingredients which have impact on the environment and human health, although they have not been included in the hazardous waste. Therefore, they need to be scientific disposed. But there is a global difficulty—the management of reverse logics, especially for the electronic wastes. The early researches and practices on the waste reverse logistics started in some developed countries. Most countries' legislations on electronic wastes are mainly based on the system of extended producer responsibility theory. Thus, they build the reverse logistics system of electronic wastes.

2 Foundations of the Study

Goggin and Browne (2000) studied the terminal of electronic wastes recovery. They divided them into three categories: (1) The public and the private; (2) Commercial and domestic market; (3) The huge and the small. Thierry (1995) divided the processing method of recovery into three types: (1) Direct reuse; (2) Recovery management (repair, renovation, re-manufacturing, disassembly and recycling); (3) Wastes management (incineration and landfill). Carter and Ellram (1998) come up with the drive and restriction model on reverse logistics. They believed that there were four kinds of force directly influenced the reverse logistics: (1) The government; (2) Supplier; (3) Buyer; (4) Competitors.

Anderson (2005) believed that reverse logics, which made wastes collected, storied, sorted, classified and transported and so on, could be constructed based on original logics. The participants of reverse logics can be dynamically select from the existing

distribution chains. So they could become two-way channels. Rezzan (2000) believed that manufacturers could better use of their abilities as the main recycling participants. It also could achieve different products recycled through the same channel. The reverse logistics integrated with original ones will change the long-term actions of participants from the strategic perspective. The coordination within supply chain would be optimized, and finally, it would become a closed loop. Spicer (2004) believed that producers would pay attention to product design under the manufacturer recovery mode. Producers would consider the reverse logistics management according to the life cycle of product, which could do good to improve technology. At the same time, the processing activities would be carried out according to the product design data because of the two-way flow of information. The economic and information closed loop would also formed correspondingly with logistics closed loop. The two-way flow of information could provide timely and reliable information for recycling logistics, effectively guide the recycling activities.

3 Current Situation of Recycling Channels in China

The key to build a reverse logistics system is building recycling channels of waste products. The main modes of recycling channel in China now are as follows: civil recovery, supply and marketing cooperatives/recycling companies, and electronic waste processing centers.

3.1 The civil recovery method

Civil recovery means that individuals recycle electronic wastes and then sell them to hand-work shops. Dismantling process of these shops is: classification and inspection. Firstly, they pick up ones that could be directly sold again as second-hand electrical appliances. Secondly, they scatter the others. Thirdly, they refurbished or even reassemble the components and raw materials. This mode is rather low reproductive, backward processing technology and serious pollution.

3.2 Supply and marketing cooperatives/ recycling companies' recovery method

This mode recycles electronic wastes through supply and marketing cooperatives/recycling companies. Recovery sectors were founded in the period of planned economy. Recovery sectors process and classify electronic wastes generally, and then provide components and raw materials to corresponding industrial enterprises. Complex recycling categories and non-professional processing are the disadvantages of this mode.

3.3 Waste electronic processing centers recovery method

Some recycling centers fitted with national standards are established in Zhejiang Province and Qingdao City after they were both listed as experimental unit by National Development and Reform Commission. These centers have been modernized and effective with no pollution through the introduction of expensive dismantling and purifying equipment. But the price is lower than civil recovery with high cost. Besides, consumers' awareness and social responsibility are not widely spread. Therefore, all recycling centers are facing the same problem: the shortage of raw materials.

The recovery mode of electronic products in China is very backward as the above analyzed, not only in efficiency, but also in serious environmental pollution. The advanced electronic waste processing center in developed countries can't be introduced directly, because our recovery rate is rather low.

4 Channel Modes

Recycling system mainly depended on manufacturers' completing the reverse logistics processing of recovery. This is the idea of extended producer responsibility that is producers should not only be responsible for the environmental pollution caused by the production, but also bear certain responsibility for waste products. The later is more important of extended producer responsibility. But it is unrealistic to apply the extended producer responsibility in China now. Subsidized by government, manufacturers taking responsibility for waste products will urge them turn the waste to raw material and reuse them.

The manufacturer recycling system subsidized by government constructs reverse logistics about recycling, processing and reusing. It is dominated by manufacturing enterprises, which complete recovery and processing. There are a variety of subsidies to them. The participants include manufacturers, retailers, consumers and third party.

Manufacturers contribute capital to set up recycling & sorting centers, reproducing factories, and warehouses encouraged by the government. The manufacturer recycling system has the following options: (1) They can recycle directly from consumers; (2) They can provide appropriate incentives to the existing retailers (distribution channels) to encourage the recycling; (3) They can transfer recycling activities to any third party.

4.1 The operation of recycling mode of manufacturers on their own — M

The recycling mode of manufacturers on their own refers to a mode that consumers return discarded products directly to the manufacturer after consumption. Manufacturers are responsible for recycling and processing. Subsidies from government are

obtained all by manufacturers in this mode. The basic way of the recovery processing shows in Figure 4.1. This way of recycling cost less because of fewer participants. It is more suitable for small size products. It was adopted by Xerox Co on ink cartridge recycling. The procedure is: consumers put the waste into a special bag and sent back to the manufacturer. On the bag, special postage label must be pasted, which is paid by manufacturer. Returns are used again on the whole, component reuse or recycling after cleaning and testing. Perfect wastes are distributed to consumers again through market. Reverse logistics is compose of recycling process and waste product sales.

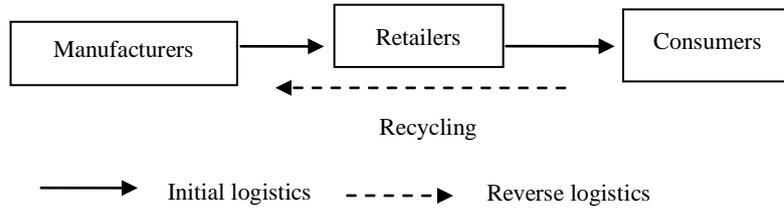


Figure 4.1 Recycling mode of manufacturers

4.2 The operation of recycling mode of retailers — R

In the retail recycling mode, consumers return the used product to retailers, and retailers transfer to manufacturers for processing, see Figure 4.2. Retailers have lots of shops, wide network, and direct contact ions with consumers, so they can effectively recycle the waste appliances. The manufacturer and the retailer share recycling subsidies given by government in this mode. But how to distribute the subsidies is according to the t negotiation. The retailer recycling mode works as following: retailers recycle the waste electronic products and transfer to manufacturers according their negotiation. Retailers can recycle in two ways: by change new products with used one, or by setting up a recovery point where consumer can return the waste products. The returned products are stored in the warehouse, and retailers sent them jointly to the recycling center (built by the manufacturer). Waste products are transported to the manufacturers and remanufacturing after classification in the recycling center. Product quality is ensured by strict testing of remanufacturing. Remanufactured products deliver to retailers to sell again without any difference.

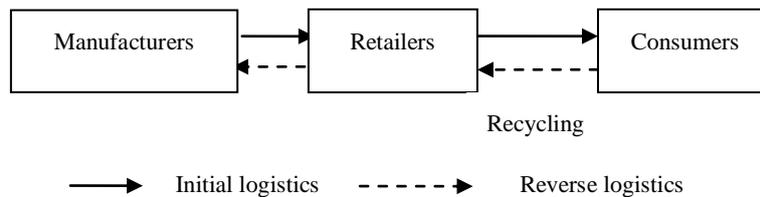


Figure 4.2 The recycling mode of retailers

4.3 The operation of the third party recycling mode — 3P

In the third party recovery mode, the manufacturers sign agreements with the selected third parties. Consumers give used products back to a third party, who transfers to manufacturers. Government subsidies are shared by the manufacturer and the third party, but how to distribute the subsidies is according to the t negotiation, the same as manufacturers and retailers. The third party recovery mode works as following: The third parties recycle waste products and transfer to the recycling enterprises manufacturer sited. Components that can be reused are disassembled or processed. Useless components are classified and cut into pieces, becoming different types of raw material of plastic, metal etc. The plastics and metals are further processed into raw materials for daily necessities, manufacturing pen, ruler, benches, the rest of the materials can be used for energy production, or disposed in an environmentally friendly way.

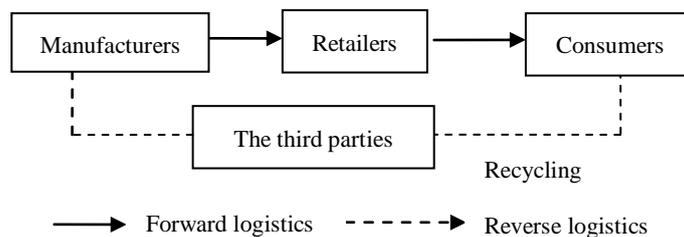


Figure 4.3 The third party recovery mode

5 Conclusions

It can be viewed as a highly professional mode that manufacturers play a main role in recycling, which is led by the manufacturers. As Steinberg leader, manufacturers are responsible for specific issues, such as recovery, processing and reuse. The original manufacturers take certain economic and physical responsibility for their own products.

5.1 Make full use of the forward channel

Decisions on recycling can be adjusted according to initial logics for the processing center which is governed by the manufacturers themselves. So the efficiency of the whole chain increases. We can build up the reverse logics using the initial logistics to achieve collection, storage, sorting, classification, transportation and other reverse distribution; what's more, this network after the integration greatly improved on recycling. Compared to the initial logics, reverse logics is more beneficial for environmental protection. A lot of consumables appliances would be disposed before, while they would be reused, remanufactured and recycled through reverse logics.

5.2 In favor of producers to improve product design

Manufacturers can receive timely feedback information at first hand through the direct recovery, such as the quality and features of the products. It is also conducive to timely realize technology defectives and improve product design and production process. Establishing reverse logistics, manufacturers can not only fulfill the responsibility of environmental, but also bring about new business growth due to the design, manufacturing and processing technology improved.

5.3 Maintain images of the enterprise and their products

Consumers' repeat purchase can be increased when manufacturers change new products with used ones. Consumer loyalty improves as well. Manufacturers can rebuild the image by recycling. The social benefit increases along with manufacturers' public images. The information on raw materials, structure design can be revealed when recycled. Thus, some design patents for certain products can be let out. This secret leakage risk can be avoided by the manufacturers responsible for recycling.

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