Green Supply Chain Management: 
Do They Improves Operational Efficiency and Operational Performance

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Abstract—With the worsening of global warming, Green supply chain management (GSCM) is being a topic discussed whether in practice or in the academic field. GSCM has been viewed as a sustainable strategy, which include environmental factors into consideration to manage the supply chain. Nevertheless, the focus of the firm in the implementation of the GSCM is to increase operational efficiency and maximize the overall operational performance. The aim of this paper is to review the literature on Green Supply Chain Management and its relationship toward operational efficiency and operations performance. This article analyses the link between GSCM and operational efficiency and performances. The GSCM model is developed for further study.

Keywords—Green Supply Chain management (GSCM), performance, efficiency

I. INTRODUCTION

Supply chain management has been viewed as a management of activities to convert raw materials into final products, which then distributed to the end-consumer. Over the past 20 years, manufacturers have been pressured with obligation to address environmental challenges in their supply chains. Nowadays, it is necessary for a manufacturer to include the ‘green’ blueprint in their supply chain strategies. This trend creates a new paradigm that links conventional supply chain to the environment. The term “Green Supply Chain Management” (GSCM) emerged to include green aspects in the conventional supply chain processes. Green supply chain management is a management system that deals with various issues concerning the environment, from the environmental management systems to the guidelines for environmental auditing.

The implementation of GSCM practices is believed to give a good impact on environmental performance. However, there are debates among researchers, whether the implementation of GSCM could really give benefits and improved overall performances of organizations[1-3]. Ultimately, organizations are looking for a competitive advantage solution as strategies. It is a key survival of any organizations, as the strategies will determine whether the organization has the advantage to compete. Nevertheless, making a venture in GSCM and improvement in operational performance still is one frontier issue. Therefore, the question arises: does implementation of green supply chain management will bring competitive advantage for business operations? This study aims to develop a conceptual model for GSCM, operational efficiency and operations performances. The model will provide the related elements between the implementation of GSCM practices and the operational efficiency towards operational performance.

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II. SUPPLY CHAIN MANAGEMENT

A. The Evolution of the Supply Chain Management (SCM)

Supply chain refers to a chain of network that supplies materials to a manufacturer, the manufacturing process and the distribution of finished goods to a final customer. SCM also includes the planning and management of all activities involved in sourcing and procurement, conversion and all logistics management activities. To develop further understanding of SCM, Table I shows the definition of SCM.

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<tr>
<th>Authors</th>
<th>Definition</th>
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<tr>
<td>New and Payne [4]</td>
<td>Supply chain management aims at building trust, exchanging information on market needs, developing new products, and reducing the supplier base to a particular OEM (original equipment manufacturer) so as to release management resources for developing meaningful, long term relationship.</td>
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<td>Harland [5]</td>
<td>Supply chain management as The set of entities, including suppliers, logistics services providers, manufacturers, distributors and resellers, through which materials, products and information flow.</td>
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<td>Lee and Ng [6]</td>
<td>Supply chain management encompasses materials/supply management from the supply of basic raw materials to final product (and possible recycling and re-use). Supply chain management focuses on how firms utilise their suppliers' processes, technology and capability to enhance competitive advantage. It is a management philosophy that extends traditional intra-enterprise activities by bringing trading partners together with the common goal of optimisation and efficiency.</td>
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<tr>
<td>Tan et al [7]</td>
<td>SCM as the network of organizations that are involved, through upstream and downstream linkages, in the different processes and activities that produce value in the form of products and services in the hands of the ultimate customer.</td>
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<td>Mentzer [8]</td>
<td>The systemic, strategic coordination of the traditional business functions and the tactics across these business functions within a particular company and across businesses within the supply chain, for the purposes of improving the long-term performance of the individual companies and the supply chain as a whole.</td>
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According to this broad definition, supply chain management encompasses the entire value chain and addresses materials and supply management from the extraction of raw materials to its end of useful life. Figure 1, shows the illustration of the supply chain process from raw material until it arrived to end customers as a final product.
B. Definition of Green Supply Chain Management (GSCM)

Green Supply Chain management (GSCM) encompasses all activities range from green purchasing to integrated supply chains that begin from supplier, to manufacturer, to customer and reverse logistics, which is “closing the loop” of the chain. A comprehensive list, as shown in Table II includes some of the terms characterizing concept of GSCM.

<table>
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<tr>
<td>Linton [9]</td>
<td>GSCM as sustainable supply chains</td>
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<td>Beškovnik [10]</td>
<td>Green logistics is an extension of reverse logistics.</td>
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<td>Louca [11]</td>
<td>Considered green supply chain management to include reverse logistics</td>
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<tr>
<td>Wu and Pagell [12]</td>
<td>GSCM as “Balancing priorities: Decision-making in sustainable supply chain management”</td>
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<tr>
<td>Min and Kim [13]</td>
<td>GSCM incorporates environment-friendly initiatives into SC activities encompassing sourcing, product design and development, manufacturing, transportation, packaging, storage, retrieval, disposal and post sales services including end-of-product life management.</td>
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The above table shows that the notion of green supply chain management has emerged as an important new approach for organizations to achieve sustainability and reduces the impact and risk of manufacturing activities on the environment. The rise of GSCM practices is mostly pushed by the escalating concern of environmental sustainability by various stakeholders. Rasi et al. [14], suggested that different stakeholder have different effect on the implementation of the GSCM by the organizations. The broad perspectives of GSCM incorporate and close the activities loop in supply chain. This study has identified fives elements of GSCM, which include green procurement, green design, green manufacturing, waste management and reverse logistic.

The GSCM firstly begin with the procurement processes. Green purchasing is becoming prevalent nowadays which include realization of the 3R concepts, reduce, reuse and recycle in purchasing activities. Close relationship with suppliers are essential in green purchasing. This special relationship integrates suppliers with advance manufacturing activities such as design and production activities. Second, green design has been used extensively in the literature to denote designing products with certain environmental considerations [15]. Reference [16] stressed the importance of eco-design. Their study found that 80 percent of product related impacts on the environment could be lessened during designing phase.

Next, green manufacturing also considered under the element of GSCM. It has become the newest pledge in the mission statement of some manufacturing organizations. Green manufacturing is characterized as efficient production processes that use reasonably low environmental impacts materials, and produce minimum waste. To minimize waste generation, all equipment in the manufacturing processes is ensured to be energy efficient, reliable and fast. Green manufacturing can bring such benefit that lead to reduced material costs, minimized environmental related expenses, improved production efficiency and enhanced organization image [15].

Forth, waste management is an approach that seek to minimize waste materials that goes to the landfills or incineration [17]. Waste management include the handling of used materials via hierarchy of approaches or the 5Rs such as Reduction, Reuse, Recycling, Recovery, and Residual Waste Management. Lastly, reverse logistics is viewed as a function in supply chain to enable source reduction, materials substitution, product returns, product recycling, refurbishing, repair and remanufacturing, and waste disposal. Reverse logistics is extremely connected to green design; if a product is eco-designed it means that it will be easier to recycle and reuse.
### Construct Definitions

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<tr>
<td>Green Procurement</td>
<td>an environmental purchasing consisting of involvement in activities that include the reduction, reuse and recycling of materials in the process of purchasing</td>
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<tr>
<td>Green Design</td>
<td>designing products with certain environmental considerations</td>
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<tr>
<td>Green Manufacturing</td>
<td>characterized as efficient production processes that use reasonably low environmental impacts materials, and produce minimum waste</td>
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<tr>
<td>Waste Management</td>
<td>an effect-directed approach towards nature because it tries to reduce the landfills and incineration of the waste materials</td>
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<tr>
<td>Reverse Logistic</td>
<td>a function in supply chain to enable source reduction, materials substitution, product returns, product recycling, refurbishing, repair and remanufacturing, and waste disposal</td>
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<tr>
<td>Operational Efficiency</td>
<td>the ratio between the input to run a business operation and the output gained from the business</td>
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<td>Operational Performance</td>
<td>cost, quality, delivery and flexibility</td>
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### III. Conceptual Framework and Hypotheses

The conceptual framework for the study was developed based on literature review and previous studies. Figure 2 depicts the conceptual framework of this study. Each of the hypotheses illustrated in the conceptual framework in Figure 2 is posited as being positive and direct.

![Green Supply Chain Management Framework](image)

The hypotheses developed for this study are as follows:

- **H1**: Green Supply Chain Management directly and positively affects operational efficiency of the company.
- **H2**: Operational efficiency is positively related to operational performance of the company.
- **H3**: Green Supply Chain Management directly and positively affects operational performance of the company.

### IV. Conclusion

This paper aims to conceptualize a comprehensive Green Supply Chain Management practices model. The model encompasses five key green initiatives from the GSCM literature, which include green procurement, green design, green...
manufacturing, waste management and reverse logistics. These initiatives close the conventional supply chain loop, which begin from the procurement of the raw material up until management of the waste and reverse logistics. As the model shows, green initiatives must be implemented at the earliest stage of productions to ensure the operational efficiency and ultimately improve the operational performances of an organization.

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BIOGRAFY

Include author bio(s) of 200 words or less.

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