

A Review On Green Supply Chain Management: Driving And Barrier Factors

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Abstract - Multinational firms and industries are currently under intense pressure from the customers who are more environmentally conscious, stricter environmental rules from government and from the need to integrate ethical and environmental issues into all aspects of operating a traditional supply chain. The adoption of GSCM would have a substantial influence on an organization's environmental, financial, social performance, researchers and practitioners have paid close attention to the adoption concerns. The driving and barrier elements affecting the management of the green supply chain are comprehensively reviewed in this paper. Here the factors which influences the most in drivers and barriers are discussed.

keywords - Green Supply Chain Management, Supply Chain, Driving Factor, Barrier Factor, GSCM

I. INTRODUCTION

Supply chain is the network that connects a firm to its suppliers and customers, and it encompasses all of the transactions that occur during the transformation of raw materials into marketable items. The flow of data, information, resources, and materials to give the best product and service to all stakeholders in the process of converting raw products to a saleable product and delivering it to the end client is controlled by coordination, management, and strategy. Supply chain management's importance started to increase in the early 2000s. From that point all the industries irrespective of its field started to invest in this. They started to hire more experts with the ultimate goal of reducing the cost that is spent hidden under the supply chain. Nowadays they are moving a step further and started to think about the environment which in turn creates a need for green supply chain management (GSCM). The concern for the surrounding has increased in the recent years and all the nations are setting bold goals for green and sustainable energy. As a part of that, GSCM is one of the method most of the companies use and the best idea for industries to attain a hazard-free workplace[1].

Overall, it looks attractive and environmental healthy, but there are many barriers in implementing this GSCM like every other. Some companies somehow overcome some of the barriers and have established a sustainable GSCM. But many are trying their best to do it. Basically, along the supply chain, GSCM attempts to decrease or eliminate wastages such as hazardous chemicals, emissions, energy, and solid waste. The goal of GSCM is to integrate environmental factors into supply chain management (SCM), which includes product design, material procurement and selection, production, and final product delivery to customers, as well as product end-of-life management. As a result, GSCM is critical in prompting the whole environmental effect of any company engaged in supply chain operations, thereby contributing to improved sustainability performance. Figure.1 represents the basic outline of green supply chain management.

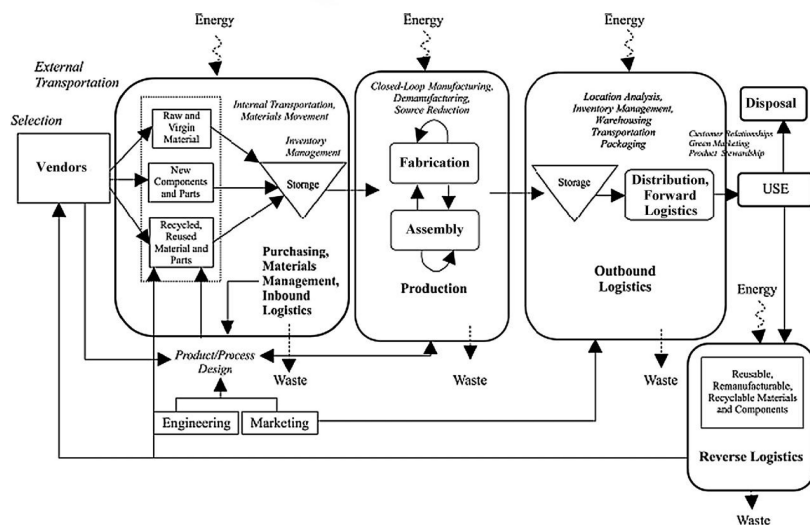


Figure 1: Process involved in green supply chain management [2]

II. LITERATURE REVIEW

Pollution free and sustainable environment can be achieved in any of the industry through green supply chain management. Masoumik and fellow authors said that eco-product design, greening upstream, greening production, greening downstream, and greening post-use are the five primary operating areas for green supply chain activities [3]. The major advantages of applying supply chains are discussed by Mefford, it results in improved working conditions, enhanced profitability, and competition. Improved staff morale, increased training, and higher skill levels can lead to higher quality and productivity, which can lower expenses and lower the firm's worth. [4].

Implementation of GSCM in SME Suppliers improves the suppliers' commercial performance, operational efficiency, also reveals the effects of employee job satisfaction on operational efficiency and corporate performance grew in that period [5] and Galanton suggests green procurement helps the company to develop financially [6]. The goal of GSCM is to reduce or eliminate waste in the supply chain, including energy, emissions, hazardous chemicals, and solid waste said Ninlawan [7].

Green supply chain management strategies (GSCM) are associated with increase in operating cost effectiveness and environmental performance [8]. Adoption of this techniques is favourably influenced by the company's environmental maturity level. Additionally, de Oliveira and his fellow mates imply that internal habits are easier to adopt than external ones. [9]. Higher level of green supply chain management approach leads to greater product development success [10].

Rizki and Augustine recently identified sustainability Performance is positively and significantly impacted by green distribution, eco design, environmental education, investment recovery, customer participation, and green information systems [11]. Embracing visibility is becoming more appealing due to the idea that it may present opportunity for performance improvement among supply chain stakeholders [12]. Uncertain conditions of environment also influence the implementation of GSCM in industry firms in order to reduce their energy usage, recommend green products or technology to their customers, and lessen their ecological imprint said Albertini. [13].

Not only recommending green products to the customers, utilizing safe materials, recycling disposable components, or handling worn-out equipment responsibly are just a few ways that businesses may limit their potential environmental damage [14]. Barrier factors greatly affects the supply chain, Govindan in his research identified not all lean, resilient, and green SCM techniques significantly contribute to the sustainability of SCs [15]. Balasubramanian found there are 32 barriers that affects the adoption of GSCM in the UAE construction sector among economic, environmental, technological, social, and cultural factors [16].

Economic rationale, legislation, and corporate citizenship are the major affecting variables in green supply and reverse logistics [17]. Stakeholders are putting more pressure on businesses to adopt green practises in their operations and supply chains, especially huge multinational organisations [18]. Companies either don't know how to implement the GSCM or do it incorrectly, in order to reduce the overall environmental loads [19]. Considering the prevailing situations, many of the firms have applied this technique to make sustainable environment. For a manufacturing company, several drivers of green supply chain management are identified using a case study approach [2].

In order to establish and manage GSC efforts in the pharmaceutical business in a way that is consistent with sustainable development goals, corporate management and government authorities can use this as a standard [20]. Bhoal and Narwal set out that the implementation of GSCM for the 2-wheeler industry relies greatly on employee motivation and health and safety [21]. Research conducted on foundries by Balaji and other researchers expressed that foundry have a significant role in a country's economy, and as a result, they should begin using GSCM as a parallel strategy for improving their environmental image, even if most countries are still at the infancy stage [22]. Exploring the industries, Ricardianto suggested electrical machines should be used instead of solar-powered machines to decrease the amount of trash generated by solar panels and improve the GSCM [23].

Various methods are used for analysing the techniques of green supply chain management and many of them founded effective. Abu Seman identified ISO 14001 certified manufacturing enterprises in the Malaysian context broaden the scope of the GSCM study [24]. Structured model can assist practitioners and managers in making eco-efficient decisions [25]. DEMATEL's methodology aids in determining interdependence between components and categorises them into cause-and-effect groups [26]. The complex information of the constructed framework and the interpretation of link can be made simpler using TISM tool [27].

III. DRIVING FACTORS

III.A. ENVIRONMENTAL FACTOR

The main driving factor of GSCM is the environment. The last couple of decades have seen a tremendous increase in the earth’s temperature. This is because of the high carbon release into the atmosphere. We call it “Global Warming”. All the countries, all the business within these countries have started to focus on how to control this disaster. The main effect of Global Warming is that the ice in the Arctic and Antarctic Circles will melt which results in increasing of sea level which in turn will drown coastal cities. Mostly in a country, the coastal cities have high importance because almost most of the import and export are taking place there. It is predicted that in 2030, parts of these cities will be under water.

There are many steps in maintaining this warming and for companies irrespective of its domain, supply chain will be present. So as part of their contribution, they try to implement GSCM concepts. Collaboration between supply chain partners and the promotion of sustainability are products of trust, dedication, and satisfaction. Collaboration in the supply chain between major companies and their suppliers is a key component for supporting ethical business practises[28]. Though it is a relatively new concept, it is gaining its popularity in order that the environmental performance of the entire chain is improved [29]. Figure 2 illustrates the impact of energy consumption on carbon emissions due to retailers' activity. This shows that the carbon emission from storage is always higher than that of transportation.

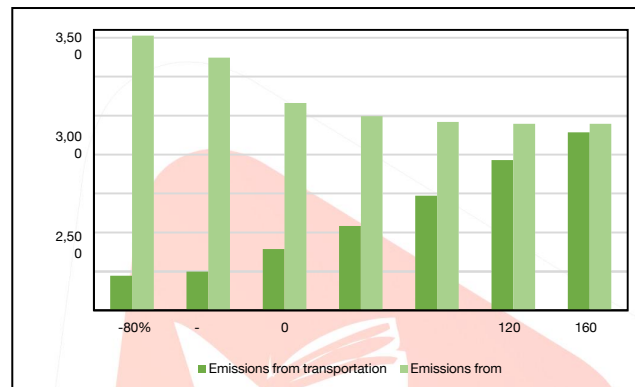


Figure 2. The effect of power consumption on carbon emissions resulted from retailer activity [30]

III.B. ROLE OF GSCM IN ENVIRONMENT

Collaboration between product designers and suppliers to lessen and eventually eliminate a product's negative environmental effects. Mutual respect and environmental awareness between product designers and suppliers can significantly minimise and even eliminate a product's negative environmental effects [2]. Implementing this GSCM, when businesses encourage internal environmental management, their financial performance suffers. Such businesses can, however, achieve their social and environmental goals. Despite the fact that such success does not directly increase profits, it does aim to improve the companies' reputation[31].

Improved safety standards, more management control, and a reduction in environmental effect are all made possible through environmental management systems (EMS) [28]. Another way to ensure green supply chain is to get the Environmental management system certification of suppliers [32]. Also, the company’s reputation towards greener environment pays a significant role. Making sure that customers are happy with all of the product's environmental and functional features can increase brand loyalty[33]. Figure 3 illustrates the role of GSCM in environment.

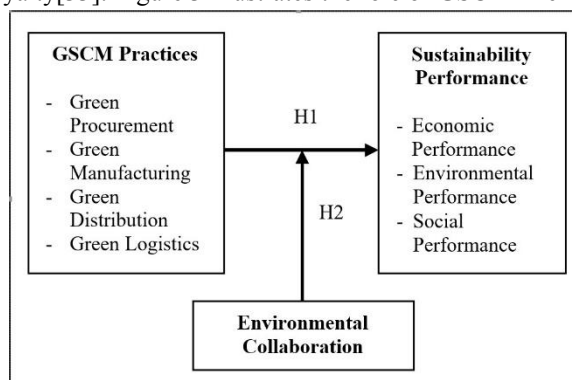


Figure 3. Environmental Impacts of GSCM[34]

Eco design has the highest contribution in environmental performance. It improves environmental performance and decrease energy consumption. Eco design improves the performance by addressing product functionality while simultaneously decreasing lifecycle environmental impacts [35]. Impact of GSCM adaptation has a significant significance from an environmental perspective. The company's environmental performance is improved by both internal and external green measures.

By recycling disposable parts, using E-materials, and utilising worn-out machinery properly, a company that practises green business will lower its pollution rate. By working with suppliers who use green methods, the organisation also enhances its environmental performance [14]. By lowering the pollutant level, environmental practises can be improved. Source reduction (SR), Eco design (ED), environmental management system (EMS), and external environmental management activities can help with this (EEM)[36].

We have identified 6 important success elements for implementing green supply chain management to improve environmental sustainability.

- Internal Management
- Customer Management
- Supplier Management
- Competitiveness
- Societal
- Regulatory

III.B.1. INTERNAL MANAGEMENT

Senior managers provide encouragement and assistance as part of internal environment management. For businesses to embrace green practises, internal management is a crucial success component. Senior management is motivated by workforce pressure as well as support and encouragement from environmental protection. The adoption of green techniques may, however, shift positively as a result of how environmental threats are perceived.

III.B.2. CUSTOMER MANAGEMENT

Customers have a significant and productive role in green supply chains. In order to satisfy customer demand and remain competitive in the market, businesses in developing countries are under significant pressure to implement green practises in their supply chains and corporate operations. To reap the benefits of green supply chain management, customer cooperation is helpful.

III.B.3. SUPPLIER MANAGEMENT

Without the active involvement of customers and suppliers, green supply chain practises cannot be established. Strong supplier partnerships improve incentive programmes and promote the acceptance and growth of creative eco-friendly initiatives. Technologies, partnerships with environmentally friendly businesses, and an openness to implementing cutting-edge green practises may improve operational and environmental performance and help businesses accomplish their financial objectives.

III.B.4. COMPETITIVENESS

Numerous studies that have been published suggested that competency and pertinent factors might contribute to the adoption of green practises in their supply chain. Instead of an organization's desire to safeguard environmental sustainability, competitiveness has been seen as a key element in the implementation of green practises. The adoption of green practises in businesses can be traced back to more voluntarily competitive factors.

III.B.5. SOCIETAL

Several investigations discovered the importance of societal elements in achieving environmentally friendly practise goals. Businesses must exchange end-to-end information on the impact of their supply chain operations on the local community and people's lives as regulatory bodies' scrutiny and customer knowledge of the environment increase. Also, more effective in pressuring businesses to adopt green practises are NGOs (nongovernmental organisations), electronic, and social media.

III.B.6. REGULATORY

Environmental issues are becoming more prominent, which has compelled regulatory agencies to tighten their environmental laws and policies. In order to combat climate change, global warming, and pollution, governments have enacted

stringent environmental regulations. Businesses are also expected to minimise the detrimental effects of their supply chains on the environment. As a result, it is becoming increasingly crucial for supply chain companies to comply with laws in order to implement eco-friendly methods.

III.C. GOVERNMENT FACTORS

The government is also a driving factor for adopting GSCM. The government wants everyone to move towards greener practices so that the major environmental issues can be maintained. One of the key motivators for businesses to launch green efforts is proved to be state and federal government regulations and programmes [32]. Employing green practises in organisational policy can assist businesses in establishing their brands in the marketplace. So, all the start-up companies try to capitalise these policies and try to acquire a name for them. Government, a significant player in the green supply chain, can simply compel corporations to comply by exerting influence over their internal and external resources.

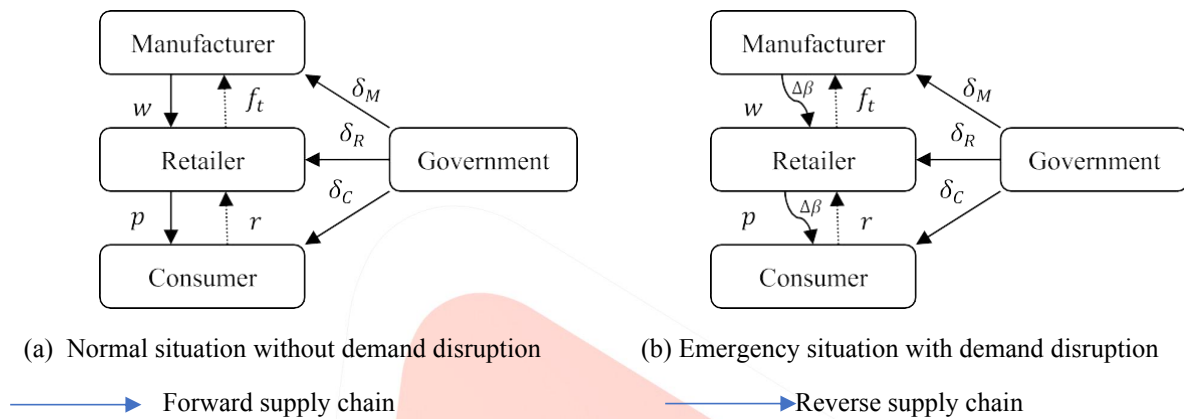


Figure 4. Closed – loop supply chain models with government subsidies[37]

Figure 4 illustrates the Government-sponsored closed-loop supply chain models. According to one point of view, the government, acting as regulator, can offer incentives for environmentally friendly businesses by subsidising EFP items or encouraging consumers to buy environmentally friendly goods, increasing their market share. Government can also encourage the media to increase the credibility of green businesses [38]. Governments may apply fees on businesses that don't manage their supply chains sustainably as a second measure. Figure 5 depicts the government's role in GSCM.

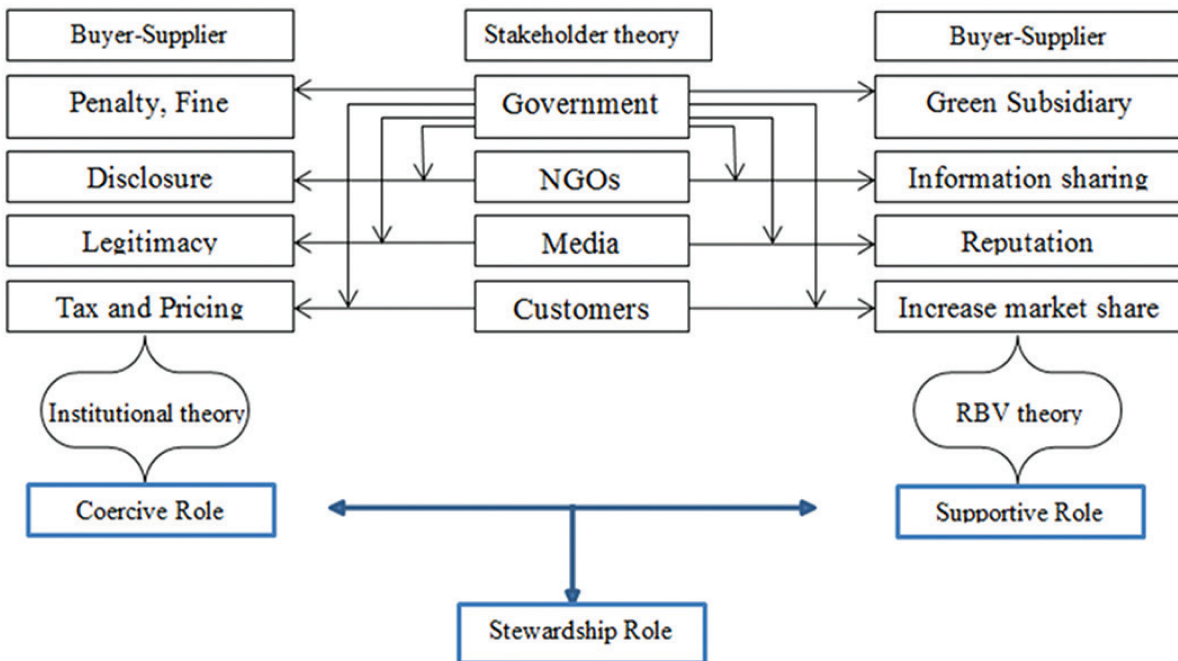


Figure 5: Conceptual framework for the government's involvement in the management of the green supply chain [39]

IV. BARRIER FACTORS

IV.A. COST FACTOR

One of the main hindrances for adopting GSCM is cost factor. Even though if someone wants to move to greener side, cost plays a major role and stops them. Same thing happens in any firm. The basic goal for every company is to make much profit as possible and the problems caused for the environment is generally ignored. The reason for not moving to green supply chain is that it requires extra investment. Generally, the companies which have a concern for environment try to adapt GSCM even though their profit is reduced. Due to their economies and low labour costs, some emerging nations have lower manufacturing costs than industrialised ones. Therefore, some firms and investors prefer to relocate their production facilities to developing nations [40]. So people in developing countries, they tend to keep the cost higher than others. Even to change from plastic carry containers to biodegradable, more money should be spent that increases the loss.

Apple company has removed charger from their new phone boxes mainly in order to reduce the e-waste, but now they can shrink the size of the box by 50% and have gained a huge profit through logistics as they can fit a greater number of phones. This is an exception for cost barrier. Most likely, companies need to spend more than the existing cost so that they can adopt GSCM. The substantial initial investment costs necessary to apply various green approaches, such as green manufacturing, green packaging labelling, etc., are reflected in this [16]. The modern supply chain management literature, which emphasises the cost issue because managers have mastered the skills to lower costs and know how to allocate resources to cost reduction, does not support the investigation of cost drivers using simply descriptive instances. Although most businesses always strive to enhance their efficiency, there is little actual data regarding the significance of cost drivers in GSCM procedures.

IV.B. FINANCIAL RESISTANCE

When businesses integrate supply chain management with green practises, efficiency considerations are typically disregarded, which may be because stakeholders frequently demand the deployment of GSCM methods. Responding to these stakeholders' needs is frequently expensive [14]. Despite the predicted long-term cost reductions from waste reduction and closed-loop systems, managers may be unwilling to invest firm resources in green practises due to the short-term costs. On the other hand, large businesses will save more money through green initiatives than small businesses. Cost-related factors will therefore be more economically appealing for large businesses than for small businesses. Additionally, there may be both apparent and unseen cost savings in green activities. Less reworking, material recycling, or equipment reuse could all result in observable cost reductions.

The company's standing as a maker of ecologically friendly products, its social acceptance, or the likelihood of receiving a harsh penalty for wrongdoing are examples of invisible cost savings. Due to their diminished reputation for offering environmentally friendly products or being penalised for environmental misconduct, large corporations will be more sensitive to the cost risk. The largest obstacle to the implementation of a green supply chain is high investment and low return. Other obstacles for firms implementing the GSCM include the expensive initial capital cost of environmentally friendly packaging and the high cost of trash disposal [41]. There are two different types of costs associated with environmental management: direct costs and transaction costs. Both of these expenditures are probably going to be major obstacles to the adoption of environmental management [42].

For an example, Products were given a green level by the producer, who then sold them at wholesale to the retailer, who then sold them to customers at retail. Additionally, retailers who deal directly with the demand market at the downstream end of the supply chain are more likely to make bigger profits. To increase resource usage and environmental protection, the manufacturer in the upstream must incur a certain expense. Therefore, when its profit is smaller than the store, the manufacturer with fair preferences will cut the supply chain's input of green production [43]. In construction industry, businesses' investment costs, such as green design costs, green building materials costs, and green construction and operation costs, rise as green buildings adopt more effective measures and processes to protect the environment and conserve resources, which lowers their enthusiasm for GSCM investment [44].

IV.C. HUMAN FACTOR

Human beings also can act as a barrier if proper training and knowledge is not provided. A large obstacle to the implementation of a green supply chain is high investment and low return. Other obstacles for firms implementing the GSCM include the expensive initial capital cost of environmentally friendly packaging and the high cost of trash disposal [16]. Lack of employee adoption of new technology advancements. It places a strong emphasis on integrating newer, more advanced technologies into current organisations.

V. CONCLUSIONS AND FUTURE SCOPE

To acquire a sustainable organizational structure and a competitive advantage in today's global market, firms must look to modern strategic approaches. Green supply chain management (GSCM) is a cutting-edge managerial technique that

may be utilized as a tactical weapon to boost an organization's competitiveness and concurrently improve its financial and environmental performance.

Based on the GSM literature and interviews with academic experts, different drivers and challenges of green supply chain management were identified in this study article. These obstacles and drivers frequently stand in the way of a better implementation of GSCM in any firm. Therefore, adequate attention must be given to these obstacles and drivers in order to overcome the challenges and properly adopt GSCM inside any industry.

Several variables, including production management, logistics management, societal and regulatory environments, will determine how successful the green supply chain is in the future. However, it is anticipated that the adoption of Industry 4.0 technologies would significantly improve the performance of the entire supply chain.

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