



Review Paper

An Overview of Green Supply Chain Management in India

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Abstract

The green supply chain management (GSCM) is a powerful way to differentiate a company from its competitors and it can greatly influence the plan success. With increased awareness to corporate responsibility and the requirement to meet the terms with environmental policy, green supply chain management (GSCM) is becoming increasingly important for Indian manufacturers. Companies that have adopted GSCM practices with a focus on distribution activities have successfully improved their business and environmental performance on many levels. Today's also some of remaining companies have not adopted green supply chain management, due to this environmental performance index (EPI) ranking of India is not good. Today's environmental performance index (EPI) of India and the major four activities of the green supply chain management; namely green purchasing, green manufacturing, green marketing and reverse logistics are being covered throughout the paper.

Keywords: Green manufacturing, green purchasing, green performance index 2012, reverse logistics.

Introduction

Green supply refers to the way in which innovations in supply chain management and industrial purchasing may be considered in the context of the environment. Environmental supply chain management consists of the purchasing function's involvement in activities that include reduction, recycling, reuse and the substitution of materials². The practice of monitoring and improving environmental performance in the supply chain³. Integrating environmental thinking into a supply chain management, including product design, material sourcing and selection, manufacturing processes, delivery of the final product to the consumer as well as end-of-life management of the product after its useful life⁴. From these four definitions we see that there is a range of author focus and purpose on green supply chains and their management. The lack of consensus in practice and definition of green supply chain is not surprising, since its foundational elements of corporate environmental management and supply chain management are both relatively new areas of study and practice.

Globalization and Greening the Supply Chain: Today's Globalization increases the opportunities for buyers. As buyers increase their focus on environment improvement, which increases the supplier environmental performance. It is true for organizations that regard environmental improvement as a social goal, not just an issue cost, risk and public image.

Manufacturers need to work with their suppliers of raw material and component, in order to produce environment friendly products. By using their purchasing power, the industries can set up environment criteria for their suppliers upstream in supply

chain. Ultimately it can result in the greening of the supply chain.

GSCM = Green purchasing + Green manufacturing/materials management + Green Distribution / marketing + Reverse logistics.

Research Background

The concept of green supply chain is new concept, appearing in recent literatures. Although this has been very important in business, it is introduced recently and now also literature for environment friendly supply chain is still limited.

"Sustainable Development" is the key concept as discussed in 1992 Earth Summit in Rio, in this, governments and other international organizations decided to take useful measures to protect environment for long term economic development.

Today's highlighted agenda is to raise environmentally responsible consumption and production to recover environmental quality, reduce poverty and bring about economic growth, with resultant improvements in health, working conditions, and sustainability.

A researcher studied green supply chain management, it includes pressure practice and performance within the Chinese automobile industry in which they observed that on increasing pressure from a variety of directions have caused the Chinese automobile supply chain manages to initiate carrying out of green supply chain management (GSCM) practices to improve both their economic and environment performance. The GSCM

pressures (motivators), initiatives and performance of the automotive supply chain using an empirical analysis of 89 automotive enterprises within China have been earlier done⁵.

After that another researcher studied the green supply chain management in electronic industry. According to that, there are various approaches for implementing green supply chain management practices has been proposed and recognized in previous literatures according to the author, but there is yet no investigation that identified the reliability and validity of such approaches particularly in electronic industry. The fuzzy analytic hierarchy process method was used by authors to prioritize the relative importance of four dimensions and twenty approaches among nine enterprises in electronic industry. The findings indicate that these enterprises would emphasize on supplier management performance in the crucial role of implementing green supply chain management⁶.

After this, study on the implementation of green supply chain management in textile enterprises is also done in which the author considered the environmental influence and resource utilization efficiency in the whole supply chain and here also one problem was arise that how to execute the green supply chain management in special industrial operation at present⁷.

Further works on the Implementation of green supply chain management practices in electronics industry in which they aims to survey existing green activities in computer parts manufactures in Thailand to evaluate GSCM. For this the questionnaire related to investigate GSCM practices measure GSCM performance and explore GSCM demands within that electronics industry⁸.

After this, some researchers introducing green transportation cost in supply chain modelling in which they thinks that Escalating environmental concerns with relevant transportation modes that has lead to an increased interest in the adoption of green sustainable practices in the area of supply chain management, in this the amount of carbon emission resulting from transportation element of a supply chain is growing concern for supply chain managers⁹.

Green Purchasing

Environmental issues are becoming important part of business today, while there are environmental regulations as well as the increasing demand of environmental friendly goods from buyers, the environmental issues are becoming non-tariff barriers for export though Europe and Japan are shifting to eco-friendly products but presently there is a limited market for eco products, there are definite sign that this would grow big way.

In many countries, government with industries and civil society organizations are working together to purchase eco-products.

Environmentally preferable purchasing (EPP) or green purchasing is process of selection and acquisition of product and

services which minimise negative impact over the life cycle of manufacturing, transportation, use and recycling¹⁰.

International Green Purchasing Network: IGPN is located in Tokyo, Japan. It globally promotes the spread of environmentally friendly product and service development and green purchasing activities. It shares information and know-how internationally on green purchasing and environmentally friendly products and services. It also harmonizes the efforts of green purchasing and the development of environmentally friendly products and services from a global viewpoint.

Outline of Activities: i. Collect and deliver information on global green purchasing activities, the best examples and recent trends. ii. Hold workshops in each region. iii. Hold regular international conferences on a global scale. iv. Cooperate to develop tools that can be used internationally (mid-to- long term activity objective). v. Other activities like market research, promoting green purchasing¹¹.

Green Purchasing Network India: GPNI is an evolving network of professionals interested and active in the general area of sustainable consumption and production- more specifically: green purchasing and public procurement. It is currently a loose informal network of professionals primarily operating as an internet based electronic forum.

The objectives of the GPNI are: i. To create awareness amongst Indian industry and other stakeholders about green purchasing and procurement (GPP). ii. To encourage and facilitate implementation of GPP and greening supply chains (GSC) projects to enhance the competitiveness of the Indian industries¹².

Green Purchasing Strategies and Impact on Suppliers: There is a range of green purchasing strategies available to MNCs. Different strategies have different effects on the environmental behaviour of suppliers. The strategies can be grouped into three major categories: product standards, behaviour standards, and collaboration.

The effect of the various strategies on supplier environmental performance tends to follow a continuum from low (product standards) to high (collaboration). For example, specifying product standards is not likely to change a supplier's behaviour since the supplier only has to change ingredients. At the other end of the continuum, collaborating with suppliers on environmental issues is almost certain to change the supplier's behaviour. This also requires much more effort by the buyers. In general, more effort by buyers is needed to increase the environmental performance of suppliers. Thus buyers must make a cost-benefit analysis regarding how much they want their suppliers to improve.

Green Manufacturing

Green manufacturing has become the newest item in the mission statement of several manufacturing companies. The controversy

between manufacturing companies and global warming tends to often dominate conversations between manufacturing companies and environmentalists. Several manufacturing companies have begun going green, in order to reduce waste.

In Green manufacturing, manufacturing equipment is made to be fast, reliable, and energy efficient. One of the examples is the energy-efficient light bulb. These bulbs use almost half the energy as a standard light bulb and yet they still produce a good amount of light. Manufacturing companies are using this example and re-designing their machines. Green manufacturing can benefit your manufacturing company in many ways. Not only it will benefit the environment, but it will impact your consumer, the shareholders, and the company perception in the market.

The first benefit of the green manufacturing is the impact it will have on the environment. Insurance companies are actually giving better rates to manufacturing companies that are taking steps to go green. The government is also offering tax breaks for green manufacturers.

The second benefit of the green manufacturing is the money it will save. Manufacturers can look for machinery that is earth friendly. Wind and solar energy can save your company thousands of rupees. The reality is that if you can save money on energy, your product costs can go down and your customers will not need to pay as much. In addition you can always maintain the same costs and turn a great profit on your products, helping out your shareholders.

The third benefit of the green manufacturing is the help it will provide to the community at large. Renewable energy sources are considered to be one of the fastest growing job markets. New manufacturing plants that are opening with renewable energy sources are offering many more jobs to their communities, giving them a larger respect in their market. Studies show that manufacturing companies that have gone green are expected to employ almost 70 percent of the new jobs in the future.

Green manufacturing will be a large investment, for this some questions are arises here: i. why researcher's going for green manufacturing? ii. Green manufacturing has some advantages or not?

It is important to know that there are also safety concerns that come with going green, especially if you are re-designing a facility that is currently in use. You may need to shut down parts of the facility while you install new equipment and transform your power source to renewable energy. Although the costs can be high initially, the benefits will far outweigh them. Both the manufacturing company and the environment will benefit greatly from going green.

It has been shown that employees that work for companies that have gone green highly value the company and they often have a higher performance level than other company's employees.

Going green can also produces a better air quality for the employees and the community. Better air quality may be one of the biggest benefits of going green. With the public awareness surrounding going green, it is also important to go green to keep your manufacturing company competitive. Some customers have begun making purchasing decisions based on products that are manufactured at facilities that have gone green and they boycott the other companies that do not have green manufacturing plants. Comparison table is constructed by us based upon the very useful and meaningful factors are shown below. The current damage to the earth has many concerned about global warming and the air quality. Going green is not only important for your employees and your community, but can be better for the bottom line.

Lean Manufacturing

Lean manufacturing, which is simply known as Lean, because it is a competitive practice that reduces costs, improves environment and quality, and improves the bottom line. Lean manufacturing is aimed at the elimination of waste in every area of manufacturing. Here any expenditure that does not create a value for the customer is a waste and must be eliminated. This could include activities from various processes such as customer relations, product design, and supplier networks to factory management. Its main aim is to incorporate less human effort, less inventory, less time to develop products, and less space whilst being highly responsive to customer demand and, at the same time, producing top quality products in the most efficient, environmentally responsible, and economical manner possible. Lean manufacturing is closely associated with green manufacturing as there is an overlap between the goals and drivers for both processes. A key component of Lean principles is just-in-time (JIT) inventory strategy. It focuses on reducing inventory and provides material, energy, and space savings.

JIT Manufacturing: Purpose of JIT is reduction of cost and quality improvement.

ISO 9000 AND ISO 14000: Purpose of ISO 9000 and 14000 are to recognize quality standards are followed by the companies and changes the motivation.

Zero Emission Strategy: Purpose of zero emission strategy is to environmentally damaging production products are eliminated. 16% of companies are actively following zero emission. 85% of companies are following reduced emission strategies.

Six Sigma: Six Sigma is another management methodology which became very popular. It supports green production by primarily eliminating defects from manufacturing processes and, hence, cutting waste. Through exercising greater care and management control minor investment defects are caught as early as possible through the process. As a result, significant savings can be made by reducing the number of defects, rework, and spending time on defective pieces.

Table-1
Comparison of Lean Manufacturing with Green Manufacturing

Factors	Lean Manufacturing			Green Manufacturing
	Just-In-Time (JIT)	Six Sigma	ISO 9000 and 14000	
Improve Efficiency	✓	✓		✓
Quality Improvement	✓	✓		✓
Customer Satisfaction	✓	✓		✓
Reduction of Cost	✓	✓		✓
Defects Elimination	✓	✓		✓
Quality Standards			✓	
Reduced Resource Consumption		✓		✓
Recycling Programs For Reusable Component Parts				✓
Remanufacturing Programs				✓
Recycling Programs For Raw Materials				✓
Reducing CO ₂ emissions in manufacturing processes				✓

It was originally developed to eliminate defects from manufacturing processes and other business processes. Six sigma projects involve the utilization of statistics based on quality management tools, to train a group of people within the organization who become experts in these methods. Six sigma projects have quantifiable financial targets to make more money and, at the same time, satisfy customers and improve efficiency. They focus on customer requirements, cycle time reductions, error elimination and cost reductions. Elimination of defects from products or services being delivered, therefore, it has a direct impact on the bottom line of the business. Six sigma projects aim to cut out the waste of fixing the defects by rework or disposal which wastes a significant amount of an organizations resource.

Green Marketing

Green marketing can be viewed as adherence to ethical and social responsibility requirements in marketing. This approach emerged as a response to increased environmental challenges in recent years. This marketing approach has emerged in response to a global increase in concern about protecting consumer rights, and a concurrent growth of organized movements to address environmental trends in such a way that people will be protected and assured a clean and safe environment in which to live. The antecedents of green marketing were developed through many stages since the 1960s. These movements paved the way for the emergence of green marketing in the late 1980s.

Green marketing involves a commitment from the organization to deal with environmentally friendly products (i.e., products that do not harm society and the environment) and to conduct marketing activities in a way that reflects the organization's commitment to environmental responsibility through adherence to specific controls to ensure the preservation of the natural environment¹⁸.

Most definitions of green marketing deal with this dimension. For example, green marketing is defined by researcher as any marketing activity of an organization that aims to create a positive effect or remove a negative effect of a particular product on the environment. Pride and Ferrell define green marketing as any developing, pricing and promoting process for a product which does not cause any damage to the natural environment¹⁹.

After this, researchers clearly indicate that adoption of a green marketing approach achieves many benefits for organizations and may place an organization at the top of the competitive pyramid. It provides them with market leadership, especially in the context of increasing environmental awareness in the market²⁰.

Adopting a green marketing philosophy brings an organization close to its clients, particularly those clients who have other environmental concerns besides maintaining the environment and rationalizing the use of natural resources. In this context, the study by researcher indicates a number of advantages resulting from green marketing practices, as follows:

Owners' satisfaction: The green marketing approach is likely to open new horizons and good opportunities for organizations that practice green marketing. This, in turn, is likely to provide organizations with the ability to avoid traditional competition and to thereby achieve competitive leadership in the market, especially when they introduce environmentally friendly products and target those who had environmental trends in the market. This competitive situation will lead to more profits in addition to promoting a good reputation and meeting the owners' needs.

Achieving security in the introduction of products and in operations management: An emphasis on producing safe and

environmentally friendly goods will push organizations to raise their production efficiency to reduce the pollution level and other harmful effects caused by the production process. It may also help them to avoid legal sanctions, obligations to pay compensation to injured parties, and the revocation of the membership of environmental or consumer protection associations.

Organization social acceptance: Organizations who adopt a green marketing philosophy will gain strong support in the community because of their goal to benefit all society through their commitment to the environment. This support will help the organization to consolidate its relationships with current customers and to gain new ones in the future.

Sustainability of activities: Green organizations, which avoid legal problems and have strong support in the community, will obtain general acceptance for their goals and philosophy. This support for their operations and business activities will help them to continue to provide the market with environmentally friendly products.

Reverse Logistics

Reverse logistics has been defined as “the term most often used to refer to the role of logistics in product returns, source reduction, recycling, materials substitution, reuse of materials, waste disposal, and refurbishing, repair and remanufacturing”²¹.

Environmental Performance Index (EPI)

It measures the effectiveness of national environmental protection efforts in 132 countries. Reflecting our belief that on-the-ground results are the best way to track policy effectiveness, EPI indicators focus on measurable outcomes such as emissions or deforestation rates rather than policy inputs, such as program budget expenditures. Each indicator can be linked to well-established policy targets. The 2012 EPI ranks 132 countries on 22 performance Indicators that capture the best worldwide environmental data available on a country scale.

India Ranks at 125 of 2012 Environmental Performance Index, which is worst rank²².

Conclusion

Cost and complexity are perceived as the biggest barriers to implementing Green SCM, which highlights the need for cost effective and easy to implement solutions. Brand building is one of the top incentives for green SCM, highlighting the importance of public perception of how companies operate. Recycling of raw materials and component parts are the top green manufacturing and production focused initiatives. Adoption of green practices is highest in those areas of the supply chain where there is a direct relation to cost savings and efficiency, for example in inventory reduction, recycling of raw

materials. Almost a third of respondents are not collaborating with their extended supply chain on green practices.

Most of the Indian manufacturing small and medium enterprises like cutting and hand tools and auto parts and spare parts and industrial equipments and machinery manufacturer and various other products manufacturer are seem to be quite advanced in the implementation of green warehousing and distribution initiatives, most likely because these initiatives often also mean added efficiency. While green supply chain management shows direct cost and efficiency benefits, then why more companies have not adopted them up to now?

EPI-2012 rank of India is worst, this also shows that awareness of green supply chain management and greening in India is poor, so there will be need to spread the knowledge of green supply chain management, with the help of this green supply chain management, Indian manufacturing enterprises get their cost and efficiency benefits.

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