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Reverse Supply Chain in Fashion: Just Profit or More

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Abstract—*To respond towards decreasing life cycle of products and being competitive by managing the business in an effective manner, more firms are now embracing the concept of Supply Chain to increase their overall profitability. Popularity of E-Commerce, faster technology up gradations, reduction in Life Cycle, increased consumer interest and preference to what is in fashion has increased the rate of returns and their disposals. Companies have started realizing the value they could recover by remanufacturing or recycling the returned or disposed products. The value is more than just Monetary Profits; it is about Company's overall image. Companies have started focusing on ideas of Corporate Social Responsibility and concerns for environment. The tool to streamline and optimize this task of collecting the used products, refurnish them and finally sell it is Reverse Supply Chain. The defective products and scrap material are brought back to supply chain using process called Reverse logistics. Companies have also started realizing the importance of reusing or recycling products and thus reverse supply chain is becoming an integral part of the company's strategic planning. This paper reviews the literature in Reverse Supply chain. It enumerates the major issues and motives involved in designing the reverse chain for Fashion Products Industries like Apparels and Handlooms.*

1. INTRODUCTION

Rapid changes in technology and changing market conditions motivate and sometimes force the companies to be more competitive. This race between the companies brought about new innovative ideas and methods to run the business in most efficient way. The concept of Supply Chain Management thus emerged, to assist the industries in achieving their primary goal of making money.

A supply chain consists of all stages involved, directly or indirectly, in fulfilling a customer request [1]. It exists to satisfy the customer needs, in the process generating profits for the supplier. It has not only manufacturer and suppliers, but also transporters, warehouses, retailers, and customers themselves. The main objective of every supply chain is to maximize the overall value generated. Supply chain management involves the management of flows between and among stages in a supply chain in order to maximize the total profitability. In short a Forward Supply Chain will involve all the entities from suppliers to manufacturers and finally to the end customers. A traditional Supply Chain mechanism looks like this

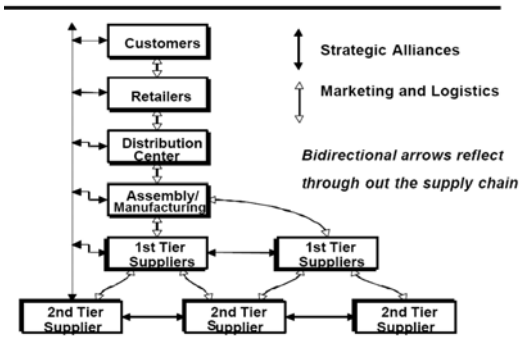

Fig. 1: Supply Chain Architecture [1]

But, there are many things to go and so the work can't be limited to this. Gradual technological advances, sudden style changes and shortening of economic life cycles for products like in consumer electronics, the recovery of value from products after use is becoming a necessity. The transition from buying products to buying sets of services makes the reuse of recovered materials, parts, and products desirable.

Besides such economic factors, the environmental considerations and limitation of natural resources also make reuse of materials, parts, and even complete products lucrative. No industry can now survive and be competitive in this era of awareness without being environmentally alert. Society, government and industry are increasingly confronted with the results of our throwaway society [2]. Proper disposal of the product also demands attention. Saturation of Dumping yards and pollution is hurting the habitation leading to ozone depletions, acid rains, and water needs filtration before consumption. Unfortunately, studies have proved that most, if not all, of the problems mentioned above are directly related to industrial and agricultural emissions [2]. Due to this industries

nowadays are becoming all the more conscious about following environmentally friendly habits and procedures. Reverse Supply Chain (RSC) is an idea evolved from this need to keep environment healthy.

1.1. Motivation

Statistics reveal that around 20% of everything that is sold in America is returned [2].Although reuse is a hit but surprising this part of the supply chain, known as reverse supply chain or backward supply chain is less attended phenomenon. A very common example of reverse supply chain is the soft drinks bottles pickup and delivery system, where soft drink bottles are returned and reused repeatedly. Companies were so long under the impression that returns generate little or no money. However, with the growth of direct-to-consumer channels like catalogs and internet sales, returns of fashion merchandize by the consumers have increased. Increased sales have increased the overall percentage of rejections also, thus, there is growing recognition of the value that can be recaptured from the unproductive assets resulting from return merchandize, among all the industries. Most of the time products are mere victims of availability of just a better looking product. This has lead to growing research activities in this field.

1.2. Definition

The Council of Logistics Management has defined reverse supply chain 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"[3]. It includes remanufacturing and refurbishing activities, processing returned merchandize due to damage, seasonal inventory, restock, salvage, recalls, excess inventory and recycling programs, hazardous material programs, obsolete equipment disposition, and asset recovery.

1.3 Reverse Supply Chain Entities

The following are important elements of a reverse supply chain [4]

I. Suppliers

Suppliers differentiate the reverse supply chain from the traditional one. Suppliers provide the input to the resource recovery task. End users may return products if they are not satisfied. Hence, supplier could be assumed as the primary motivation for the recovery task. In traditional supply chain, the supplier provides its service when demand or need arises. But, in reverse chain, the suppliers provide service only when the product is of no use or obsolete. This is a major differentiating criterion. Thus the recovery activity becomes “supply driven” rather than “demand driven”. This makes the recovery a very uncertain and complex task.

II. Collectors

The role and effectiveness of the collector determines the overall efficiency of the recovery operation. The collection method is product dependent. Focusing only on the effectiveness of the collection operation is not advisable. Many times the collection operation itself could be efficient, but not the entire reverse chain due to increasing collection costs. Thus, determining the best collection operation to give reverse supply chain profitability is very important.

III. Recoverers

Recoverers are responsible for converting the input, which is generally end of life or obsolete products, to output to the secondary market. They are into activities of remanufacturing, reprocessing etc.

IV. Distributors

Distributors bridge the gap between the recoverers [5] and the customers. They may be firms providing warehousing services, retailers etc. Thus, they become responsible for delivery of the product to the customer, and for creating a link between the recovery operation and the end user. They manage their independent channels to make the product available to the final consumer as and when required.

V. Customers

They are the ones who cause economic viability. They need to be fully chased after so as to ensure bulk sale volumes and ultimately lift up the profits. They generally have a different mindset so as to use the remanufactured or recovered products. There are several supporting activities, playing significant role in assisting the above entities to ensure successful recovery operation.

VI. Sales & Marketing

Selling and Marketing a reused product is very challenging but has tremendous potential to excel considering the uncertainty in demand and supply. A good marketing strategy could increase the sales and ultimately the reverse chain profitability.

VII. Process Re-engineering

Process Re-engineering includes efficient production planning and control mechanisms for remanufacturing as well as re-designing the current process for increasing the effectiveness of disassemblies. Just for example most of the plastic parts in automotive industry are made from easy to recycle plastics. The above- mentioned players and the activities supporting them are responsible for a smooth running reverse supply chain.

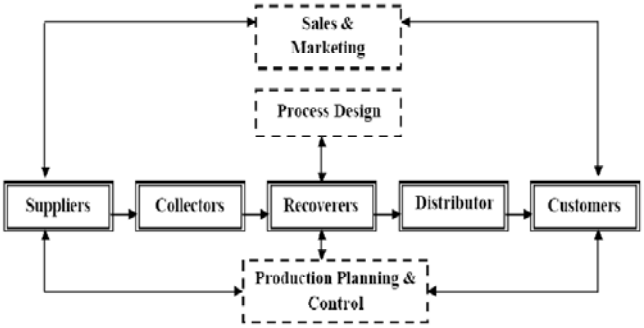

Fig. 2: Elements of a reverse supply chain [4]

2. NECESSITY OF REVERSE SUPPLY CHAIN

The popularity of the concept of Reverse Supply Chain can be briefed under two main heads:

2.1. Social Responsibility

Making just the profits can now not be the main idea for corporate governance. Companies have started realizing their moral responsibility to keep the environment healthy, and reverse supply chain is the key to it. Fast Dyes and chemicals that use to negatively affect environment have been banned in major part of globe. Use of certain ozone depleting chemicals are being supervised and as far as possible substitute and nature friendly products are being used In some cases companies are forced to set up reverse supply chain because of environmental regulations. E.g. From 2003, European Union brought a legislation that requires the tire manufacturers [6] operating in Europe to arrange for the recycling of one used tire for every new tire they sell. All the organizations have absorbed the fact that creating reputation and maintaining it in the market is one of the most challenging tasks. Companies are forming policies that can be of benefit in this context.

2.2 Monetary Benefit

The popular reason behind companies giving importance to reverse supply chain is that it reduces operating costs by reusing products or components. E.g. The Estée Lauder Companies Inc. is one of the world's leading manufacturers and marketers of quality skin care product dumping nearly $60 million worth of its products into landfills every year. However, after setting up their reverse supply chain they have been able to reduce the volume of destroyed products by half, which is a significant saving.

Companies have started realizing the importance of reusing or recycling products and thus reverse supply chain is becoming an integral part of the company's strategic planning. The increased emphasis on new high tech products and product "freshness" has caused a need to clear the distribution channel more often, requiring an efficient mean to bring back obsolete, outdated or clearance items to avoid stagnation. Big companies like Xerox replace or upgrade hundreds of office printing machines every month. With the use of high tech products increasing at such a rapid pace, in many cases nowadays there is not much difference between the prices offered for the same product by different competitors. The thing, which differentiates these competitors, is the after sales service they offer, which in turn leads to consumer satisfaction. Thus, even firms like GE Aircraft Engines have started investing more in servicing its aircraft engines. Firms like **Nike** encourage their consumers to return the old shoes to their stores. These are then shredded and used to build athletic tracks and basketball courts. So, the combined effect of environmental concerns and optimization of resource consumptions has created a necessity of increasing research activities in the field of reverse supply chain.

Apart from these there are a number of forces influencing this increase in need for reverse supply chain activities. [7] These include

- Returns due to increased demand for customer service and satisfaction. Large retail chains usually have an agreement with suppliers allowing them to return goods. Now consumer can't return what they don't like it.
- Shortened product life cycles make products quicker obsolete.
- The drive to reduce costs. Firms are striving to reuse potentially good items through reuse, recycling or secondary usage. For example, Ford Motor Company has a program for recycling plastic bumpers into tail light housings.
- Increased e-commerce sales. It is basically buying an unseen product has a risk of return associated with it all the time.
- Increased demand for upgrades, revisions or re-calibration.
- Potentially valuable products that are no longer viewed as such by the current user.
- Warranty returns. For many items with warranties, the good is first returned and then its disposition determined.
- Product recalls. Products may be recalled by the manufacturer due to potential failure in the field or safety concerns.

3. FORWARD VS REVERSE SUPPLY CHAIN

Reverse supply chains differ from forward supply chains in terms of information flow, physical distribution flow and cash flow. The forecasting in reverse supply chain is a great challenge and the product quality, packaging, routing becomes too complicated dependent upon the user. Normally it's preferable to have an early return to maximize the value that can be captured. There is also not much clarity in terms of the pricing and delivery due to missing management systems. To manage reverse supply chain, companies need sophisticated information systems, there should be well known marketing methods as there is a very different set of consumers for reused products.

Similarly the costs involved in both the chains are very different as in case of reverse supply chain we have much greater handling, sorting, repackaging of the products unlike the traditional change. Also there is significant change of value when we compare the economy's the thing that's gradual in any forward supply chain. [8]

4. THE FINANCIAL IMPACT OF REVERSE SUPPLY CHAIN

Financial impact can be explained in four ways.

1. **Greater revenues can be generated by replacing fresh stock in place of less popular styles:** [9] Companies can avoid markdowns on older product by managing inventories to keep "fresh" product at the point of sale. New product fetches more value than an older one. A manufacturer can arrange to take back unsold stock from retailers and replace it with the new season's model to maintain retail prices and avoid markdowns, thus maintaining profits. Reprocessed or remanufactured products can generate revenue—a factor that no marketing plan should overlook. The revenue levels range from relatively minimal (less than 1 percent) in cases involving fresh stock to increases of more than 5 percent when remanufactured returns could be sold in alternative channels or markets
2. **Real value can be generated by being socially and environmentally responsible:** Companies believe that there being concerned about society and environment makes customers loyal towards the company. For example, researchers report that Nike takes back used running shoes and converts them into public basketball courts and running tracks as a community action efforts. Likewise, Kenneth Cole [10] accepts used shoes from customers and donates them to those in need. Although this activity might be expensive but creates loyal customers.
3. **Lower operational cost and reduced cost of goods sold leads to Cost reductions.** Products and parts can be easily reclaimed. While the reclamation process may incur additional costs, every product or component that can be reinserted into the forward supply chain for sale is one less unit that must be procured or manufactured. For example, a major computer manufacturer has managed to reduce its procurement costs by recapturing usable parts from returned computers. This process has enabled the company to reduce the cost of its service parts.
4. **Asset turnover can be improved by managing the return inventory.** For managing inventory, returned goods are not any different from new goods. Returns inventory require storage space and management. Effective management of returns can help lowering the inventory of revenue-generating items and reduce the need to store items that do not generate revenue. One consumer goods company managed to reduce returned inventory levels from 10 to three days. It did this simply by developing a returns management process that included better gate keeping and returns processing.

4.1. To make reverse supply chain is to be economically viable

Certain factors need to be managed to make a chain economically viable:

- Flow of materials: Uncertainty in the condition of products arriving in reverse supply is an important consideration. The item may be like new or may require substantial repair or even disposal. Typically, 30 to 35 percent of high tech returns are perfectly good.
- Customer Variation—the return flow can be dependent upon the specific customer or end user. It's important to know the customer and how they use the product.
- Time—for a product point of view it's preferable to obtain a product as quick as possible quick disposal or reused.
- Transition of Value— companies intend to transform a less value product to a most value product.
- Flexibility—drivers of supply chain need to be flexible to support returns.
- Multiparty coordination—there is a need for a transparent real time coordination to improve efficiency.

5. 5. BENEFITS OF REVERSE SUPPLY CHAIN

- •Worth of returned merchandise and significant reductions in inventories, improvement in cash flow, and improved customer satisfaction.
- •Popularity of catalog and e-business shopping resulted in a liberalization of return policies in order to gain customer trust and reduce risk. Competition forces the companies to have a managed return program leading to loyalty.
- •The demand for freshness leads to the removal of obsolete hence creating a win win for a customer point of view.
- •Removal of inefficiencies is a result of better managed system
- •Efficient record keeping and tracking as a regulatory requirements regarding recycling and product disposition.

5.1. Barriers to Reverse Supply Chain

Despite the need still the successful implementation is treated more like a forced evil of the back end process of a logistics process. Lack of commitment on the behalf of senior management is a major barrier. Senior management should show commitment in the form of dedicating a team of individuals, software and conveyor systems for reverse supply chain there are two types of barriers,[3] internal and external barriers. Internal barriers include preparedness in terms of processes, systems and infrastructure of the company to handle returns, while external barriers include amenability of the customer

6. WORK DONE IN VARIOUS INDUSTRIES FOLLOWING REVERSE SUPPLY CHAIN

- **Battery recycling:** In United States, the recycling rate of batteries is 90%, with new batteries containing up to 80% recycled material. Leading companies like Exide are following reverse supply chain **[**11].
- **Recycling in Coke:** Coke already is trying to raise recycling awareness with its Eco-Fashion line of apparel, wallets, shoulder bags and jewelry—including a $110 bracelet made from a Tab can and sterling silver **[**12]. It is an environment concern initiative. In a venture with recycling company United Resource Recovery Coke has innitaiate to recycle about 100 million pounds of PET annually, equal to about 2 billion 20-ounce beverage bottles
- **Dell:** As a part of electronic recycling Dell has initiated that No Computer Should Go to Waste. NRC is following recycling and reuse infrastructure, including educational workshops and a community grant program. Dell provides its consumers a donation option for old computers. Through Dell Recycling, consumers can donate their computers to the National Cristina Foundation to help disabled and economically disadvantaged children and adults in your own community. They pick up your old computer from your doorstep [13]
- **Recycle** Dell offers an environmentally friendly method to dispose off your old computer and its peripherals irrespective of the brand.
- **Nike and NRC REUSE-A-SHOE Partnership [14]** Nike and the National Recycling Coalition have partnered to bring the Reuse-A-Shoe program to select recycling organizations in the United States [20]. Its an initiative to provides community members an innovative approach to recycling athletic shoes and avoid landfill. The program accepts all brands of athletic shoes without any metal (e.g., eyelets or cleats). A minimum 5,000 will be arranged for shipping by Nike and will be recycled into Nike Grind. This unique ground-up material is then used to resurface athletic fields, courts, tracks and playgrounds. Since the program began in 1993, some 15 million pairs of shoes have been recycled [15].
- **Estée Lauder Companies Inc**. is one of the world's leading manufacturers and marketers of quality skin care products. Previously, they used to dump nearly $60 million worth of its products into landfills every year. However, after setting up their reverse supply chain they have been able to reduce the volume of destroyed products by half
- **The GOONJ Project:** GOONJ project is setting a great example of Reverse Supply chain Indian capital New Delhi. Exploring the potential the GOONJ project collects unused clothing from all over India to recycle the materials to provide clothes, sanitary and many other basic amenities to people living in poorer communities across the country. The 300+ volunteers and mass participation of housewives, professionals, schools, colleges, corporates, exporters, hotels and hospitals behind the recycling and distribution center help to send out over 20,000 Kg of recycled waste materials every single month. A vast network of more than 100 grassroots agencies is also helping GOONJ reach parts of 20 states of India [16].

7. POSSIBLE REASONS OF GROWTH IN APPLICATION OF REVERE SUPPLY CHAIN IN FASHION INDUSTRIES"

7.1 CSR activity: Vest Recycling Project of Walmart

Wal-Mart has set an example of CSR as in 2007, they changed the dress code for store associates and instead of sending those vests to landfills, and they recycled them into lap blankets. Working with the Veterans of Foreign Wars (VFW), Wal-Mart sent 5,000 blankets to injured soldiers returning from war zones, and to veterans in VA hospitals and homes [17]. Wal-Mart also makes new, never-worn vests into "wheelchair caddies" for patients in VA and children's hospitals.

7.2 Environmental Concern

Greening the Supply Chain: A major reason to cater with the future environmental threats like ozone depletion and global warming firms are investing time and money in creating an environmentally friendly supply chain, which has also extended to reverse supply chain. eg Tiruppur, in the Coimbatore district of Tamil Nadu is known for the production of T-Shirts to the global market. It is one of the oldest centers of textile processing, particularly for the knitted cotton hosiery, popularly known as "banian" Tiruppur produces 90% of India's cotton knitwear. The rapid pace of technological development in textile industries and practice of age old methods of bleaching and dyeing have affected the ecological balance in Tiruppur. But the ecology of Tiruppur is totally degraded the ethical problem is who will pay for the damage caused to the river, ground water, agricultural land and the health of the ecosystem**.** Unclassified Chemicals Used In Fashion(Textile) Industries the use of synthetic organic dyes like yarn due, direct due, basic dye, vat dye, sulfur dye, naphthol dye, developed dye and reactive dye is adversely affecting ecology. The large variety of chemicals used in bleaching and dyeing process render them very complex. These chemicals have a history of degrading the water bio life as well.

Similarly, Nike and Estée Lauder Companies Inc are recycling to avoid land filling and help avoid environmental pollution. Exide is reversing the chain to avoid the detrimental effects of acid on environment.

7.3 Way for any possible use of material that has no value

Nike recycling shoes into Nike Grind and using it for basketballs courts and old clothes are being collected and

further converted and refurnished to carpets and rugs show possible usage of almost no value material. Moreover disintegration of an old product to useful components as raw material for a new product is also fashionable.

8. CONCLUSION

In the race to evolve challenging business strategies and a way for being competitive and responsive firms have realized Reverse Supply Chain as an important tool. It has shown worth in several industries where it has been commercialized also. In Fashion industry it's definitely more than profits as the residual cost after use is not so large for the products associated with this industry. Of course affected by increased advances in technology in an era of competition frequent trend changes leads to greater returns still there are factors like Corporate Social Responsibility and environmental concerns that forces companies to adopt such practices as a part of their operational system.

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