

Reverse Supply Chain: Completing the Supply Chain Loop

Executive Summary

Traditionally, businesses have concentrated on improving the forward supply chain for their products (e.g., manufacturer-wholesaler-retailer). However, as the business environment becomes more competitive, it becomes increasingly important for them to concentrate on optimizing the backward loop, as well. Reverse logistics practices have been in existence for a long time, especially in the automotive industry, where manufacturers try to recover value from recycling car parts.

In this whitepaper, we've defined the reverse supply chain process, the steps involved and how it can be used as a strategic business weapon. Examples of how the consumer electronics, automotive and retail industries handle reverse logistics are offered. We also provide an overview of key trends and best practices that will power the reverse logistics process going forward. Also covered are reverse supply chain models such as centralized postponement of returns, decentralized preponement of returns, use of information technology in enabling supply chains and the zero returns policy adopted by some consumer electronics players. In the end, we briefly look at the inherent challenges that a reverse supply chain faces, such as managing customer expectations on returns policies, partnering with other players in the supply chain and handling the mounting pressure from regulatory authorities.

Reverse Supply Chain

Reverse supply chain refers to the movement of goods from customer to vendor. This is the reverse of the traditional supply chain movement of goods from vendor to customer. Reverse logistics is the process of planning, implementing and controlling the efficient and effective inbound flow and storage of secondary goods and related information for the purpose of recovering value or proper disposal.

Typical examples of reverse supply chain include:

- Product returns and management of their deposition.
- Remanufacturing and refurbishing activities.
- Management and sale of surplus, as well as returned equipment and machines from the hardware leasing business.

In these cases, the resource goes at least one step back in the supply chain. For instance, products move from customer to distributor or manufacturer. Other instances of products reversing direction in the supply chain are manufacturing returns, commercial returns (B2B and B2C), product recalls, warranty returns, service returns, end-of-use returns and end-of-life returns.

There are various types of reverse supply chains, and they arise at different stages of the product cycle; however, most return supply chains are organized to carry out five key processes:

- **Product acquisition:** Obtaining the used product from the user by the reseller or manufacturer.
- **Reverse logistics:** Transporting products to a facility for inspecting, sorting and disposition.
- **Inspection and disposition:** Assessing the condition of the return and making the most profitable decision for reuse.
- **Remanufacturing or refurbishing:** Returning the product to its original specifications.
- **Marketing:** Creating secondary markets for the recovered products.

Figure 1 demonstrates a simplified schematic of a generic reverse supply chain for commercial product returns. The customer returns the products to the reseller (product acquisition), from where they are shipped to the returns evaluation location (reverse logistics) for issuing credit and product disposition (inspection and disposition). Diagnostic tests are performed to determine the commercially optimal disposal action for the returned product.

There are various types of disposition actions, including remanufacturing if this is considered to be cost effective. Some organizations simply treat all product returns as defective. There are returned products that may be new and never used, and these are returned to the forward distribution channel. Other products may be sold for scrap or recycling, usually after physically destroying the identity of the product. Remanufactured products are sold in secondary markets for additional

revenue, often to a market segment unwilling or unable to purchase a new product (e.g., used cars). Another common use of returns is as spare parts for warranty claims to reduce the cost of providing these services to customers.

In certain cases, legal requirements make it mandatory for product companies to take back their old and used products (e.g., in the case of refrigerators in the U.S., companies are mandated to take back old products because of hazardous materials used in their manufacture). In such a case, the reverse supply chain needs to be not only well managed, but also tightly integrated into the delivery mechanism.

Another example comes from Europe, where tire manufacturers need to recycle at least one old tire for every new tire they sell. In India, a common use of reverse supply chains is for promoting sales of new consumer products. Older products are collected, reconditioned and resold at prices lower than the fresh products but much higher than “scrap” or salvage value.

The importance of reverse supply chain is demonstrated through a statistic originating in the U.S. that suggests nearly 20% of everything that is sold is returned. This number obviously varies by product and channel type; nevertheless, with the high ratio and challenging economic conditions, addressing returns within the reverse supply chain can help cut costs, increase profit margins or both.

Reverse Supply Chain

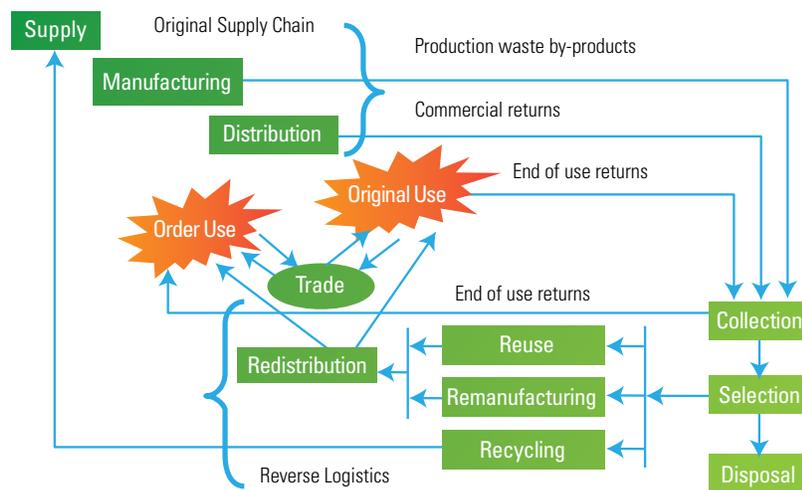


Figure 1

Reverse Logistics as a Strategic Weapon

For any company, strategic variables are those that have a long-term bottom-line impact. These variables must be managed effectively, efficiently and proactively – not tactically or reactively – for the viability of the company. Until recently, most companies concentrated only on business functions such as finance or marketing as strategic variables. Logistics capabilities were looked at as a strategic variable during the late 1970s and 1980s. Most companies now look at reverse logistics as holding an important strategic role, but this function has yet to gain the status of a strategic variable. The importance of reverse logistics is increasing for a number of reasons:

- Companies are seeing tangible benefits from the value that can be recaptured from unproductive assets resulting from returned merchandise, such as significant reductions in inventories, improvement in cash flow, reduced labor and improved customer satisfaction.
- There is an increase in competitive pressure to provide an effective, efficient returned goods process. The increase in catalog and e-business shopping has resulted in a liberalization of return policies in order to gain customer trust and reduce risk.
- Product lifecycle compression and an increased emphasis on introducing new products and product “freshness” has created a need to clear the distribution channel more frequently, requiring an efficient means to bring back obsolete, outdated or clearance items.
- Increased regulatory requirements regarding recycling and product disposition – especially around products having environmental hazards – has increased the need for precision record keeping and tracking.

Examples of Reverse Logistics Across Industries

Computer/Electronics Industry

The computer and electronics industry is known for short product lifecycles. A big market has emerged for used PCs – both in developing and developed countries. According to Gartner, 37 million secondary PCs were refurbished and exported to emerging markets in 2008, and the market research firm predicts that this number will rise to 69 million by 2012.¹ In 2007, nearly 68 million secondary PCs had to be discarded worldwide. In emerging countries, approximately

15 million secondary PCs had to be discarded in 2007. Gartner estimates that by 2012, emerging countries will need to dispose of a total of 30 million secondary PCs annually. The need and opportunities for reuse of obsolete products cannot be over emphasized.

Building to order is an effective way to minimize the return chain, as it allows manufacturers to postpone final transformation of the product until the end of the channel and configure the exact computer that the customer wants. The inventory holding period decreases sharply with this approach. This is in sharp contrast with the rest of this industry, which typically will have 30 to 60 days of inventory pre-sold into the channel. Manufacturers/retailers that sell directly to the customer and build to order have significantly lower return rates than the rest of the industry. Statistics indicate that return rates for these companies are around 5%, about half of what the rest of the industry experiences. In the words of one executive interviewed, “We send out a million computers. Pretty soon, most of them come back.” The build-to-order model, combined with direct sales, eliminates this problem.

Manufacturers also contract with remanufacturing specialists to develop solutions to this problem. These specialists work with manufacturers to evaluate the root cause of returns, excess and obsolete machines, and develop methods to control cost and return rates. These companies test, recondition, repair, repack and then resell the machines. The functions of service center, warranty repair and other servicing are often outsourced to a third party that specializes in this business. These programs have led to lower returns.

Automotive Industry

The automobile industry is one of the largest industries in the world and deals with the most expensive of consumer goods. Therefore, it is not surprising that reverse logistics is an important subject for this industry. The three primary areas in which reverse logistics plays a significant role are:

- Salvage of parts and materials from end-of-life vehicles.
- Remanufacturing of used parts.
- Stock-balancing returns of new parts from dealers.

The big three automakers in the U.S. have joined together to form the Vehicle Recycling Development Center (VRCD) in order to increase the

recyclability of cars. At VRDC, the focus is on learning to build vehicles that can be disassembled more easily. The center is investigating one of the newest trends in engineering, Design for Disassembly (DFD). With DFD, product disassembly is made easier by reducing the number of parts, rationalizing the materials and snap-fitting components instead of using chemical bonds or screws.

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Unlike other environmental initiatives for manufacturing, DFD offers the possibility of many unintended positive effects, such as remanufacturing. The automobile industry may be the industry with the longest history of making use of old products. According to the Auto Parts Remanufacturers Association (APRA), the market for remanufactured auto parts is estimated at \$34 billion, annually. The APRA also estimates there are 12,000 remanufacturing firms (including large-scale companies) involved in the auto parts industry. One particular company remanufactures more than four million alternators, starters and water pumps every year. Between 90% to 95% of all starters and alternators sold for replacement are remanufactured.

Automakers want to maintain a closed-loop system with their parts. When a vehicle needs a new

transmission, it is their hope that the consumer will bring the car to a dealer that will replace the old transmission with a remanufactured one. The dealer will send the old transmission (now called a transmission “core”) to the automaker for remanufacturing. In this way, the automaker will maintain a stable supply of transmission cores.

The estimated cost of reverse logistics in the Indian auto and auto components industry is around 0.5% to 1% of total sales. The reverse logistics segment has been growing at the same rate for both the auto and auto components industries during the same period.

Retail Industry

Reverse logistics in the retail industry is depicted in Figure 2.

Industry Practices and Emerging Trends

Marginal Value of Time for Product Returns

A study of commercial returns shows the returns process as a shrinking, leaking pipeline. As a product moves through the reverse supply chain, more than 45% of its asset value is lost in the process. This loss is due to two prime reasons: the downgrading of the product to a lower value product as it gets remanufactured, salvaged for parts or scrapped; and the product’s decrease in value with time. Electronic goods like PCs can lose value in excess of 1% per week, and the rate increases as the product reaches the end of its lifecycle.

Retail’s Forward and Reverse Supply Chains

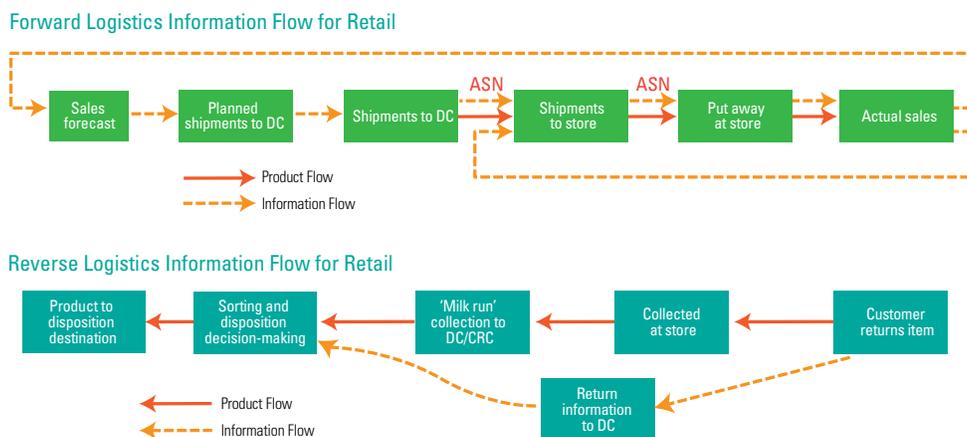


Figure 2

Shrinking Pipeline of Product Returns

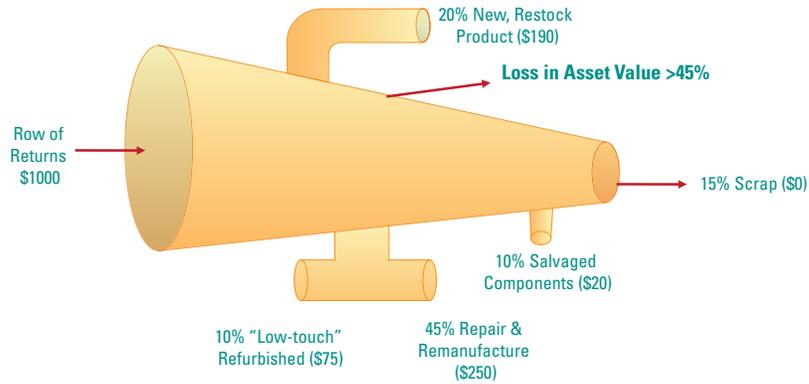


Figure 3

Figure 3 shows how product returns lose time value in the reverse supply chain. However, this loss depends on product type; some products like PCs and laptops have a higher time value depreciation as compared with machine tools, etc.

Centralized Efficient Reverse Supply Chain

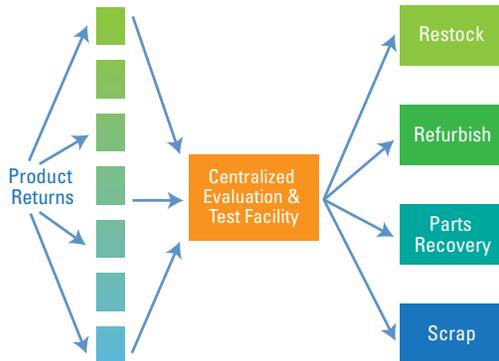


Figure 4

An efficient reverse supply chain focuses on processing product returns at an overall lower cost. This supply chain model sacrifices speed over cost efficiency and is typically applicable to products with shorter time/value depreciation.

The cost efficiencies in the supply chain are obtained by centralizing the testing and evaluation of the returned product at a central facility, after which credit is issued. The retailer or reseller doesn't partake in any product evaluation at their end. Shipping costs are minimized by shipping the returns to the vendor in bulk.

Once the product condition is determined at the testing facility, it is appropriately disposed of (i.e., sent for restocking, refurbishing, salvaging or scrapping). This model achieves economies of scale at each level, thus enabling minimization of processing costs. It is also easier on the retailer, which doesn't have to sort returns or ship them to multiple locations, as well as the third-party credit issuer, which has to issue credit at one time for multiple product returns.

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In the previous model, we saw that product differentiation is delayed until all returns are shipped to the central facility. This can be thought of as a postponement strategy. On the other hand, for products like PCs where the asset value loss over time is relatively high, we can prepone the testing and evaluation of

Decentralized Reverse Supply Chain with Preemption

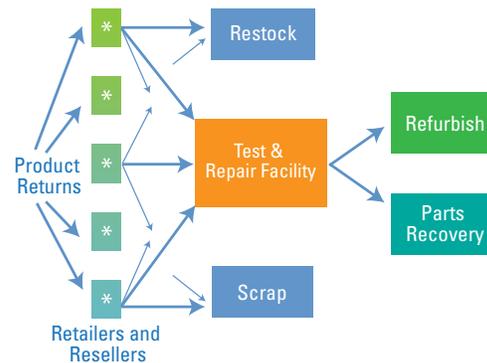


Figure 5

the returned product using a decentralized model so that the unused products can be restocked immediately. This testing can be performed at the point of return by the reseller/retailer, but it would need to be technically feasible, and it might require expertise development among resellers. Moreover, resellers would need to be incentivized through shared savings contracts with manufacturers, or vendors can set up a vendor-managed inventory process with large retailers and maintain their own technicians to test the returned products.

Information Technology in Reverse Supply Chains

Information technology can be used in various ways to improve the reverse logistics in industries. One of the main uses of IT is to enable item tracking in the supply chain, enabling vendors to see the travel history of the item. This can help in quickly discerning whether products are as good as new and should be put back into the forward supply chain. This tracing ability also enables forecasting of product returns based on historic linkage between product returns and sales.

Reverse logistics also involves refurbishing/testing facilities at multiple locations, routing of vehicles between retailers and these facilities, as well as scheduling of operations, all of which can be aided by information technology. It was found that a German recycling network could reduce its transport volume by 20% based on software optimization.

In high-tech products, the customer often ends up ordering parts that may not fulfill the product's technical specifications (e.g., printer cartridges) and thus end up returning the product unused. If the transaction takes place online, the company can allow/disallow parts ordering based on the model specification (e.g., printer) that the user enters on the Web site. Again, complicated electronics items like VCRs, PCs, etc. require complex set-up specifications, and so, in addition to a simplified user manual, remote online support for fault detection can greatly reduce the number of product returns.

Technology can also be embedded in high-value products such as heavy engineering machines, auto engines, etc. to keep track of the usage the machine was subjected to during the time it was used by the customer. For example, Bosch uses an inexpensive "data logger" chip in the electric motor of its power tools, which records the number of hours of use and the speed at which the tool has been operated. This enables the company to determine if it should send the tool for remanufac-

turing or recycling based on the number of hours used and the speed at which the tool was run.

Zero Returns Policy

Under this policy, the manufacturer does not allow products to be returned through the channel. They instruct retailers downstream to dispose of their products appropriately and provide a return allowance for that purpose. This frees the upstream members of the supply chain from the burden of logistics for product returns; it increases the same for the downstream members. The return allowance can be as much as 4% of sales by manufacturer to the retailer. This approach is used by several electronics companies, with mixed results. The products that were supposed to have been scrapped upon return have found their way to secondary markets.

Environmental Concerns

Increased regulations by U.S. and European governments are causing manufacturers to invest in reverse logistics processes to ensure proper disposition of their products. Computer manufacturers such as Dell and Hewlett-Packard have received criticism for not properly disposing of the e-waste they generate. Land-filling practices are being overhauled due to stiffer disposal regulations, which have increased operating costs. Some companies are trying to apply internal research to establish environmentally friendly measures; however, the truth is that no company will implement processes that are not sustainable to them in the long run. If legislation forces them to do so, they will have to pass on the increased manufacturing costs to customers.

Challenges persist across the manufacturing value chain for managing the reverse logistics process. Chief among them:

1. **Meeting consumer needs:** Customers want the best price and completely flexible and hassle-free returns policies.
2. **Volume management:** Retail returns are around \$60B+ annually, and total returns across the U.S. high-tech service industry are forecast at \$818B+ through 2008. Especially during peak seasons, most of these returns are time-sensitive to process and restock for resale.
3. **Management of costs:** Expense management can represent up to 7% to 8% of the cost of goods. The process is labor intensive with very little automation.
4. **Data management:** Having accurate data is important, but it is very difficult to obtain and manage relevant information. An organiza-

tion should understand the data source, know how to analyze it and should use third-party experts if possible.

5. **Disposition of product:** Knowing the best location to handle, destroy, salvage and even where to donate products is critical. So is the ability to handle a supplier return, whether it is defective or working with overstock balancing.
6. **Regulatory compliance:** Organizations require complete understanding of waste management

laws, regulations and processes, including the company's corporate social responsibility.

7. **Partnership throughout the product lifecycle:** Having the right partner throughout the product lifecycle is key. Creating a strong and cohesive supplier agreement, jointly determining the best approach, cost sharing and having a positive relationship will help improve the bottom line for everyone.

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Footnote

- ¹ Gartner Inc., "Gartner Says Emerging Markets Could Become Dumping Grounds for Secondary PCs," www.gartner.com/it/page.jsp?id=1037212, June 2009.

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