

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

Raja Zuraidah Rasi

Department of Production and Operations Management
Universiti Tun Hussein Onn Malaysia

Johor, Malaysia
rzuraida@uthm.edu.my

Md Fauzi Ahmad

Department of Production and Operations Management
Universiti Tun Hussein Onn Malaysia
Johor, Malaysia

Siti Sarah Omar

Department of Production and Operations Management
Universiti Tun Hussein Onn Malaysia
Johor, Malaysia

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.

TABLE I. DEFINITION OF SUPPLY CHAIN MANAGEMENT

Authors	Definition
New and Payne [4]	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.
Harland [5]	Supply chain management as The set of entities, including suppliers, logistics services providers, manufacturers, distributors and resellers, through which materials, products and information flow.
Lee and Ng [6]	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.
Tan et al [7]	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.
Mentzer [8]	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.

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.

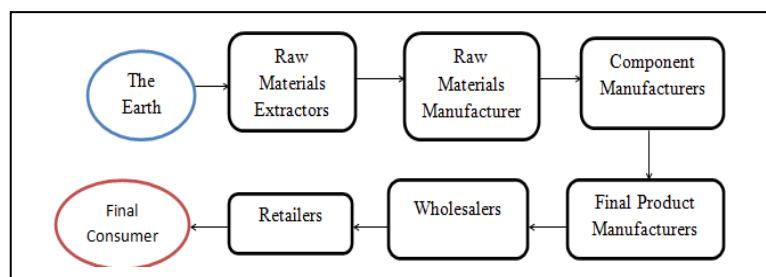


Fig. 1. The Supply Chain Process

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 II. DEFINITION OF SUPPLY CHAIN MANAGEMENT

Authors	Definition
Linton [9]	GSCM as sustainable supply chains
Beškovnik [10]	Green logistics is an extension of reverse logistics.
Louca [11]	Considered green supply chain management to include reverse logistics
Wu and Pagell [12]	GSCM as “Balancing priorities: Decision-making in sustainable supply chain management”
Min and Kim [13]	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.

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 five 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.

TABLE III. CONSTRUCT DEFINITIONS

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

III. CONCEPTUAL FRAMEWORK AND HYPOTHESES

The conceptual framework for the study was developed based one 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.

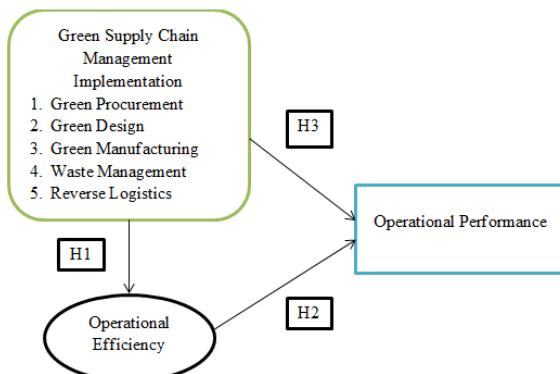


Fig. 2. The Green Supply Chain Management

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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BIOGRAPHY

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

Raja Zuraidah Rasi is a Senior Lecturer of Operations Management at Universiti Tun Hussein Onn Malaysia (UTHM). She also hold a position as a head of department at Strategic and Quality Management Office, UTHM. Dr Raja Zuraidah holds a PhD in Industrial

Management from Swinburne University of Technology, Melbourne, Australia. Her research interests include green supply chain, sustainability and operations performance. Her more recent work has been on sustainability in supply chain, and improving operations process through concepts such as root cause analysis, critical chains and lean systems. Raja Zuraidah is the corresponding author and can be contacted at rzuraida@uthm.edu.my

Md Fauzi Ahmad is an academic staff at UTHM. His undergraduate studies was in Electrical & Electronic Engineering from Muroran Institute of Techonology (MIT), Japan and Post Graduate studies in Total Quality Management (TQM) from Universiti Teknologi Malaysia (UTM). His majoring research is in TQM of Japanese companies and actively publishing international and local journals. He embarked his career as Quality Engineer at Sharp Corporation in 1999 and has been assigned at various departments which include Product Quality Assurance (PQA), Quality Control (QC), Product Planning and Sales Department. He has working experience for 12 good years in quality and marketing management. He is a Certified Quality Engineer (CQE) from Federation Manufacturing Malaysia (FMM) and Sharp Corporation Japan. He also participated in On Job Training (OJT) for quality, reliability management and data analysis at Sharp Corporation, Japan under Association of Overseas Technical Scholarship (AOTS). He also contributed in establishing company strategy for improving customer satisfaction and other major improvement projects. He has working with Japanese companies for more than 12 years.

Siti Sarah Omar is a lecturer at the Faculty of Technology Management and Business, Universiti Tun Hussein Onn Malaysia (UTHM) Johor Malaysia since 2008. She obtained her Phd Degree in Management from University of Southampton United Kingdom in 2015. She was graduated from International Islamic University Malaysia for the Bachelor Degree of Business Administration with Honors in 2002 and Master of Science (Human Resource Development) at Universiti Teknologi Malaysia (UTM) Johor in 2006. Prior to joining UTHM she had two years teaching experience at the private higher institution, Universiti Tunku Abdul Rahman (UTAR) at Kajang Selangor. Her expertise is in the field of Human Resource Management, Human Resource Development, Entrepreneurship and Entrepreneurial Networking. In total she has published about twenty Scopus indexed journals and conference proceedings since 2010.