Reverse Logistics Process
Reengineering:
Improving Customer Service Quality

by

Mohammad M. Amini
Donna Retzlaff-Roberts
The University of Memphis

Reverse logistics, the movement of materials back up the supply chain, is being recognized by many organizations as an opportunity for adding value. While global environmental concerns have been the motivation for initiating the field of reverse logistics, businesses have discovered that valuable commercial opportunities are embedded in reverse logistics. The management of customer returns of previous purchases, a common type of reverse logistics, may be a last frontier of competitive advantage. Here potential avenues may be explored to enhance customer service quality and reduce cost and cycle time.

This article provides an overview of the various types of reverse logistics and describes a reverse logistics reengineering study for a major direct marketer. The primary objective of the study is to enhance customer service quality by reducing the cycle time of providing refunds and exchanges to customers. A secondary objective is to enhance the internal efficiency of processing returned items. Computer simulation models are developed and examined to compare the current process with a proposed new reverse logistics process under different operational scenarios. Also, potential modifications in the subprocesses are explored to further improve the customer service level.

Interest in the field of reverse logistics is growing rapidly as many types of businesses recognize it as a vital part of the overall supply chain. Traditionally, reverse logistics has attracted little attention, as organizations focused on the forward moving supply chain including marketing, sales, procurement, manufacturing, and distribution. The catalyst that sparked this interest in reverse logistics has been environmentalism. Reverse logistics practices have often been environmentally driven, particularly in European countries such as Germany, where environmental regulations are more stringent than in the U.S. However, many organizations are discovering that improving their reverse logistics processes can be a value-added proposition that may or may not have anything to do with environmental concerns (Retzlaff-Roberts, 1998). The added value could be attributed to improved customer service leading to increased customer retention and sales. The added value could also be through reduced cost and/or reduced cycle time. So while environmentalism is and will continue to be a driver behind reverse logistics, it is by no means the only one. In fact the reverse logistics study described in this article is driven by customer satisfaction. It involves a direct marketer that is considering an innovative reorganization of its returns process in order to increase the convenience of the process, while reducing the cycle time.

Reverse Logistics

Reverse Logistics (RL) or Reverse Distribution (RD) is defined as “the logistics management skills and activities involved in reducing, managing, and disposing of hazardous waste from packaging and
Reverse Logistics Process Reengineering: Improving Customer Service Quality

products.” It includes reverse distribution, which causes goods and information to flow in the opposite direction from normal logistic activities (Kroon and Vrijens, 1995, Pohlen and Farris, 1992). The Council of Logistics Management has published a comprehensive review of concepts, organizations, and activities in the area of reverse logistics (Kopicky et al., 1993).

Notice that the first part of the above definition sounds quite environmentally oriented, which is indicative of the origins of the reverse logistics field. This field is considered to have begun in Europe during the ’70s and ’80s with environmental concerns. Much of what has been published on reverse logistics has to do with reusing and recycling products and shipping materials. However, the motivation for paying attention to reverse logistics can be purely economic. For example, well before anyone had coined the phrase “reverse logistics” Henry Ford was dismantling the wooden cases from car batteries and reusing the pieces as floorboards in his early automobiles. Was Henry Ford an early environmentalist? Probably not. It simply made good economic sense and just happens to conform to today’s “reduce, reuse, and recycle” mantra. The point is that improving reverse logistics processes can have a variety of motivations and can pay off in a variety of ways.

Motivation for Returns

Both products and packaging return for a variety of reasons, but returns can be broadly divided between those that are unplanned and undesired – what we might call “traditional returns” – and those that are planned and desired. Unplanned returns are typically limited to products which customers have purchased, where reasons for return include:

- Returns of new products
  - The customer changed his/her mind
  - The product was defective
  - The customer perceived the product to be defective
  - The product was damaged in transit
  - A vendor error (such as wrong item or quantity sent)

Returns of used products
- Warranty returns
- Product recalls

While the return of a particular item is not expected at the time of sale, most organizations know what percent of their sales volume typically comes back. The magnitude of this percent depends upon the nature of the business and the organization’s return policy, and return rates can vary from as low as 2% to as much as 50%. Generous return policies have become quite common, particularly in consumer sales, including both retail and direct marketing. The reverse logistics of unplanned returns are particularly difficult because organizations do not know what will be arriving when. This is the type of return which the direct marketer in our study deals with.

Planned returns involve a much wider variety and can include:

- Return of reusable packaging or shipping containers - can be environmentally and/or economically motivated.
- Trade-in programs - where a customer exchanges an old product for partial credit on a new one.
- Company take-backs - where a customer returns an old product to its manufacturer at the end of the product’s useful life. The motivation can be either economic, environmental, or both.
- Leased or rented products - where the customer returns the product at the end of the lease.
- Service work - where the product is shipped to a service location and then back to the customer.

An advantage of planned returns is that it is much easier for the organization to know what is coming back when.

Disposition of Returns

After a product has been returned, the question is what to do with it to maximize its value. This is referred to as the disposition of the product and
alternatives include:

- **Reuse** - where packaging is reused or a product is sent back to stock for resale to another customer.
- **Repair/repackage** - where a moderate amount of repair and/or repackaging will allow the product to be reused.
- **Return to supplier** - if the product was purchased from a supplier and is returnable.
- **Resell** - where the product is resold in a secondary market “as is.” Some logistics companies have found a niche in matching sellers with buyers in secondary markets and say that there is a market for virtually anything.
- **Junk** - where the item is sent to a landfill, which can be a far more expensive choice than most organizations realize due to landfill fees, transportation costs, and the value of the impaired assets that are being thrown away.
- **Recycle** - where the product is broken down and “mined” for components that can be reused or resold.
- **Renew** - where a used product’s utility is restored by replacing worn parts or remanufacturing in some manner, such that the product is again useful and can be put back into service.

The disposition choice is based upon maximizing the value from the returned item. Many organizations will use a variety of these options depending on the type of goods and their condition. The direct marketer in our study is no exception and uses several of these options.

**Challenges and Opportunities**

The following problems have been identified in reverse logistics: (a) most logistics systems are not well-equipped to manage product movement in a reverse channel; (b) the costs associated with reverse logistics may be nine times higher than moving the same product in a forward channel; (c) returned goods and products often cannot be transported, stored and/or handled in the same manner as in a forward channel (Lambert and Stock, 1993). The inherent problems in reverse logistics present opportunities to develop new reverse distribution processes or reengineer the existing ones. For the direct marketer in this study we investigate avenues to reengineer the current reverse logistics process with the primary objective of enhancing customer service quality. A secondary objective is to explore opportunities for increasing operational efficiency.

**Background**

The organization studied for this article is a direct marketer of apparel and other goods with sales in excess of one billion dollars annually. The forward distribution process is efficient and effective with most customer orders being shipped within 24 hours. During the busy holiday season well over 100,000 packages may be shipped daily. Customer satisfaction is a high priority.

In the spirit of continuous improvement, management is eager to explore new opportunities to enhance customer satisfaction with the returns process. This type of reverse logistics, where customers return previously purchased merchandise for credit, is also known as returns management. The means of increasing customer satisfaction are (1) reducing the cycle time of customer receipt of the refund or exchange, and (2) increasing the convenience of sending a return.

A disadvantage in direct marketing is the inconvenience and time involved in returning an item. Most direct marketers try to mitigate this inconvenience by providing a return form and a preaddressed shipping label with each order.
Reverse Logistics Process Reengineering: Improving Customer Service Quality

However, the typical return process for a customer of any direct marketer is something like this:

- Fill out the return form or write a letter to the direct marketer to indicate the reason for the return and the requested action, such as exchange for another item, issue a refund check, credit a credit card, etc.,

![Current Reverse Logistics Process Map](image-url)

**Figure 1. Current Reverse Logistics Process Map**
Reverse Logistics Process Reengineering: Improving Customer Service Quality

- Repackage the item and enclose the paperwork,
- Go to the post office and stand in line to have the package weighed and postage assessed,
- Wait for the package to be received and processed, then wait for the requested action to be completed by the direct marketer.

All of this is time consuming and inconvenient for the customer. The inconvenience of the return process is often cited by consumers as a major deterrent from ordering from direct marketers. Finding ways to reduce the inconvenience and cycle time of a customer return should increase customer satisfaction, increase customer retention, and enhance sales. A reengineered returns process is studied with these as the means of enhancing customer service.

The Reverse Logistics Process

The reverse logistics process begins when a customer decides to return one or more products. The majority of the time these are new products which the customer has recently ordered and received. Reasons for return often include the customer changing his/her mind, wanting a different color or size, etc. In addition to return of new products, customers also return used products that they feel did not live up to expectations, so these would fall under the category of warranty returns. Regardless of whether the product is old or new the customer will request either an exchange or a refund.

Current Process

Figure 1 depicts a simplified version of the current reverse logistics process map. This includes numerous processes and subprocesses to effectively manage arrival of a large volume of packages containing items from a variety of product lines. These packages need to be sorted and routed to the correct locations, which is a difficult task given that the only indication of what the package might contain is the size and shape of the box. For this reason package processing is a separate operation from merchandise preparation. In package processing each package is opened, its paperwork read, and its contents assessed and sorted by product line. This is the point at which the customer transaction is separated from the merchandise and the two processes proceed independently and in parallel.

The documents are transferred to the financial transaction process, where depending on the initial means of transaction - credit card, personal check, or gift certificate - customers are reimbursed for the returned merchandise. If an exchange has been requested, the appropriate information proceeds to the distribution center, from which the exchange item is shipped. This completes the customer transaction process.

Meanwhile the merchandise has been removed from the package and sorted into the various product groups. It is then conveyed to the appropriate merchandise preparation area. Here the quality of each item is assessed and the item is prepared as needed for its destination. First-quality items are repackaged for return to the distribution center. Lower quality items go to a variety of destinations depending on their condition. For example, some items are donated to charity while the lowest level of quality is discarded. Items are consolidated and shipped to the appropriate destination. Notice that there is some duplication of effort between package processing and merchandise preparation because two different people have spent time handling and assessing the merchandise.

Also, notice that the customer financial transaction waits to commence until the package has been received, opened, and its contents assessed. Only at this point can the information needed for the customer financial transaction be separated from the merchandise. This is the usual procedure in virtually all return processes; the merchandise must be in hand before any further transaction takes place. The bulk of the time from when a customer decides to return something until the financial process can begin is taken up by the shipping time.
Reverse Logistics Process Reengineering: Improving Customer Service Quality

Figure 2. Proposed Reverse Logistics Process Map
Proposed Process

The innovation of the proposed process is that the shipping time is removed from the customer transaction by having customers call first and use a scannable postage-paid label. As shown in figure 2, customers would call first to indicate what they are returning and specify the details of the desired exchange or refund. The return label would have been provided with the order. Having the label postage paid provides a significant convenience to the customer - the ability to skip standing in line at the post office. When the carrier receives the package, the label would be scanned and the information transmitted to the direct marketer. This allows the information to be separated from the merchandise at a much earlier point in time so that the customer transaction can be completed without the delay of waiting for the package to arrive.

When the package arrives at the returns center all that remains is to reconcile the transaction and do the usual merchandise preparation. Information on the scannable label would allow the package to be sorted prior to opening it, based on the product line. This means the returns center could be restructured to combine package processing and merchandise preparation into one operation for each product line, thereby avoiding the duplication of effort that occurs in the current process. This restructuring would make it possible for the merchandise to be handled and assessed by only one person. All of which creates an opportunity for redesigning the returns center in a way that increases the internal operating efficiency.

Comparison of Processes

Recall that the primary objective is to enhance customer service by (1) reducing the cycle time of the customer transaction, and (2) increasing the convenience of making a return. The former is achieved by separating the merchandise from the information much earlier in the process. The latter is achieved by the postage paid label which allows customers to skip waiting in line at the post office. It is clear that the proposed process would achieve both means of enhancing customer service, but it is not necessarily clear just how much the customer cycle time would be reduced.

The ability to route unopened packages to the correct product line via the scannable label gives rise to the secondary objective, which is to increase operational efficiency. A reengineered returns center might increase operating efficiency by either (1) reducing the cycle time of moving merchandise through the returns center, or (2) reducing the number of full time equivalents (FTEs) required to operate the returns center. If and to what extent this secondary objective might be achieved is uncertain since the proposed process has never been tried. It is very much a “what-if” scenario. However, it is expected that the cycle time of moving merchandise through the returns center will not change meaningfully. The more likely benefit is a reduction in the FTEs needed to staff the returns center.

In order to make an informed decision about the advantages and disadvantages of adopting the proposed process, a more detailed analysis must be made. Answers are needed to the following questions regarding the proposed process:

- What would the customer cycle time be?
- What would the product cycle time be?
- How many FTEs would be needed?

The customer cycle time (CCT) is defined as the time from when a customer ships a package until the customer receives the refund or exchange. The product cycle time (PCT) measures the time from when a customer returns an item until it is shipped out from the returns center. The CCT clearly will diminish, which is the major motivation for the proposed change. As mentioned above, the PCT is expected to remain approximately the same, so it will be measured to verify this expectation. The required number of FTEs for staffing the proposed process is unknown because many of the tasks are

---

1 The customer would be charged a nominal fee for using the label. This is not about providing free shipping. The motivation is to increase convenience.
restructured by reengineering the returns center in the proposed process. Fewer FTEs should be needed because the use of scannable labels and customer calls should allow packages to be sorted and processed very efficiently. However, this creates a new job that did not previously exist – personnel to answer the telephone calls for returning merchandise. How many FTEs would be needed for the various job types in the proposed process is an important question to answer.

**Computer Simulation Modeling**

Due to the complexity of the reverse logistics process, the answers to the questions above are not easily determined, but there appears to be two possible methods. One is to go ahead and adopt the process, collect data, and evaluate in hindsight whether it was a great idea or a mistake. The second method is to create a computer simulation model.
of the new process to allow the organization to try “what-ifs” in virtual reality.

The complexity of the reverse logistics process is due to the fact that there are hundreds of probabilistic activities, events, and man-machine-equipment interactions within different subprocesses involving a high degree of complexity. Computer simulation modeling is known as an effective approach for process reengineering, particularly when the level of complexity is high. It allows for accurate and effective study of alternative operational scenarios without costly and time-consuming interruption of the real physical process. Also, simulation models are capable of capturing the probabilistic nature of the processes under study, where simple analytical methods fail.

When using simulation to compare a proposed process with an existing one, it is highly advisable to first model the current process to allow validation against reality. After working out any “bugs” the current model can be modified for any number of what-if scenarios to evaluate proposed changes. Therefore, in this study both a current model and a proposed model are created.

Figure 3 shows major steps involved in a computer simulation modeling and analysis. Step 1 of the modeling and analysis begins with a clear objective and identification of what questions need to be answered. The objective of the current study is to evaluate the proposed process by comparing it to the current one. Measuring and benchmarking the related cycle times under different operational scenarios is essential along with determining the FTE requirements of the proposed process.

Next, in Step 2, process maps are prepared for the current and new processes. These maps give a clear view of the process, facilitate communication between the research team and the practitioners, and in addition, clarify the types of data that will need to be collected for use in the simulation model. This step is one of the most time consuming phases throughout the project, taking 70% to 80% of the project duration. The process maps are applied as a fundamental basis for the computer simulation modeling. While data is being collected, in Step 3, Arena 3.01 (1997) software is utilized to develop the simulation model for the current process.

To simplify the model verification and validation phase, the computer models are laid out to resemble the process maps. As data is being collected and processed, it is incorporated into the simulation model and the model verification and validation phase, Step 4, is completed. In this phase, the detailed characteristics of the simulation models and preliminary measures of cycle times are communicated with the project team members.

After data collection is completed and the simulation model is verified and validated, in Steps 5 and 6, full model experimentation and scenario analysis are conducted. Cycle times are measured under different operational scenarios that characterize the reverse logistics processes’ operation under different levels of load, which occur with seasonal fluctuations. For the proposed process, iterative trials were needed to adjust the FTEs for each job type. When a given process was experiencing a large backlog, the number of FTEs were increased and the simulation rerun to evaluate the effect of the change. In this way the appropriate number of FTEs for each job type was identified. After these steps were completed for both the current and proposed processes, Step 7 offered presentation of final results and recommendations to the organization.

As Figure 3 shows, computer simulation modeling is presented in the context of continuous improvement where the steps involved should be considered as an interactive and continuous process. The set of objectives from one modeling application to another will vary, but throughout a project the objectives of a given study remain unchanged and at the core of the modeling effort.

---

2 The simplicity of figures 1 and 2 may be misleading. The actual process maps developed during the study involve a high degree of complexity.
Observations and Recommendations

Both the current process model and the proposed process model were analyzed with three different levels of package volume: low, medium, and high. These levels represent common seasonal load fluctuations. For all simulated scenarios, the same operational capacity is assumed and a common simulation period of 40 operational days is applied. Statistics collected for each scenario include the average CCT for different types of financial transactions and the PCT for different lines of products.

Results from the model of the current process were validated against operational data with good conformance. This forms the base case to which the proposed model is compared. Analysis of the proposed model required a number of iterative scenarios, as mentioned above, in which bottlenecks were identified and resolved by adjusting the number of FTEs for each job type. Determining the number of FTEs needed for the various tasks was also essential to identify staffing needs.

Results showed that reengineering of the returns center would indeed improve efficiency and productivity and would require only about 65% of the current staffing level. The amount of reduction would depend on the volume of customers who fully utilize the new process by calling and using the scannable label. The reduction to 65% of current staffing levels is associated with 35% of customers utilizing the new process. As this percent of customers increases, the staff percentage decreases. However, as mentioned earlier the new process creates the additional task of answering phone calls for returns. With this function included, total FTEs would be about 85% to 90% of current levels.

Customer cycle times are substantially reduced for customers who use the new process, due to removing the delay of shipping time from the customer to the returns center. Customers who use a credit card can receive credit in only a few days. For other customers, who request a check or exchange, the cycle times involve an additional three or four days due to the need to ship or mail the request to the customer. These reduced customer cycle times along with the postage paid return label represent a significant increase in customer service.

Summary and Conclusions

For a number of decades, industries have been concentrating on development, implementation, and management of forward logistics processes to reduce operational costs. In the age of quality, the attitude toward forward logistics has evolved to include enhancement of customer service quality. Meanwhile, ever growing concern for environmental problems, and pressure from the global competitive marketplace toward further improvement of customer service, have been presenting industries with a new challenge; development and management of effective reverse logistics processes.

Many organizations are realizing that reverse logistics can provide a significant opportunity for competitive advantage. This study focuses on benchmarking of alternative reverse logistics processes for a major direct marketer. The objective is to evaluate reengineering the current reverse logistics processes for improved customer service quality, with a secondary objective of increased operating efficiency. To capture the complexity and dynamism of the reverse logistics process, computer simulation modeling has been utilized to benchmark the current process versus a proposed process. As expected, results show the proposed process significantly reduces the cycle time of the customer return process, thereby increasing efficiency.
Reverse Logistics Process Reengineering: Improving Customer Service Quality

Less certain was the internal operating behavior of the “new” returns center. Use of scannable return labels creates the opportunity for reorganizing the returns center in a way that had never been done before. So the simulation was necessary to evaluate performance of this system, identify and correct bottlenecks, and determine staffing needs. Results show that sizeable reductions in FTEs are possible for staff who handle packages and merchandise. For example if only 35% of customers utilize the new process these FTEs could be reduced to 65% of current levels. However, this reduction was offset somewhat by the creation of a new job type – personnel to answer phone calls for returns. With this task accounted for, the total reduction in FTE is only about 85% to 90% of current levels, but still yields a net reduction.

So in summary, this study has shown an example of reengineering a reverse logistics process whereby customer service can be improved while simultaneously reducing operating cost. This example, which was not in any way motivated by compliance with environmental regulations (as many reverse logistics efforts are), shows how competitive advantage can be achieved from reverse logistics. For this reason reverse logistics is and will continue to be a growing field and should be viewed as an integral part of the organization’s overall supply chain.

References


Mohammad Amini, Ph.D., is an Associate Professor of Decision Sciences at The University of Memphis. His current research interests include design and implementation of metaheuristics for the combinatoric problems, optimization models and computer simulation in logistics, supply chain management, productivity measurement, process reengineering, and cycle time. Dr. Amini has been involved in consulting projects and education programs for a number of national and international companies in the past 20 years.

Donna Retzlaff-Roberts, Ph.D., is an Associate Professor of Decision Sciences at The University of Memphis. Her research interests include productivity and efficiency, computer simulation, supply chain management, and cycle time reduction. Dr. Retzlaff-Roberts has published many articles in refereed journals and has done consulting work for a wide variety of organizations.
Reverse Logistics Process Reengineering: Improving Customer Service Quality