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## “Identifying Opportunities of Green supply chain in Logistic of LED Television”

<sup>1</sup>Abhi Hetalbhai Thaker, <sup>2</sup>Avadh Nileshbhai Lalpurwala, <sup>3</sup>Shantanu Nirgude

<sup>1</sup> MBA student, Parul Institute of management and research Management and Research,  
<sup>2, 3</sup> MBA students, Parul Institute of Engineering and Technology,  
 Faculty of Management Studies,  
 Parul University, Vadodara, Gujarat, India

**ABSTRACT:** The basic value of reverse supply chain is to give a long term, sustainable and efficient solutions to enterprise in supply chain to make it efficient in terms of environmental and monetary benefits. There are varieties of challenges in order to implement reverse supply chain in practical or even design the ecosystem of it, challenges faced during this are delivering the final assembled product to end customer and return the packaging boxes to top of flowchart specifically the assembly units. In this research under the context of studying the supply chain with respect to both traditional supply chain which is currently used and the green supply chain suggested in this research, both the methods are analyzed through cost efficiency and benefit to the environment with respect to a particular sized LED TV specifically 32” inch. Cost efficiency of both the supply chains is compared and the results indicate that the green logistic is beneficial and always lower in cost than traditional supply chain. It is particularly observed that material cost of shipping boxes mainly contributes total cost of shipping, so this research particularly focuses on cost of material of box used for shipping with respect to both supply chains namely traditional and green supply chain.

Keywords – Green supply chain logistic, Reusable Packaging, Led television

### 1. INTRODUCTION

With globalization picking up pace, the supply chain industry has marked its presence across countries and various regions where the presence was negligible. The entities of the supply chain are suppliers, manufacturers, distributors, retailers, and customers whose presence is usually not there in same area, country or region. Goods or services delivered in supply chain have various contributing factors in order run a supply chain efficiently and satisfy the end customer, various contributing factors are warehouse, logistic model, transporting mode and packaging material. Packaging has major contribution in total logistic cost of a product, its pre consumer and post consumer logistic activities have severe environmental impacts. For instance, Amazon reported record sales of about 7.5 billion rupees (\$7.07 million) in 36 hours in the premium Smartphone brands category in Amazon’s “Great Indian Festival”, but it also required a significant amount of packaging for processing around a million parcels in the following day (Reuters, 2019). Moreover, most of the packaging is single-use and is then discarded as waste. A Federation of Indian Chambers of Commerce and Industry (FICCI) study estimates that 43 percent of India’s plastic goes towards making disposable, single-use packaging, like those used by e-commerce facilities such as Amazon and Flip kart. There are various regulations around the world which majorly focuses on reduction of use of resources and reducing its adverse environmental affects which occurs due packaging, there have been specific amendments by European Union (EC) in Packing and Packaging Waste (PPW) recently in 2015 which forces organization to rethink on how various activities are carried out in supply chain namely product marketing, warehousing and logistic.

Considering the fact that consumers are likely to purchase or render the services of organization which share value same as theirs, organization in order to gain competitive advantage should develop a green consciousness in packaging process which ultimately makes supply chain more efficient and reduces cost. In today’s era of globalization and firms

targeting global market the finished products and even semi finished goods are located in different region or even different countries eventually the products will have to be shipped to longer distance so package process and material should be such that that it should withstand adverse conditions and keep the product to idealistic standards. Hence for shipping if organization opts out for traditional supply chain which has single use material such plastic, thermocal, cardboard, wooden boxes, bubble-wrap etc, the material once used will be disposed of to waste after unpacking them, hence this will eventually increase the consumption of resources cost will increase and environmental effects will also be there hence to avoid this adverse effects recycle and reuse should be applied to ecosystem.

To adapt recycle and reuse in traditional supply chain in order to make it green supply two important aspects should be covered. First, the logistic networking model for supply chain should be established in such a way that it should be efficient for packing and shipping products or semi finished product to consumer in the way customer expects it to be delivered and networking model of supply chain should be efficient to deliver the returnable shipping boxes to the manufacturers of the product. Second, the design of the returnable packages should be such that it should be adapted quickly to manufacturing or assembly of semi-finished or finished product. Is the reuse and recycle packaging system suggested feasible monetary wise and how efficiently it will work? In order to give answers to these questions, this paper presents the case of LED TV (Liquid Electronic Display) of specifically 32 inch in which monetary and economic practicability of returnable packing logistic system in combination with reusable packages used for above mentioned product in paragraph. The reusable package is general purpose design which is capable of accommodating a 32 inch LED television set which is reusable after the product is delivered to end customer which replaces the conventional or traditional supply chain in which the package was disposed as wastage, hence adding further more this paper compares the economic costing and performance of both green or reusable logistic system and traditional logistic system.

## 2. LITREATURE REVIEW

This section mainly covers green logistic and economic feasibility of it; the other factors such as opportunities in various B2B and B2C market for development of green supply chain are discussed and environmental benefits are also discussed.

### 2.1 Green and reverse logistic

The current increasing environmental norms each company looks for feasible solution which are cost efficient and meeting the environment norms. The traditional supply chain have been noticeably leaving adverse effect on natural resources and leave carbon footprints which is harmful in long term. Green Supply Chain Management “has appeared as an environmental innovation which integrates environmental concerns into supply chain management”. (**Noor Aslinda Abu Semen, Norhayati zakuan and Ahmad Juson, 2012**).Green Logistic are basically planning, management and implementation of logistic system in such a way that it includes green distribution, green manufacturing and green purchasing in order to effectively reduce various pollutant emissions.

Previous research has shown that successful management of green logistics activities not only affects an organization’s operational and economic performance but also improves its long-run competitiveness (**Álvarez Gil, Burgos Jimenez et al. 2001; Rao and Holt, 2005**).Reusable packaging systems, knowledge and awareness are more often found in B2B markets, while in some B2C market segments there is a Wide and long experience with reusable systems e.g. beer, mineral Water, soft drinks (**Patricia Megale Coelho, Blanca Corona, Roland ten Kloosterb, Ernst Worrell,2020**).In fact of the major source of inspiration for practically implementing reverse and green supply chain is logistic model illustrated by soft drink company’s in case of glass bottles used for refilling the product.

First, under the context of global manufacturing, the total cost of the green logistics mode is always lower than that of the traditional logistics mode, even if the recycling rate is at a lower (30%) or higher level (70%). Although this finding contradicts the general perception that going green must be costly (Tsai-Chi Kuo, Ming-Chuan Chiu, Wu-Hsun Chung, Tzu-I Yang, 2019).

The general principles of green packaging design can be simplified as 3Rs:

**Reduce:** Minimize the consumption of packaging materials.

**Reuse:** Increase durability to use packaging materials more than once.

**Recycle:** Use recyclable packaging materials and return them for remanufacturing for other useful materials.

## 2.2 Case study and Gap bridging section

The above section of literature review covers the basic idea of Green supply and on what symphonies it functions and its economical feasibility which is studied in previous research papers, now in this section there are basically few case studies and reverse logistic models which are source of inspiration in order to develop a green feasible supply chain for 32 inch led television sets.

The other subdivided section in this literature review covers the one the most important sections or research which has given a strong foundation to this research paper, and the paper presented basically bridges the gap between what actually needed in terms of modification in traditional supply chain.

**Case study 1-** Tesla and veritable vegetable shows us why we need to switch to reusable packaging in every sector possible before joining hand with veritable vegetable Tesla produced around 317 tons of scrap of cardboard packaging and around 50,000 thousand pounds of plastic wrap after switching to reusable packaging not only they contributed to greener environment but also the method was cost efficient. It also makes life easy for the employees working in packing department as single use packing takes more effort than reusable.

**Case study 2-** Most of the soft drink companies provide an option of glass bottles to their end consumer, which when consumed by the end consumer is collected again by the retailer and the distributor collects the empty bottles in crates and gathered in refilling warehouse where the bottles are cleaned, sanitized and made efficient for refilling the soft drink. Such models have been adapted by various companies in various sectors such as frog box, repack, Mumbai Dabbawallas and many more organizations have adapted the concept reversible logistic.

It was revealed that about 30% of LED TVs are reported defective and non-functioning within 4 years of purchase whereas manufacturers claim more than 9 years of product life. On further research, it was discovered that cause of defect lies in the wrong and damaging packing style. They make use of wooden crates for packing and moving your precious LED TVs. To fix nails in such wooden crates, the hammer is used for around 40-50 times on each box. This over-usage of hammer creates invisible, yet considerable damage like hairline fractures to the circuit or on the consoles of LED TV screens. (IIM Ahmedabad, 2015). Hence Agarwal packers and movers on basis of this research have started using reusable cardboard boxes in order to ship LED television hence the company is only limited up to movers and packers job so perspective of this research paper to use this reusable cardboard boxes in supply chain of television manufacturing company itself and use this reusable boxes to deliver product to end customer.

As observed there is evident scope for the use of reuse packaging in television shipping which will have advantage of reduction of environmental impact. Research conducted till now have evidently remained restricted to certain sectors and mainly focuses on post consumer packaging waste recycle, very less attention is given for reuse of packaging in case of electronics equipment. To fill the research gap above, this paper analyzed the packaging logistics system in LED assembled unit and compared the cost of the traditional logistics mode and the green logistics mode to comprehend the economic practicability and potential limitation of implementing the reusable packaging logistics system.

## 3. Objectives

- To find out cost efficiency of Green supply chain (Reusable packaging) for LED TV (32 inch).
- To compare and analyze cost efficiency of reusable packaging and single use traditional packaging.

## 4. Research Methodology

### 4.1 Case Description

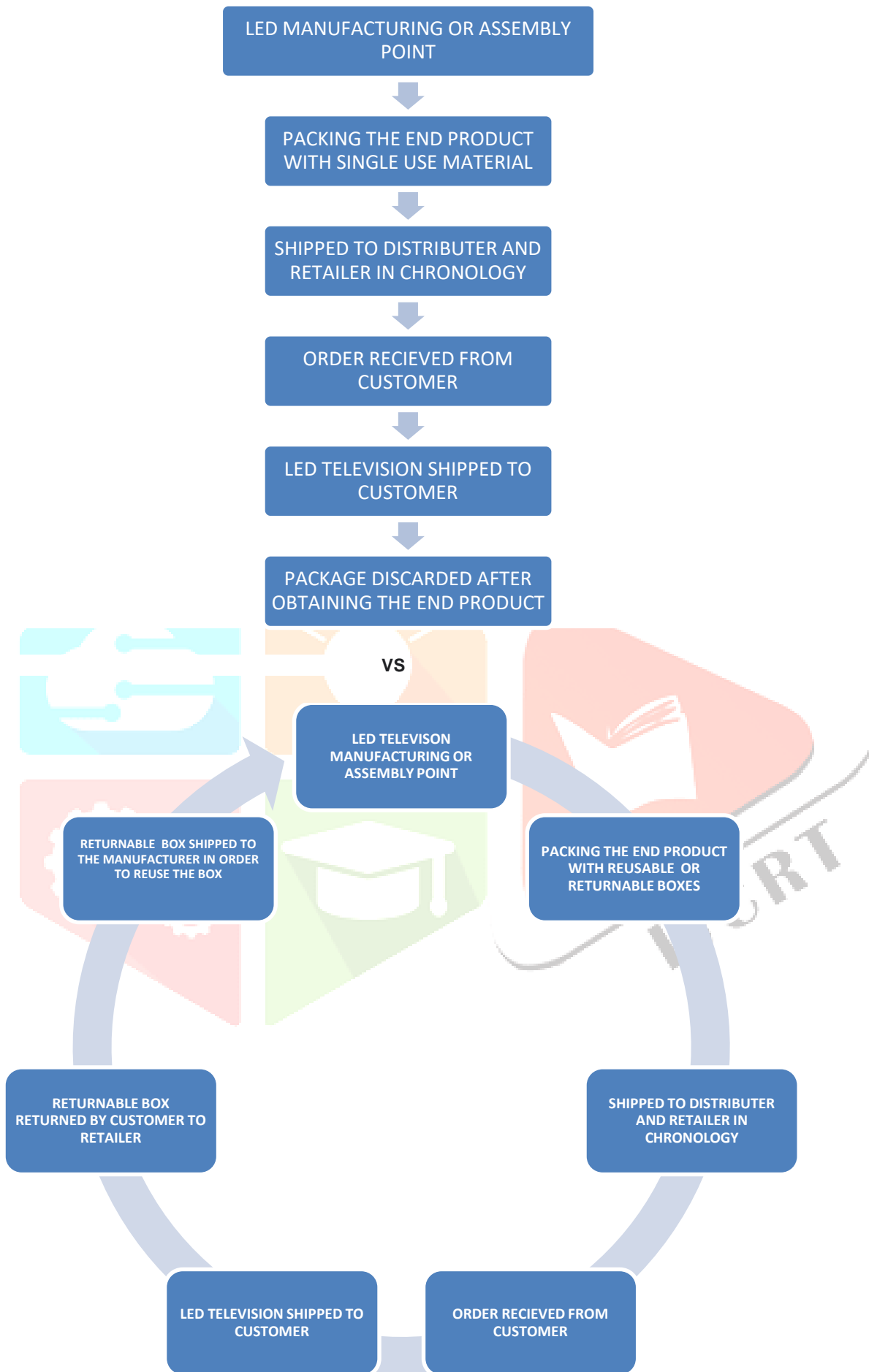
The demand of LED television sets are increasing around the world especially in India as number of household are increasing with increase in infrastructure projects and therefore is a urgent need to transform the traditional supply chain to green supply chain. The production process of LED television sets are divided into various processes and there are various key components such as metal frame, display unit, host controller, color filter are mostly made in South Korea, Japan and then this components are shipped it India for final assembly to convert it into end product. Hence in order to ship the product to end customer there should be proper handling and packing operations, the packaged television being fragile and bulky critical protection measures should be taken. Packaging material of the particular [product accounts second highest cost in traditional supply chain, it takes around 15% of total cost.

In recent years due to various contributing factors such as lockdown due to pandemic, dependence on Smart TV due to various OTT platforms the demand of LED television sets have particularly increased and hence forth the usage of packaging will also increase, hence from the view point of environment this packaging will only be used once and then discarded into wastage in traditional supply chain.

Hence previously discussed the Led televisions which are shipped to long distances in traditional supply chain which uses corrugated cardboard boxes, cellophane tapes prepared from synthetic derivative of cellulose which comes from pulp of wood pulp or cotton seeds, bubble wrap are prepared or formed from polyethylene (LDPE) which is biodegradable. Because LED's are fragile and have high priced glasses there are specific structure of boxes used in shipping of television sets in order to absorb shocks.

In order to fulfill the demand of volatile markets organization have mainly shifted to assemble to order and make to stock mode in order to satisfy customer's customized demand. In order to recognize real market demand and to carry out precise numerical analysis historical demand data was collected from the retail shop owner. According to the interview with the retail shop owner stated that demand in month 1 and month 2 are comparatively more and it gradually decreasing in last two months of the respective quarter. The flow chart described below shows both traditional supply chain and green supply chain with respect to shipping of assembled LED television sets. In traditional logistic various materials including shipping boxes including the shipping box are used only once in contrary to that in green supply chain the box used for shipping are sustainable, standard and reusable. This research compares traditional and green logistic mode from the economic and environmental perspective by taking example of shipping of LED television set of particularly 32 inch to end customer from assembly or manufacture point.





1. Comparison of green and traditional logistic supply chain

## 4.2 Product profile

The reusable boxes are perfectly designed with hard exterior for external safety, soft foam interior for providing cushiony effect and holding grip of the article packed inside. These boxes are basically made of cardboard which are reusable with interior of soft foam and plastic coating to provide protection to LED television set.

## 4.3 Parameters

The subsection shows details of computation of cost model, the cost model was developed on the basis the data collected from the retailers and the from the data obtained from various logistic internals through retailers and reconfirming the data with data available on various research papers and various packers and movers website such as Agarwal packers and movers. The below listed are further specifications of how research was conducted

### 1. Scope of study

Researcher would like to analyze to cost and environmental efficiency of traditional and logistic supply chain.

### 2. Collection of data

The proposed data will be based on both primary and secondary data.

Primary data- Primary data will be collected through retailer owner of shops through their historical sales data.

Secondary data- Secondary will be collected from various logistic company's website, previous researches, articles.

### 3. Area of study

Country-India, State – Gujarat, City- Dahod

### 4. Sample selection

Convince based sampling

### 5. Sample size

Under the study, three retail shops on random and convince basis where selected in the city of Dahod from whom there sales historical data was collected, in which around 254 television sets on average were sold in an year.

### 6. Tools of analysis- Simple mathematical functions

#### 4.3.1 Total cost of traditional logistic

Hence the total cost of shipping LED television to end consumer is calculated in this subsection, the total cost of traditional logistic cost with respect both is calculated by multiplying the number of units sold in that with the cost of logistic which include shipping cost and material cost. Mathematically in can describe as follows:-

$$TC = N * TC_{lc}$$

$$TC_{lc} = TC_{sc} + TC_{mc}$$

TC=Total cost of logistic operation, N=Number of units sold in respective month

TC<sub>lc</sub>=Total cost of logistic

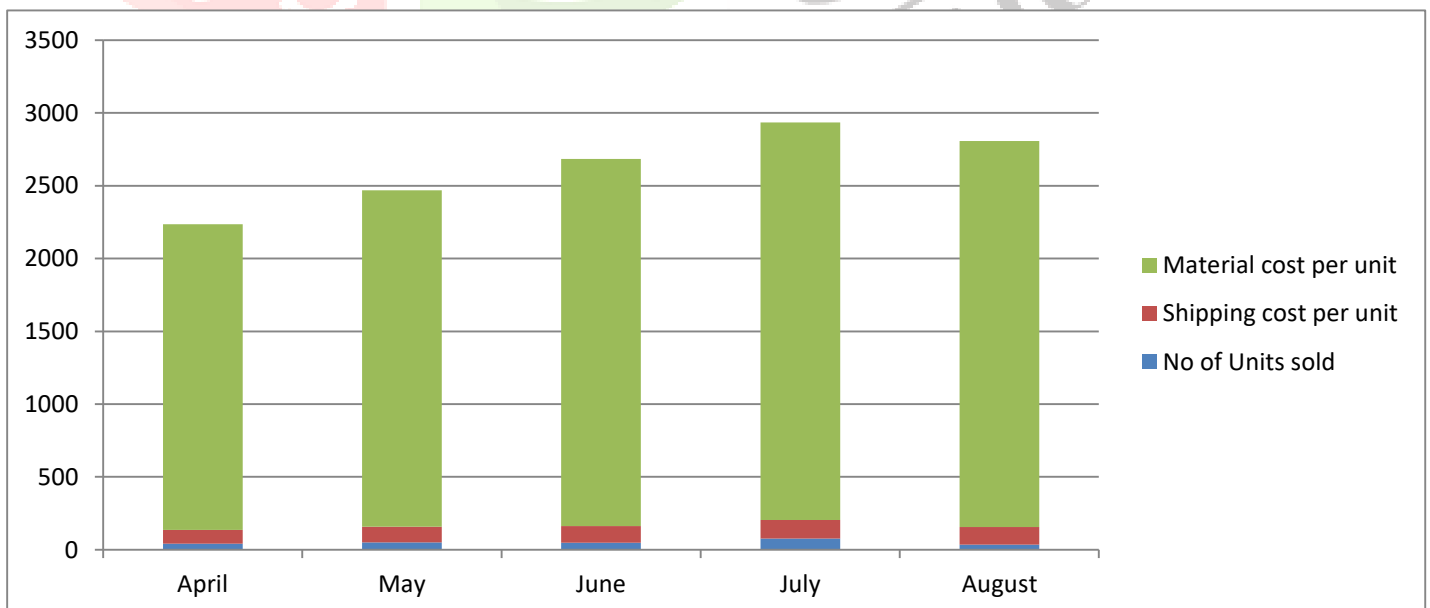
TC<sub>sc</sub>=Total shipping cost

TC<sub>mc</sub>=Total material cost

Month (Year 2020)	No of LED Television sold of 32 inch (N)	Shipping cost per unit (INR)	Material Cost per unit (INR)	Cost of Logistic (INR)	Total Cost Of Logistic Operation (INR)
April	42	93.6	2100	2193.6	92131.2
May	50	108	2310	2418	120900
June	48	115.2	2520	2635.5	126504
July	76	128.8	2730	2858.8	217268.2
August	36	121	2650	2771	99756
<b>Total</b>	<b>254</b>	<b>566.9</b>	<b>12310</b>	<b>12876.9</b>	<b>656559.4</b>

1. Table showing cost involved traditional logistic cost

Hence from the above table few things are to be noted, first that number of LED television sold every month is equal to no. of single use boxes required in a month. Second that the price of shipping and material cost keeps fluctuating due to increase or even decrease in fuel prices, paper prices, inflation and various other domestic and global factors. Hence the total cost incurred of logistic and packaging to ship 254 thirty two inch LED television from assembly point or manufacturer to end customer is 656559.4 Indian Rupees in traditional logistic supply chain.



2. Graph showing which cost contributes the most in case of shipping LED TV to end customer



### 4.3.2 Total cost of green supply chain

The variants and calculation models in green logistic supply chain remain same as traditional logistic supply expect that the material cost of boxes is incurred only once as initial cost after that the recyclable box can be used up to 12 cycles to its full efficiency. The table below shows replicates the data used in traditional logistic in terms of no of units.

Month (Year 2020)	No of LED Television sold of 32 inch (N)	Demand surge or demand contraction in LED television	Shipping cost per unit (INR)	Material Cost per unit (INR)	Cost of Logistic (INR)	Total Cost Of Logistic Operation (INR)
April	42	0	93.6	2100	2193.6	92131.2
May	50	8	108	2100	2208	22200
June	48	-2	115.2	2100	2215.2	5529.6
July	76	28	128.8	2100	2228.2	12572
August	36	-40	121	2100	2221	4356
<b>Total</b>	254		566.9	10500	11066	136788.8

1. Table showing cost involved in green logistic supply chain

Hence through above figures we can clearly state that by using green logistic supply chain the total amount of cost incurred is 136788.2 Indian rupees which is significantly less compared to traditional logistic supply chain.

Calculations

**Total cost of logistic operation (April)** = N \* Cost of logistic in month of April

**Demand surge or contradiction** = Current month – Previous month units sold

**Total cost of logistic operation when there is demand surge** =

(Demand surge \* Total logistic cost) + (Current month demand – Demand surge) \* (Shipping cost of that month)

**Total cost of logistic operation when there is contradictions in demand** =

No of units sold in that month (N) \* Shipping cost incurred in that month.

Hence negative in demand surge or contradiction column suggest contradiction in demand or positive represents surge in demand of led television which is directly equal to number of boxes required.



Here in this table there are number of points to be explained in order to understand the efficiency of green supply chain.

- The initial cost incurred in the month of April is considered for the whole lot of 42 units because it assumed that from that point the particular organization switches to reusable boxes so the initial cost is incurred in the month of April.
- Demand surge and contradiction mentioned in third column are important in order to calculate the total cost of logistic operation in each month.
- Empty reusable boxes will be reverted to manufacturer or assembly point at the time of delivery of new order.
- Hence when the demand has contradicted we have enough no boxes in previous month which can be recycled so the material cost will be saved in that case and only shipping cost will be considered when demand is contradicted, so in that case the shipping cost will be directly multiplied with no of units sold as material cost has not incurred in period of contradiction.

#### 4.5 Assumptions and constraints

1. Customer spontaneously returns the shipping box at the time of delivery.
2. The recycling process for reuse which includes sanitization in normal scenario whose cost is negligible.
3. The shipping boxes which are reusable are considered hundred percent efficient and damage shipping boxes are not taken in consideration.
4. The shipping boxes are efficient for its full 12 recyclable cycles.

#### 5. Result analysis and discussion

Using a demand data of historical sales of retail shops both cost of traditional supply chain and green supply chain total cost were calculated in terms of shipping and packaging cost, the conclusion which has arrived is that the cost of green supply chain logistic is significantly lower than traditional supply chain. Additionally with usage of reusable boxes in context of green supply chain the material cost constantly decreased with every passing month. While examining the functional cost of green supply chain the recycling rate for boxes to be used again which includes process like quality checks of boxes, sanitization etc are of negligible cost compared to material cost, hence so forth reusing the boxes will ultimately reduce material costs.

Hence from the various calculations conducted in this research paper it is clearly evident that green supply chain saves around 519770.6 Indian rupees for a small sample size of 254, 32 inch led television. So on large scale basis if worked efficiently company can save ample amount of monetary fund's and capital costs and can gain competitive advantage. However in real there are various constraints which are needed to overcome in order to run green supply chain efficiently such as return time, return quantity, quality of returned containers, etc.

#### 6. Conclusion and Future outlooks

This finding contradicts the general perception that going green must be costly. This result also indicates that the reusable general purpose package design has great positive effects on the life span of product and switching to green logistic supply chain is beneficiary on both contrary namely economically and environmentally. Since the proposed calculations and the case study are new to the relevant study, it may not be sufficiently refined. Many factors have not yet been fully considered and need to be perfected in future work. Various kinds of market demand patterns may be considered for further analysis. Besides demand patterns, package return time and inventory are other issues can be also considered in future work. And in addition it can be further done on road map of other electronic equipments.

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