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An Evaluation of Pros and Cons Indulged in Application of Green Supply Chain in Manufacturing Companies

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Abstract--- *In recent years, the concept of green supply chain management has started gaining importance in India in spite of unclear regulations from the government. Logistics involve not only transportation but also warehousing, packaging, inventory management and material handling. All these activities in logistic make a substantial adverse impact on the environment. Green logistic practices are the need of the hour to reduce the impact on the environment and gain competitive advantage. The major objective of this paper is to empirically analyze the major barriers to implementation of green logistics and to statistically rank the best green logistics practices with respect to Manufacturing Sector. Quantitative approach was carried out to find out the barriers to green logistics and filter out the best green practices with the help of the survey conducted among the middle level managers in the operations department of different organizations in Manufacturing Sector. This study will help the decision makers to understand the significance of GSCM.*

Keywords--- *GSCM, Problems of Green Logistics, Manufacturing Companies.*

I. INTRODUCTION

In the present scenario, Global Warming is seriously acclaimed everywhere and the effect of the same can be seen in the form of changing climatic condition. On the other hand, we are exploiting the natural resources to maximum possible level and it is a just a matter of time that the Earth will get depleted of the same. Considering all these issues many of the organizations, especially those who are into manufacturing, had started to look forward for the alternative options. New means and ways are being identified to carry out the routine work without hurting the natural settlement of the environment.

Out of the many, Green Supply Chain Management (GSCM) is one such way that can protect the environmental setting and the respective business of the company is also not affected. At the initial level it was not easy for the companies to implement the GSCM practices because a particular amount of money is involved and even the employees also need to be trained accordingly. There is some or the other kind of resistance from the side of employees and even the respective suppliers of the companies are not willing to accept the extra burden.

At the initial level it was not easy for any of the companies to implement GSCM in their respective processes, because only the thought process is not sufficient, there are a number of issues which are required to be taken care of right from the supplier to the end consumer of the product. This is true that the industries are responsible for the decimation of the environment to a great extent, like increase in air pollution, degradation of soil and water by industrial waste and finally harming the ozone layer and even the greenhouse effect. But as of now the companies are vigilant about the same and are ready to do whatever is necessary to serve the purpose.

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This present study is based on the identification of advantages and barriers of implementing GSCM in the manufacturing companies. As mentioned above it is not an easy task to implement GSCM in a given company but then again if the process of implementation is right then in the due course of time all the stakeholders will accept it.

II. CONCEPT OF (GSCM) GREEN SUPPLY CHAIN MANAGEMENT

Green supply chain originated from the idea of supply chain management and sustainable development theory. Traditionally supply chain management has been considered as a process in which the raw material is converted into the final products (Beamon, 1999). The exploitation of the environment led to the need of the concept of green supply chain management. GSCM is integrating environmental aspects, considerations and practices into the traditional supply chain of design, procurement, manufacturing, logistics and waste management, thereby reducing the environmental risk and impact (Srivastava, 2007).

III. REVIEW OF LITERATURE

Indian practitioners and researchers have started examining the green supply chain management practices due to the performance pressure from consumers, environmental regulations and drivers (Afrozet al, 2019). Long term benefits can be reaped when all the components of GSCM work hand in hand in order to reduce the risk faced by the environment (Wibowo et al, 2018). Chen 2014 stated that the green product development means that the product itself and allied components like packing of the product, remains and other things are not harmful for the environment. Green manufacturing encompasses the usage of green technology in the organization which necessitates environmental development (Paul et al, 2014).

IV. CONCEPTUAL FRAMEWORK

Green Procurement, Green manufacturing and Green logistics are the different facets and aspects of green supply chain practices (Srivastava, 2007). Green design denotes the design of products with environmental considerations. Green procurement is the selection of suppliers following environmental practices and purchasing environmental friendly products.

Green Procurement:

The term procurement is related to the purchase of material from the suppliers, generally raw material and semi-finished goods. These are needed to get a finished product. Green procurement means purchasing those goods from the suppliers which are not harmful to the environment and the major concern of the manufacturer is that the price of such items should not affect the final price of the product. In many of the manufacturing organization the procurement department is being trained about the same.

Green Product Development:

Product development is another stage in the overall supply chain model and in case of GSCM the concept of green product development becomes even more important. It also states that minimum of non-renewable resources are used to manufacture the same and even toxic materials are avoided in the same.

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Green Manufacturing:

Green manufacturing is related to the basic production process and making the required changes in the existing system so as to make it environment friendly. The people who are working in the manufacturing process should make the minimum use of natural resources, pollution should be reduced, minimum waste and the material can be recycled and reused. Even there is direction for the level of emission in the process of manufacturing. The sources of energy used in the manufacturing process, should be from the renewable process and most importantly all the employees should be trained accordingly.

Green Operation:

There are a number of operations taking place at the back end in any of the given organization, like preparing orders, inventory management; contracting and subcontracting, etc. the basic ideal of green operation suggest that minimum use of paper should be involved in the process and generally E-mails should be used for the inter and intra communication. This will preserve the trees in future and make the earth to re-establish its ecosystem.

Barriers for the Implementation of Green Logistics Practices

V. RESEARCH OBJECTIVES

- To evaluate the implication of GSCM in the manufacturing operations,
- To find the factors responsible for the application of green supply chain management in a given organization
- To find the need of GSCM in the present day manufacturing concerns.

VI. LIMITATIONS OF THE STUDY

- As this present research is based on primary data, hence the loss of data and redundancy in the form of unanswered and skipped questions cannot be avoided.
- Level of preciseness in the stated results can deviate from the actual results, as this is a sample study.

VII. RESEARCH METHODOLOGY

7.1 Sources of Data

Both primary and secondary data were considers for the conduct of this study.

Secondary Data

To explore various dimensions of the selected area of study and developments made till the recent past secondary data was considered. The different sources of secondary data con be stated as follows:

- national and international research papers
- a number of article from different websites
- data archives of IMRC and IMRB (*Published only*)
- IBEF reports, (*last five published issues*)

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Primary Data

The study involves a quantitative approach of research. Survey method was used with the help of a questionnaire to collect data. Questionnaire had been developed with Section 'A' comprising of the demographic details, Section 'B' concentrating on the barriers to green practices in different organizations in Manufacturing Sector, Section 'C' on the importance of the best green practices with respect to different organizations in Manufacturing Sector. Likert scale options ranging from 1 to 5 had been used for measuring the importance of items with 1 being very important and 5 being least important and for measuring the barriers option 1 meant strongly agree and option 5 meant strongly disagree.

7.2 Sampling Area

The area of sampling is Gurugram and Faridabad region, as many of the automobile manufacturers are situated in this area. The companies that are selected for the study were:

- Escorts
- Toyota
- Hyundai
- Hero Motors

7.3 Sampling Technique

In this study the sampling was Judgmental sampling, this is because of the reason that only the middle level managers were contacted for the study and in all the four companies the total number of such respondents was approximately 223 considering all the departments together. Some of the respondents did not participated and some other were not available at the desired location, hence this becomes a sample study.

7.4 Sample Size

Quantitative approach was carried out to find out the barriers to green logistics, filter out the best green practices with the help of the survey conducted among the middle level managers in the operations department of different organizations in Manufacturing Sector.153 questionnaires were received in which only 150 was considered to be valid sample and used for the study.

7.5 Statistical Tools Used

Mean, Standard Deviation and Skewness are used to analyze the data.

VIII. DATA ANALYSIS

The Statistical package tool (SPSS) version 20 was used to analyze the data.

Data Interpretation and Analysis

Reliability Analysis

Variables	Number of Item	Value of Cronbach Alpha
Cons (*Barriers*) of GSCM	7	0.803
Pros (*Benefits*) of GSCM	9	0.789

Cronbach alpha value for the variables was above 0.75 which indicates that all the items are positively correlated to one another and internally consistent.

Cons (*Barriers*) of GSCM

The Mean values of the barriers are shown in Table given below. The 10 barriers in the questionnaire were evaluated on a five point scale. (1 being Strongly Agree and 5 being Strongly Disagree).

Component Under Study			
Improper Technological Integration	Mean	3.68	N=100
	S.D.	1.224	
	Variance	1.931	
Issues Related to Radio Frequency Identification and Cross Docking	Mean	1.973	N=100
	S.D.	.879	
	Variance	.701	
Availability of GSCM Professionals	Mean	2.107	N=100
	S.D.	1.224	
	Variance	.962	
Training Related Issues	Mean	2.148	N=100
	S.D.	.764	
	Variance	.692	
Uncertainty of Market	Mean	2.98	N=100
	S.D.	1.968	
	Variance	1.224	
High Cost of GSCM Implementation	Mean	1.98	N=100
	S.D.	.712	
	Variance	.571	
Unawareness of Customers	Mean	2.715	N=100
	S.D.	1.209	
	Variance	1.519	

Inference

The above result state that among all the given issues cost is one of the major constraints in accepting GSCM and on the other hand, lack of knowledge in green logistics barrier ranks last.

Importance Level of Best

Green Practices in Manufacturing Sector the mean values of the importance of green practices are shown in the table. All the variables were evaluated on a five point scale (1 being Very important and 5 being Least Important).

Component Under Study			
Paperless Processing	Mean	1.67	N=100
	S.D.	.683	
	Variance	.401	
Use of Bio-Degradable Packing Material	Mean	2.54	N=100
	S.D.	.518	
	Variance	.392	
Reduced Carbon Footprints	Mean	3.501	N=100
	S.D.	.734	
	Variance	.662	
Electric Vehicles within premises	Mean	2.05	N=100
	S.D.	.813	
	Variance	.302	
Onsite Reuse and Recycling of Material	Mean	2.995	N=100
	S.D.	1.071	
	Variance	.952	
Minimum Scope of Contamination	Mean	2.008	N=100
	S.D.	.812	
	Variance	.609	
Reduction in Energy Consumption	Mean	2.819	N=100
	S.D.	.914	
	Variance	.771	
Company Provides Training	Mean	2.355	N=100
	S.D.	.901	
	Variance	.771	
100% Automation of Warehouse	Mean	2.981	N=100
	S.D.	.886	
	Variance	.743	

Inference

The results from the above table show that Paper reduction is considered most important and onsite recycling being the least important of the above practices with respect to Manufacturing Sector. Onsite recycling is said to be a function of reverse logistics and is found to be the least important best green practices because it is not feasible for implementation in the manufacturing sector.

Most preferred Five Benefits of GSCM

Component Under Study	Mean Value
Reduced Carbon Footprints	3.501
Onsite Reuse and Recycling of Material	2.995
100% Automation of Warehouse	2.981
Reduction in Energy Consumption	2.819
Use of Bio-Degradable Packing Material	2.54

Most Acknowledged Five Barriers

Component Under Study	Mean Value
Improper Technological Integration	3.68
Uncertainty of Market	2.98
Unawareness of Customers	2.715
Training Related Issues	2.148
Availability of GSCM Professionals	2.107

IX. FINDINGS OF THE STUDY

As can be seen from the Mean Values given in the above table which shows that cost is one of the major barriers then comes the lack of training of individuals and groups. Even the willingness of top management of implement GSCM can be one of the barriers. There are some of the instances where the employees are reluctant to undergo the training programs, (like RFID, cross docking, etc), lack of skilled human resource professionals in sustainability and green logistics, uncertainty and competition in market, lack of government regulations and policies for green logistics, lack of integration technology systems and customer's unawareness towards green logistics practices, whereas lack of knowledge in green logistics ranks last. The results show that Paper reduction is considered most important, which is followed by reconditioning and reuse of pallets and containers, electric forklifts instead of diesel forklifts, usage of different packaging technologies and materials to reduce contamination, carbon footprint assessment, monitoring fuel consumption of vehicles, solar roof top in warehouses, training for drivers, implementation of Automatic Warehousing System (WAS) and onsite recycling is the least important of the above practices with respect to Manufacturing Sector. Onsite recycling is said to be a function of reverse logistics and is found to be the least important best green practices because it is not feasible for implementation in the manufacturing sector.

X. CONCLUSION

This study is a first step in manufacturing Sector for its transformation into a sustainable industry. Sustainability cannot be achieved in single day and it can be achieved only by continuous improvement. This paper identifies some of the important green practices which are the need of the hour for gaining a competitive advantage and logistics cost reduction. This study empirically ranks the green practices which should feature in the future of the company's operations. Cost implication is the major barrier for the integration of green practices in the company. By working on the barriers enumerated in the study and application of best green logistic practices, the organizations can move towards the path of green supply chain practices. Strong management commitment and training in the green technologies will surely help organizations towards a cleaner and sustainable environment. Further research and study can be undertaken to find out more areas of improvement and planning of green practices framework involving employees for implementation.

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