

STUDY OF GREEN SUPPLY CHAIN PRACTICES AND ITS PERFORMANCE EVALUATION

¹Prof. Anil S. Dube, ²Dr. R. R. Gawande, ³Prof. Kunal U. Shinde

¹Research Scholar, ^{2,3}Department of Mechanical Engg,

^{1,2}Bapurao Deshmukh College of Engg, Sevagram, (Wardha) M.S. India.

³Sandip Institute of Engg & Management, Nashik. M.S. India.

¹anildube100@gmail.com, ²wsbdcoe@rediffmail.com, ³kunalrajeshinde@gmail.com

Abstract- The objective of this paper is to explore the peer literature reviewed on green supply chain practices and its performance evaluation with the intention of characterizing the research methodologies used in these areas of research. As indicated by the literature published already there seems to be certain set of methodologies which have mostly been used and that too frequently. Consequently, there is a need to do a more detailed study that can pinpoint particular research methodologies that are generally used in research related to green supply chain practices and its performance. This paper attempts to attain the aim by using a keyword search for identifying papers related to green supply chain practices and its performance. Finally the methodologies used are grouped in order of their usage in order to characterize the research methodologies used in linking green supply chain practices and its performance. This will help newer research work to flow in the right direction without reinventing the wheel and also it will act as a ready reference for newer research work to practicing managers.

Keywords— Green Supply Chain Practices; Economical Performance; Environmental Performance Review; Research Methodologies.

I. INTRODUCTION

Organizations are trying hard to perk up their sustainability through different strategies such as environmental management systems, agile, lean, resilient, green and world class manufacturing, eco-effectiveness and competency to sustain their position in today's cut-throat environment. As the environmental awareness is growing across the world, organizations are increasingly facing heavy pressure to reduce the emission throughout the supply chain. In fact, they need to think seriously about integrating their business practices in manufacturing and service sector with sustainability and cutting supply chain expenses to achieve a competitive edge over others. The Rio Declaration on Environment and Development, which is an modified version of the Stockholm Declaration of 1972, published general principles for future international action on development and environment. The agenda 21 of the Earth Summit, 1992 lays down an action plan for the next hundred years along with a framework for dealing with the environment and development issues. Accordingly, Global warming has raised alarming concerns worldwide due to the adverse effects it has been having on the environment. Nations worldwide are posed with the immediate issue of reducing this adverse impact on the environment which is predominantly due to the anthropogenic activities Supply

chains are also not free from these anthropogenic activities. Thus, activities of supply chain must be managed in order that they do not adversely impact the environment. Activities aimed at attaining this goal are termed as green supply chain practices. The research problem here is to identify the research methodologies generally used in researching the linkages of green supply chain practices are green supply chain performance. There is a growing body of literature that has studied Green Supply Chain Management (GSCM) Practices, GSC Practices; and GSC Performance. Though, there is a need to have a summary of research methodologies used in reaching the linkage of green supply chain performance and green supply chain practices. This will help in characterizing the research methodologies in this area. This paper addresses this requirement in a suitable way by referring to thirty-two papers published in peer-reviewed journals in the recent past.

II. MOTIVES FOR GREEN SUPPLY CHAIN MANAGEMENT

The Green supply chain is emerged as a response for long term trends in manufacturing industries. In the early 20th century the manufacturing industries are characterized by consolidation of vertical integration i.e. the major components for the product is manufactured and assembled within the industry. In the later

part of the 20th century it is characterized by outsourcing functions were the industries made to be more dependent on their suppliers for good and needed quality, promptly delivery of goods and to make the product in competitive prices. So the supplier's environmental impact can affect the any of those elements, so it is demanded that the suppliers should practice the green supply chain to help the organization to overcome the environmental challenges (Green Business Network, 2001). The green supply chain can be practiced in organization through several internal and external drivers. New Zealand Business Council for Green Development (NZBCSD) as described in their practical guide for Business Guide to a Green supply chain (2003) is that the supply chain is mainly focused on three areas as central:

- Improving the performance of business's own operations.
- Ensuring that the goods and services provided by suppliers are green and working with the suppliers increases the efficiency and competitiveness.
- Working effectively with customers and sales channel to design green products and services.

On against the backdrop of these general trends the companies mainly relay on the motivation factors which are classified as internal and external motivations. The primary motivations explained in the Green Business Network (2001) are risk management, enhanced brand image, regulatory stance, international purchasing restrictions and customer pressure.

III. GREEN SUPPLY CHAIN MANAGEMENT: AN OVERVIEW

Today, environmental effects caused by the industries is the main problem that mankind faces every day. The traditional supply chain practiced in the industries in early 1990's, focuses on the cost reduction and improving of different flows within the organization but the environmental consideration is ignored (Srivastva 2007). So the researchers and industries started to redefine the traditional supply chain by including the environmental factors in to the supply chain and also making the industries economically profitable by using this extended supply chain. In the present globalized and competitive market the industries are pressurized to follow the environmental management, these pressures are derived from the internal and external sources in the organization (Zhu et al, 2008). So the need of interest of practicing is increased among the industries till to the end customer. According to Srivastva (2007) Green Supply Chain Management has its roots from Green management and supply chain management. Srivastva (2007) defined Green supply chain management as —integrating environmental thinking into supply-chain management, including product design, material sourcing and selection, manufacturing processes, delivery of the final product to the consumers as well as end-of-life management of the product after its useful life. This shows that the environmental aspects are considered in every process of the product life cycle. Johansson and Winroth (2009) stated that Green supply chain aims for continuous improvements of industrial processes and products to prevent or reduce pollution to air, water and land. They also suggested that by these improvements, there is possibility of reducing risks to humans and other species. There are some challenges that has been pointed out by Richards (1994) in associate with the Green manufacturing which are meeting the customer demands for development of recycling schemes, environmentally sound products, minimizing the materials use, and selecting the materials causing low environmental impacts. Adding the concept of green to the supply chain invokes the consideration of natural environment in to the process. Similar to the supply chain, the green supply chain has its 14 boundary and scope ranging from green procurement to integrated green supply chain to green distribution flowing from supplier to manufacturer to customer. Zhu and Sarkis (2004) even included the concept Reverse Logistics (RL) in to the Green Supply Chain Management. Green Supply Chain Management is a broad term in which all the industries work with their suppliers and customers to improve their environmental performance. These environmental performances can be practiced by different focuses (Green Business Network, 2001).

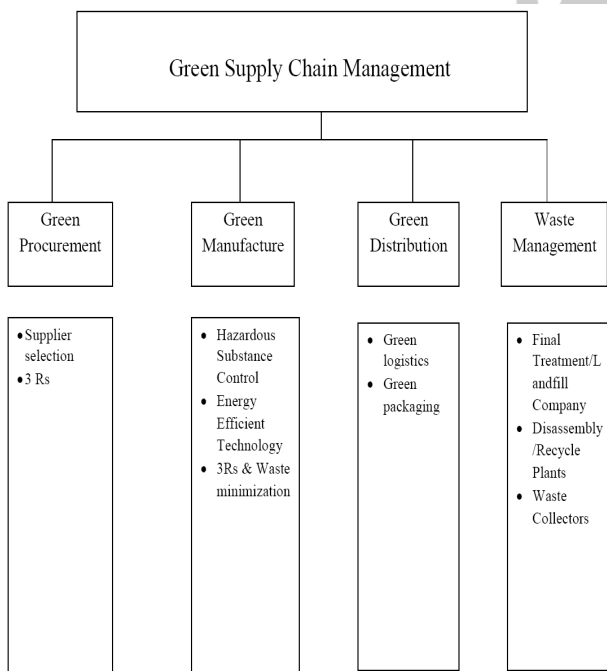
- Focus on reducing or eliminating the excess materials used in the manufacturing processes or products.
- Focus on the supplier's environmental compliance status during the operations.

Primary motivations	
Internal motivations and possible effects	External motivations and possible effects
Risk management <ul style="list-style-type: none"> • Supply interruption • Long term risk to human and environment • Competitive disadvantage 	Enhanced brand image <ul style="list-style-type: none"> • Corporate culture of forecasting trends and moving proactively • Potential for harm to public image for environmental concern.
Regulatory stance <ul style="list-style-type: none"> • Desire to go beyond compliance • Suppliers knowingly or unknowingly provide problematic substances • Supplier non-compliance poses production risk 	International purchasing restrictions <ul style="list-style-type: none"> • Eco-labeling and product take back gaining momentum • May drive the creation of system for collection • Frequently focused on high-profile brands transport, disassembly or recycling
Customer pressure <ul style="list-style-type: none"> • Often appear in conjunction with a threat to brand image • Regularly focusing on high-profile brands 	
Secondary motivations	
Cost reduction as suppliers apply pollution prevention	Increased innovation <ul style="list-style-type: none"> • Can result from supplier participation in new product development
Enhanced quality	

- Joint venture for developing the new materials, products and solutions for environmental issues.
- Requiring suppliers to implement and possibly certify environmental management systems.
- Educating the suppliers regarding the material use, prevention of pollution and tools of interest to the customer company.
- Refining the suppliers would help in developing new materials, parts and process with environmental concern.

IV. PRACTICES IN GREEN SUPPLY CHAIN MANAGEMENT

Ninlawan et al. (2010) had done a study on Green implementation on electronics industries where he proposed activities of Green supply chain management. These activities comprises all the process in green supply chain starting from green procurement to green manufacturing to green distribution till recycle and waste management of the product. Thai manufacturers presented their findings of Green manufacturing activities in different aspects (Ninlawan, et al., 2010).



Green practices

Six green practices (Green Design; Green Purchasing; Green Production; Green Management; Green Marketing and Green Logistics Practices) to accomplish environment sustainability are recognized using literature and are explained as below.

1. Green Design practices

Green design practices suggested in their research that about 80% of product and process related impacts on the environment may be minimized by green design practices. Green design practices are used to reduce biological impact of products during their

useful life. Green product and process design incorporates many concepts such as green raw material, use of cleaner technology processes, use of reverse logistics practices etc.

2. Green purchasing practices

Green purchasing practices means purchasing items that have enviable environmental properties such as recyclability, reusability and non-use of hazardous materials. Growing concerns about environmentalism have encouraged purchasing professionals to review their existing purchasing strategy and role in supply chain.

3. Green production practices

Green production practices are the function of environmentally and socially responsible practices to diminish the negative impacts of manufacturing activities while, at the same time, to achieve economic benefits. GSCM production practices and related principles assist an organization to attain profit and to enhance efficiency in the process. Adoption of green production practices improves worldwide competitive position of suppliers as well as manufacturing organizations in automobile industry.

4. Green management practices

Green management practices offer an organization to supplementary sources of information to improve their environmental and business performances. Implementation of better management practices leads to improve corporate image, environmental compliance improvement, achievement of social commitment, increased efficiency, cost savings and reduced emissions etc.

5. Green marketing practices

Green marketing practices are the practices to promote or present the products with environmental characteristics. Green marketing involves the actions to fulfill human requirements or desires with least negative impacts on the natural environment. Green marketing practices may perk up organization's profitability and competitiveness. Green marketing practices enhance corporate image, product image and corporate Reputation.

6. Green logistics practices

Green logistics practices are the integration of activities required to move products throughout the supply chain with the aim of producing and distributing goods in a green way by considering ecological and societal issues. An efficient transportation & distribution system saves logistics overheads and improves customer relationships to generate more profitability reverse logistics practices are the set of logistics and rehabilitation actions (recycling, reusing and remanufacturing) to products that are once again usable by Globally, the end-of-life vehicles and concern for resources are becoming major pressures for automobile manufacturers to initiate remanufacturing activities. Green logistics activities

will help in decreasing environmental impacts while at the same time maintaining or improving quality, energy savings, reliability and cost reductions etc.

V. PERFORMANCE OUTCOMES

Expected performance outcomes Likely, sixteen expected organizational performance outcomes were extracted into the four categories of expected performances (Economic; Social; Environmental and Operational outcomes) by implementing GSCM practices to attain sustainability in Indian automobile industry extracted four expected performances outcomes have been defined from the literature.

5.1. Economic performance outcomes

Many researchers have revealed that cost reduction is considered the most important factor for organizations while engaging in green activities. The adoption of GSCM initiatives may help to minimize the costs of raw materials and packaging because of use of recycled/reused materials. GSCM practices have become important strategies for business organizations to attain profit and increase market share objectives.

5.2. Social performance outcomes

Social performances that indicate improvement and maintenance of quality standard of life of people if possible without damaging the environment and over exploitation of the natural resources need to be researched. The sustainability in GSCM practices has been recognized as an imperative issue for environmental and social benefits. Further, the social performance outcomes include reduction in environment risks, contribution to environmental protection and corporate image enhancement.

5.3. Environmental performance outcomes

Numerous researchers have identified environment performances in greening the supply Effective management of suppliers can lessen costs; and encourage reuse, recycling and remanufacturing activities. An integrated environment management system into organization's manufacturing strategy will help to improve its biological performance.

5.4. Operational performance outcomes

Many researchers have identified operational performances by applying green/ green principles in the supply chain GSCM initiatives will help to improve quality of products or processes improvements, improvements in delivery and flexibility etc.

VI. CONCLUSION

The paper analyzes the current scope of green supply chain management practices in Industries and the one of the major conclusions drawn is that organizations have started working towards enhancement of green supply chain management systems. Parameters of sustainability may be formalized and

universalized as per the need but doesn't seem to the utmost requirement at this moment. The most important aspect is that companies must realize the fact that sustainability measures and declarations would genuinely do good to them and would not only be beneficial for their businesses but also for the life span of their companies which actually would have an enhanced effect, which is strengthened by the fact that, the study has tried to outline that awareness and importance given to sustainability in manufacturing companies is accepted or tested positively. Green supply chain management systems must have models to follow and measures and procedures may also be shared through formal and business arrangements amongst the organizations. One of the limitation is inadequate methods of examining and stating tangible and comparative benefits to establish the strengths of green supply chain management systems. GSCM systems have to be popularized as a movement, which anyways would take place in the light of the fact that in globalized scenario, most of the organizations somehow get associated within a larger system, but the question is that do we have that much of time and if not then it's a matter of creating a well-crafted uniform strategy and an integrated environment to propel the adoption and development of GSCM systems.

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