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Abstract

This seminar research paper will explain how industries are changing their supply chain to better impact the environment by implementing green procedures and policies. Research topics will include the history and the influences that green practices have on supply chain management systems. It will also examine the benefits of supply chain management and the green practices related to these methods, along with the viewpoints that are associated with green supply chain management, such as green manufacturing, green procurement, green distribution, and green logistics. The product life cycles, along with the operational life cycles, will be discussed to explain how corporations are influenced to thrive in the supply chain industry. Waste reduction processes will be explored, along with the five major practices that affect the creation of waste by the supply chain, which include reduction, reuse, recycle, remanufacture, and disposal substitutions.

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Introduction

Carbon monoxide emissions, removal of packaging materials, scrapping of toxic materials as well as other industry pollution that business actions possess can cause a substantial threat to the environment. Companies need to implement practices that will lessen their carbon footprint to help ease the pollution impact that the industry creates. “Supply chain management (SCM) is grouping all activities related to manufacturing from raw material acquisition until delivery of the final product. Green supply chain management (GSCM) is an integration of natural environmental concerns into SCM through the implementation of diverse green solutions and practices like green design, life cycle analysis, green purchasing, green logistics, environmental technologies, and collaborative practices with suppliers, distributors, and customers” (Boutkhoum, Hanine, Boukhriss, Agouti, Tikniouine, 2016). Simply put, the main purpose of GSCM is to reduce waste within a company’s everyday operation so they can save energy and prevent the introduction of detrimental materials into the environment.

Chopra and Meindl (2010) explain that “a typical supply chain includes the following five stages: component/raw material suppliers, manufacturers, wholesalers/distributors, retailers and customers,” which are linked through product flows, information, and money. SCM practices contain methods that a company utilizes to effectively combine supply and demand to develop a more efficient management system for the supply chain. When companies add a “green” element to their work systems, GSCM procedures integrate green activities into procurement, manufacturing, distribution, and reverse logistics. Alfred and Adam (2009) state that “organizations should become greener by implementing many GSCM practices which consist in several environmental supply chain management directives that can be adopted both inside and outside the company.”

Statement of Purpose

The purpose of this seminar research paper is to identify the green systems that companies should implement to help keep the longevity of a sustainable environment intact while gaining an understanding of how GSCM interacts within the SCM systems. Industry experts and company decision-makers are under immense pressure to diminish the adverse effects on the environment that supply chains exhibit. Most companies have established positive environmental habits “because of the pressure from external and internal forces as well as an awareness of the consequences of non-compliance with environmental imperatives. If companies have a legitimate concern for the environment and there is social approval, then environmental practices will be deployed more rapidly throughout the supply chain” (Laosirihongthong, Adebajo, ChoonTan, 2013). Customers are becoming more engaged in their buying choices by basing their decisions on which companies are attempting to make a positive environmental impact. Some circumstances that affect customers’ purchasing decisions are the packaging choices that would benefit the ecosystem and the alternative to choosing a more ecological logistic option. “As customers begin to demand eco-friendly products and services that are produced by processes that do not damage the environment, manufacturing organizations must modify operations to reflect these new customer demands” (Green, Inman, Sower, Zelbst, 2019).

Significance of the Study

How environments are being affected by industrial decisions along with a company’s decision on how to make changes that will improve environmental hazards is a significant aspect of this paper. Reducing the exposure of waste to the environment that a company creates is a feature of GSCM that includes reduction, reuse, remanufacture, recycle, and disposal alternatives. Every supply chain operation produces a version of waste. If waste management

processes are regularly followed, it will guarantee that fewer waste materials will go into the systems and reduce pollution to our environment.

Literature Review

Supply chain management currently is the pillar of most markets and thriving multinational industries. While the term “supply chain” goes back to the early 20th century, the concepts of supply chain date back to the early ancient times with logistics, while the actual term “supply chain management” did not get invented until the 1980s. With the invention of the personal computer systems came more technology that affected SCM, “such as spreadsheets, optimization models, and algorithms that could predict logistic issues for the supply chain. These solved problems with planning, resource management, and forecasting, as well as making oversight of the entire supply chain easier to visualize, save, and share” (2019). Enterprise Resource Planning systems, or ERPs, were established in the 1990s at the time faster computers were developed and provided companies the ability to manage all their activities, such as managing finances, tracking performances, automating business functions, and centralizing information. As efficiencies have increased and product life cycles have reduced, SCM has had to use technology to meet the needs of investors by having access to real-time information, which is just one benefit of SCM. Some other benefits include shipping optimization, reduced inventory and overhead costs, better partnerships with suppliers, and improved quality control. Having a healthier relationship with suppliers allows for both parties to work to the same standards, which also lets quality control problems be identified earlier so that the problems can be fixed before they get to the consumers.

The concept of green supply chains initiates from the notion of green purchasing that was first proposed for the Environmental Responsibility Manufacturing (ERM) study in 1996 (Shan,

Wang, 2018). Since then, more companies have started implementing green practices into their supply chain environment. For a company to achieve a sustainable supply chain, it must concentrate on environmental, social, economic, and legal issues across its full supply chain. The main goal of GSCM is to help companies reduce their carbon emissions and minimize waste while maximizing profit. GSCM is essential to the health of our planet. “According to the US Environmental Protection Agency (EPA), CO2 emissions have increased by nearly 90% since 1970. By making the switch to more sustainable practices, businesses can do a lot to slow or stop global warming and ensure a bright future for our planet” (Agility Logistics, 2022).

A company has the potential to run across some challenges when implementing GSCM into its systems. Initially, it can be costly to implement green marketing campaigns since it usually requires a lot of money spent on R&D programs. However, once a company masters becoming successful at maintaining sustainability, they will then see costs begin to reduce, and saving money converts to a reality. A good example of this cost savings from sustainability is PepsiCo. “A.T. Kearney reports that the company saved more than \$60 million in energy – 16% reduction per unit across its beverage plants – as the result of managing the carbon associated with those activities” (2022). PepsiCo also was able to save around \$44 million by switching its packaging from corrugated to reusable plastic containers for their bottles. Convincing the customers of the effectiveness of the company’s green strategies may also become challenging at the beginning. Profits will initially be low at the startup of green practices because recyclable and renewable products, along with green technologies, can be more expensive and customers may not be willing to pay the higher price for the green products at first. Companies may also come across global trade barriers due to the increasing environmental regulations that have been developed.

With challenges, come benefits. Some benefits that are associated with GSCM include reducing the environmental impact, improving the stability of supply, protecting against reputational damage, and the potential of winning more business and partnerships. Reducing the impact that GSCM has on the environment can lead to huge savings due to the reduction of waste and expanding the efficiency of industry tools. The ability to have numerous suppliers in many areas of the world can help expand the stability of a product or service. GSCM will also help protect a brand's reputation so that it will improve the growth of the business. With that growth comes the potential for acquiring new partnerships and customer business. Having the flexibility of possessing more environmental certificates will cause a company to appear more attractive so that other companies might want to partner with them. Also, customers are more likely to interact with companies that have the environment in mind when making business decisions.

GSCM is based on four important views: green procurement, green manufacturing, green distribution, and green logistics. Green procurement is best defined as “a set of supply-side practices utilized by an organization to effectively select suppliers based on their environmental competence, technical and eco-design capability, environmental performance, ability to develop environmentally friendly goods, and the ability to support focal company's environmental objectives” (Chin, Tat, Sulaiman, 2015). In the green procurement section of a business, the reuse, recycle and reduce processes are practiced by having purchase orders come through emails as opposed to a tangible order, along with utilizing eco-friendly labels for the products. Green manufacturing occurs in the production of products that switches inputs into outputs while reducing dangerous materials and increasing energy efficiencies. It also minimizes the amount of

waste that production creates and encourages manufacturers to create products that can utilize the reuse, recycle, and reduce components of GSCM.

There are numerous focuses that green distribution aims to meet to make it an effective green solution. Two concentrations are to downsize the packaging so there is not as much needed and to use “green” packaging materials. A couple of examples of “green” packaging materials are materials that are 100% recyclable, corrugated containers, and compostable packaging. Promoting a recycle and reuse program within the distribution areas will also help establish a green space. Having the ability to work with suppliers to standardize packaging requirements will also help keep costs down and allow for fewer packaging variations. Approving a returnable packaging method will allow for materials to be recycled, which can include possessing a recyclable pallet system. Finally, acquiring an energy-saving warehouse facility will allow a company to have green distribution processes in place. An example of an energy-saving concept is installing energy-efficient equipment that utilizes high-efficiency motors that will make the machines more reliable. Also, companies may build a more vertical type of warehouse as opposed to a wide warehouse so that it will have a smaller environmental footprint. There is also the option of building a warehouse closer to the customers so that transportation costs and emissions will reduce.

The final viewpoint that GSCM is based on is green logistics, which is about delivering the goods directly to the customer’s site. Companies that use alternative fuel vehicles along with grouping orders together to save on the need for more vehicles will help establish green aspects for the environment. Logistics optimization is key when applying GSCM practices because inefficient transportation methods are a large part of the environmental problems that we are facing. Green logistics is also focused on reverse logistics which includes collecting used

products and packaging materials with the desire to recycle and reuse the materials. According to Jenkins (2021), “[W]orldwide, returns are worth almost a trillion dollars annually and have become increasingly common with the growth of e-commerce.” For example, Proctor & Gamble, PepsiCo, and Unilever are all switching to reusable packaging that allows consumers to return. The companies will arrange a pick-up of these returnable containers when they drop off a new order, then clean and reuse the containers.

Product life cycles and operational life cycles aid as the foundation for decision-making in prioritizing procedures that will help in managing green supply chains within companies. The product life cycle arranges the product or service of a company and will encourage the management of a supply chain. There are four phases of a product life cycle: “a product introduction phase that is characterized by investment in product research and development, a growth phase characterized by increasing production capacity and logistics channels, a maturity phase where process and cost efficiencies are typically implemented, and a decline phase where the focus is on product divestment” (Sarkis, 2003). The product life cycle will influence the greening process of supply chains since the product is manipulated by the design in the introductory phase and the design of the product can be created with environmental issues in mind. During the mature and decline phase, the development of procedures and having an efficient reverse logistics system prepared will affect the environmental practices of the industry.

The operational life cycle will influence how the supply chain is managed within an organization. The major parts will include procurement, packaging, production, distribution, and reverse logistics. Procurement and purchasing decisions will affect green supply chains by purchasing materials that are already recycled or reused. Having suppliers that are environmentally certified will help in lowering the risk of possessing materials that are harmful

to the environment. Lessening these risks will also increase the chance that the suppliers will have longevity within the industry. Packaging has an intense relationship with other sections of the operational life cycle. More efficient packaging can reduce the number of materials that are needed, which will reduce the amount of storage space and the amount of handling that may be required. Production systems can stimulate the greening of supply chains by retaining certain materials and machines that are environmentally friendly and designed to reduce waste within the system. Distribution operations are also important to the operational life cycle because “several decisions including distribution outlet locations, mode of transportation to be used, control systems, and just-in-time policies, will not only influence the forward logistics network, but also the reverse logistics network” (Sarkis, 2003). The customers are tied to distribution since they are involved in the design and development of the distribution systems and will improve just-in-time systems. From an environmental angle, reverse logistics is defined as the return of recyclable or reusable products and materials. Many companies utilize reverse logistics as a cost savings measure since receiving reusable materials back into the system is usually more cost beneficial than purchasing new materials.

Waste, which is commonly called Muda in the lean manufacturing industry, is a large factor that companies will need to address if they wish to have a sustainable GSCM system in place. Waste is defined as “anything that provides no value to the customer and contributes nothing to the bottom line but has an associated cost” (Sarkis, 2003). There are seven types of waste: defects, overproduction, waiting, inventory, transport, motion, and overprocessing. These waste types may be present in either manufacturing or the service industry, but the manufacturing industry is where most recycling opportunities lie. Defective products will need to be recycled or disposed of if they can not be reworked back into the system. Overproduction is

the process of producing excess products which may have the potential of becoming obsolete while waiting to be consumed by the customer. Also, overproducing could lead to extra hazardous materials being used and then needing to be disposed of. Waiting as a waste function may cause the product to become damaged from having the product staged for when the customer will take the product. Products can also become damaged through possessing too much inventory, which can result in limited space available to store the product. Transport and motion are similar in that there can be more packaging requirements needed to protect the product during movement or shipping, along with the possibility of unnecessarily moving the product from one location to another. Overprocessing can require the use of inappropriate techniques or equipment to be used in production.

Reducing the amount of waste a company creates includes five major practices: reduction, reuse, remanufacture, recycle, and disposal alternatives. Reduction can be a proactive approach that can benefit an organization by implementing programs such as total quality management and just-in-time programs. Reuse will normally keep the original physical characteristics of a product while remanufacturing will require disassembly and reconstructing the product. Recycling will break down a product and take on a new physical and chemical trait of the product. An example of a product being recycled is newspapers. When heat and water are added to the newspaper, its physical trait is turned into a pulp substance. This pulp can be added back into a forming machine to create a paperboard or corrugated cardboard, making it a new physical product altogether. Waste disposal alternatives will include different practices that will benefit the company. Different disposal options will be decided based on what type of waste is being collected and the product's characteristics. Handling the disposal of waste in a safe, ethical, and responsible manner will support the adverse impacts on the environment.

Methodology

The main method used in creating this seminar research paper consisted of gathering research information from various scholarly articles and journals and creating literature reviews. Literature reviews summarize published information in a particular subject area while including a critical evaluation of the material. The sources utilized were created to express the authors' concepts and theories concerning how SCM is affected by GSCM practices, which help understand the ideas and views within this paper. GSCM has been a thriving topic over the past decade, so luckily there were several articles of information to use in this research paper. Information and data about GSCM practices were also collected by interviewing a continuous improvement team member, Don Davis. Mr. Davis holds a Kaizen black belt certification and has a history of working in the continuous improvement area of two different manufacturing companies over the past six years. In his career, he has witnessed improvements and failures within GSCM practices. The discussion allowed for the discovery of how green practices, such as reverse logistics practices, waste disposal procedures, and overproduction activities, have recently been implemented in the everyday environment of a fiber optic manufacturing company.

Discussion

In a discussion with Mr. Don Davis, a continuous improvement employee who works for a fiber optic manufacturing company, there have been advancements in GSCM practices established in the company over the years. One of the developments that have been created is a reverse logistics practice of returning used cable reels. This program allows for cable reels to be picked up by truck lines and returned to the plant to be reused for future orders. Discounts are also given to the customers who participate in the return program to help encourage customers to return cable reels, rather than dispose of them. The reverse logistics program established helps

reduce the need for more material to be purchased and supports the reduction of excess waste. Waste disposal procedures are another GSCM practice that has been created in recent years at this fiber optic company. There are systems in place for the disposal of harmful materials that employees are expected to follow to help eliminate dangerous materials from getting into the environment. Some aspects that these systems focus on are properly labeling hazardous material, using the correct packaging for disposal, and placing the material in the proper bins which indicate how they are to be discarded. A social event has also been launched quarterly that encourages employees to bring any harmful household products to the plant to be discarded properly. This event has brought awareness to recycling and helping the environment by properly disposing of unsafe items.

The final topic Mr. Davis discussed was the plant's implementation of a procedure to reduce the amount of overproduction that was being created. As previously mentioned, overproduction has the potential of being wasteful by generating excess products before they are needed. This fiber optic plant has developed a Kanban that allows for controlling the amount of production created by limiting the amount of material staged for production. A Kanban is a visual system for managing work as it moves through a process. The Kanban system this company has implemented is using tags to indicate when more material needs to be staged for production. Fiber makes up the construction of a fiber optic cable and is staged for operation's use. The fiber lab assembles fiber racks for each production line and controls how much production is needed for the beginning stage of the process. The tags are rotated through the system to indicate when another fiber rack is to be staged. There should only be two racks staged for each production line at a time. Once the line operators use a fiber rack, then the corresponding tag is returned to the fiber lab to indicate that another fiber rack is needed in the

staging area. This Kanban system helps limit the amount of production that is created, which helps reduce the chance of waste from changes being made. For example, if the fiber lab stages multiple orders for production and a change is needed for one of those staged orders, then that staged fiber may be scrapped since it is job specific once it is in the staging process. This Kanban process has shown success by providing a 4% waste reduction over the last year.

Climate change has become a steady threat to our planet and economy so much that it is causing businesses to develop solutions to help it become greener in the future. According to Kenyon (2021), “FedEx plans to convert its entire parcel pickup and delivery fleet to ‘zero-emission electric vehicles’ by 2040. FedEx CEO Fred Smith said that decision was based on the increasing economic viability of sustainable solutions and concern about carbon pollution.” Today, customers are conscience about what companies are doing to protect the environment. They base their relationships with transportation providers on these environmental advancements that companies are instilling. Trucking industries are also beginning to use route optimization, which is the process of establishing the most cost-efficient route. Utilizing this route optimization can be very beneficial to trucking and delivery companies as it helps provide reliable arrival times and improve customer satisfaction. “Well planned routes mean drivers spend less time driving, which reduces fuel costs and wear and tear on vehicles and can also increase both times on-site and the number of stops a driver can make in a day. Optimal route management can help improve operational costs as well” (Kenyon, 2021). In the aviation industry, emissions from aircrafts are a substantial contributor to climate change and the best way to start eliminating these harmful emissions is to incorporate sustainable aviation fuels. British Airways has become the first European airline group to commit to powering 10% of its

flights with sustainable jet fuel by 2030. These are just a few examples of companies that are working towards helping sustain our environment by the reduction of emissions.

Conclusion

Green supply chain practices are significant to the health of our planet and the continued sustainability of the industry. According to Agility Logistics (2022), GSCM “leads to competitiveness and economic performance in several ways: by increasing cost efficiency, reducing waste, and meeting consumer demand for green products.” Today, customers are more aware and involved in their buying choices and tend to lean more towards companies that are environmentally focused. To sustain in today’s economy, companies need to continue to implement more GSCM practices in their industry to help reduce costs and gain more customer loyalty. SCM can stand alone in this economy, but it is stronger with GSCM practices associated with it. As an industry and a consumer, we must continue to practice GSCM to help sustain our environment to ensure our future.

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