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# Impact of Supply Chain Strategies On the Reduction of E-WASTE

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**Abstract** - India is one of the largest consumer goods market in the world. However, with the growing consumption of electronics and IT goods in the country, the environmental threat posed by E-waste has touched an alarming level. 'E-waste' is a collective name for discarded electronics devices that enter the waste stream from various sources that include electronic appliances such as discarded computers, televisions, VCRs, cell phones, batteries etc. In concern with the environment and its healthy living, the government has undertaken many reforms and policies to mitigate the impact of e-waste. For instance, Corporate Responsibility for Environmental Protection (CREP) 2003, Hazardous Wastes (Management and Handling) Rules, 1989 etc. These reforms have brought out several impacts in the industrial sector and have a huge impact in the making of the products and their selling. Our paper portrays the impacts of the Supply Chain Management techniques which led to the design of innovative steps and practices undertaken by the industries like reverse logistics, RFID tools etc to reduce the E-waste in the recent past.

**Keywords:** E-waste, Supply chain management, Reverse logistics

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## I. INTRODUCTION

The term **e-waste**, expanded form **Electronic Waste**, as a generic term embracing all types of waste, refers to all electronic devices, surplus, broken or obsolete, which have been discarded. Examples: Computers, LCD / CRT screens, cooling appliances, mobile phones, etc., contain precious metals, flame retarded plastics, CFC foams and many other substances. According to estimates by the UN, the world produces up to 50 million tonnes of e-waste per year. The decreasing cost of electronic goods has only compounded this problem. In practice, computers, televisions, mobile phones and electronic gaming devices form the biggest proportion of e-waste.

E-waste is particularly significant because disposal of electronic items can result in toxic rubbish, as they contain dangerous metals like lead, cadmium and mercury, which can contaminate air and water when they are dumped. Concern about the environmental issues surrounding e-waste has led governments across the world to implement laws prohibiting its disposal in landfills and issue directives on recycling. There is also now tighter regulation on the movement of electronic waste, which traditionally found its way into Asian countries such as China and India.

## II. CLASSIFICATION OF E-WASTE

- *Large Household Appliances*  
Washing machines, Dryers, Refrigerators, Air-conditioners, etc.
- *Small Household Appliances*  
Vacuum cleaners, Coffee Machines, Irons, Toasters, etc
- *Office, Information & Communication Equipment*  
PCs, Laptops, Mobiles, Telephones, Fax Machines, Copiers, Printers etc.
- *Entertainment & Consumer Electronics*  
Televisions, VCR/DVD/CD players, Hi-Fi sets, Radios, etc.
- *Lighting Equipment*
- Fluorescent tubes, sodium lamps etc. (Except: Bulbs, Halogen Bulbs)
- *Electric and Electronic Tools*  
Drills, Electric saws, Sewing Machines, Lawn Mowers etc. (Except: large stationary tools/machines)

- *Toys, Leisure, Sports and Recreational Equipment*  
Electric train sets, coin slot machines, treadmills etc.
- *Medical Instruments and Equipment*
- *Surveillance and Control Equipment*
- *Automatic Issuing Machines*

TABLE 1: Composition of e-waste in India

Equipment Category	Weight in Composition
Computer equipment	75
Telecommunication equipment	13
Entertainment equipment	3
Electrical equipment	4
Medical equipment	4

### III. MARKET SHARES ON DIFFERENT ELECTRONIC GOODS

Companies	Revenue 09-10 (millions)	Revenue 10-11 (millions)	Growth	Market Shares
Nokia	12,900	12,929	0.2	39
Samsung	4,700	5,270	21.7	17.2
Micromax	1,602	2,289	42.9	6.9
BlackBerry	1,210	1,950	61.2	5.9
LG	1,600	1,834	14.6	5.5
G'Five	755	1,326	75.6	4
Karbons	800	1,004	25.5	3
Spice	1,040	920	11.5	2.8
Maxx	514	745	44.9	2.2
Sony Ericsson	590	690	16.90	2.1

This table represents the total revenue of the mobile phone companies in the calendar years 2009-2010 & 2010-2011. From the table it is seen that the brand Nokia surpasses other companies in its shares although their growth rate is minimum.

TABLE 3: Laptop market Shares 2010-2011

Rank	Vendors	2011 Shipments	Market Share	2010 Shipments	Market Share
1	HP	4,692	26.3	4,721	25.3
2	Dell	3,959	22.2	4,408	23.7
3	Apple	1,917	10.7	1,671	9
4	Toshiba	1,617	9.10	1,560	8.40
5	Acer	1,513	8.50	2,028	10.9

This table represents the market shares and year over year growth of the laptop in 2010 & 2011. From the table it is clear that HP leads in its market share.

TABLE 4: Television Market Shares

Rank	Brand	Share
1	Sony	20.40%
2	Samsung	19.50%
3	LG	17.40%
4	Videocon	17.20%
5	Onida	7.50%

This table shows the list of TV companies showing its shares in quantity and growth wise and it is clear from the table that Sony has its highest market share.

### IV. WHAT IS SUPPLY CHAIN MANAGEMENT?

It is the oversight of materials, information, and finances as they move in a process from supplier to manufacturer to wholesaler to retailer to consumer. It involves coordinating and integrating these flows both within and among companies. It is said that the ultimate goal of any effective supply chain management system is to reduce inventory. The supply chain philosophy ensures that customers receive the right products at the right time at an acceptable price and at the desired location.

### V. SCM AND THE ENVIRONMENT

As environmental practices increase in importance supply chain strategies will do the same. Firms finding that release of waste into the biophysical environment is becoming more difficult or even impossible are saddled with a new responsibility, waste control. This may have far-reaching implications for supply chain management. When source reduction is impossible or incomplete, the firm must deal with returned products as well as disassembly, recycling, reuse, repair work or remanufacturing, all of which mean more movement of material. The supply chain is then extended beyond the final consumer to become a "reverse supply chain"

## TOOLS APPLIED TO REDUCE E-WASTE BY SCM

- Prequalification of suppliers
- Environmental requirements during the purchasing phase
- Supply base environmental performance management
- Building environmental considerations into product design
- Cooperating with suppliers to deal with end-of-pipe consumer environmental issues
- Reverse logistics
- Influencing legislation to facilitate better SCM policies
- Working with industry peers to standardize requirements.
- Informing suppliers of corporate environmental concerns
- Promoting the exchange of information and ideas

## VI. SCM BENEFITS

It plays a large part in reducing costs. Supply chain costs can represent more than 80% of the cost structure in a typical manufacturing company. These numbers indicate that even slight improvement in the process eventually can translate into millions of dollars on the bottom line. Leaner inventories free up a large amount of capital. Depending on the industry, companies leading in supply chain performance achieve savings equal to three to 70% of revenues compared with their median performing peers.

## VII. FACTORS INFLUENCING IMPLEMENTATION OF SCM

1. Supplier Management
2. Product Recycling
3. Life cycle management

### *Supplier management*

This section involves in environmental audits for suppliers, seeking their product testing reports through bills of materials, establishing environmental requirements for purchasing items and implementing green purchasing.

### *Product recycling*

It plays a vital role in reduction of E-waste that includes joining local recycling organisation through collaboration on product recycling to produce disassembly manuals.

### *Life cycle management*

The last stage that includes establishment of an environmental database of products by applying Life Cycle Assessment (LCA) tools to carry out eco-report.

## VIII. ILLUSTRATION OF SCM IN COMPANIES TO REDUCE E-WASTE

*Toshiba* uses Supply Chain Solutions to repairs damaged laptops. Toshiba's customers can take damaged laptops to more than 3,300 stores throughout the country, and it manages the entire repair process. Laptops are shipped to the company's global hub, repaired, and returned to the customers. The one-stop repair model not only increases efficiency by reducing the amount of flights shipping parts back and forth, but also helps to consolidate the collection of e-waste and accelerate its recycling.

*Kodak* is an example of a company that has a remanufacturing line to the supply chain. It is reported that 31 million single-use cameras have been returned since 1990. Although the timing of returns of single use cameras is unknown; Kodak has managed to allocate 310 million single use cameras back into their production line. The reason for this success came from its own product design. Kodak's single-use cameras are simple, reusable and easy to recycle, and because of this, Kodak has managed to reuse their products and save costs.

## IX. REVERSE LOGISTICS

Reverse Logistics is defined as the process of planning, implementing, and controlling the efficient, cost effective flow of raw materials, in-process inventory, finished goods and related information from the point of consumption to the point of origin for the purpose of recapturing value or proper disposal. Reverse Logistics (RL) is the opposite of traditional or forward logistics. The reverse logistics as a process where a manufacturer accepts previously.

Shipped products from the point of consumption for possible recycling and Re-manufacturing. Reverse logistics have been widely used in automobile industries such as BMW and General Motors. Other companies such as Hewlett Packard, Storage Tek are also using reverse logistics as a supply chain process. Collection is the first stage in the recovery process. Products are selected, collected and transported to facilities for re-manufacturing. Used products come from different sources and should be brought to product recovery facility to begin the converging process. Sorting and Recycling are also an important mechanism when sorting reusable products. The goal is to sort products

that can be reused to reduce costs of making new products.

Panasonic Corporation of North America, Sharp Electronics Corporation and Toshiba America Consumer Products has established a new electronic product recycling management company, Electronic Manufacturers Recycling Management Company to provide a recycling service to electronics manufacturers. MRM has already entered into collection and recycling agreements with Hitachi Electronics, JVC, Mitsubishi, Philips, Pioneer and Sanyo. Some of the e-waste can be refurbished and sent to developing countries for resale. Many electronics companies are designing their products so that they can be disassembled easily. Dell already uses fewer screws in its computers so that they can be snapped apart easily.

#### X. IMPLEMENTATION CHALLENGERS

- Due to diversion of large chunk of e-wastes from retail consumers to informal recyclers and demand-supply mismatch organised e-recyclers are not getting adequate e-wastes to recycle.
- Collection centres are currently present only in a few cities in India and the collection process for these facilities are restricted due to logistical and geographical problems.
- Lack of legislation has been the core concern for e-waste management. There is no centralized mandatory or strict legislation in this regard. For better management, the legislation must clearly define e-waste and the limitations in terms of quantities of e-waste generated.

#### XI. CONCLUSION

Formal e-recyclers have to be supported by the central and the state governments to avoid the bottlenecks in building a better reverse supply chain of

E-waste. In the long run formal e-recyclers have to be merged and have to make a presence of an influential body in this industry. They can do lobbying with the government to promote some innovative methods of collecting e-waste from retail consumers and promote awareness of the environmental impact of e-waste.

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