Framework for Sustainable Supply Chain Management

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Abstract: The notion of sustainability has been presented in various domains, including management, technology, and supply chain. Companies now incorporate various environmental initiatives into their company plans in order to improve both their environmental and business operations. One environmental technique used in firms is supply chain management (SCM) activities. Sustainable Supply Chain Management (SSCM) is an important method that assists firms in enhancing their overall performance. This study gives a short review of the literature on SSCM. According to the review of literature, the impacts of SSCM techniques are yet unknown and may result in either positive or bad economic performance. As a result, the researcher presents a detailed definition of the SSCM. This study also explored the benefits and drawbacks of SSCM in order to clear some of the ambiguity in this sector. Furthermore, an overview of each SSCM activity has been provided. The value of technological systems in this subject has been demonstrated. In addition, the chronology of SSCM actions during the last two decades has been defined and summarized. Finally, a framework has been provided to assist managers in building SSCM.

Keywords: Sustainable Supply Chain, Technology Management, SSCM trends, SSCM framework, Manufacturing

I. INTRODUCTION

In recent years, the notion of sustainability has been brought to numerous disciplines, including management, technology, and supply chain (SC). According to Hansmann and Claudia [27], as well as Liang and Chang [17], implementing environmental initiatives creates new chances for organizations. On the agenda of organizations, corporate social responsibility has given way to environmental business laws [1]. Companies now incorporate various environmental initiatives into their company plans in order to improve both their environmental and business operations. One environmental technique used in firms is supply chain management (SCM) activities. Sustainable Supply Chain Management

(SSCM) is an important technique that assists firms in gaining an advantage over their competitors and enhancing overall performance.

According to Wagner, Schaltegger, and Wehrmeyer [41], the impacts of SSCM techniques are still unknown and may have a favorable or negative impact on economic performance. As a result, the benefits and drawbacks of SSCM have been examined in this study in order to clear some of the misunderstanding. A framework for SSCM has also been introduced. Finally, the chronology of SSCM operations in recent years has been established.

II. SSCM DEFINITION AND ACTIVITIES

2.1. Materials

1. **SSCM Definition and Activities**

The most widely accepted definition of SSCM is "the process of managing SCM activities with consideration for environmental, economic, and social issues in order to enhance the long-term economic goals of individual organizations and their supply chains." [14][16][23][18].

Figure 1 summarizes the SSCM activities covered in the literature review. Each action has received a brief evaluation as it relates to the concept of sustainability.

Fig. 1 SSCM activities

Sustainable Design and Packaging:

The first step in implementing SSCM is to develop sustainable design solutions for the product and package. This activity also includes creating things in such a way that they can be recycled or rebuilt. Navin-Chandra [34] was the first researcher to emphasize the need for a sustainable design to reduce the impact of product waste [2]. According to Baojuan [3,] sustainable design has a substantial impact on resources and the environment. He argues that "aside from functions, quality, development cycling, and costs [3], it would optimize the relevant designing factors."

A successful recycling process will result from sustainable design. It also assists firms in earning the respect of their customers, saving money, and leading to better products [4]. Interest in implementing environmental packaging, selecting suitable raw materials based on environmental standards, and paying attention to recycling were seen in the mid-1990s [42] [45]. According to Baojuan [3], sustainable packaging can be achieved by reducing package materials through sustainable design.

Sustainable Production:

The second crucial activity in the development of SSCM is production. Environmental production can be achieved by the use of clean manufacturing methods, innovative technology, and the reduction of raw materials and resources to achieve low input, high output, and low pollution [3]. Lean manufacturing, often known as the Just-in-time technique, was the first production strategy to accomplish environmental goals ([25]; [30]; [35]; [34] [44]; [14]. According to Srivastava [39], "lean manufacturing is a critical

consideration in reducing the environmental impact of the manufacturing phase." According to Liang and Chang [17], lean production can assist industries improve their environmental performance by reducing waste and minimizing hazardous wastes.

According to King and Lenox [31], "lean production leads to improvements in environmental implementation and helps organizations reduce the marginal cost of pollution." According to Rothenberg, PiI, and Maxwell [38], lean plants strive to decrease waste products and buffers in environmental technology and management. Another production activity that contributes to the development of SSCM is recycling. According to Baojuan [3], recycling assists enterprises in improving their environmental image in the eyes of their clients. Sustainable products lead to sustainable recycling for the items and some pieces. Another activity of implementing sustainable production is reverse logistics [2, which accepts products for remanufacturing and recycling reasons [24] [22]. Economic variables such as lower production costs have aided firms in adopting reverse logistics [5].

Sustainable Marketing:

Marketing is a critical component of developing and implementing SSCM. To accomplish sustainable marketing, firms "should maintain biological balance and pay greater attention to environmental protection" [3]. Rao [37] feels that waste control in sustainable marketing can lead to cost savings and improved competitiveness. It also assists firms in improving their relationships with consumers, suppliers, and other partners.

Sustainable Transportation:

Another critical component in the development of efficient SSCM is sustainable mobility. In constructing environmentally friendly transportation systems, many elements such as fuel sources, mode of transportation, infrastructure, and operational and managerial techniques should be considered. These parameters, according to Kam, Christopherson, Walker, and Smyrnios [29], and the dynamics that connect them, "determine the environmental impact generated in the transportation logistics phase of the supply chain."

Sustainable Purchasing:

SSCM development necessitates the implementation of long-term purchasing strategies. Liang and Chang [17] confirm that adopting environmentally friendly raw materials reduces waste and hazardous materials. Furthermore, sustainable purchasing is important in SSCM since it helps firms reduce the source of pollution and trash by employing tactics such as recycling, scrapping, dumping, or sorting, as well as using biodegradable packaging [6].

Environmental Management System (EMS)

Technology has reduced the complexity of environmental management challenges and aided in

environmental decision-making. EMS, an information system that may be utilized to improve environmental and commercial performance, is one new technology that assisted in making environmental decisions in SSCM [7]. Each activity in SSCM is affected by EMS, and companies can employ EMS to reduce environmental impacts with less work and in less time [8]. Florida and Davison [7] highlight the benefits of EMSs in terms of managing environmental risk, assisting firms in reaching their environmental goals, environmental commitment, enhancing business performance, and enhanced community relations.

Because of the ease with which information can be shared with many parties such as employees, suppliers, distributors, customers, and government agencies, EMS will lead to the effective implementation of SSCM. It also assists in the creation of reports that aid in the assessment and monitoring procedures. Various technology developments, such as database systems, aided EMS in becoming more effective in handling SSCM activities. Radio Frequency Identification (RFID) is the most modern technology to be employed in SSCM. RFID aided in "improving the environmental health of the world and the financial health of the retail giant and its suppliers... reducing unnecessary truck deliveries... and reducing customers' trips to stores for items that were out of stock during their initial visit" [9].

The Importance of SSCM

Integrating environmental practices into SCM activities will assist firms in reaching a variety of benefits. Many researchers are investigating the SSCM's benefits. Hock and Erasmus [28], Liang and Chang [17], Carter and Easton [19], and Carter and Rogers [23] feel that using SSCM will assist reduce environmental risks, pollutants, and improve environmental performance. Furthermore, Hock and Erasmus [28], Liang and Chang [17], Carter and Easton [19], and Carter and Rogers [23] state that by implementing SSCM, firms will acquire marketing advantages, better corporate image, and organizational reputation.

Another significant advantage of deploying SSCM is cost savings [36][14][19]. Furthermore, Farahani, Asgari, and Davarzani [14] feel that it is critical to include suppliers in a participatory decision-making process, as well as to defend brand reputation and address corporate social responsibility. Carter and Easton [19] summarize the benefits of using SSCM as reducing packaging through more effective design for reuse and recycling, lowering health and safety costs, lowering turnover and workforce costs due to safer warehousing and transport, improving product quality, and lowering disposal costs. Certain environmental and social initiatives assist organizations in maintaining the closest relationship with consumers [10] by sponsoring environmental activities and offering funds for local environmental projects and activities [7].

Barriers for implementing SSCM

There are a number of challenges to implementing the SSCM strategy. Many research have looked into these obstacles. According to Min and Galle [6, 13], Hines and Johns [13], and Farahani, Asgari, and Davarzani [14], the fundamental challenge in creating SSCM is the high cost of environmental programs. Uneconomical recycling and re-use, as well as a lack of management commitment and human resources, all have an impact on creating SSCM strategies [6] [13]; [14]; [7]. In addition, lack of understanding (customers and suppliers), inadequate company-wide environmental standards or auditing systems, and a lack of state and federal requirements are all significant impediments to implementing SSCM [6]. Hines and Johns [13] and Farahani, Asgari, and Davarzani [14] argue that intense competition and shifting market demand have a negative impact on SSCM development.

II. RESULTS AND DISCUSSION

Two conclusions can be drawn from a random sample of literature review research. The first covers the development of SSCM strategies during the last two decades. The second is a framework that guides managers through the process of building SSCM strategies in their firms.

In the literature review, the sequence of creating SSCM techniques was examined.

Reviewing prior studies aided in understanding the stages of SSCM development over the last twenty years. The foundation of SSCM is lean manufacturing, which has helped to reduce costs while improving production quality. The second level of the SSCM activates individual environmental responsibility with government legislation [11] [12]. The third stage of establishing SSCM is to use sustainable design and packaging materials. Then, in 1999, recycling, remanufacturing, and reverse logistics were created. Following that, more coordinated laws and global initiatives assisted in raising customer awareness. Customers' knowledge put pressure on firms to adopt sustainable methods, and thus advanced the SSCM to the next stage.

This pressure forced organizations to adopt SSCM strategies in order to meet consumer demand for sustainability [46][33][40][14]. Organizations expended more effort to meet the criteria of their buyers. Then, to achieve more effective SSCM, organizations created assessment and monitoring procedures. Furthermore, awareness seminars and education programs were provided to employees, suppliers, vendors, and customers in order to raise awareness [13]. Improving quality is still a priority in the development of SSCM [14]. Rapid technological advancements have played an important role in increasing the quality of SSCM implementation. RFID is currently the most recent strategy used to establish effective SSCM throughout all of its activities.

IV. CONCLUSION

This study gives a brief review of the literature on SSM. The researcher presents a complete definition for the SSCM after studying a random sample of the existing literature review. This study also explored the

benefits and drawbacks of SSCM in order to clear some of the ambiguity in this sector. Furthermore, an overview of each SSCM activity has been provided. The significance of technological systems in this field has been demonstrated. In addition, the chronology of SSCM actions during the last two decades has been defined and summarized. Finally, a framework has been provided to assist managers in building SSCM.

Declaration of interest

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of this article.

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