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Green Supply Chain Management Practices

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Abstract: Almost all the countries in the world are considering how they can respond to environmental problems through using eco-friendly processes and products. The supply chain is one of the main drivers causing significant environmental issues such as emissions. As a result, the idea of green supply chains have been consider to address these environmental problems through buyer–supplier alliances. In this paper, we present the benefits of the green supply chain management. The benefits impact not only environment but also many stakeholders.

Keywords: Green supply chain (GSC); green designs; green supply chain management (GSCM).

Introduction

From an industrial company to an academic institution, everyone is keeping environmental factors in mind for sustainability purposes. For instance, designing a new building is a good example of making many decisions affecting the green computing and environmental issues. The decision can be range from the type of material used in the building to the type of electrical and water supplies within the building. Due to recent technological advances, one can easily reduce the consumption of electricity in a building through use of sensors, harvesting energy from solar panels placed on roof tops, and so on. Similarly, we can saving water indoors and outdoors through applying intelligent techniques to water use/reuse. It is clear that green technology provides significant savings for both customers and suppliers by cost reductions. The environmental issues are especially important for manufacturers located in European Union, Japan, and US [1].

1980s were considered an era for quality improvements and 1990s highlighted supply chain. As everyone agrees, the best practices should include environmental factor into operations of the business. Green supply chain management (GSCM) naturally becomes a common interest domain for academics and practioners. Environmental sustainability has become a global issue by almost all the nations. The supply chain management includes many components such as product design, manufacturing, and lifecycle of the products and so on [2].

Green Supply Chain (GSC)

The researchers in BearingPoint, Inc [3] state "The Green Supply Chain is an approach which seeks to minimize a product or service's ecological footprint". This definition essentially means that the green supply chain includes phases of a life cycle of a product from beginning to the end. The concept of green supply chain demands various expertise to provide solutions to environmental problems.

Green Designs:

Green designs generally consider designs with characteristics such as modularity, removability and retrievability, and standardized design [4].

- As the software products should be developed using modular design, the same rule applies here such that the maintenane of a green product would be manageable.
- Due to the standardized design, structure does not change which means that the processing, energy consumption and the complexity of equipment can be significantly decreased.
- The removable design allows loose coupling among the parts of the structure such that when a part is removed, the rest of the parts still work.
- As the name refers, the recyclable design allows multiple reusability of a part.

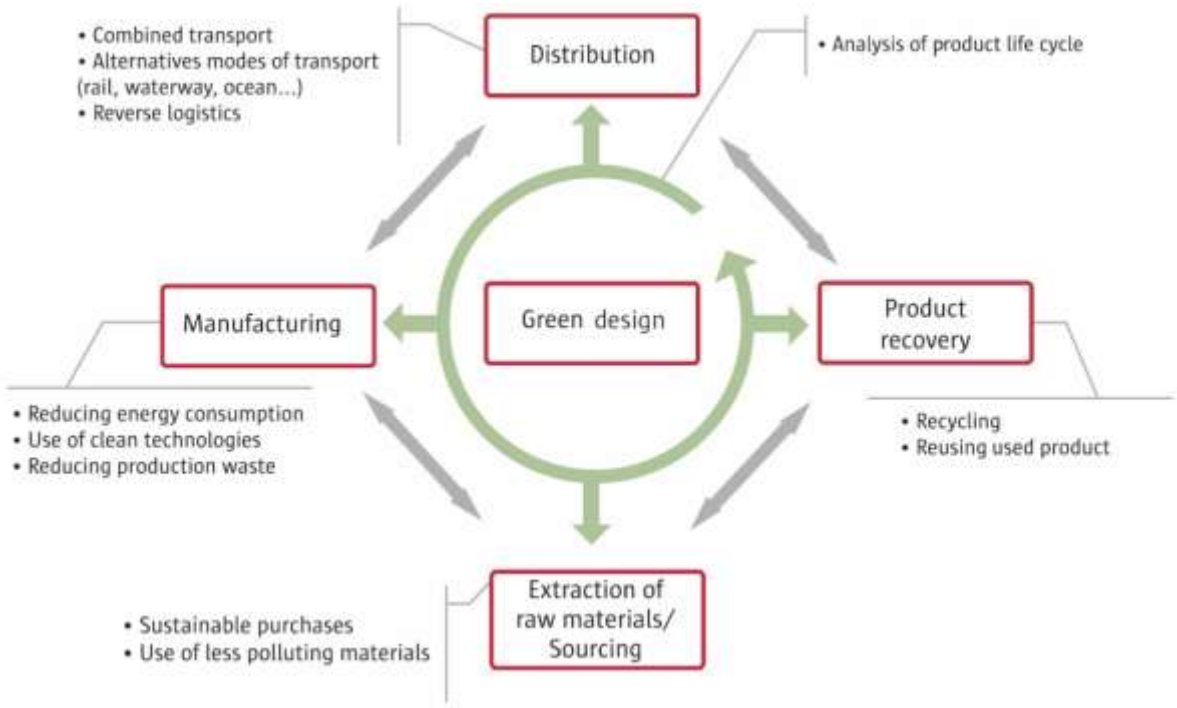

Figure 1. Delimiting the Green Supply Chain [3]

Distributing:

The marketing of the products include steps such as green marketing and green transportation. Green marketing of the products is generally the best way for our environment. The components of the green marketing can include changes to the production process, the product itself as well as packaging and advertising aspects. Green transport essentially depends on the logistic process which in turn includes aspects such as path planning for transporting the green products [5].

Manufacturing:

As the technology advances, the life cycles of the products shorten while the resulting products are no longer adhering to simplicity. The customer would want to change their products before the lifetime of the product reaches. For instance, cell phones are good examples where people change them every two years, mainly because of the cell phone plans, regardless of whether they continue to function. The new version of the phones continues to include additional complex functionalities. Those exchanged cell phones basically increase consumer waste in addition to causing environmental problems. One way to address this problem is through green recycling concept [5].

Sourcing:

We call obtaining materials a procurement process and it includes both the supplier of the materials and the logistics such as coordination of transportation aspects.

Green Supply Chain Management (GSCM)

There are many definitions to green supply chain management. Narasimhan and Carter [6] define it as "environmental supply chain management consists of the purchasing function's involvement in activities that include reduction, recycling, reuse and the substitution of materials". Srivastava [7] on the other hand states "integrating environmental thinking into a supply chain management, including product design, material resourcing 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 life". Green supply chain management includes product lifecycle which is essential to the overall process [8].

The Boston Consulting Group [22] predicts that there will be about 19% yearly growth in Turkey's economy between 2011 and 2017. The consumption is expected to drive the growth due to increase in the usage of e-commerce, broadband, and Internet (see Figure 3).

Figure 2. Supply Chain in the Environmental Life Cycle [8]

GSCM can be defined as the combination of green purchasing, green manufacturing, green distribution, and green reverse logistics.

Green purchasing:

It relates to purchasing products which are made up from environmentally safe materials and supplies, legitimate list of suppliers, quality of environment, and packaging which is prepared again by environmentally friendly materials [9]. The aspects of reuse and recycling of the materials must adhere to the quality standards set [10, 11].

Green manufacturing:

It is comprised of product design and processes which results in products where the environmental effects are negligible (e.g., less waste and pollution) [12, 13]. In order to achieve this desirable outcome, the total components of a product must be minimal, the complexity of the assembly process must be reduced, and reuse/recycling aspect must be further improved. As a result of green manufacturing, the cost of materials and energy is decreased while the environment quality is increased.

Green distribution:

It requires green packaging which promotes optimizing the size of packaging, reuse and recycling of the materials [7, 11]. Green distribution also encourages cost and energy efficient techniques for distribution of the products such that carbon footprints and energy consumption are further reduced.

Green reverse logistics:

Reverse logistics is used to recover the used product and/or materials. Green reverse logistics regains the possession of the materials or the products from the consumers such that either the value of the product can be restored or in many cases, the product can be disposed in an environmentally safe manner [7, 14]. Some of the activities of the green reverse logistics include parts/waste collection, recovery, and disposal [15, 16]. For instance, the car batteries are not recommended to be disposed with the regular trash, instead they need special process for disposal such that environment is not affected. Some of the recovered parts and materials can be recycled or reused [16, 17].

Green logistics:

It focuses on reuse, recycling and transportation related matters. Green logistics, leveraging environmentally safe materials and green transportation modes, give companies an edge and creates positive the public image [18]. Green logistics is also referred as ecological logistics, reducing the environmental damage [19].

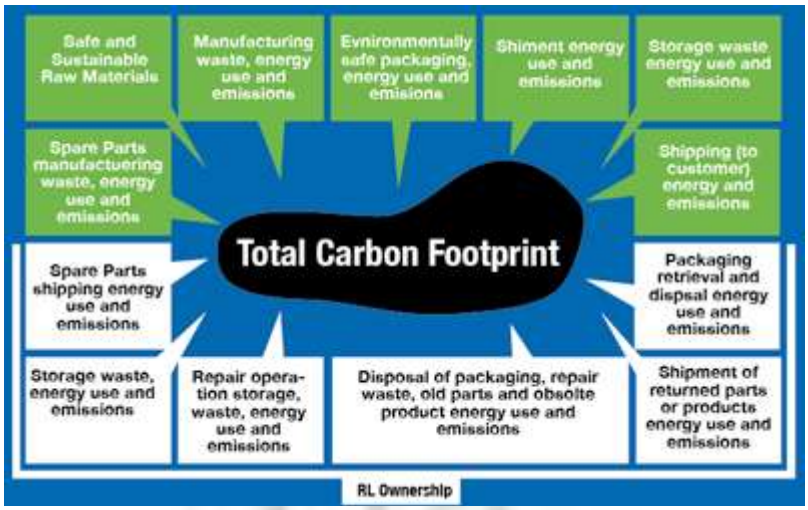

Figure 3. Total Carbon Footprint [20]

Figure 3 presents the topics related to green logistics and reverse logistics which can contribute to minimizing the carbon footprint. The green and white boxes refer to green logistics and reverse logistics respectively. While the two concepts are similar, they differ the way the process is carried out to minimize the total carbon footprint. The best practice for a company would be to appropriately balance these possible techniques. For instance, redesigning packaging is part of green logistics instead of reverse logistics. On the other hand, if we want to make the packaging reusable or recyclable, then it belongs to reverse logistics [19]. In essence, the packaging example falls within the broader umbrella- green reverse logistics.

The aim of the reverse logistics may not be only minimizing the waste of the materials. We need to understand that every decision we make in product life cycles affects the reverse logistics. It is never an easy task to improve the process and the product while reducing the associated costs [20, 21].

CONCLUSIONS

As the efforts for sustainable future increase, the green technologies become essential in this endeavor. Designing and developing products which are made up of environmentally friendly materials and components are essential to protect the environment we live in for us and for the next generation. These products must adhere to standardized techniques and follow best practices. Governments are paying great deal of attention to products which do not affect the environment in a negative way. The rules putting in place are much more rigid than before. Similarly, the consumers are demanding environmentally safe products from the companies. As a result, the companies have no choice but to design and develop their products with environmental protection in mind. In this paper, we present the green supply chain and green supply chain management practices.

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