

# **Reverse Logistics: Performance Measures and their effect in product lifecycle**

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## **Abstract**

In today's world reverse logistics has been gaining more interest than ever to overcome government regulations and generate profit making opportunities. Increased competition due to globalization and technological advancement has driven organizations to make efforts to improve efficiency in their supply chain. Increasing efficiency of reverse logistics processes is one way in which firms attempt to maintain and increase competitiveness and market share. Good reverse logistics design can save cost, increase revenues, and gain competitive edges over the rivals. An optimized performance measurement of reverse supply chain is an important task for an organization to gain maximum benefit.

**Keywords:** Strategic Performance Measures, Product lifecycle, Reverse logistics strategies.

## **Introduction**

In a world of finite resources and disposal capacities, recovery of used products and materials is the key to supporting a growing population at an increasing level of consumption. [21][13] Reverse logistics is the term often used to refer to the role of logistics in recycling, waste disposal, and management of hazardous materials; a broader perspective includes all issues relating to logistics activities to be carried out in source reduction, recycling, substitution, reuse of materials and disposal [20]. 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 or creating value or proper disposal." [19] Reverse logistics practices are in the position of being an

asset rather than a liability. Volumes of product returns are increasing every day in several industries. Returns can occur at any time during the product lifecycle [10]. Reverse logistics refers to the movement of goods from a consumer towards a producer in a channel of distribution. It is the process whereby companies can become environmentally efficient through recycling, reusing, and reducing the amount of materials used. Reverse logistics can be seen as part of Sustainable Development. It is an approach to meet the needs of the present without compromising the ability of future generations to meet their own needs. A good reverse logistics strategy is needed to cope with this return to gain the most benefits. Enterprises need to measure their logistics performance to improve their revenue growth, reduce their operation cost, and increase their shareholder value.

Reverse logistics is necessary for the following reasons:

- Positive environmental impact
- Competitiveness advancement
- Regaining value

There are four important stages in Reverse Logistics:

- Collection is the first stage, where product types are selected and products are located, collected.
- Inspection/ Sorting is the next stage which may be carried out either at the point/ time of collection itself or afterwards.
- Location and distribution is the critical stage of reverse logistics. [22]
- Capacity decisions aims at providing the right amount of capacity at the right place. Facility decisions are affected by estimated returns, costs, competitors' behavior and other strategic and operational considerations.

[11] defined reverse logistics process (recovery chain) as:

- Collection refers to purchasing, transportation and storage activities.
- Inspection / separation result in splitting the flow of used products according to re-use options. It may encompass disassembly, shredding, testing, sorting and storage steps.
- Re-processing means the actual transformation of a used product into a usable product. It may take different forms including recycling, repair and remanufacturing.
- Disposal is required for products that cannot be re-used for technical or cost reasons. It may

include transportation, land filling and incineration steps.

- Re-distribution refers to directing re-usable products to a potential market and to physically moving them to future users. This may include sales, transportation and storage activities.

Five strategic factors those are important for reverse supply chain, as follows: [8]

1. Costs
2. Quality
3. Customer
4. Environmental concerns
5. Political/legal concerns

The objective of this research is “To define important measures responsible for measurement the Performance of Reverse Logistics, to maximize revenue within given technical and organizational attributes” using fuzzy theory and statistical process.

## **Literature review**

Council of Logistics Management (CLM) published three relevant studies on reverse logistics. The first one making a thorough exam of reverse logistics introduced the subject from a waste reduction perspective [20] the second study was dedicated to

the opportunities offered by reverse logistics in the context of reuse and recycling [16]. Third study was dedicated to the implementation and development of reverse logistics [19] took a slightly different perspective on Reverse Logistics by analyzing companies' product take back policies. RevLog published two books, one on quantitative modeling as for aiding reverse logistics decision-making [7] And the other on managing closed-loop supply chains [7]. Thierry (1995) has provided one of the first systematic analyses of operations management issues in a product recovery environment. [14] investigated the performance of collection and recycling systems of household waste, with specific emphasizes on packaging materials. [17] addressed the determination of recovery strategies and the logistics network design. [11] dealt with quantitative models for reverse logistics network design and for inventory management with returns. [5] analyzed the influence of both the product and the relationship between actors on the efficiency of logistics systems for recycling. [6] put together a review of transportation and packaging, purchasing and other literature on reverse logistics. He investigates drivers and constraints determining a company's Reverse Logistics activities.

## **Reverse Supply Chain Performance Measurement**

Reverse Logistics being a relatively new concept demands some kind of performance measurement methodology. Performance measurement drives actions in two aspects. First monitored measures get high visibility with an organization; second, metrics drive organizational actions by identifying areas of improvement [3].

Some of the desirable attributes of performance management are: [1]

- 1) Performance metrics should be linked to strategy
- 2) Performance metrics should be developed for activities and business processes
- 3) Performance metrics should be dynamic, keeping pace with changes in strategies, processes.
- 4) Performance metrics should be developed in an inclusive, team based manner.

The nominal group technique suggested by Wisner and [9] is a tool specifically designed for developing strategic performance metrics for business processes and activities.

### **Strategic performance perspective**

The balance scorecard has been recognized as a leading tool for performance measurement in both research and industry. It helps aligning the measures with the strategies [15]. The balanced scorecard allows managers to look at the business from four divergent important perspectives: Customer, Internal business, Innovation and Learning, and Finance [2]

1. The customer perspective asks what customers must believe about the company's reverse logistics operations in order for it to be successful.

- **Objective** To improve customer view of RL operations and services and to increase customer satisfaction

- **Measures**
  1. Customer satisfaction Index
  2. No of eco friendly products
  3. Response time for reimbursement

2. The Internal business perspective asks what the reverse logistics operations must achieve internally to meet and exceed the customer's needs. [4]

- **Objective** To reduce the product recovery time and to decrease the no of items entering the RSC

- **Measures**

1. Disposition time
  2. Idle time of returned products
  3. Capacity utilization
  4. Recycling fraction
3. The innovation and learning perspective asks how the reverse logistics operations can continuously perform and improve to create more value for the customers.
- **Objective** To develop new RL operations and be competitive in the market
  - **Measures**
    1. Number of ISO 9000 and EPA certification
    2. Implementation of leading technologies
    3. Information flow
4. The finance perspective recognizes that ultimately companies must succeed financially in nature.
- **Objective** To reduce the overall cost of the RL operations and capture maximum value
  - **Measures**
    1. Annual sales of returned product
    2. Cost of additional equipment and labor
    3. Cost of transportation of returned products

## **Product Lifecycle Analysis**

In order to understand the reverse logistics flow behavior there are five phases that are defined

during the lifecycle of a product: introduction, growth, maturity, decline, and obsolete.

Characteristics	Introduction	Growth	Maturity	Decline	Obsolete
Sales	Slow but increasing	Increasing rapidly	High and Stable	Decreasing	Sales only aftermarket source if at all
Return Volumes	Low	High	High and Stable	Low	Low
Variability of returns	Low	Very High	High	Low	Low

### Reverse Logistics activities

- **Gate keeping** has been defined as “the screening of defective and unwanted returned merchandise at the entry point into the reverse logistics process”. It is determining which products to allow in the reverse logistics system. Successful gate-keeping allows firms to control and reduce the rate of returns without damaging customer service. It is the best point to avoid unnecessary cost and management of materials by screening unwanted returned merchandise.
- **Sorting and Storing** refers to deciding what to do with each product by segregating into categories that will be processed, sold, or disposed. It is a crucial step in the reverse logistics process because employees make

decisions on what ultimately happens to the returned product.

- **Asset recovery** is the “classification and disposition of returned goods as surplus, obsolete, scrap, waste and excess material products, and other assets, in a way that maximizes returns to the owner, while minimizing costs and liabilities associated with the dispositions” [19]. The objective of asset recovery is to recover as much of the economic and ecological value as reasonably possible, thereby reducing the ultimate quantities of waste. The various actions that an organization can take in asset recovery are:
  - Repair, Remanufacture, Refurbish (these three involve making the product reusable for its intended purpose)
  - Recycle, Retrieve (these two for reusing the parts of a product for different purpose)
  - Dispose (landfill as waste).
- **Transportation** of the reverse logistics process is considered to be the actual movement of goods from one node to another within the reverse logistics network. Transportation is usually the largest reverse logistics cost, often

25 per cent or more of the total reverse logistics costs.

### **Reverse Logistics Enabling Strategies**

Economic factors, legislation, corporate citizenship and environmental and green issues are considered as the four main drivers of reverse logistics. Based on the importance of these drivers to an organization and their goals and objectives the company must adopt six core business strategies to be successful in reverse logistics. The selected strategies are:

- Customer Satisfaction (CS) the voice of the customer is the most important aspect of reverse logistics management. Customers do respond to companies' behaviors, and the goodwill developed through reverse logistics and proper disposal of products can create substantial customer loyalty. Efficient reverse supply chains can mean happier customers and higher profits.
- New Technology (NT) Implementation and technology support has been recognized as a competitive weapon capable of enhancing firm performance [18] new applications and tools may be required for compliance reporting, track

and monitor customer returns and manage returns data. The technology development to handle reverse logistics should be flexible enough to handle inevitable future expansion and exceptions involved in reverse logistics.

- Eco-compatibility (EC) and environmental performance continues to be a focus item for many companies. Regulations, laws, corporate and consumer awareness, as well as competitiveness, have companies initiating actions to reduce hazardous material, to take back their products, and to minimize product energy usage [12]
- Strategic alliances (SA) are often used to rationalize business operations and improve the overall competitive position of a company. A strategic alliance allows a company to take advantage of what it does well and enables it to seek partners who have strengths in other areas. The strategic alliance formation benefits every member of the supply chain to focus on their core competencies.
- Knowledge management (KM) is a multi-disciplined approach to achieve organizational objectives by making best use of knowledge. It involves the design, review and implementation



of both social and technological processes to improve the application of knowledge, in the collective interest of stakeholders. Constant innovation and learning processes are necessary for the successful conduct of reverse logistics operations.

- Value Recovery (VR) from returns is a key to successful reverse logistics in any organization. Reverse supply chains were designed to be cost efficient. For items that can be resold, the goal is to get them back in the sales channel at the highest selling price as soon as possible. The goal of an organization in terms of value recovery is to get returned product available for resale at the highest possible price.

## Summary and conclusion

Since reverse logistics is an important approach for any organization to achieve maximum growth and it involves a number of activities and factors. There are various strategies involved in reverse logistics those affect the performance of reverse logistics operation. During a product lifecycle at every stage these measures and strategies causes for a chance of improvement. So while evaluating the performance of reverse logistics system these measures and their

relative effect to the strategies should be considered.

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