Original Article

A Study on Impact of Green Supply Chain Management Practices on the Environmental Performance of Apparel Industry in Sri Lanka

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ABSTRACT

Setting new strategies has become necessary due to increased attention to environmental concerns and a rising tendency among nations and organizations toward environmental sustainability. This study explores the impact of Green Supply Chain Management Practices on environmental performance in the Sri Lankan apparel industry. As a result, the study's objectives are to identify the impact of green supply chain management practices on environmental performance and provide recommendations for improving the environmental performance of the apparel industry. This study mainly focused on investigating the level of green supply chain management practices (GSCMP) including Internal Environment Management (IE), Eco Design (ED), Green Manufacturing (GM), Green Purchasing (GP), and Cooperation with Customers (CC). By adopting the convenience sampling technique and quantitative survey method and using a self-administered questionnaire, the study collects data from 60 employees, including managers and executives, from three leading apparel manufacturing companies located in the Western and North Western provinces of Sri Lanka. These findings imply that GSCMP are more likely to impact environmental performance, as evidenced by correlations and regression analyses. The study will analyze the data to identify the extent to which green supply chain management practices are implemented in the industry and provide insights into the potential benefits of green supply chain management practices for the apparel industry in Sri Lanka. Furthermore, the study's limitations are discussed, and potential areas for further research based on the study's findings are highlighted.

An exploratory study can also examine the influence of GSCMP practices on organizational performance based on the other service sectors of Sri Lanka.

Index Terms- Supply Chain Management, Green Supply Chain Management Practices, Environmental Performance, Sustainability, Apparel Industry

INTRODUCTION

Today's economic environment is more competitive and global than in the past. We can see the shorter product life cycles, rapid new product releases, and sophisticated clients who are becoming more intelligent and well-informed are characteristics of modern business. In this context, there has been an increase in the importance of corporate activity that is environmentally friendly, and many forward-thinking businesses are adopting green supply chain management. With the increase in globalization in every corner of the world, most businesses now realize the value of implementing Green Supply Chain Management (GSCM) techniques, particularly in connection to supply chain management, which also has positive environmental outcomes.

"Green supply chain management means adding "green" component to the company supply chain" (Meera & Dr. P. Chitramani, 2014). Over time, the concept of Green Supply Chain Management (GSCM) gained popularity among researchers and practitioners in the logistics chain for various reasons. According to the (Srivastava, 2001) defined GSCM, "stating that it involves incorporating environmental considerations into supply chain management (SCM), encompassing areas such as product and service design, procurement, manufacturing processes,

distribution, and end-of-life management, all aimed at achieving sustainable competitive advantage." In today's complex and dynamic business environment, organizations must prioritize the adoption of Green Supply Chain Management Practices to remain competitive and survive.

Within the Sri Lankan business context, there is limited evidence regarding the adoption of green supply chain management practices and the impact of these practices on organizational performance. The challenge lies in striking a balance between achieving both environmental and economic sustainability, which has hindered the widespread adoption of green practices in design and manufacturing while maintaining a cost-effective supply chain.

This study aims to explore how the implementation of green supply chain practices can establish a sustainable environment within the apparel industry. Specifically, the research will focus on assessing the industry's environmental performance about sustainability. To achieve this, the study sets research objectives to examine the current state of green supply chain processes and practices and investigate the influence of implementing Green Supply Chain Management Practices on the apparel industry's organizational performance, particularly in terms of environmental performance in Sri Lanka.

The green logistics concept refers to all initiatives that are made to measure and minimize the environmental effects of logistics operations. This idea first appeared in the mid-1980s and was used to describe logistical techniques and systems that make use of state-of-the-art machinery and technology to minimize environmental harm (Marcus, et al., 2011). A variety of green business strategies that operate at various points in the supply chain process are included in sustainable business operations in manufacturing companies.

The Sri Lankan clothing industry has fully embraced the concept of environmentally friendly production, which extends beyond being a passing trend. Sri Lanka is at the forefront of innovative technologies in the apparel sector, exemplified by the world's inaugural "Green Garment Factory." This groundbreaking facility achieved a remarkable 70% reduction in both energy and water consumption. By implementing efficient manufacturing practices, these businesses have achieved long-term viability, resulting in reduced expenses and accelerated returns on investment. To meet global standards for recycling, wastewater treatment, and waste management, companies in Sri Lanka strive for LEED Platinum and Gold certifications. Collaboratively, suppliers and manufacturers in Sri Lanka are actively working together to minimize the carbon footprint of the country's clothing industry, aiming to enhance sustainability and environmental consciousness. It is important to note that Sri Lanka adheres to the regulations established by the World Trade Organization (WTO) (Anon., 2022). According to the provisional data released by the (Sri Lanka Export Development Board (EDB), 2022) In September 2022, apparel and textile exports increased by 5% year over year to reach US$ 479.88 Mn.

Table 1
Summary of the Supporting Literature

GSCMP	Operational Definition	Source
Internal Environment Management	Practice of developing GSCM as a strategic organizational imperative through commitment and support of the imperative from senior and mid-level managers	(Zhu, et al., 2008), (Rao & Holt, 2005)
Eco Design	Use of ecologic raw materials and recycling product at end of life, life cycle analysis of product	(Diab, et al., 2015), (Kumar & Chandrakar, 2012)
Green manufacturing	Equipping an environmental management system, Use of production techniques respectful of the environment	(Ninlawan, et al., 2010), (Amemba, et al., 2013), (Al-Odeh & Smallwood, 2012)
Green Purchasing	Selection of eco-suppliers, Environmental collaboration with suppliers	(Xiao, 2006), (SM, et al., 2015), (Zhu, et al., 2008)
Cooperation with Customers	Environmentally sustainable products with green packaging is a requirement for customer cooperation	(Theyel, 2001)

PROBLEM STATEMENT

As aforementioned, the purpose of this study was to examine the impact of Green Supply Chain Management (GSCM) practices on environmental performance.

Environmental concerns and global warming are gaining media attention in the garment sector, prompting organizations to consider greening their manufacturing farms for sustainability. While there may not be immediate financial gains, reasons include customer demand for environmentally friendly products, government tax deductions, environmentally friendly infrastructure, competitive advantages, and ethical position. Green supply chain management methods include internal environmental management, eco-design, and green purchasing. This research focuses on the impact of green supply chain practices on the Sri Lankan apparel industry, analyzing the adoption level and providing recommendations for improving environmental performance.

RESEARCH OBJECTIVES

The primary objective of this research is,
- To identify the impact of green supply chain practices on environmental performance of apparel industry of Sri Lanka.

According to the main objective the outcomes of the research would supplement the secondary objectives as stated below,
- To identify the most significant green supply chain practice that impacts environmental performance in Sri Lankan apparel industry.
- To give recommendations for improving environment performance in Sri Lankan apparel industry.

RESEARCH METHODOLOGY

A. Research Design

The research design section outlines the data collection and analysis methods, as well as the measurements for the variables identified in the problem statement. It provides a comprehensive overview of the research methodology, which aims to investigate the impact of green supply chain management (GSCM) practices on the environmental performance of the apparel industry in Sri Lanka. Specific questions were formulated to measure each independent and dependent variable, drawing upon constructs, dimensions, and indicators derived from existing research literature.

A survey technique was employed, utilizing a hand-delivered questionnaire to reach every unit of analysis within the sample. This study adopted a quantitative approach, which enables the collection of categorical data required for statistical testing through the survey questionnaire. As the focus of this study is on examining the impact of green supply chain practices on environmental performance in the Sri Lankan apparel industry, data was gathered from various primary sources and will be analyzed accordingly. The research design of this study is descriptive and supported by relevant research articles as highlighted in the literature review.

B. Data Collection

The primary data collection method used for this study involved distributing a self-rated questionnaire through Google Forms. The questionnaire was distributed among 60 participants who are working in the sustainability department of the selected Apparel Manufacturing Companies located in Western and North Western provinces. Respondents were approached through email, phone calls, and in-person visits to the companies.

C. Data Analysis

In this study, five key demographic variables were analyzed which are gender distribution, age distribution, level of education, current job position and work experience in the apparel industry.

Cronbach's alpha is utilized to assess the scale reliability of the study based on environmental performance. A Cronbach's alpha value of 0.7 or above is generally considered acceptable for scale reliability. The Cronbach's alpha values for all five dimensions of GSCM practices are above 0.7, indicating good internal consistency. The Cronbach's alpha value for the overall conceptual framework of the 25 items is 0.967, indicating a high level of internal consistency.

Based on descriptive statistics, the mean values for all variables are relatively high, ranging from 5 to 3.67, indicating agreement among the responses. The

highest standard deviation is observed in Eco Design (0.56), indicating higher variance, while the minimum standard deviation is in Green Manufacturing (0.41), indicating lower variance. The coefficients of skewness fall between -1 and +1, suggesting a normal distribution of the data. The absolute values of kurtosis are less than three times the standard error of kurtosis, further indicating a normal distribution and enabling the application of parametric techniques in the analysis.

According to the correlation analysis, all the probabilities are highly significant between the Environmental Performance (Dependent variable) and independent variables. Coefficients of correlation between them are positive. Their values are more than 0.7. This means that Internal Environment Management, Eco Design, Green Manufacturing, Green Purchasing and Cooperation with Customers are having strong positive correlation with Environmental Performance.

In the model summary, the multiple correlation (R Square value) is 0.980, indicating that approximately 98% of the variability in Environment Performance is accounted for by this model. All GSCM Practices show significant probabilities with positive beta values, indicating their influence on Environmental Performance. The probabilities for Internal Environment Management, Eco Design, Green Purchasing, and Cooperation with Customers are highly significant, with probabilities less than 0.01. This implies that these practices have a significant positive impact on Environmental Performance. Additionally, Green Manufacturing is also significant and positively influences Environmental Performance.

RESULTS AND DISCUSSION

This research study examines the impact of selected green supply chain management (GSCM) practices on environmental performance in the apparel industry of Sri Lanka. The study collected data through a questionnaire administered to apparel manufacturing companies with approximately 60 employees working in the sustainability department. The reliability of the questionnaire was assessed using Cronbach's Alpha, which yielded a value of 0.967. Hypotheses were tested using correlation and regression analysis.

Table 2

Summary of findings of the study

No	Hypothesis	Regression B	Sig	Acceptance Rejection
H_1	There is a relationship between Internal Environment Management and Environment Performance	0.204	0.002	Accepted
H_2	There is a relationship between Eco Design and Environment Performance	0.124	0.000	Accepted
H_3	There is a relationship between Green Manufacturing Environment Performance.	0.240	0.022	Accepted
H_4	There is a relationship between Green Purchasing the Environment Performance.	0.298	0.000	Accepted
H_5	There is a relationship between Cooperation with Customers and Environment Performance.	0.266	0.000	Accepted

The regression analysis results indicate that GSCM practices significantly contribute to environmental performance (F = 516.081, p = 0.000). The R-square value is 0.980, indicating that the GSCM practices account for 98% of the variability in Environmental Performance explained by the model. Based on the regression analysis, it can be concluded that Green Purchasing has the highest impact on environmental performance (p = 0.000), making it the most significant practice among the GSCM practices.

CONCLUSION

The apparel industry has a significant impact on global environmental issues, such as pollution and waste generation. In Sri Lanka, the apparel industry is crucial to the economy but also poses environmental challenges. Implementing green supply chain practices can help improve the environmental performance of the apparel industry in Sri Lanka by promoting sustainability and reducing the overall environmental footprint.

Green supply chain practices involve adopting sustainable practices throughout the supply chain, from sourcing raw materials to production, transportation, and distribution. This requires collaboration and engagement from all stakeholders involved, including suppliers, manufacturers, retailers, and customers.

However, implementing green supply chain practices in the apparel industry in Sri Lanka comes with challenges and requires significant investment, collaboration, and commitment from stakeholders. It may also necessitate changes to existing practices and processes. Nevertheless, the benefits of adopting green supply chain practices outweigh the costs and can lead to a more sustainable and environmentally conscious apparel industry in Sri Lanka.

The adoption of green supply chain practices in the apparel industry in Sri Lanka offers several benefits. It can help reduce the industry's carbon footprint, conserve natural resources, minimize waste and pollution, and enhance overall sustainability. Additionally, it can improve the industry's reputation by demonstrating a commitment to sustainability and environmental stewardship. To successfully implement green supply chain management practices, effective coordination between various administrative levels within organizations is crucial.

Recommendations are made to support the implementation of green supply chain practices. These include finding environmentally friendly raw materials, adopting environmentally safe design and packaging practices, developing an annual training plan for employees related to green supply chain practices, and allocating a sufficient budget for scientific research in the field. These recommendations aim to foster a more sustainable and environmentally conscious apparel industry in Sri Lanka by prioritizing sustainability and environmental stewardship.

DECLARATIONS

A. Study Limitations

Limitations of the study include its focus on the apparel manufacturing sector in Sri Lanka, which may limit the generalizability of the findings to other sectors. The study also examines only five green supply chain management practices and their impact on environmental performance, leaving room for further exploration of additional variables that influence environmental performance. Additionally, the research sample size was limited to a specific region and a small number of responses, which may affect the generalizability of the findings. Accessing the entire apparel supply chain was also challenging, resulting in a focus on employees in managerial and executive-level positions within sustainability departments. The study relied on primary data collected through questionnaires, further constrained by time limitations and a relatively smaller sample size.

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