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Introductory Chapter: Introduction of Green Supply Chain Management

Syed Abdul Rehman Khan

1. Introduction

Since last couple of decades, environmental issues have been increasing and traveling faster than forest fire, country to region, region to world level territory, which is a serious cause of climate change and global warming. In addition, scarcity of natural resources and air and water pollution badly affect the fauna and flora, human life with different diseases they cause definitely, such like ischaemic heart disease, lung cancer, chronic obstruction pulmonary disease, stroke, Dracunculiasis, Cholera, Hepatitis, Typhoid fever, and Norovirus [2]. While, the green supply chain concept occurs to mitigate environmental degradations and control air, water and waste pollution through the adoption of green practices in business operations. Undeniably, the basic ideology behind green concept is to enhanced environmental sustainability, but firms adopt green concept as “kill two enemies with one bullet”. Because green supply chain can reduce the environmental pollution and production costs and it also can spur economic growth, create competitive advantage in terms of greater customer satisfaction, positive image and reputation and provide better opportunity to export their products in pro-environmental countries [1]. The definition of green idea is expanding with new innovations and techniques to protect environmental sustainability, which can be recognized by corporate social responsibility, green manufacturing, waste reduction, recycling and remanufacturing sustainable/environmental friendly supply chain, green supply chain, etc.

The term sustainable or green supply chain refers to the idea of integrating sustainable environmental processes into the traditional supply chain. This can include processes such as supplier selection and purchasing material, product design, product manufacturing and assembling, distribution and end-of-life management. Instead of mitigating harmful impact of business and supply chain operations, green supply chain involves value addition and/or value creation through the operations of whole chain. Undeniably, reducing air, water and waste pollution is the main goal of green supply chain, while green operations also enhance firms' performance in terms of less waste manufacturing, reuse and recycling of products, reduction in manufacturing costs, greater efficiency of assets, positive image building, and greater customer satisfaction. **Figure 1** displays a green supply chain of child's crib manufacturer as an example.

Green supply chain makes the applications of the key sustainable development strategy outstand. It emphasizes how green practices can be adopted in firms to mitigate the environmental degradations and increase the economic and operational

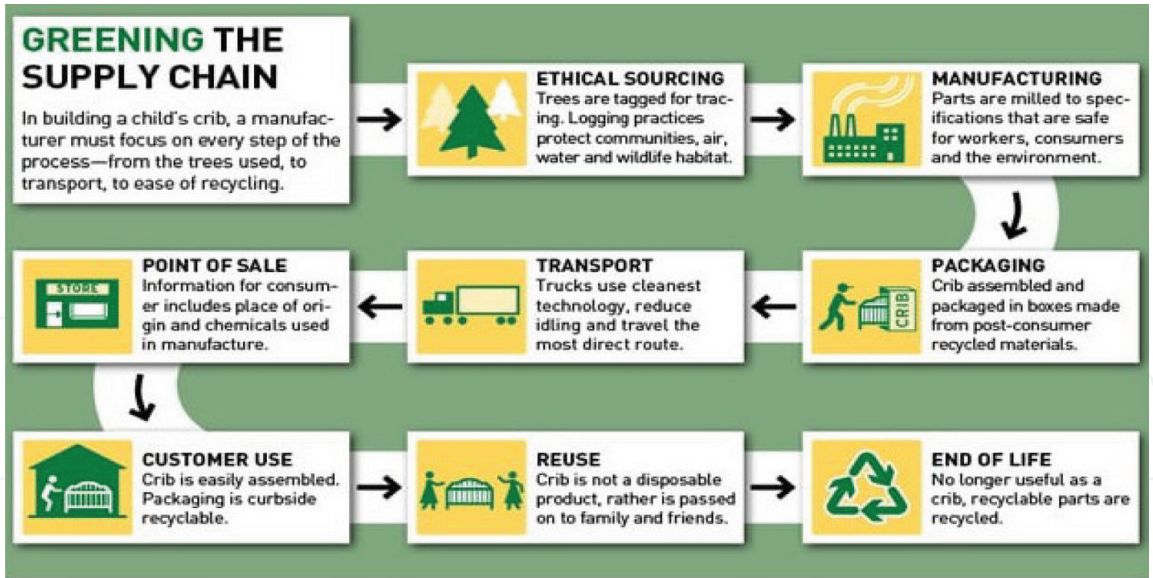


Figure 1.
Green supply chain of child's crib manufacturer.

performance of firms, while **Figure 2** illustrates a simple model of green supply chain. Khan et al. [2] have explained the concepts of sustainable and green supply chain management:

Application of environmental management principles to the entire set of activities across the whole customer order cycle, including, design, procurement, manufacturing and assembly, packaging, logistics and distribution [3].

Integrating environmental thinking into supply chain management, including ecological design of products, purchasing green materials and components, reengineering of manufacturing steps towards ecofriendly, reverse logistics management of the product after its useful life [4].

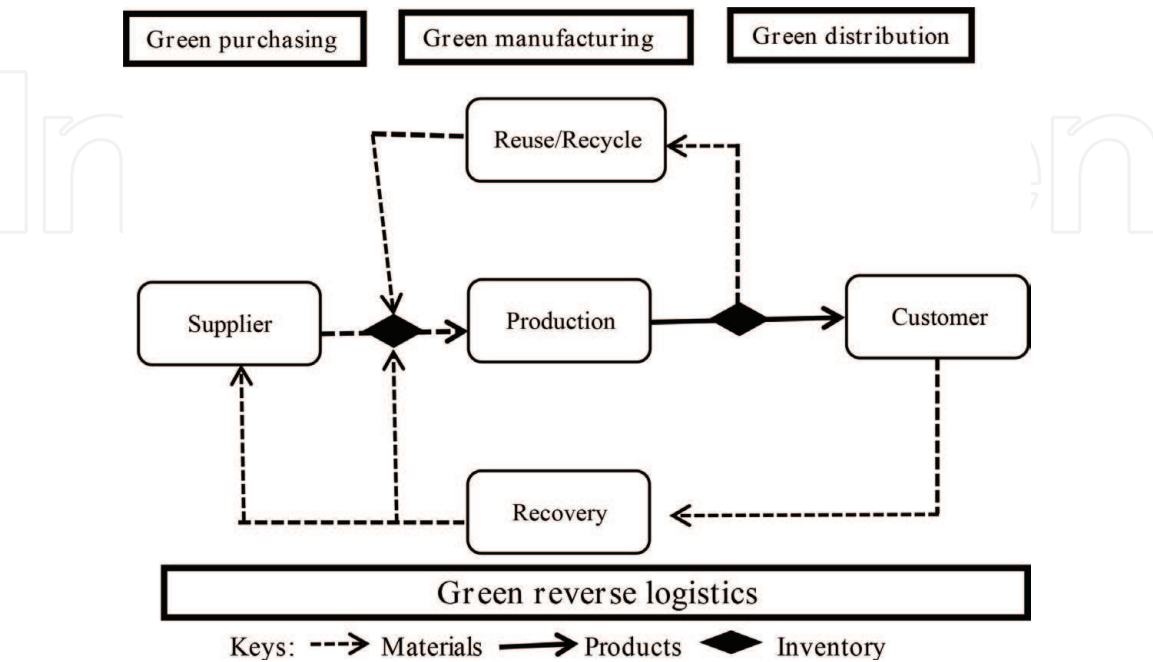


Figure 2.
Simple model of GSCM.

Integrating environmental consideration onto firms' supply chain including reverse logistics [5].

Reducing and controlling the harmful impacts of supply chain on the environment [6].

Adoption of ecological design, sourcing green materials and chemicals, and provide green trainings to employees under ethical leadership [7].

Green supply chain are integrating ecofriendly concept into supply chain management to improve environmental sustainability with different green practices including, green purchasing, green distribution and warehousing, green transportation with usage of biofuels, green manufacturing processes and the products' end-of-life management [2, 7].

In the World, as the environmental awareness is increasing, firms are facing heavy pressure from different stakeholders including government and customers to mitigate their harmful effect on the environment [8]. Indeed, corporate sector needs to consider integrating their business practices in service and manufacturing industry with sustainability and reducing end-to-end supply chain costs to achieve competitive advantage [1, 9]. Since last couple of decades, growing impacts of global warming, climate change, waste and air pollution issues have involved increasing world-wide attention of experts to think more ecofriendly and find optimum possible solution towards "Green" [10, 11]. Rath [12] identified GSCM (green supply chain management) plays a part in motivating organizational sustainability. With the environmental concerns rising continuously, GSCM deserves a persistent community concern in developed nations. Further, it has recently woken up the developing nations to the green movement [13].

2. The role of critical success factors in GSCM

There is no doubt that green supply chain is a relatively new idea, which is gaining popularity so as to improve environmental performance in the whole chain [5, 14]. We have identified the following six key critical success factors for putting green supply chain management into practice to attain better environmental sustainability

- Ethical leadership/internal management
- Customer management
- Supplier management
- Competitiveness
- Societal
- Regulatory

2.1 Ethical leadership/internal management

Internal environment management contains support and encouragement from senior managers. Internal management is a key critical success factor for enterprises

to adopt green practices. Pressure employees bring about, encouragement and support from environmental-protection motivate senior management. Meanwhile, the perception of environmental risks involved could bring positive change in adoption of green practices [8, 15, 16].

2.2 Customer management

In green supply chains, customers play an important and effective part [13]. Indeed, developing nations' firms are facing heavy pressure to adopt green practices in their business operations of supply chain to meet their customers' demand so that they can be competitive in the market [17]. Cooperation with customers becomes very useful to attain fruitful advantages from green supply chain management [7, 18].

2.3 Supplier management

Green supply chain practices are unable to be adopted without active participation of customers and suppliers [19, 20]. Strong collaboration with suppliers enhances incentive systems, boosts the adoption and development of innovative ecofriendly ideas. Technologies, green partnership agreements and openness in implementation of innovative green practices may generate enhancement in operational and environmental performance so as to achieve economic goals of firms [21].

2.4 Competitiveness

A number of published researches showed that competence and relevant elements could play a part in green practices implementation in their supply chain [22, 23]. Competitiveness has been perceived as a significant factor to implement green practices rather than organizations' wish to protect environmental sustainability. Implementing green practices in firms' business operations may also be dated back to additional voluntary for competitive factors [8].

2.5 Social

A number of researchers found the significance of societal factors for attaining environmental friendly practices objectives [15, 22, 24]. With growing attention of regulatory bodies and awareness of customers on environment, firms have to exchange end-to-end information regarding their supply chain operations' effect on local community and people lives [25]. In addition, NGOs (nongovernment organizations), electronic and social media are more effective in exerting pressure on firms to adopt green practices.

2.6 Regulatory

Increasing prominence of environmental concerns has forced regulatory authorities to strict their environmental laws and policies [8, 26]. Governmental bodies have been farming strict environmental laws to control climate change, global warming and pollution; and firms are required to reduce their supply chain's negative effect on environmental sustainability [27]. Hence, it becomes more and more important for firms in supply chain to have conformity with regulations so as to conducting ecofriendly strategies.

3. Green practices in supply chain management

With numerous green practices adopted, companies in their business and supply chain operations improve their productivity with better environmental growth. While, some well-known green practices are as follows;

3.1 Green material sourcing

Green sourcing means sourcing or purchasing materials and components which have such enviable ecofriendly characteristics as reusability, recyclability and nonuse of hazardous/dangerous chemicals [28]. With more and more concerns on environmental protection, procurement professionals have been motivated to reconsider their existing sourcing, purchasing strategy and their impact on environmental sustainability [29, 30]. The role of ecofriendly purchasing is the involvement of recycling and remanufacturing. Min and Galle [31] further emphasized green sourcing supporting waste reduction enhances recycling and remanufacturing and other activities in supply chain. Carter and Rogers [32] did a research to explore the impact of green sourcing on firms' environmental and financial performance. They concluded that owing to the successful adoption of green purchasing strategy, products' cost is reduced and environmental performance and financial performance of firms is increased with positive reputation obtained in the market. Zailani et al. [33] highlighted that ecofriendly purchasing has positive relationship with firms' operational and environmental performance. Yang et al. [34] green purchasing was categorized into five main facets: design operation management, supply chain management, environmental authentication, ecological, and external environmental management. They confirmed that green purchasing improved to the overall firms' performance [35]. The adoption of green purchasing in supply chain and business operations is a reliable tool in mitigating waste, air and water pollution.

3.2 Green marketing

The actions directed to all incorporates and consumers comprise green marketing, a broad range of marketing activities (e.g., planning, production,, process, price, promotion and after-sale service) designed to illustrate the goal of organization to mitigate the harmful effects of their products [36]. Green marketing practice promotes the products with environmental friendly properties [8, 37]. It contains the activities that can satisfy human desires of minimum negative effects on the environmental beauty. In addition, green marketing enhances firms' competitiveness and financial and environmental performance with positive corporate reputation and image [35, 38].

3.3 Green management

Green management practices (GMP) provide a firm with supplementary sources of information that can enhance their business and environmental objectives [39]. Adoption of green management practices help with improved firm image, increased efficiency, environmental compliance improvement, cost savings, achievement of societal commitment and reduction of carbon emissions etc. [40, 41].

3.4 Green distribution and warehousing

Green distribution and warehousing can reduce the waste and play an important role in energy reduction and value addition of green products in warehousing

significantly improve overall performance of organization with better corporate image [7]. Green distribution helps enterprises to obtain superior financial and environmental performance [42, 43].

3.5 Green manufacturing

Green manufacturing practices are to implement socially and environmentally accountable practices to mitigate harmful effects of manufacturing and increased profitability of firms [8, 29]. Green practices in production improve efficiency of processes [33]. This practice involves the application of the green resources, which may lead towards competitive advantage through reduction in products' cost and improvement in products' quality. Lean and green manufacturing industry both are working for eliminating waste and improving the efficiency of manufacturing processes [43]. Baines et al. [42] highlighted the benefits of green manufacturing: green practices in production processes mitigate the bad effects of manufacturing processes on environmental sustainability, while green manufacturing improve operational, environmental and financial performance of firms.

3.6 Ecological design

Luthra et al. [8] highlighted that 80% impacts on environment from product and process related could be controlled with the adoption of ecological design in supply chain management. Ecological design incorporates many ideas such like using cleaner technology processes, green raw material and components [28, 44]. Green design of products reduces ecological impacts of products during their life [8, 45]. In addition, green design of products also supports reusing, recycling and remanufacturing of products, which not only helps firms to improve their environmental performance but also provide opportunity to reduce their costs [1].

3.7 Green transportation and reverse logistics

Green transportation and reverser logistics practices provide opportunity to organizations, to improve their image and reduce their costs [46]. Logistics overheads can be saved through promoting transportation system's efficiency and enhancement of customer association also can be obtained to create more profitability [8]. The logistics activities integrated with rehabilitation comprise the practice of reverse logistics (reusing, recycling, and remanufacturing), which can produce the products that can be used again for customers [29]. Green logistics practice helps firms to reduce their environmental impacts with improved quality and cost reductions [47].

3.8 Renewable energy and biofuels

Undeniably, global logistical and supply chain operations mainly depend on energy as well as fossil fuel, which are the main cause of climate change, global warming and pollution with greater carbon and greenhouse gas emissions [46]. Renewable energy and biofuels are required in supply chain operations so as to obtain sustainable environmental and economic growth [48]. Anable et al. [49] highlight that logistics related activities consume greater energy to accomplish their task. Renewable energy and biofuels improve economic performance of firms and also reduce carbon emissions. In addition, fossil fuel is more expensive than biofuels and green energy sources [50]. The strict governmental policies together with customer awareness build pressure on corporate sector to use biofuels and

environmental friendly energy in their supply chain operations. The bioenergy mitigates the carbon emissions and also improves profitability of enterprises with better image and reputation building [7, 46].

The cost minimization is considered as the most important factor for firms to implement green practices in their supply chain operations. The implementation of green supply chain initiatives would help to cut down the costs of packaging, components and materials due to use of reused, recycled and remanufactured products. Khan et al. [2, 46] highlighted that green practices provide opportunity to capture new markets and export to pro-environmental countries, while polluted firms are unable to export their products in pro-environmental countries such as USA, Germany, UK and Poland. Undeniably, green supply chain management practices have been a tool for firms to decrease their products' cost, enhance profitability and increase market share [51]. On the other hand, to improve social performance, firms also adopt green practices in their business activities. Social performance indicates improvement of people's quality life standard without compromising on environmental beauty. In addition, social performance includes the enhancement of firm image and the improvement of environmental sustainability, as well as reduction in environmental risks [29].

By adopting GSCM practices, firms may enhance their operational performance through improving products quality and improving delivery service [15]. Green supply chain management initiatives also help organizations to improve their environmental performance such as reduction in carbon emissions, elimination of waste from end-to-end supply chain, effective and strong collaboration with suppliers would decrease their communication costs and easily promote reuse, recycling and remanufacturing [52]. Environment management system (EMS) integrated into firms' manufacturing strategy will assist the firms to enhance its ecological performance [53].

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