THE IMPACT OF REVERSE LOGISTICS ON QUALITY IMPROVEMENT IN MANUFACTURING INDUSTRY: IN CASE OF SMALL AND MEDIUM ENTERPRISES OF SRIKAKULAM, ANDHRA PRADESH, INDIA

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Abstract: *This research aims to assess and analyze the impact of reverse logistics on quality management. Besides other studies conducted in the state of Andhra Pradesh, this research tries to extract out roles and impacts of reverse logistics concentrated on quality management. Both primary and secondary data sources were used for gathering information. The target population of the study was small and medium manufacturing sectors which are engaged in many businesses in Srikakulam District. Stratified sampling was employed to make strata for different manufacturing sectors. Moreover, purposive sampling technique will be used to select respondents from each sub sectors. Then for gathering relevant data, questionnaire, in-depth interview, field observation and focus group discussion was also used. Analysis was carried out through descriptive statistics that describe, compare, and contrast various issues related to reverse logistics with respect to the desired characteristics. With the support of the results and findings, the conclusions and recommendations backed by management implications were submitted to the related communities.*

Key words: Reverse Logistics, Quality Management, Small and Medium Enterprises, Srikakulam.

1. BACKGROUND OF THE STUDY

Reverse logistics and reverse processes emphasized green logistics (Carter & Ellram, 1998; Murray, 2000), that means added environmentally into logistics strategies, including product return, recycling, waste disposal, refurbishing, repair and remanufacturing (Autry, 2005).

Many companies have recognized the economic impact on reverse logistics (Klausner & Hendrickson, 2000), effective reverse logistics could improve company outcomes, and remanufacturing, repair, and recycling have been proved impact on company's value reclamation (Andel, 1997; Giuntini & Andel, 1995).

In the early nineties, a formal definition of reverse logistics was put together by the council of Logistics management, stressing the recovery aspects or reverse logistics (Brito & Dekker, 2004).

One of the most significant production issues that businesses have focused on during the last decades is quality that includes not only the quality of products but also the quality of services and processes. As markets become more and more competitive, quality becomes a key ingredient for business success, as customers get more and more aware of its significance and ask from every company to assure the fulfillment of their needs.

Reverse Logistics has emerged as an important field only in the last two decades. Many years ago, Supply Chains (SC) was well-organized sequences of production processes and products, from sourcing of raw materials to disposal to the final consumers. Evidently, products are still and will always be flowing to end users, whereas at the same time a continuously increasing volume of used products has started moving backwards, namely from end users to original equipment manufacturers (OEMs) or recycling/remanufacturing companies.

In line with the aspects discussed above with ample literature support, the researchers have an ideology to execute the research of finding the impact of reverse logistics on quality management of small and medium enterprises in Srikakulam district of Andhra Pradesh.

Manufacturing has emerged as one of the high growth sectors in India. Prime Minister of India, Mr Narendra Modi, had launched the 'Make in

India' program to place India on the world map as a manufacturing hub and give global recognition to the Indian economy. India is expected to become the fifth largest manufacturing country in the world by the end of year 2020. India is ranked 30th on WEF global manufacturing index in 2017-18. As per 2011 census of India, Andhra Pradesh is one of the 29 states of India, situated on the southeastern coast of the country. The state is the eighth largest state in India covering an area of 160,205 km^2 (61,855 sq mi). The present research is confined to the area of Srikakulam district since the importance of reverse concept is quite novice to the small and medium manufacturing sectors of different categories. Srikakulam being called as one of the backward districts have enough resources for the industrial development. Srikakulam District formerly known as Chicacole, which is located in the extreme Northeastern District of Andhra Pradesh.

Among tall the registered industrial units of 5576 including all MSMLEs, the registered Medium & Large unit are 35 in all five industrial areas. Since the researchers focus on only small and medium the status available manufacturing sector in specific is dynamically changing time to time, yet the limited data gathered through DIC is as follows.

S no	Type of the manufacturing industry	No of units
1	Cotton textile	194
2	Leather based	95
3	Chemical/Chemical based	490
4	Mineral based	145
5	Metal based	141
6	Engineering units	364
7	Others	1613

Source: DIC

Consequently, the research in Srikakulam is expected to be ideal enough since the need for industrialization, the challenges in quality management and advantages of reverse logistics in common are found demanding.

2. OBJECTIVES OF THE STUDY:

The main objective of this study is to identify and examine the impact of reverse logistics on quality management of small and medium manufacturing enterprises in Srikakulam district of Andhra Pradesh.

Specific objectives

1. to identify roles of quality management in reverse logistics
2. to describe the relationship between quality management and Reverse Logistics
3. to find out the impact of Reverse Logistics process on quality management.

Hypothesis

H 1: Perfection in the Process of logistics has a positive impact on quality improvement

H 2: Effective Recycling process has a positive impact on quality improvement

H 3: Management of waste disposal has a positive impact on quality improvement

H 4: Management of hazardous material has a positive impact on quality improvement

H 5: Flow of all material, inventory, finished goods and information has a positive impact on quality improvement

3. METHODOLOGY OF THE STUDY

The main source of data for this study were primary source with the appropriate stakeholders such as Manufacturing managers, logistics experts and officials. Besides, we based our research on secondary data sources that are expected to support our analysis. These would include annual reports, magazines, journals, guidelines and other research papers related to this area will be considered. In this study both qualitative and quantitative research approaches were used.

The target population for this study was all manufacturing units of small and medium scale in the district and the list of manufacturing sectors were considered with observation and local information. Based on the Confidence level of 95%, Degree of variability (sample proportion) 75 % (p) and Maximum tolerable error (sampling error) was 5% (w), the sample size (SS) for very large population and landed at 131 where the sampling technique used were firstly the stratified when it comes to the different manufacturing firms but due to the non-sampling errors were confronted much, the non-probability and purposive in specific was adopted finally. The methods of data collection

used in this study are focus group discussion, semi-structured interview, questionnaire (open ended and close ended) and observation and focus group discussion. Descriptive statistics were used as for the analysis of data to provide detail information about each independent variable's impact on the three dependent variables used. Collected data also was analyzed by using SPSS software. Analysis backed up with percentages, SD, ANOVA and Correlations were used.

4. LITERATURE REVIEW

The term often used to refer to the role of logistics in recycling, waste disposal, and management of hazardous materials; a broader perspective includes all relating to logistics activities carried out in source reduction, recycling, substitution, reuse of materials and disposal (Brito & Dekker, 2004).

Among the multiple definitions of quality that can be found in literature, the most comprehensive one is the following: ''Quality is meeting or exceeding the needs and expectations of customers.'' This means that quality is more than a product that simply works properly. It may also include the concepts of performance, appearance, availability, timely and proper delivery, reliability, maintainability, cost-effectiveness and low price. Quality Management (QM) includes all activities ensuring that products and services fit their purpose and meet the predetermined specifications.

The history and evolution of QM, from the mere inspection and QC of the past to the contemporary QA, Total Quality Management (TQM) and the various modern QM techniques, such as Six Sigma, Quality Function Deployment, etc., have led to the development of theories, processes, methods and tools that are crucial to organization development and performance improvements.

The roots of QM in early 1920s when Shewhart developed the inspired ''Control chart'' Over the years, his work has evolved due to the contribution of various researchers. In the late 1940s, Americans, such as Deming, Juran, etc., developed further the concept of QM in Japan. These quality gurus and their theories were then followed by the respective Japanese experts, namely Ishikawa.

Along with this evolution, over the years, the industrial world understood little by little the usefulness of QM standards, such as ISO 9000, ISO 22000, ISO 14000, etc., which were initiated to establish a framework on how businesses should manage their key processes. Standards can improve the organization of enterprises, whether they manufacture products or they offer services, regardless of their size or field of activity. Moreover, they can assist businesses in clarifying their objectives and, more importantly, in avoiding expensive mistakes and nonconformities.

The positive effects of QM on companies are numerous. For example, through effective QM companies enjoy reduced costs of poor quality of products or services, increased productivity, better relationships with suppliers and customers, reduced cycle times, faster distribution of products or services to market, improved process flow, reduced waste, increased added value to customers, lower overhead costs, faster decision-making processes, operational efficiency, better working conditions, etc.

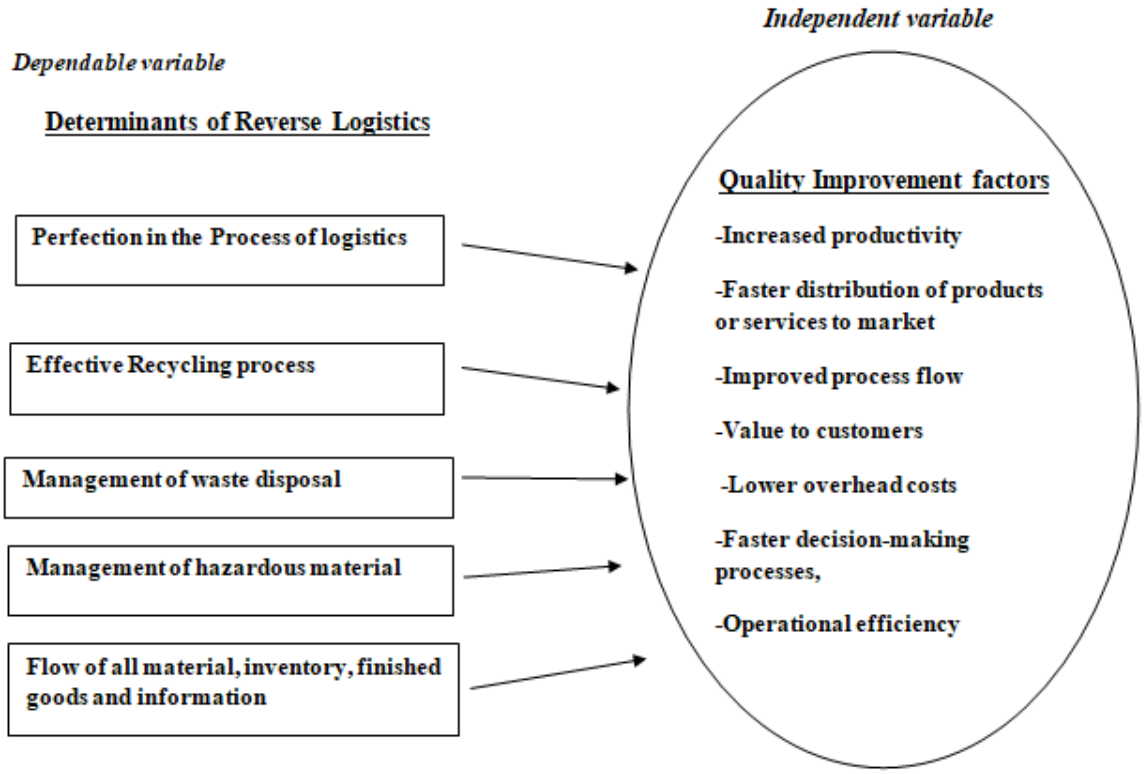
Reverse Logistics is actually the process of moving products from their typical final destination to OEMs and/or companies involved in recovery activities, in an attempt to recapture some of used products value, e.g. through resale, or for proper disposal of the item if not resalable or reusable. According to 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 starts with products going back in the supply chain or calling for recovery or value reclaim. In principle there is a returning party, who had the product, and a receiving party, who is trying to resell, redistributes or recover value from the product. In this part of the why of Reverse Logistics, we will first reflect at a high level over the receiver perspective, i.e. the driving forces for companies and other organizations to become active in accepting returns or in recovery.

It is no surprise that almost every company is looking for ways to increase sales, decrease costs and to reduce risks. But in such tough economic times, the easy cuts have been made and all of the

simple process improvements have been put in place. Reverse logistics is an often overlooked process that can help companies to reduce waste and improve profits. And yet reverse logistics seldom receive much attention — that is, until something goes wrong. Many executives go out of their ways to avoid dealing with returns because it may be hideous and a thought as nothing more than a cost of doing business. According to Aberdeen Group study in 2010, what many fail to realize is that the average manufacturer will spend 9% to 15% of total revenue on returns. They are often unacquainted of the impact of returns management that can have on their customers, their resources or their bottom line. In fact, improving reverse logistics can help any company in increasing their revenue 5% additionally to the total sales.

➢ ***Conceptual framework:***



Researchers' framework

5. ANALYSIS AND INTERPRETATION

As shown in table 5.1 Model Summary, R Square value is 0.105 which means that all the levels of items of Reverse Logistics Determinants are contributing 10.5 per cent in quality improvement. The remaining 89.5 is being contributed by other unknown variables.

Table 5.1: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.323[a]	.105	.064	1.144

a. Predictors: (Constant), Perfection in the Process, Effective Recycling process, Management of waste disposal , Management of hazardous material, Flow of all material, inventory, finished goods and information

According to table 5.2, ANOVA result shows the significant value between the Quality Improvement and the predictors as 0.031 which is less than tested alpha value and can be drawn that there is significance between dependent variable and its predictors. By this we can also conclude if there is one level in items' increase, there will be 143.936 increase in the distribution.

Table 5.2: ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	16.822	5	3.364	2.571	.031[b]
	Residual	143.936	110	1.309		
	Total	160.759	115			

a. Dependent Variable: The Quality Improvement
b. Predictors: (Constant), Perfection in the Process, Effective Recycling process, Management of waste disposal , Management of hazardous material, Flow of all material, inventory, finished goods and information

As depicted in table 5.3, we can understand the significance of the dependent variables i.e. the determinants of reverse logistics practices on the quality improvement in detail.

- As regards the first variable of reverse logistics determinants i.e. *"Perfection in the Process*", which is insignificant relating with quality improvement since the p value (.018) is not less than the significant value (0.05). Hence the hypothesis "Perfection in the Process of logistics has a positive impact on quality improvement" is REJECTED.
- As far as the second item is concerned, the "*Effective Recycling process"* is showing significant result to the quality improvement where the p value (.018) is less than significant value. Hence the hypothesis "Effective Recycling process has a positive impact on quality improvement" is ACCEPTED.
- The Third variable of *"Management of waste disposal"* is also showing significant result to the quality improvement where the p value (.019) is less than significant value. Hence the hypothesis "Management of waste disposal has a positive impact on quality improvement" is ACCEPTED.
- "Management of hazardous material" as another important variable is not resulted significant relating to the quality improvement where the p value (.086) is greater than the significant value. Hence the hypothesis "Management of hazardous material has a positive impact on quality improvement" is REJECTED.
- Finally, the fifth variable *"Flawless flow of all material, inventory, finished goods and information"* is also not significant relating to the quality improvement where the p value (.587) is greater than significant value. Hence the hypothesis "Management of hazardous material has a positive impact on quality improvement" is REJECTED.

It can be interpreted that among all the variables pertaining to the determinants of reverse logistics practices, Effective Recycling process and Management of waste disposal show significant influence on the quality improvement

Table 5.3: Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
	(Constant)	3.217	.621		5.182	.000
	1. Perfection in the Process	.223	.176	.152	1.263	.209
	2. Effective Recycling process	-.378	.157	-.290	-2.403	.018
	3. Management of waste disposal	.224	.095	.249	2.373	.019
	4. Management of hazardous material	-.193	.111	-.212	-1.734	.086
	5. Flawless flow of all material, inventory, finished goods and information	.059	.109	.061	.545	.587

a. Dependent Variable: The quality Improvement

6. CONCLUSIONS AND RECOMMENDATIONS

1. Perfection in the reverse logistic process being either totally unfamiliar or new to many, especially to small and medium sectors of manufacturing firms, which could be one of the major reasons found insignificant to the level of impact and relatedness with the quality improvement of the production. The training by the concerned authorities in line with the knowledge and outcome based education on reverse logistics should be given especially to small scale enterprises since they generally are in good size and generally ignore this kind of emerging issues to be implemented.

2. Since most of the firms confront with the tasks of recycling process, the importance for the effective recycling process generally is showing impact on the quality improvement and the techniques in order to achieve the total productivity management should be adopted by all manufacturing firms for the cost of manufacturing will be reduced, environmental disorders will be decreased and the quality of the production will be increased with high productivity as well.

3. Management of waste disposal is a factor majorly known for costing to environment and quality hence considered influencing quality improvement which should be commonly taken up by all firms as a unit or industrial hub-wise or else estate-wise. Waste in the form of air, water and substance should be arranged for removal firstly from the factory individually which will route to the quality improvement of the firm and further action as a whole industry is to be adopted for the environmental security.

4. Because of many firms are not habituated with risky products and practices at the production place, the concept of Management of hazardous material has not been found as a variable having impact on the quality. Yet the government should educate the firms by providing contagious information about the hidden and ignored risks which will damage physical, economic and environmental constituents so as to prevent from some uneven dangers mostly associated with energy material that causes perilous.

5. In any business sector, the flawless flow of all material, inventory, finished goods and information help the consistency and sustainability of business but in this study, it is a surprise to note that many respondents from the manufacturing sector relate not the same to the quality of the production which might be the ideology of the commercialization is more highlighted than the quality factor since the study underwent for small and medium who ignored the quality of work is just not confined with products but also for the processes.

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