



# Reverse Logistics: An Empirical Study for Operational Framework

Ijaz Yusuf <sup>1\*</sup> and Abdul Raouf<sup>2</sup>

<sup>1</sup>Department of Operations and Supply Chain, School of Business and Economics,  
University of Management and Technology, Lahore, Pakistan

<sup>2</sup>University of Management and Technology, Lahore, Pakistan

**Abstract:** This paper presents framework of reverse logistics optimizing the stakeholders' gain, social gain, economic gain and environmental gain. It identifies the roadblocks that prevail in recycling industry and describes various types of returns and wastes. Framework of the reverse logistics is evolved on the basis of actual happening of the items shown in table 1-4 disposed off from industries shown in table 6. The rejected items require environmental disposal passing through the different phases described in flow of operational framework. An operational framework of reverse logistics is developed studying fifty organizations.. In addition three best practices of reverse logistics are proposed by consolidating the experiential information and rich hands on industrial experience in supply chain and reverse logistics area. The research has proposed the Social, Stakeholder, Economic & Environmental (SSEE) sustained gain model optimizing the benefits of stakeholders and highlights the variety of waste and its operational methodology in Pakistani industry. The proposed framework does not include the hospital waste, radioactive waste, hazardous materials waste, municipal waste, agricultural waste and cold chain waste like meat, milk, etc. The operational framework is existing way of doing that takes the waste materials from point of origin to the point of recycling. A better understanding of this framework may help researchers and front line managers to develop better, more accurate models for effective and sustainable utilization of waste materials, benefiting organizations and society by simultaneously enhancing the cost effectiveness and improving environmental awareness. The paper provides an operational framework of reverse logistics and 2S2E sustained gain model. Specific applications are examined through empirical research.

**Keywords:** Reverse logistics, supply chain management, operational framework, recycling

## 1. INTRODUCTION

In the era of information technology where the whole world is connected and going to concentrate on one point market the whole Globe. Rising populations, globalization policies, fluctuating currency exchange rate, oscillatory behaviour of prices of world commodities and WTO regulatory requirements are threatening more and more. Intensive competition among manufacturers is increasing day by day and encouraging them to explore the innovative options for waste materials.

Increased environmental awareness and upcoming stringent environmental laws exert the pressures on manufactures to dispose off

waste materials in an environmental friendly way otherwise the high pollution charge and closure of the manufacturing units will be the destiny. Returns whether they are manufacturing or distribution or customer they always have a potential for cost recovery and there is a way to reclaim the material to capture the monetary benefits [1]. Reverse Logistics deals with the flow of materials from point of consumption to the point of origin to recapture value or to ensure disposal [14].

As per the council of Logistics Management, "Reverse Logistics is 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 can be defined as reverse process of logistics [2]. Reverse Logistics aims at the backward flow of material which starts from consumer to the producer and defectives appearing during the manufacturing process with a goal of maximizing value from items which require proper disposal [6]. Reverse Logistics programs and its effective implementation affects the bottom-line and boost the productivity. [17] Reverse logistics starts where formal supply chain ends. It starts from the consumer instead of supplier in the forward flow. Environmental friendly disposal, monetary returns to parties involved are the part of green logistics and require focus and attention of Life cycle assessment [8] this is the result of conscious efforts from Industrial Waste Contactor and the company itself to build the company image in society and provide a confidence to environmental protection agency.

## **2. LITERATURE REVIEW**

Logistics is the vast field. In supply Chain context, logistics deals with flow of materials, equipments, and people from point of origin to the point of destination. A flow associated from the supplier's supplier to customer's customers is regarded as forward flow. But there are sometime returns of any form that require backward flow of materials that is reverse logistics. In early nineties, the council of logistics management has published two books on reverse logistics. The first by Stock [9] recognized the field of reverse logistics as being relevant for business and society in general. One year later Kopicki et al. [12] paid attention to the discipline and practice of reverse logistics, pointing out opportunities on reuse and recycling. Kostecki [12] discusses the marketing aspects of reuse and extended product life. Stock [10] reports in detail how to set up and how to carry out reverse logistics programs. In literature there are many models which are developed on the basis of Liner programming for multi-items and multi-locations [2]. The structure of the Operational Framework of Reverse Logistics is not restricted to any item or any site or any party. The beauty of this framework is it involves all the

operational stakeholders and ends up with Social, Stakeholder, Economic and Environmental (SSEE) gain model optimizing their gains. To understand the effective operation of this framework we must explore the impediments which create hurdles.

## **3. ROAD BLOCKS FOR REVERSE LOGISTICS**

### **3.1 Lack of Awareness about Reverse Logistics**

Impact of the reverse logistics is implicit in nature. Customers have greater value for the product in the local as well in the global markets. That is the reason focus towards the by product, scrap and rejected materials is less and it has a great potential to recover the money back.

### **3.2 Lack of Technical Expertise**

Reverse logistics is the forgotten dimension. There is no formal education center that educates and guides how to play in the field of reverse logistics. Mostly people involved in this business are uneducated and non-technical. They have learned the recycling techniques over the period of years and doing the businesses on the basis of experience and creativity. That discipline has a lot of entrepreneurial potential and there is lot of room that educated people may opt this field as source of income.

### **3.3 Inconsistent Quality of Rejected Materials**

Production of waste and nature of rejections are highly unpredictable. No one can indicate the nature of waste generated. In some cases like defective cartons or poly film or confectionary waste or biscuit crumb or rotten potatoes a slight idea of quality can be conceived but most of the cases it is highly inconsistent the quality of defectives and rejections. So accordingly every time you will have to explore recycling techniques accordingly.

### **3.4 Financial Constraints**

People in the business of reverse logistics can work either as a local waste contractor or Industrial waste contractor. To be the industrial waste contractor, one requires a strong financial muscle to make the payments on cash at the time of lifting the rejected material. Unless one knows about the fate of the rejected material the lifting may ruin or destroy his/her whole business.

### 3.5 Management Inattention

Due to green logistics and industrial ecology there is a lot of pressure on management to dispose them off in an environmental friendly way of the lack of information of the materials demanded in the small markets. Top management is highly involved in the core activities of the organization that is why they least bother to the rejections.

### 3.6 Poor Measurement System

In most of the organizations there is no formal mechanism for measurement. Usually they combine all waste under one head. No doubt the selling is item wise and the income generated is booked in the accounting ledger the amount recovered against scrap or waste. That is why, one can not exactly have details what they have sold in which category. That hampers the good decision making with respect to the disposal initiatives.

### 3.7 Forecasting and Planning Constraints

MNCs and System Based Organizations have the estimated values for the reverse logistics that is usually based on previous year's estimates, future sales projections and the defect reduction initiatives. In spite of all these efforts, there are some anomalies like variation in the temperature of cold storage in the system that results in huge quantities. Industrial waste contractor is supposed to lift the material and suppose to line up the resources accordingly.

### 3.8 Inadequate Information System

Information System support always adds the value in reverse logistics for the identification of the rejections in every stage along with determining the impact on the bottom line. Most of the companies usually have inadequate information system and their conventional information systems do not contain the information about reverse logistics.

### 3.9 Environmental and Legal Issues

Due to green logistics, industrial ecology and life cycle assessment [3] there is a lot of pressure on management to dispose off reverse materials in an environmental friendly way. The Heavy pollution charge, bad impact on brand image and the closure of the businesses compel the management to take appropriate measures to handle the materials. Land filling of waste is not the effective way to dispose

off the material rather it imposes the unacceptable environmental risks [15].

### 3.10 Absence of Performance Indicators

Absence of the performance indicators with respect to the reverse logistics is as well the source of impediment. Waste percentage and value recovered is the generic indicators usually used in the industry. There is a strong need to establish some indicators to effectively monitor the reverse logistics.

## 4. METHODOLOGY

### 4.1 Reverse Logistics and Scope

In the manufacturing units and corporate world, returns are very much imbedded in the system. There are some returns from customers [4] due to not meeting the customer's specifications and some time there are returns during the manufacturing process because of unsatisfactory parameters or characteristics of the product within the manufacturing units. It happens many times distributors take the materials back just to ensure the effective implementation of the product recall procedure. Whatever the reason is product returns [4] exist in the system and one of the important processes of reverse logistics [18]. Different types of the returns materials are defined as under:

#### I. Manufacturing Returns

- a) Scrap
- b) Defectives
- c) Rework
- d) By products
- e) Planned waste
- f) Production left-over

#### II. Distribution Returns

- a. Product recall
- b. Promotional material returns
- c. Customer returns (Retailer, whole saler, Distributor)
- d. Stock adjustments
- e. B2B commercial returns

## f. Packaging

## III. Customer Returns

- a. Excess quantities
- b. Rejected materials
- c. Service returns (spare parts, repair)
- d. B2C Commercial returns
- e. Reimbursement
- f. Warranty claims
- g. End of lease returns
- h. End of life returns

The above-mentioned returns are the generic returns identified from the literature; actual types of waste explored through the study of 50 companies are mentioned in Table 1, Table 2, Table 3 and Table 4. Types of the waste are taken from the list of contractual items. List of the companies explored is mentioned in Table 6. Sampling is convenience and snowball and random in nature. It is good to know that one of the important trends in supply chain management is recognition of the reverse logistics operations. These reverse logistics operations include many recycling activities like re-use, repair, re-furbish, re-assemble, re-manufacture and reduce the environmental impact performing variety of activities like dumping, biogas generation, and composting [16].

### TYPES OF REVERSE LOGISTICS

Followings are the types of waste:

Sr. No.	Nutritional Wastes	Sr. No.	Biodegradable Wastes
1.	Chips	1.	Rotten Potato
2.	Starch	2.	Potato Soil
3.	Potato Peel and Hash	3.	WWTP Sludge
4.	Undersize Potato	4.	Kitchen Waste
5.	Biscuits Crumb	5.	Melted ice cream
6.	Broken Sweets	6.	Rotten milk
7.	Rotten Milk	7.	Rotten cheese
8.	WWTP FAT	8.	Wood
9.	Vegetable Used Oil		
10.	Meal Waste		

**Table 1.** Nutritional and biodegradable waste.

Sr. No.	Metallic Wastes	Sr. No.	Plastic Wastes
1.	Iron Scrap	1.	Polyethylene
2.	Iron Drums	2.	Polypropylene
3.	Stainless Steel Scrap	3.	Poly Film
4.	Mix Metal Scrap	4.	High Density
5.	Aluminum	5.	Laminates Wrapper
6.	Tin	6.	Empty Palm Oil Bags
7.	Copper	7.	Film Waste
8.	Electric Cables	8.	PET Materials
9.	Brass	9.	Rubber/plastic items
10.	Machinery Scrap	10.	Plastic Drums
11.	Computer scrap hardisk/casing	11.	Plastic Cans
12.	Cast Iron	12.	Hard Rubber
13.	Silver can/bottles	13.	Printer Cartridge

**Table 2.** Metallic and plastic waste.

Sr. No.	Paper/ Ghatta Wastes	Sr. No.	Chemicals Wastes
1.	Ghattah /Carton	1.	FFA
2.	Ghattah Rolls	2.	POV
3.	Newspaper	3.	Nitric Acid
4.	Stationary Paper	4.	Used Mobile Oil
5.	Paper Strips	5.	Ink residuals
6.	Gum paper	6.	Solvents Waste
7.	Cigarette Paper	7.	HCL
8.	Wrapping Paper	8.	Sulpheric Acid
9.	Filter Paper	9.	Caustic Soda
10.	Toffee Paper	10.	Borax

**Table 3** Paper/ghatta and chemical waste.

Sr. No	Non-Organic Wastes	Sr. No	Bags Wastes
1.	Glasswares	1.	Description
2.	Sanitary wares	2.	PP Bags
3.	Lino Kinari	3.	Leno Bags
4.	Cotton Lint	4.	Paper Bags
5.	Cotton Yarn	5.	Cement Bags
6.	Sizing materials	6.	Meal / Seasoning Bags

**Table 4.** Non-organic and bag waste.

Waste Contractors and Recyclers			
Sr. No.	Organized Recyclers	Sr. No.	Non-Organized Recyclers
1.	Waste Busters	1.	Malik Plastics
2.	Green Earth Recycling	2.	Saddaqt Recyclers
3.	Tradeasia	3.	Many more
4.	Punjab Nylo Block Recycling Plant		
5.	Lahore Compost Pvt Ltd		
6.	Lahore Solid Waste Management Company		

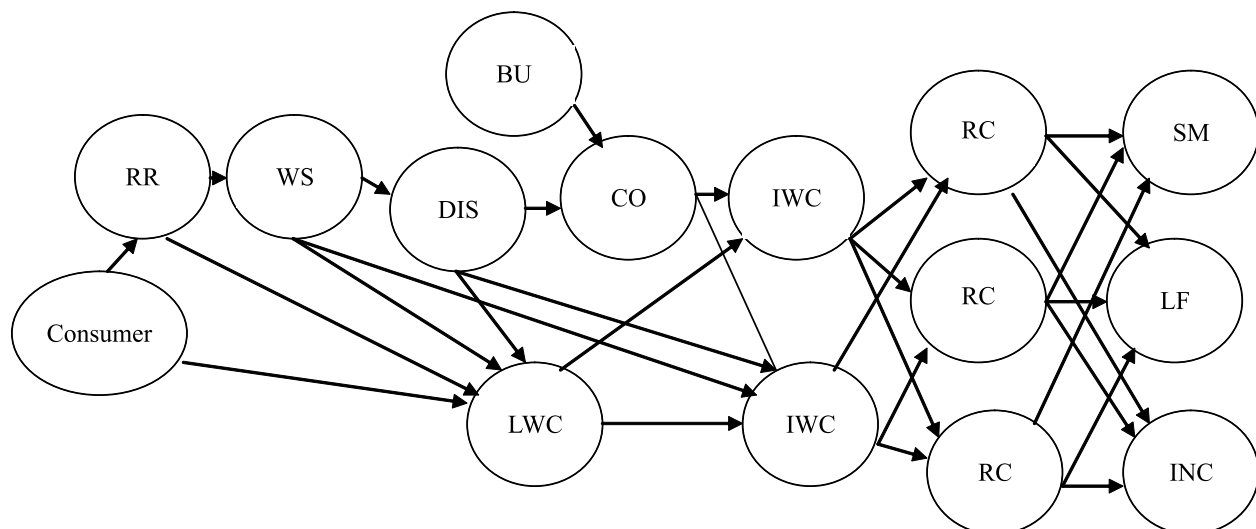
**Table 5** Waste contractors & recyclers. Industries being explored for reverse logistics.

<b>System-based Companies</b>	
1. Tetra Pak	5. Maxim International
2. Nestle	6. Service Industries
3. Pepsi Cola International Pvt Ltd	7. Green Earth Recycling
4. Unilever Pakistan	8. Darson Industries
5. Coco Cola	9. Spelling Packaging
6. Packages Ltd	10. Kohinoor Textile Mills
7. Pakistan Tobacco	11. Farhaj Footware Pvt Ltd
8. Descon Engineering	12. Pioneer Board Mills
9. CCL Pharam	13. Shan Food Pvt Ltd
10. Treat Corporations	14. Servaid Pharmacy
11. Packaging Solutions	15. Matrix Sourcing
12. Irfan Textile	16. Infinity Engineering Pvt. Ltd.
13. Bullah Shah Paper Mill	17. Bunny Food Industries
14. Century Paper Mill	
15. Walls Ice Cream Pvt	<b>Owner-based Companies</b>
16. Khanewal Tea Factory	1. Express Pac Pvt Ltd
17. Key Emms Pvt Ltd. Faisabalad	2. Vandana Pvt Ltd
18. Bata Pvt Ltd.	3. Organon Live Stock Feeding
19. METRO	4. Tradeasia
20. Coca Cola	5. Waste Buster
	6. Metal Forming Pvt Ltd
	7. Chaudry Rice Mills
	8. Shahraj Textile Mills
	9. Wali Oil Mills
	10. Plasplastics
	11. Mehrab Packaging
	12. Gul Ahmed
	13. Gourmet Bottling Plant
<b>Manager-based Companies</b>	
1. Asian Food Industries	
2. Ravi Motorcycles	
3. Mian Tyre and Rubber industries	
4. DIC Ink Factory	

**4.2 Operational Framework of Reverse Logistics**

The reverse logistics has a strategic importance in the field of supply chain.[11] This operational framework of reverse logistics is designed and developed on the basis of exploratory study of Industries mentioned in Table 6. Operational framework is the generic flow of reverse logistics in Pakistani Industries.

End consumer and retailer follow the stream of Local Waste Contractor (LWC) for packaging materials like empty can, empty wood boxes, and plastic materials. In case of product rejections, end consumer return material to retailer (RR) then retailer send this material back to wholesaler (WS) then distributor (DIS) and then company (CO). Wholesaler and distributor may have a link with Local Waste Collector (LWC) and Industrial Waste Contactor (IWC) depending upon his need but retailer has a single link with the local waste contactor for his reverse materials. Company always engage the Industrial Waste Contractors (IWC) as a supply chain partner for reverse logistics to ensure the effective and efficient disposal of material adding maximum value to company. Industrial Waste Contractor work with multiple recyclers (RC) and disposing off their material with best monetary recover. Recyclers after due segregation, cleaning and processing sell recycled materials to small manufacturers (SM). Few quantities go to



**Fig. 1.** Operational framework of reverse logistics.

dumping stations for land filling (LF) purpose and some which cannot be land filled met the fate of incinerations (INC). This framework is designed on the basis of study of fifty companies indicated in Table 6. The waste items generated from these companies helps to develop the generic flow of waste items coming from end consumer and industries and going back to industries, recyclers, dumping stations and incinerators depending upon the material type, recycling process and nature of the items shown in Table 1-4. Recyclers highlighted in Table 5 are keen for capacity building and keep on adding the new recycling techniques to dispose off waste items as per the requirements of Environmental Protection Agency (EPA).

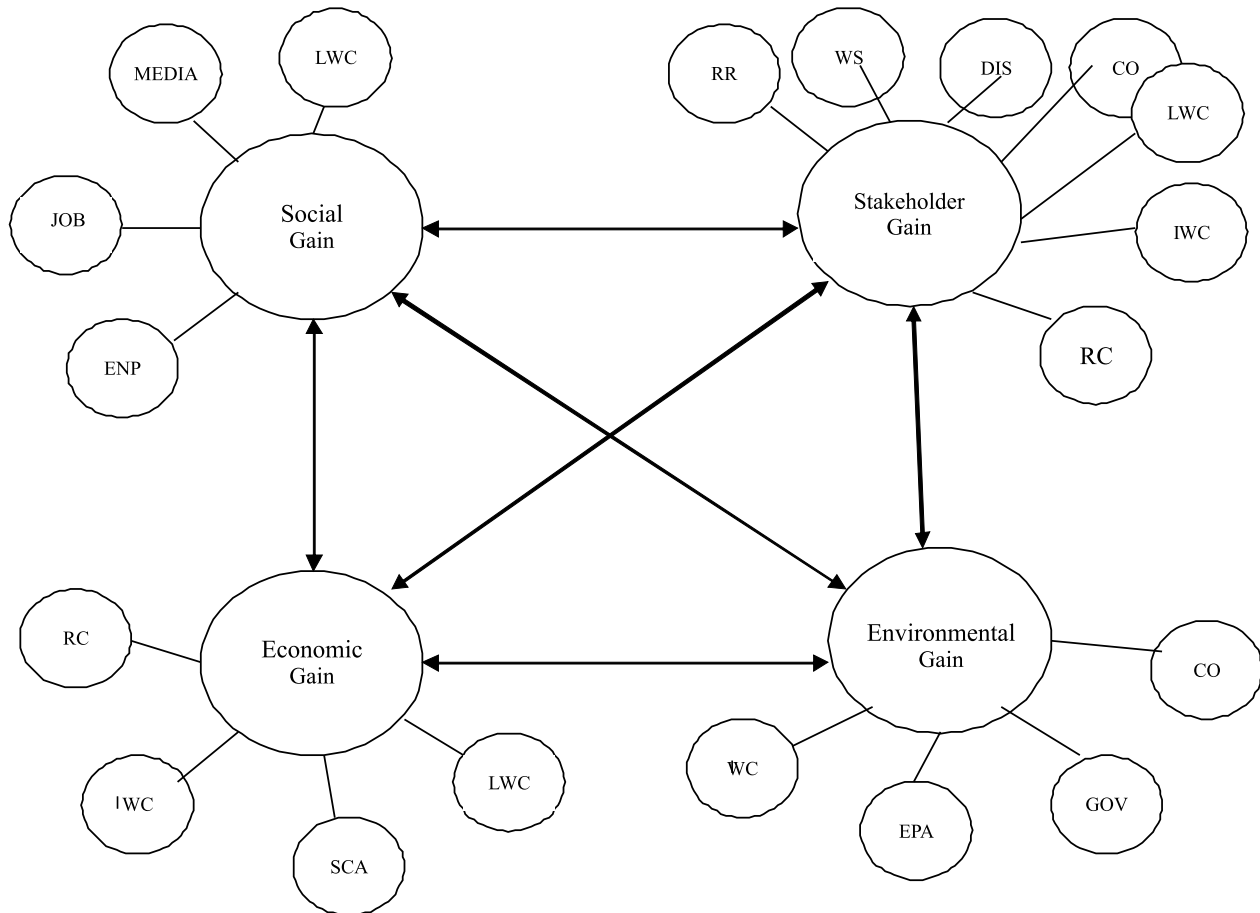
**4.3 Limitations of the Operational Framework**

The operational framework of reverse logistics does not encompass the waste of following areas:

1. Hospital waste
2. Municipal waste
3. Radioactive waste
4. Agricultural-based waste
5. Cold storage waste
6. Pharmaceutical waste
7. Hazmat materials for high tech equipment
8. Meat waste

**4.4 Assumptions**

The assumptions of the framework are as under:



**Fig. 2** 2S-2E self sustained gain model.

**Abbreviations in Fig. 2:**

- |                                       |                                     |
|---------------------------------------|-------------------------------------|
| RR = Retailer                         | IWC = Industrial Waste Collector    |
| WS = Wholesaler                       | RC = Recycler                       |
| EPA = Environmental Protection Agency | LWC = Local Waste Collector         |
| DIS = Distributor                     | Job = Job Opportunity/Employability |
| ENP = Entrepreneurial Spirit          | GOV = Government                    |
| MEDIA = Media Fear                    | SCA = Supply Chain Actors           |

1. End consumer does not hold / store the packaging materials and empty products.
2. End consumer sells packaging materials and scrap to Local Waste Collector and in case of defective product procured returned to retailer. Medical waste is not the part of the operational model.
3. Retailer sells outer packaging to local waste collector and rejections sends back to wholesaler, wholesaler to distributor and then company. Wholesaler and distributor may engage the Local waste collector or Industrial Waste Contractor depending upon his need and volumes of the waste materials and may return materials to company.
4. Wholesaler and distributor may engage the Local waste collector or Industrial Waste Contractor depending upon his need and volumes of the waste materials and may return materials to company.
5. Medical waste is not the part of the operational model.
6. Retailer sells outer packaging to local waste collector and rejections sends back to wholesaler, wholesaler to distributor and then company.
7. Wholesaler and distributor may engage the Local waste collector or Industrial Waste Contractor depending upon his need and volumes of the waste materials and may return materials to company.
8. Company always engages the Industrial Waste Contractor for the disposal of reverse logistics.
9. Operational Framework of the reverse logistics gives the driving power to SSEE Self Sustained Model for its operation. Media fear, environmental concerns, competition and monetary returns drive this model that ultimately ends up with four gains, i.e., stakeholders' gain, social gain, economic gain and environmental gain, which are elaborated as under:

#### A. Stakeholders' Gain

- a. Stakeholders have win-win situation
- b. Everyone earns benefits
- c. Everyone love economic activity as it enhances the quality of life

- d. Stakeholder's gain provides business opportunity
- e. Stakeholder's gain drives value chain among all stakeholders and associated partners like transporter

#### B. Social Gain

- a. Employability
- b. Moral compensation
- c. Job Opportunities
- d. Encouraging entrepreneurial spirit
- e. Media Fear
- f. Entrepreneurial Spirit
- g. Social Corporate Responsibility

#### C. Economic Gain

- a. Creating impact at company productivity
- b. Wealth creation
- c. Cost Reduction
- d. Monetary value addition
- e. Enhancing profit margins

#### D. Environmental Gain

- a. Environmental care
- b. Environmental awareness
- c. Green Image and Clean environment
- d. Saving environment for future generations
- e. Avoiding Pollution Charge
- f. Enforcement of Environmental Laws

Social gain loop has single variable linkages and multi-variable linkages. Social gain has a multivariable linkage with stakeholder gain building the brand image of the stakeholders.

**Table 6** Industries being explored for reverse logistics.

Sr. No.	Multi-Variable Linkages	Impact
1.	Social Gain – Stakeholder Gain	Protect Brand Image, Enhance Goodwill
2.	Social Gain – Environmental Gain	Green and Save Environment
3.	Social Gain – Economic Gain	Encourage Recycling
4.	Stakeholder Gain – Environmental Gain	Contribute towards Social Corporate Responsibility
5.	Stakeholder Gain – Economic Gain	Win-win opportunity
6.	Economic Gain – Environmental Gain	Creating wealth through proper recycling

**Table 7** Multi variable linkages and its impact.

Sr. No.	Single-Variable Linkages	Impact
1.	Social Gain--- Media	Media fear encourage towards corporate citizenship
2.	Social Gain--- Jobs	It enhances more job and employability
3.	Social Gain--- Local Waste Collectors	Local waste collector gets good return and hire more persons as employees.
4.	Social Gain--- Entrepreneurial Spirit	Wave of entrepreneurial spirit spreads and encourage people to build the career as a entrepreneur
5.	Environmental Gain-- EPA	Strengthen the role of Environmental Protection Agency
6.	Environmental Gain-- Govt	Establish the good governance from governmental side
7.	Environmental Gain-- IWC	Encourage the Industrial Waste Contactors to manage the things in an environmental friendly way
8.	Environmental Gain-- CO	Building the company image in general public and in society as a environmental friendly company
9.	Economic Gain --- LWC	Local Waste Collector (LWC) gets its own share
10.	Economic Gain --- RC	Recycler (RC) gets good return
11.	Economic Gain --- IWC	Industrial Waste Contractor (IWC) gets more contracts and good returns
12.	Economic Gain --- SCA	Supply Chain Actors (SCA) get nominal chunk due to various reasons.
13.	Stakeholder Gain --- RR	Retailer (RR) gets money back guaranty
14.	Stakeholder Gain --- WS	Wholesaler (WS) gets as per its contract
15.	Stakeholder Gain --- DIS	Distributor (DIS) sends back material to company and money back
16.	Stakeholder Gain --- CO	Company either hold the supplier or employees for continuous improvement and earns good reputation
17.	Stakeholder Gain --- RC	Recycler being the part of reverse logistics love to have such gain
18.	Stakeholder Gain --- IWC	Industrial Waste Contractor gets its own share
19.	Stakeholder Gain --- LWC	Local Waste Collector sells product to industrial waste contactor and generate revenue

## 5. REVERSE LOGISTICS ACTIVITIES

- Reuse (Value added)
- Recycle (Value added)
- Repair machinery / equipment (Value added)
- Refurbish (Value added)
- Reclaim materials (Value added)
- Salvage (Value added)
- Remanufacture (Value added)
- Recondition (Value added)
- Resell products (Value added)
- Return to supplier (Value added)
- Recover Chemicals (Value added)
- Re-assemble (Value added)
- Compositing (Value added)
- Landfill (Non-value added)
- Incineration (Non-value added)

## 6. BEST PRACTICES FOR REVERSE LOGISTICS

### 6.1 Identify the Right 3PL

Identification of the right Industrial Waste Contractor (IWC) is one of the biggest challenges. Lucrative returns attract many 3PL service providers to quote the bid at high rate to grab the contract and sometime few companies award the contract on the basis of price tag without properly evaluating the infrastructure, capacity and capability of 3PL service providers. Company must evaluate the Industrial Waste Contractor on the basis of full box view comprehending all the areas. Environmental disposal and optimal gain on the basis of win-win approach should be the winning principle. Zero sum game while engaging the contractor may deface the company image and mar the corporate citizenship.

### 6.2 Explore the Sustainable Solution

Appoint a Sustainability Manager who must work for sustainable solutions [8] for the reverse logistics and keep on working with Industrial Waste Contractors [13] for more value addition initiatives. Manager and Industrial Waste Contractor must



be awarded at the end of year for the cost cutting initiatives and exploring the value added recycling activities.

### 6.3 Make the System Auditable

Enhance the visibility in the system. Encourage documentation. Keep on conducting the second party audits to the Industrial Waste Contractor and customers of Industrial Waste Contractors. Second party audits not only help to identify the opportunities for improvement but as well ensure the effective and environmental friendly disposal of reverse logistics.

## 7. CONCLUSIONS

This paper presents a framework that is operational in the field of reverse logistics and highlights the 2S-2E Self Sustained Gain Model that is basically the main driver behind this operational flow. Open media, environmental awareness, brand image, and social corporate responsibility are key variables that provide the conducive climate for its success. List of recycling categories and the value and non-value added activities are a way to bring effective disposal of environmental pollutants [16]. Best practices are the real strength of company to enhance visibility, check appropriateness and search long term sustainable, economically viable, environmental friendly, labour intensive solutions. This paper encourages strategic managers to focus this forgotten dimension and pushing the tactical managers for exploring sustainable competitive advantages. Mathematical modeling and the System Dynamics modeling are open areas for research in future.

## 8. REFERENCES

- Gill, A.R., R. Wright, R.E. Glenn, R.R. Tokman, Mert & J.C. Palmer. Recycling and reverse logistics. *Journal of Applied Business and Economics* 12 (5): 9–20 (2011).
- Afifa, K., B. Mounir & C. Habib. Facility location model for reverse logistics. *APEM Journal – Advances in Production Engineering and Management* 6: 37–44 (2011).
- Brockman, T. Warehouse trends in 21st century. *Journal IIE Solutions* 31: 36–40 (1999).
- DeBrito, P. Marisa, D. Simmert, P. Flapper & R. Dekker. Reverse logistics: a review of case studies. *Econometric Institute Report EI-2002-21*, Erasmus University Rotterdam, 3000 DR Rotterdam, The Netherlands (2002).
- Geyer, R. & T. Jackson. Supply loops and their constraints: The industrial ecology of recycling and reuse. *California Management Review* 46 (2): 54–73 (2004).
- Rogers, D.S. & R.S. Tibben-Lembke. *Going Backwards: Reverse Logistics Trends and Practices, RV7*. Center for Logistics Management, University of Nevada, Reverse Logistics Executive Council, Reno, Nevada, USA (1998).
- Jack, E.P., T.L. Powers & L. Skinner. Reverse logistics capabilities: Antecedents and cost savings. *International Journal of Physical Distribution & Logistics Management* 40: 228–246 (2010).
- Murray, J.G. Effects of green purchasing strategy: The case of Belfast city council. *Supply Chain Management: An International Journal* 5: 37–44 (2000).
- Hazen, B.T., C. Cegielski, & J.B. Hanna. Diffusion of green supply chain management: Examining perceived quality of green reverse logistics. *International Journal of Logistics Management* 22: 373–389 (2011).
- Genchey, S.E., R.R. Glenn & C.B. Gabler. Evaluating reverse logistics programs: A suggested process formalization. *International Journal of Logistics Management* 22: 242–263 (2011).
- Alvarez-Jil, M.J, P. Barrone, F.J. Husillos & N. Lado. Reverse logistics, stakeholders' influence, organizational slack, and managers' posture. *Journal of Business Research* 60: 5 (2007).
- Kostecki, M. & A. Fehervary. *The Durable Use of Consumer Products: New Options for Business and Consumption*. Kluwer Academic Publishers, Dordrecht (1998).
- Yusuf, I. Framework of reverse logistics: The case of Pakistani industries. In: *Proceedings of 2<sup>nd</sup> International Conference on Business Management*, p. 1–28 (2012).
- Schatteman, O. Reverse logistics: operational Excellence. In: *Gower Handbook of Supply Chain Management*, 5<sup>th</sup> edn., John Gattorna (Ed.). Gower Publishing, Aldershot, UK, p. 267–279 (2003).
- Veerakamolmal, P. & S.M. Gupta. *Optimizing the Supply Chain in Reverse Logistics*. Proceedings of the SPIE International Conference on Environmental Conscious Manufacturing. vol. 4193, p. 157–166 (2000).
- Murphy, P.R. & R.F. Poist. Green perspectives and practices: A comparative logistics study. *Supply*

- Chain Management* 8: 122–131 (2003).
17. Stefan, E.G., R.G. Richey & C.B. Gabler. Evaluating reverse logistics programs: A suggested process formalization. *International Journal of Logistics Management* 22: 139–148 (2011).
  18. Lauren, R.S., P.T. Bryant & R.G. Richey. Examining the impact of reverse logistics disposition strategies. *International Journal of Physical Distribution & Logistics Management* 38: 518–539 (2008).
  19. [https://libra.unine.ch/Publications/Michel\\_Kostecki/3333](https://libra.unine.ch/Publications/Michel_Kostecki/3333)