

*Classification of green supply chain management disciplines and best practices: A review*Manish Gupta¹ Rajendra Kumar Shukla²¹ Department of Mechanical Engineering, Shri Vaishnav Polytechnic College, Indore, MP, India² Department of Mechanical Engineering, Medi-Caps University, Indore, MP, India

ABSTRACT:

This article aims to provide a brief overview and classification of green supply chain management disciplines and best practices for finding value, conserving resources, eliminating waste, and increasing productivity in various industries. Green operations, green design, green manufacturing, reverse logistics and waste management are the main topics in the literature. These issues will be briefly discussed in this paper. The following is the structure of the remainder of this paper: The disciplines of green supply chain management and their classification are discussed in Section 2. The benefits and application of green practices are discussed in Section 3. The paper ends with a conclusion.

Keywords: *Green supply chain management, literature review, discipline, and best practices*

1. Introduction:

According to Beamon (1999), supply chain management has traditionally been viewed as a process in which raw materials are transformed into finished goods and delivered to the final consumer. Some of the main factors that have led to the adoption of green practices include new government regulations, shifts in consumer attitudes, a limited supply of raw materials and resources, an abundance of waste sites and the pollution they cause, and these factors. According to Nelson and Rao (2012), green supply chain management (GSCM) has emerged to address the issues by involving businesses and expanding their environmental responsibilities to SC activities.

Stakeholders are increasingly holding companies responsible for damage in the environment created by their supply chains and putting pressure on firms to extend their environmental responsibilities with the adoption of Green Supply Chain Management (GSCM) practices (Silva et al., 2021).

In a 1996 study titled "Environmentally Responsible Manufacturing," the Manufacture Research Consortium (MRC) of Michigan State University first presented the idea of a "green supply chain." The main research in this program was "Green Supply Chain Management". A new supply chain design was proposed by Beamon (1999) and some environmental elements were incorporated into a supply chain model.

According to Srivastava (2007), "Green supply chain management" is a type of supply chain management in which environmental considerations are incorporated into various stages, including product design and material sourcing, manufacturing, sales, delivery of the final product to customers, and care for products after they have reached their end-of-life.

Zhu (2004) says that GSCM businesses collaborate with their upstream and downstream counterparts to maximize environmental benefits throughout the supply chain—from product design and material selection to retailing and recycling—and to achieve sustainable supply chain development.

Green supply chain management includes green practices in purchasing, manufacturing, and materials handling, distribution, and marketing, as well as reverse logistics, to optimize waste and energy consumption. Initiatives for packaging and waste reduction, as well as emission reduction, also play a significant role in achieving the goals of green supply chain management (Walker and McBain 2008, S. Bag et al. (2022)).

Their basic reasoning is that investments in greening can be resource-saving, waste-eliminating, and productivity-improving S.S. Panpatil and R. Kant (2022). Three approaches in GrSCM, namely reactive, proactive and value-seeking, are suggested. The key themes in the literature are green design, green operations, reverse logistics, waste management, and green manufacturing (Srivastava, 2007).

Green supply chain management aims to promote the coordinated development of environmental, social, and economic performance by achieving optimal resource allocation, increasing economic benefits, and enhancing environmental consistency throughout the product life cycle.

2. Classification of green Supply Chain Management Discipline:

The various fields of GSCM, green product design, green purchasing, green production, green packaging, green marketing, and green logistics are discussed as potential applications of green practices in this section.

a. Green product design

It involves a series of actions with the goals of making the factory safer and cleaner, lowering the cost of disposal, reducing the risks to health and the environment, increasing product quality at a lower cost, improving public image, and increasing productivity. Green design has received more attention (Srivastava, 2007)

b. Green purchasing

Green purchasing is a strategy that makes use of the company's power as a consumer of raw materials to help the environment by purchasing goods that have less of an impact on the environment. Green purchasing activities can be broken down into the following categories: Buying standard or eco-labeled goods or services that are limited to a certain level of environmental performance; evaluating goods or services before purchasing them by in-house or third-party evaluators; assisting suppliers in improving their operations, goods, or services; and (Murray, 2000; Zhang et al., 2014, A.R. Al-Batayneh et al. (2021)

c. Green Manufacturing

The term "green manufacturing" refers to production processes that produce little or no waste and produce little or no pollution. Among the most common wastes that should be avoided are defective products like scrap and reworked materials, as well as overproduced products because of a build-to-

stock policy. Among the most common pitfalls are unnecessary labor movements during the manufacturing process or holding work-in-process materials, as well as an excessive inventory of raw materials. In this category of green activities, eco-friendly materials like green lubricants can also be mentioned (Liang, Shaoqiang, 2019, Kim, H., Choi, J., 2013).

d. Green marketing

The practice of selling goods based on their positive effects on the environment is known as green marketing. It is possible for a product to be environmentally friendly if it is packaged in a way that is good for the environment or produced using an environmentally friendly method. Green marketing, on the other hand, has a significant impact on the buyer's decision and directs their attention to "green" products and services. Targeting, green positioning, green pricing, marketing waste, green promotion, and green alliance are among the major initiatives taking place in this discipline of GSCM practices (Grundey and Zaharia 2008; F. Rizzi and M. Gigliotti (2022)).

e. Green logistics

Green initiatives are applicable in different logistical elements of the SC, from the acquisition of raw materials and inbound and outbound transportation to facility location/building design and warehousing. There are three main types of environmentally friendly practices in this field: managing the return flow of waste, minimizing the effects of warehousing on the area surrounding the facilities, and transportation. Reverse logistics (Srivastava and Srivastava 2006; Min et al., 2006). However, these existing research are dispersive and have not yet formed a systematized theory (Sarkis et al., 2006).

3. Best Practices in Green Supply Chain Management (GSCM):

1. In GSCM, "best practices" refer to a variety of actions taken by businesses to lessen the impact of their SC activities on the environment. The most significant of the company's numerous green initiatives is rationalizing its distribution centers, maximizing the transportation distance, and reducing the number of trucks. Fujitsu Ltd. is a multi-national IT and consumer electronics company headquartered in Tokyo, Japan. The company's green activities were initially started in 2003, with most of the initiatives being formed around the green logistics area. The standardization of the shipping instructions and amendment of the operating systems are more technical and require considerable expertise. The further reduction of CO₂ emissions via the Fujitsu logistics solution system is another notable mission in this respect.
2. The most recent green initiative in Fujitsu is the development of a CO₂ exhaust estimation tool. Decreasing the number of trucks by intensive vehicle-allocation control, installation of in-vehicle terminals in trucks, implementing eco-drive practices, and building an accurate emission calculator in trucks are some of the other initiatives in this regard.

3. Apple's has three priorities for green initiatives:
 - i. Replacing conventional energy sources with renewable energies to reduce the impact of climate change.
 - ii. Using environmentally friendly materials in the manufacturing of Apple products
 - iii. Conserving precious resources by employing new production/design strategies
4. Apple has started working on three major approaches to reduce its product's energy consumption in the green product design discipline: "more efficient power supplies to bring electricity from the wall to the device", "more efficient hardware", and "smarter power management software".
5. Apple has attempted to minimize the environmental impact of employee commutes, inter-office trips, and business travel through green logistics initiatives. The company provides all employees with a transit subsidy.
6. The green design of new buildings and updating of existing facilities to consider their energy efficiency is probably the most significant greening initiative by the company. The goal is to provide all the network facilities with energy from renewable sources.
7. *Removing toxins.* Green manufacturing processes can remarkably reduce toxins in products. Apple is applying its standards to stop using toxins that potentially dangerous to environment.
8. Dell has aimed at minimizing waste by persistently refining the processes and tools it uses, too make the most efficient use of air, land, and ocean transportation for receiving supplies, shipping products, delivering services, and accepting returns.
9. Dell has also implemented many innovative strategies to minimize its transportation activities to decrease fuel consumption and carbon emissions. Dell has also conducted Container Optimization initiatives to improve the processes for pallet building and trailer loading.
10. In its packaging department, Dell uses bamboo packaging for lightweight consumer products and mushroom-based packaging for heavier products. They have also attempted to reduce the volumes of paper used in the shipping of products through green design and packaging.
11. Dell has also established initiatives to recycle packaging/protective dunnage in each regional logistic center.
12. Dell collaborates with its partners in various ways to form green purchasing initiatives. They outsourced their shipment activities to logistics and transportation companies such as DHL, FedEx, and UPS, which are known to offer eco-friendly activities.
13. Replacing conventional fuels with biofuel sources is also contributing a lot to the company's environmentally friendly performance.
14. Electronically transmitting the shipping documents as well as using recycled cardboard dunnage for the necessary paper works is the other remarkable green practice in Dell.
15. DHL has assigned a budget to reduce the carbon footprint of its facilities by replacing its lighting

and energy control systems, applying energy efficiency standards in the green design and construction of new buildings, and the installation of modern supplements for the use of sustainable resources.

16. The installation of a photovoltaic system with solar cells and the utilization of an innovative system to collect and store rainwater to cover a considerable amount of the facility's water needs are just some examples in the above-mentioned area.

In the future, it is expected that all companies will need to implement strategies to reduce the environmental impacts of their products and services.

4. Conclusion

The green supply chain is an innovative supply chain with social development trends. It integrates economic performance, environmental performance, and resource efficiency into the entire spectrum of supply chain activities involving raw materials and component purchasing, manufacturing, packaging, distribution, retailing, and the subsequent recycling of the products. This brief review of GSCM practices disclosed the superiority of implementing green practices, particularly in the manufacturing area. Green supply chain management aims to promote the coordinated development of environmental, social, and economic performances with an emphasis on green the transformation of the whole product life cycle while minimizing resource consumption and environmental impact and at the same time, pursuing economic benefits.

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