

# Critical review of Reverse Logistics in Packaging Industries

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**Abstract:** *Artery and vein are responsible for the transportation of blood in human body as well as vertebrate. Two directional flows are simultaneously occurred in the circulation with nearly zero environmental impact. An industry is analogous to a human body and logistics deals with transportation system. But only when logistics and reverse logistics play effective role consistently the industry can be said to be balanced, more profitable and more environment friendly. Reverse Logistics is the process of moving goods from their typical final destination for the purpose of capturing value. Reverse Logistics and closed loop have garnered a lot of attention among both academia and practitioners because of their diverse environmental, legal, social and economic factors. This is evident by the vast number of publications in scientific journals which have been published in recent years. The sole aim of this paper is to review recently published papers in reverse logistics and closed loop supply chain in scientific journals.*

**Keywords:** Reverse Logistics, Closed-Loop Supply Chain, Forward Logistics, secondary market.

## 1. Introduction

Initially, the growing attention on Reverse Logistics (RL) and Closed-Loop Supply Chain (CLSC) issues originated with public awareness [6]. Then governmental legislation forced producers to take care of their End of Life (EOL) products. For instance, the Waste Electrical and Electronic Equipment (WEEE) directive [11] became European law in 2003, which consisted of obligatory prerequisites regarding the collection, recycling and recovery for all types of electrical goods, with a minimum rate of 4 kilograms per head of population per annum [7]. This was followed by introduction of WEEE like legislation was in Canada, Japan, China, and many states in the US [8]. RL/CLSC is now a revenue opportunity for manufacturers instead of a cost-minimization approach [9]. A supply chain, in its classical form (forward supply chain), is a combination of processes to fulfil customers requests and includes all possible entities like suppliers, manufacturers, transporters, warehouses, retailers, and customers themselves. [10]

### 1. Reverse Logistics (RL) and Closed Loop Supply Chain (CLSC):

The mere sense of cut-throat competition is prevalent in every field today be it the low-key retail sector with meagre profit margins or the ever blooming manufacturing and packaging sectors. Firms are always thirsty for new and new opportunities to enhance their bottom lines and to tackle the defects in the system in a productive manner. Logistics plays an important role in any packaging firm, as it involves the

minimal use of human-force, machine and material. Although Reverse Logistics is a new thesis, yet it holds the tendency to become an integral part of the total logistics of a company, if

planned meticulously and executed in a proper way. Reverse logistics has been observed to play a profound role in almost any industrial firm, regardless of size, product and geographical reach of the firm. According to the American Reverse Logistics Executive Council, reverse logistics is defined as “The process of planning, implementing, and controlling the efficient, cost effective flow of raw materials, in-process inventory, finished goods and related information from the point of consumption to the point of origin for the purpose of recapturing value or proper disposal” [12]. Generally reverse logistics, start from end users (first customers) where used products are collected from customers (return products). This is followed by attempts to manage EOL (End-of-life) products through different decisions such as recycling (to have more raw materials or raw parts), remanufacturing (to resale at second markets or if possible to first customers), repairing (to sell in the second markets after repairing), and finally, disposing of some used parts. Indeed, reverse logistics generally, start from end users (first customers) where used products are collected from customers (return products) and then apt attempts are made. If forward and reverse supply chains are considered simultaneously, the resultant network would be a closed-loop supply chain. Based on the new definition, closed-loop supply chain management is the design, control, and operation of a system to maximize value creation over the entire life cycle of a product with a dynamic recovery of value from different types and volumes of returns overtime [5]. This definition throws light on the explicit business point of view instead of other factors like legal, social responsibilities or even operational and technical details. Indeed, practitioners focus on the profitability and value of their RL/CLSC instead of expense efficiencies or other costly objectives. Based on the new definitions of the CLSC revealing recent requirements and new situations, it is essential to have a comprehensive review to help researchers work efficiently on future directions.

## 2. Forward and Reverse Logistics

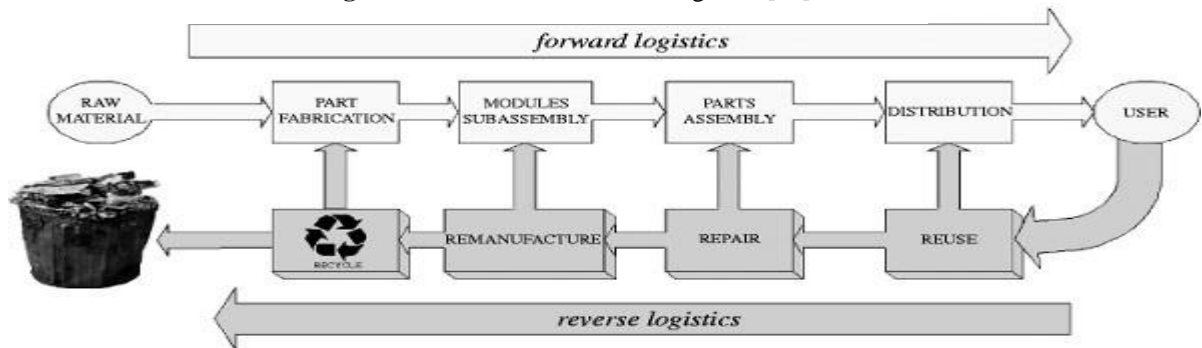
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- In Forward Logistics, forecasting is relatively straight forward whereas in Reverse Logistics forecasting is relatively more difficult.
- Forward Logistics involves one to many distribution points whereas reverse logistics comprises of many to one distribution points.
- In Forward Logistics product quality and product packaging is uniform whereas in reverse logistics product quality is not uniform and product packaging is often damaged
- In Forward Logistics Disposition options and routing/destination are explicit whereas in reverse logistics the formerly specified aspects aren't expressed in such an explicit manner.
- Pricing of Forward logistics is relatively uniform whereas that of Reverse Logistics is dependent on many factors .Moreover Forward Distribution costs are easily visible as compared to Reverse distribution costs.
- In Forward Logistics importance of speed is taken into consideration whereas in Reverse logistics speed is not considered as a priority.
- As inventory management is consistent, thus product lifecycle is manageable in Forward Logistics, whereas in Reverse Logistics, inventory management is not so consistent and product lifecycle issues are more complex.
- As far as Forward Logistics is concerned negotiations between parties is straightforward whereas in Reverse Logistics negotiations is further complicated by several factors.
- In Forward Logistics Marketing methods are well known and the visibility of process is more transparent whereas in Reverse Logistics, the marketing methods are complicated by several factors and thus aren't as clear as the formerly specified .Also Visibility of process is less transparent.

**Figure 1: Forward and Reverse Logistics [13]**



### 3. Methodology

Reverse Logistics stands for all operations related to the reuse of products and materials. It is the process of planning, implementing, and controlling the efficient, cost effective flow of raw materials, in-process inventory, finished goods and related information from the point of consumption to the point of origin for the purpose of recapturing value or proper disposal and as a result near about zero environmental effect[3]. In lay man's words reverse logistics is the process of moving goods from their typical final destination for the purpose of capturing value, or proper disposal. Apart from reusing the containers and recycling the packaging material, it also involves processing returned merchandise due to damage, seasonal inventory, restock, salvage, recalls and hazardous material programs, obsolete equipment disposition and asset recovery[17]. Logistics basically deals with events that bring the product closer to the customer. In case of reverse logistics the resource goes at least one step back in the supply chain. For instance, goods move from the customer to the distributor or to the manufacturer followed by recycling, remanufacturing, reforming damping. So two types of process are aggregated here:

- 1) Collection process.
- 2) Functional process

#### 4.1 Collection of product from customer:

Typically Reverse Logistics comprises of the processes a company uses to collect outdated products, used, damaged, unwanted (stock balancing returns) as well as packaging and shipping materials from the end-user or the reseller. Once a company receives the returned product, the firm has several methods at its disposal to choose from. When a product starts to get damaged, then the most common way adopted by the customers is to discard it (Customers may discard it into a drain too). Thus "collection" forms the base of the reverse logistics and analyzing this transportation network design of supply chain is initiated. TAILORED NETWORK is the most widely used transportation network. It is commonly known as 'Situation demand networking system'. Basically it's an amalgamation of different network system where there is a apt combination of supplier, customers, Distribution Centre, Cross-docking and milk run approach .This network is considered as advantageous mainly because it reduces the cost ,time and it also improves the responsiveness i.e. tolerance towards various other external factors .Moreover it is a perfect network for collecting product reversely.

#### 4.2 Functional Process:

Depending upon the nature and condition of the product ,different kinds of methods and treatment are adopted .If on returning a product to the supplier ,the firm acquires a full refund ,then it might be the most sought after option .If the

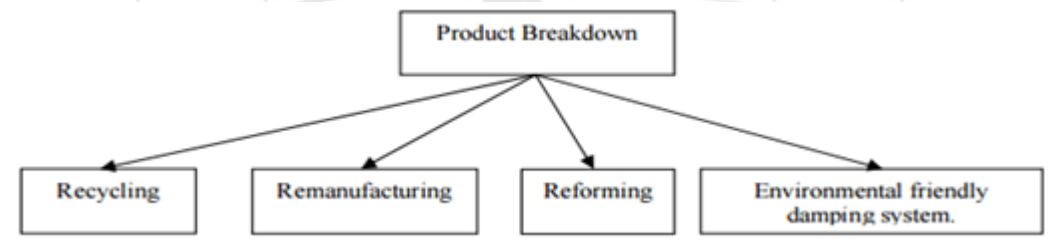
product is unused then it might be resold to a new customer or may be through an outlet store or online portal. If the product doesn't fit the formerly specified criteria the it might be sold to a salvage firm via which it might be exported to a foreign market. If the product is not fit to be sold as it is or it requires some further embellishment which might increase its selling price then appropriate activities are carried out in order to recondition, refurbish the product .If the firm is incapable to perform these refurbishment activities then an external firm may be hired to carry out these activities or the products may be sold directly to a reconditioning/ remanufacturing/ refurbishing firm. If due to certain aspects like poor condition of product, legal implications, or

environmental restrictions the product cannot be refurbished in any way, then the firm would dispose off the product at least cost. Certain recyclable materials as well as valuable materials which can be reclaimed would be separated from the remainder before it is sent to the landfill. So this system ensures us a controlled damping system where pollution is tried to be minimised. After this related parallel operations like recycling, remanufacturing, reforming and damping are functioned. The first step in the functional process for the used product is breaking down followed by other respected operation. This related parallel operations like recycling, remanufacturing are followed by reforming and damping.

**Figure 2:** Reverse Logistics Process [14]



**Figure 3:** Functional Process Overview [4]



#### 4. Improvements:

Reverse logistics serves as an important method to control the scenario of environmental pollution caused due to packaging industries. A newly design product flow with reverse logistic can solve this problem entirely. Managing reverse logistic flow is the main concern for this purpose. A few initiatives can make the system easy and efficient like:

##### 5.1 Standardization of Processes:

The lack of standardization of processes throughout an organization is one of the most common difficulties observed with current reverse logistics systems. Unstandardized processes may be burdensome as it results in the lack of proper communication among the people in an organization thereby acting as an hindrance to the proper management of reverse logistics problems.

##### 5.2 Centralized Return Centres:

Centralized Return Centre (CRC) is a must in an agreement as the presence of a separate CRC is pretty beneficial. This approach is must as it enables the user to perform their activities in association with reverse logistic system.

##### 5.3 Secondary Markets Management:

The secondary market basically comprises of firms that specialize in buying surplus, close-outs and salvage items at very low prices. It has to move secondary market for benefit of the company. The material which is not useable for quality product must be moved to secondary market.

##### 5.4 Web-Based Secondary Markets:

In today's internet era, goods can be sold via online outlet too. Selling through online outlets has its own pro's, for instance it exempts the customer from running door-to-door in search for the dealer. A proper functioning an secured interface would ensure that the dealer and the packaging industry's firm would deal with their exchange in a profitable and efficient manner. Thus as per the recent dependency on worldwide web, it seems that in the future it will be an important mechanism for dispositioning from the reverse logistics flow.

##### 5.5 Financial Management:

Good Financial Management serves as an important aspect to be considered while implementing reverse logistics. Often firms land up investing enormous sums in unwanted and unnecessary procedures, without introspecting the requirements of the process with respect to their business .Firms need to research, analyze and devise the right methodology for their business rather than blindly following the initiative adopted by others. Because what may work out for one firm might not prove to be beneficial for another firm. Investments should be made only after the conductance of proper analysis.

##### 5.6 Enrich environmental safety concern:

Adequate initiation for built national consensus on grounds of environmental safety must ensure this activity definitely motivate user to direct their useless product to CRC.

#### 6. Importance of Reverse Logistics:

With the ever growing manufacturing world and the on come of automation the number of products released into the market has increased remarkably , owing to their mass production .This enormous growth has not only resulted in the overuse of the natural resources but has also resulted in the generation of lot of packaging goods, thereby increasing the generation of industrial waste. In such an adverse situation, concept of Reverse Logistics serves as an apt solution to the problem. An activity in which no goods or materials are being sent backward cannot be termed as Reverse Logistics activity. Reverse Logistics also comprises of processing returned merchandise due to damage, restock, salvage, seasonal inventory, recalls, and excess inventory. It also includes recycling programs, hazardous material programs, obsolete equipment disposition, and asset recovery. The great competitive environment in the retail sector has resulted in the emergence of return policies as a competitive weapon .It actually began with the grocery retailers, directing serious attention towards the problems of return and contemplated over innovations related to reverse logistics, thereby introducing the concept of Reclamation centres, despite the mere fact that their profit margins are so slim that good return management is critical. Reclamation centres, in turn, led to the establishment of centralized return centres, which have turned to be quite beneficial to the firms which have implemented them. In general, the large retailers are much more powerful than the manufacturer's .Returns affecting the profits of retailers more adversely as compared to that of manufacturers. Returns reduce the profitability of retailers by 4.3%. The average amount that returns reduce the profitability among manufacturers is slightly less, at 3.80%. According to the recent records of a survey it is observed that retailers use a centralized return facility for handling returns much more frequently than manufacturers. It has been observed that retailers are tending to sell returns to a broker or similar entity.

The massive outburst in the rate of electronic consumption globally is accompanied by increased waste generation. This waste is basically electronic waste generated at the end of a device's life but there is also significant waste generated several times in the forward and reverse logistics processes for these same devices. As branded manufacturers, 3PL's and reverse logistics providers strive to reduce costs, enhance their bottom lines and work towards the call for increased sustainability there's a unique concept of Single use packaging. Single use packaging for reverse logistics is extremely prevalent in most processes today. With the multiple consolidation points, shipments to the concerned repair depot and then ultimately back to the point of purchase or consumer, packaging is changed various times throughout a cycle, thereby producing significant waste. And with some of the paper packaging that is used today, there is further damage being done to devices within this loop, often increasing the cost of repair or resulting in the disposal of the device. A bio plastic container to ship consumer electronic

devices within a closed loop serves an excellent solution for this application. It thus creates a true “cradle-to-cradle” ecosystem. It is also responsible for the dramatically lower carbon footprint, elimination of waste and ROI. Key elements to delivering the benefits include:

### **6.1 Bio-plastic containers made with petroleum free materials:**

Bio-plastic is a form of plastic derived from renewable biomass sources such as vegetable oil or micro biota. Bio-plastic containers for consumer electronic goods will not only provide a protection to the device from mechanical and physical damage but would also curb further damages in shipping. Moreover they are designed in such a rugged way that can be used be reused many times. Since they are made with bio-based materials petroleum-free these containers possess zero material carbon footprint and the process to make them produces at least 30% less greenhouse-gas emissions.

### **6.2 Reuse of containers for multiple shipping cycles-**

Reusing bio-plastic containers would give us a significant return on our packaging investment. With the unit cost of a bio-plastic container being more than the unit cost of paper packaging, most companies are observing break even at some point in the second shipping cycle. As a result of which, in less than 2 turns, they are in view of a return on their investment. Bio-plastics are capable of attaining more than 10 cycles easily.

### **6.3 Closed loop process-**

Nowadays most reverse logistics processes deploy a closed loop system. It means that while a device that needs to be repaired or refurbished venture into the repair process and stays in that loop until it returns to the retail outlet. Ensuring close integration of the delivery of bio-plastic containers into the closed loop reverse logistics process forms a major critical success factor. Because of this integration and operation in a closed loop system, it is virtually ensured that all of the reusable containers are tracked down and returned to the concerned producer.

### **6.4 Re grind of containers back into raw material**

When the bio-plastic container comes to the end of its useful life in the closed loop, it gets returned to the producer. The producer would re grind the bio-plastic container back into pellets to be used as raw material to make other products. This is the perfect instance of a term “cradle to-cradle”, thereby emphasising ultimate sustainability.

## **7. Conclusion**

Reuse of products and materials is not a new marvel, deposit systems for soft drink bottles, waste paper recycling and metal scrap brokers are all examples that have been around for a long time. However, reverse logistics as a research field is a relatively new phenomenon. In the past decade reverse logistics acquired universal recognition both as a research field and as a practice. Although reverse logistics has been garnering a lot of attention in the recent years, but it still it has not been embraced by most of the packaging companies as they yet haven't completely understood the utility of reverse logistics and its importance in the long run. As a result of

which reverse logistics is too often viewed as an expensive and recurring headache. According to a study, conducted a few years ago, two professors of University at Nevada asked more than a hundred companies why they didn't have a strong reverse logistics program, nearly 40% said returns management didn't seem as important as other issues. 34.3% of the supply chain executives said they didn't have the right system in place, more than one third said company policies inhibited them to do so. Such kind of inappropriate attitude towards reverse logistics need to be strongly condemned as reverse logistics though seems to be one of the biggest operational challenges in the world of E-Commerce cargo logistics due to the mere volume and cost of processing returns but still its effectively may result in direct benefits such as decreased resource investment levels, improved customer satisfaction and reductions in storage and distribution costs.

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