

## **Impact of Green Supply Chain Management Practices on Organizational Performance of the Manufacturing Sector in Sri Lanka**

**L. N. Priyashani**

University of Peradeniya, Sri Lanka

**G.C.I. Gunarathne**

University of Peradeniya, Sri Lanka

### **Abstract**

*The present study explores the impact of implementing Green Supply Chain Management Practices on Organizational performance, in terms of environmental, operational and financial performance among manufacturing firms in Sri Lanka. 150 no of firms (n = 150) which have already implemented GSCM practices in the Sri Lankan manufacturing industry were selected covering a variety of sectors including automobile (29), garments (36), food and beverage (13), electronics (20), chemicals (20) and other (32) as the sample size of this study. Structural Equation Modeling (SEM) was used to analyze the relationship between variables. The empirical evidence verifies that, a significant positive relationship between GSCM practices and organizational performance exists. It can be concluded that higher the adaptation of GSCM practices, higher will be the organizational performance in Sri Lankan Context. Further, it is also concluded that higher the adaptation of GSCM practices, higher will be the environmental, operational and financial performance. This suggests, that the impact of GSCM practices lead to reduce air emission, wastage of water and solid wastages and decrease the consumption of hazardous materials, frequency of environmental accidents under the environmental performance. When considering operational performance, the impact of GSCM practices lead to increase amount of goods delivered on time, decrease inventory levels and scrap rate, promote products quality, reducing and eliminating waste, increased product line and finally improved capacity utilization. Decrease of cost for energy*

---

### **Corresponding Author:**

Nilanjali Priyashani, Department of Operations Management, University of Peradeniya, Sri Lanka. E-mail: nilanjaliPriyashani@gmail.com

*consumption, cost for environmental accidents, and decrease in level of production costs, decrease in packing costs can be considered under the financial performance. This study will play an important role for managers and firms, also this study is contributing in increasing the sales through understanding the benefits of practices of the green supply chain management and got the highest benefits from it.*

**Keywords:**

*Green Supply Chain Management, Green Supply Chain Management Practices, Organizational Performance, Structural Equation Modeling (SME)*

**Introduction**

Today's business environment is more global and competitive than it has been in the past. The modern business is characterized with shorter product life cycles, rapid new product introductions, sophisticated customers who are increasingly knowledgeable and well informed. In this situation, there has been increasing emphasis on environment-friendly corporate activity in today's business world and many progressive companies are embracing green supply chain management. Increase in globalization in every corner of the world has led most of the firms to recognize the importance of pursuing Green Supply Chain Management (GSCM) practices especially in relation to supply chain management which not only result in environmental benefits but also business benefits (Laosirihongthong, Adebajo & Tan 2013).

Throughout the 1990s, researchers and policymakers increasingly are concerned with the environment and climate change and have become enthusiastic about greening supply chain (Walker Sisto & McBain 2008). Also, companies have realized that environmental management is a key strategic issue with the potential for a lasting impact on organizational performance. For example, more than 40,000 companies have implemented ISO14001, the environmental management system standard (Zhu & Sarkis 2006).

It is important for organizations to well manage its supply chain activities to contest successfully and to testify long term survival. Also due to the today's complex and dynamic business environment, organizations need to focus more on Green Supply Chain Management Practices on a regular basis as customers are shifting towards environmental concerns than ever before.

As far as the Sri Lankan business context is concerned there is less evidence in terms of adaptation of green supply chain management practices and the influence of GSCM practices on organizational performance, though Sri Lanka has been noted as one of the important countries to investigate the above noted areas by some scholars (e.g. Zhu & Sarkis 2004; Mitra & Datta 2014). That means there is a significant requirement to carry out a research on impact of Green Supply Chain Management Practices on Organizational Performance in Sri Lankan context.

Zhu, Sarkis & Lai (2012) argue that increasing in both institutional and technical pressures have made firms to focus on GSCM practices. If organizations fail to implement this type of GSCM practices, it may result in negative consequences for the entire business because of heavy competition and availability of substitutes. Moreover, scholars argue that “balancing economic and environmental performance had become increasingly important for organizations facing competitive, regulatory and community pressures” (Shultz & Holbrook 1999).

On this Context, research objective is drawn to study the impact of GSCM practices on organizational performance, in terms of environment, financial and operational dimensions. But less previous studies were found in relation to the Sri Lankan context. In specific, the Sri Lankan manufacturing industry has been selected since it contributes towards a relatively higher level of resource consumption and waste release. When considering supply chain management, manufacturer can be identified as the best person to study, since it utilizes resources to a greater extent. Also, it is pointed out that since a major portion of world manufacturing will be taken place in Southeast Asia in the coming decade. All we know that Sri Lanka being one of the Asian suppliers for some international markets has not been given much attention in the literature to investigate the GSCM Practices and its impact on organizational performance. Therefore, this study has been considered, especially on that.

Though increasingly focused and gained attention in the global area, as well as in the Asian context, the green concept is considerably a new phenomenon as far as the Sri Lankan context is considered, though the significance of studying GSCM practices in the Sri Lankan context has been highlighted in the literature (Zhu & Sarkis 2004)

The rest of the paper is structured as follows: In the following section, the literature review is presented. Then the research method and the results of the

statistical analysis are given. Finally, the paper concludes with the discussion, implications of the findings and directions for future research.

## **Literature Review**

### ***Supply Chain Management (SCM)***

Supply chain management (SCM) is a wide and new field and various authors have come up with different definitions. Supply chain management is known to be one of the most vital concepts in Operations Management. It primarily deals with linking the supplier and customer to the manufacturer/producer. Thus it paves a valuable way for firms to achieve competitive advantage, thereby enhancing organizational performance. Supply Chain Management takes an important role in managing the business in organizations as it actually focuses on the full operation of the organization. Also In 2012, Toyin, identified The key elements of the supply chain are identified as the upstream parties (suppliers, suppliers' suppliers), downstream parties (agents, retailers, distributors and end customers) and the integration of all the organizations involved, together with the internal function of an organization.

According to Li et al. (2004) pp. 107-124, “many organizations have begun to recognize that SCM is the key to building sustainable competitive edge for their products and/or services in an increasingly crowded marketplace”. In fact supply chain management is becoming of increasing strategic importance, and thus globalization, outsourcing and fragmentation are identified as three major drivers (Storey et al. 2006).

In addition, Lambert and Cooper (2000), identified supply chain management to be based on the concept of firms as part of multiple organizations oriented to the provision of goods and services for the final customer. Gibson et al. (2005), identified that SCM involves the planning and management of all activities that are involved in getting the product, processing it, creating demand, and being able to fulfill that demand and all logistic management activities. Also Christopher (2005), defines SCM as the management of upstream and downstream relationships with suppliers and customers to deliver superior customer value at less cost to the supply chain as a whole.

As per Miguel & Brito (2011), in the context of supply chain management, firms tend to set alliances with members of the same chain to improve its competitive advantage. Researchers further point out that the concept of SCM evolved from a process integration perspective to a more recent systematic and strategic view.

SCM is the management of a network of interconnected business involved in the ultimate provision of product and service packages required by end customers. SCM spans all movement and storage of raw materials, work in progress and finished goods from point of origin to point of consumption (Hines 2004).

### ***Green Supply Chain Management (GSCM)***

The concept of Green Supply Chain Management (GSCM) has been observed as a recent and novel managerial principle. GSCM is an environmental concept that is gaining popularity in the world. For many businesses in the world, adopting GSCM is a way to demonstrate their sincere commitment to Sustainability.

Environmental consideration in the context of SCM has taken a leading attention from multinational enterprises as public pressure grew, for better products. Pressures from consumers, regulators, and other communities led companies to re-think their strategy on environmental SCM which brought about the establishment of the new concept, green supply chain management (GSCM).

According to the Oliver & Webber (1982), GSCM identified as “Integrating environment thinking into supply chain management, including product design, material sourcing and selection, manufacturing processes, delivery of the final product to the consumers, and end of-life management of the product after its useful life”.

Further Zhu & Sarkis (2004), identified GSCM as an integrated supply chain system consisting of suppliers, manufacturers, customers and reverse logistics management. Also, Rao & Holt (2005), identify that GSCM as a form of environmental improvement operational initiative that many businesses are adopting to address environmental issues.

Further Hervani et al (2005) defined GSCM as follow:

**GSCM** = Green Purchasing + Green Manufacturing + Materials Management + Green Distribution+ Marketing + Reverse Logistics (Hervani et al. 2005).

In contrast Amit & Pratik (2012), have viewed GSCM to be functions of external (open system view of organization) and internal environment (management component). The external parties would be the requirements of governmental regulations, the domestic and foreign clients, competitors and neighboring communities which make firms to become aware of the importance of implementing GSCM practices for survival. On the other hand, top management

support, human resource capabilities, employees' involvement and shared expertise are some of the internal factors which are likely to impact GSCM practices.

### ***Green Supply Chain Management Practices (GSCMP) in Manufacturing Firms***

In the literature, the concept green supply chain practices (GSCMP) is commonly used for a variety of activities performed by an organization in order to minimize their impacts on a natural environment. Supply chains strive to maintain internal health and environmental sustainability using the capability to self-correct based on information from the external environment (Vachon & Klassen 2007).

There is no doubt, that every organization must make effective and efficient use of resources. Hence manufacturing firms in particular play a vital role since those firms are of more potential to cause negative impact on the environment, when compared with service oriented firms. Literature on GSCM, further suggests that manufactures need to work with their suppliers of raw materials and component in order to produce environment friendly products (Dheeraj & Vishal 2012).

Firms could use the power they possess to set environmental standards and criteria for their suppliers so that best raw material with minimal environmental harm will be provided for production.

As far as the global context is considered, many of the manufacturing firms have already adapted GSCM practices to ensure sustainability in the long run. How international firms adhere to these practices is via proper integration and coordination of all business processes, including purchasing, manufacturing, marketing, logistics, customer focus etc. (Muma et al. 2014).

The following research findings assist in understanding to what extent GSCM practices are being carried out in firms across the globe giving more emphasize to environmental protection and sustainability in the long run.

Depth study of Jordanian Food industry has pointed out that, activities such as cleaner production, environmental management systems and eco efficiency have been adapted to be eco-friendly. Further the government had also been considering on imposing green investment and other green related laws for the betterment of the economy (Diab, Bourini & Rumman 2015).

In addition to that research findings Muma et al. (2014), four different GSCM practices related to the Kenyan Tea processing industry: green purchasing, green manufacturing, green material management, green distribution as well as reverse logistics have been identified. According to Diab, Bourini & Rauman (2015), firms operating in the food and beverage sector are more likely to focus on GSCM concepts like internal environmental management, green purchasing and warehousing and green building. In contrast, this study further presents that practices of eco designing and packaging have no impact on the environment.

Furthermore, other industries like logistics are more likely to adapt GSCM practices if they perceive that adaptation of such practices result in improving performance and better reputation (Lin & Ho 2011).

The above findings from various research studies reveal that GSCM practices vary among different industries. However, less supportive literature was available in the Sri Lankan context within the scope reviewed.

Many Researchers had identified Multiple Dimensions of GSCM Practices. Upon undertaking a strong review of literature it was clear that there are certain dimensions which are being repeatedly used by scholars in measuring the influence of GSCM practices. For the purpose of this study, here consideration is made on the most commonly used dimensions by scholars in measuring the level of GSCM practices adaptation Including green purchasing, eco design, internal environmental management, reverse logistics and investment recovery.

### ***Green Purchasing:***

Green purchasing is a common GSCM practice initiated by firms. As per the literature of Xiao (2006), the increasing environmental consciousness and commitment of businesses, governments and individuals have inspired the development of procurement and purchasing policies incorporated with environmental requirements. In addition to that, Diab, Bourini & Rumman (2015), define green purchasing as environmental plans for a firm's long-term material, component or eco system requirements.

### ***Eco Design:***

Firms which practice eco design and packaging, intend to manufacture products and packaging in a way that minimal consumption of materials and energy is utilized. In addition, firms are encouraged to facilitate the reuse, recycle and recovery of component materials and parts (Diab, Bourini & Rumman 2015).

Moreover, research suggests that early eco design work primarily focused on technical improvements to products and processes to mitigate environmental costs (Kumar & Chandrakar 2012). However, firms nowadays realize the fact that designing stage of the manufacturer alone cannot result in an environmentally friendly product. Hence it is important that firms focus on relationships with both direct and indirect parties including suppliers, consumers, recyclers and government authorities.

### ***Internal Environmental Management:***

Internal environmental management is the practice of developing green supply chain management as a strategic organizational imperative through commitment and support of the imperative from senior and mid-level managers (Zhu et al. 2008a). Further Internal Environmental Management (IEM) or environmental management refers to how organizations address and mitigate the adverse impact of its operations on the environment (Rao & Holt, 2005).

### ***Reverse Logistics:***

Reverse logistics is one of the other main dimensions used by researchers. It is generally associated with recycling and waste management (Onyango et al. 2014). Further the researchers state that activities involved in reverse logistics include repair of failed items, recycle and reuse of materials and packing materials etc.

### ***Investment Recovery:***

In literature, Kumar & Chandrakar (2012) define investment recovery (IR) as 'the organizations strategic use of reverse logistics recycling, redeployment, reselling and similar Techniques. Through investment recovery organizations tend to derive better value from materials and products which they produce.

### ***Organizational Performance in Manufacturing Firms***

Performance of a firm is one of the key indicators of how well a firm operates in a given environment. Performance is a measure for assessing the degree of a corporation's objective attainment (Amit & Pratik 2012).

Organizational performance measures can be classified under several categories by reviewing past literature. The main sources were obtained via journal articles of Zhu, Sakis & Lai (2012); Zhu & Sarkis (2004); Zhu, Sarkis and Geng (2005); Laosirihongthong, Adebajo & Tan (2013). Based on those categories, Under Organizational performance, three dimensions were used to assess the level of



GSCM performance in Sri Lanka. A brief description of those dimensions can be presented as follows.

***Environmental Performance:***

Environmental Performance includes and concentrates on reduction of air emission, reduction of wastewater, reduction of solid wastes, in addition to decrease of consumption for hazardous/harmful/toxic materials, decrease of frequency for environmental accidents, and improve an enterprise's environmental situation (Alvarez Gil, Jimenez & Lorente, 2001)

Further Yang, (2013) defined environmental performance as the impact that the enterprise's activity has on the natural milieu.

***Operational Performance:***

In general, any manufacturing organization despite its scale of operation, needs to be successful in its operation (Diab, Bourini & Runnan 2015). According to Hasan (2013), some of the operational initiatives which firms would thrive to achieve via GSCM include cost savings, increased efficiency, product quality improvement, increase in market share, new market opportunities and increase in sales etc.

***Financial Performance:***

According to Melnyk (2003), financial performance includes and concentrates on Positive economic performance, decrease of cost for materials purchasing, decrease of cost for energy consumption, decrease of fee for waste treatment, decrease of fee for waste discharge, and at the same time trying to eliminate the negative economic performance, such as, increase of investment, increase of operational cost, increase of training cost, increase cost of purchasing environmentally friendly materials.

***Impact of GSCM Practices on Organizational Performance***

The majority of previous studies on the effect of GSCM studies on performance identify the positive relationship between the two constructs. Also, some of the research findings are shown negative relationship.

When the Kenyan Tea Processing industry, it had been found that there exists a positive relationship between GSCM practices and environmental performance

(Muma et al. 2014). Similar results were also found by Diab et al. (2015) whose research was based on the Jordanian Food industry. Seman, (2012), further stresses some previous studies of GSCM in relation to manufacturing firms.

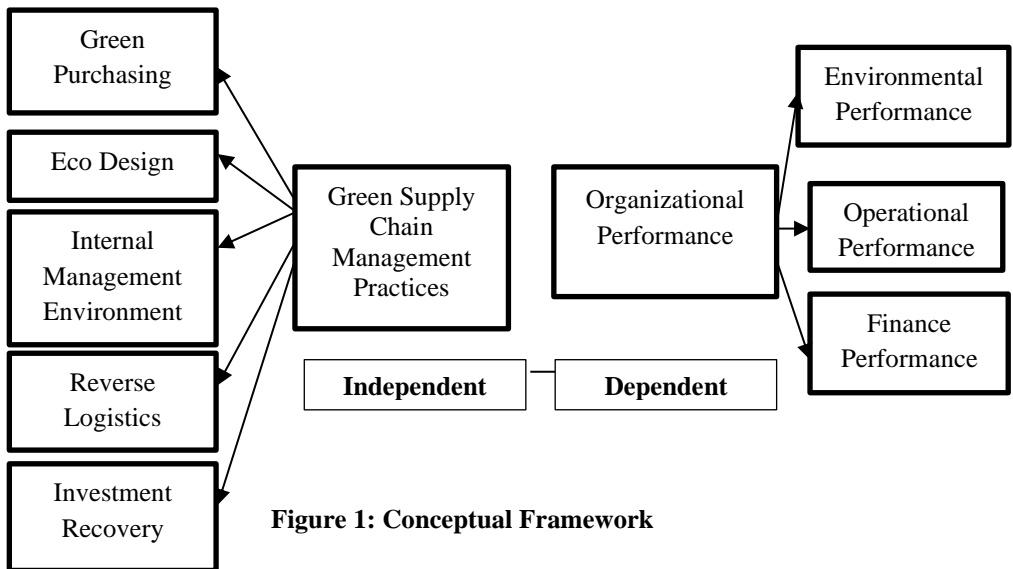
In one of his findings, it had been pointed out that there is a direct influence of green supplier assessment and collaboration on environment performance. Further it had been found that greening the suppliers leads to green innovation and competitive advantage, thereby ultimately resulting in higher performance.

Also, there are several studies that have attempted to link practices of GSCM with firm performance. While some studies such as Zhu & Sarkis (2004); Rao & Holt (2005); Green et al. (2012) found positive relationships, Giovanni & Vinzi (2012); Huang et al. (2012) showed there is no significant relationship between such practices and organizational performance. However, Azevedo et al. (2011); Wu & Pagell (2011) found a combination of positive and other relationships while Zhu & Sarkis (2007) recommended that economic performance remains the top priority for manufacturers.

**Methodology**

***Conceptual Framework and Hypotheses Development***

The framework shown in Figure 1 was developed to investigate the primary objective of this study, which is to identify the impact of GSCM practices on organizational performance.



**Figure 1: Conceptual Framework**

Based on the above conceptual framework following hypotheses are developed. The Research Hypotheses of this study are derived with respect to the research objective. Hypotheses (H1) is derived based on the objective which is to study the impact of green supply chain management practices on organizational performance.

*H0: The degree of GSCM practices does not significantly impacts the GSCM performance of manufacturing firms in Sri Lanka;*

*H1: The degree of GSCM practices significantly impacts the GSCM performance of manufacturing firms in Sri Lanka.*

According to the above findings from literature, there is less published literature on the influence of GSCM practices on organizational performance in the Sri Lankan context. However, there are a considerable number of research studies which point out that there is a positive relationship which exist between the GSCM practices and performance of the firms in the Asian context (e.g. India, China) (Laosirihongthong, Adebanjo & Tan 2013; Zhu & Sarkis 2004).

### ***Operationalization***

Operationalization refers to the process by which a conceptual domain is translated to an analytical domain which is measurable and observable. The constructs, dimensions and related indicators were drawn from previous studies. As far as this study is concerned the constructs could be identified as GSCM practices (Green Purchasing, Eco Design, Internal Environment Management, Reverse Logistics, and Investment Recovery) and Organizational performance. The Operationalization process is to develop indicators which are measurable and observable behaviors of the dimensions identified above.

The questionnaire consists of thirty one indicators to measure the adaptability of GSCM practices in manufacturing firms in Sri Lanka and twenty one items for measuring the Organizational performance. The indicators of GSCM practices were solely based on past literature (Zhu, Sakis & Lai 2012; Zhu & Sarkis 2004; Zhu, Sarkis & Geng 2005; Laosirihongthong, Adebanjo & Tan 2013). A total of nine items of green purchasing, four items of eco design and eight items of internal environmental management were used in developing the questionnaire. Further the dimensions of reverse logistics and investment recovery included five items each. In addition, twenty one items about the GSCM performance were presented in terms of environmental, operational and financial performance each dimension having six, six and nine items respectively.

The questions of the Questionnaire were measured against a five-point Likert scale ranging from 1=strongly disagree, 2 = somewhat disagree, 3 = neutral, 4 = somewhat agree and 5= strongly agree.

### ***Participants and Procedure***

As per the nature of the objective, this study falls under the positivist paradigm. This is because, the researcher is working with observable social realities and the end result can be generalized to similar circumstances (Remenyi, 2002). The population of this study is all manufacturing firms in Sri Lanka. Judgmental sampling, one type of purposive sampling was used to determine a representative sample, since GSCM is not being practiced by the entire population of the study, which adds to 2554 manufacturing firms in Sri Lanka. Thus, only the firms which have already implemented GSCM practices together with firms that consider the possibility of implementing GSCM practices and performance had been considered. Some of the common advantages of this technique are that it is inexpensive, convenient and is not time consuming. Therefore I used 150 no of firms (n = 150) which have already implemented GSCM practices in the Sri Lankan manufacturing industry were selected covering a variety of sectors including automobile (29), garments (36) , food and beverage (13), electronics (20), chemicals (20) and other (32) as the sample size of this study. Initially Questionnaires were given to a sample of 150 respondents, consisting of several questions which are relevant to each of the research objectives defined. Representatives of each of the firms (General Managers, SCM Officers and Procurement Managers etc.) were contacted via email. Initially, 182 emails were sent, of which 150 responses were received in return. The questionnaire was prepared with the aim of identifying the organizational profile, GSCM practices and its influence on GSCM performance. Accordingly, 150 questionnaires were forwarded for the data analysis. The data was analyzed using Structural Equation Modeling (SEM) with the aid of AMOS (Analysis of Moment Structures) 23.0.

### **Data Analysis Results**

A pilot survey was conducted using 30 respondents to identify and eliminate potential problems in the questionnaire design (Malhotra & Peterson 2006) and to examine the validity and reliability of the measures used in the questionnaire (Sekaran & Bougie 2009). The Cronbach's alpha coefficient of the pilot survey was greater than 0.7 for all constructs which is an acceptable value for a pilot test (Hair, Black, Babin, & Anderson, 2010).

After the pilot survey, the data collected for this study were first entered into the IBM Statistical Package for Social Science (SPSS) software version 23.0. The 150 cases were forwarded for removing outliers and missing value analysis. In this study, there were no missing values and outliers in the 150 questionnaires.

After missing value data analysis and outlier detection, the data was tested for multivariate assumptions such as normality, linearity, homoscedasticity and multicollinearity. Normality was tested by skewness and kurtosis. To measure linearity and homoscedasticity normal probability plots (p-plots) and scatter plots were drawn respectively (Hair et al., 2010) and no deviations were identified.

Finally, multicollinearity was assessed using a correlation matrix and all inter-correlation values were less than 0.9. Summarizing the results of multivariate assumptions, all variables were assured of normality, linearity, homoscedasticity and multicollinearity.

The unidimensionality of all constructs was ensured using Exploratory Factor Analysis (EFA). Cronbach's alpha was used to measure the reliability of all constructs and its value is greater than 0.7, and thus, it can be concluded that the reliability is established for all constructs. Thereafter, data was forwarded for multivariate analysis.

### ***The Measurement Model***

The measurement model “specifies the indicators for each construct, and enables an assessment of construct validity” (Hair et al., 2010). Based on the conceptual model, there are 8 latent variables, namely, Green Purchasing (GP), Eco Design (ED), Internal Environment Management (IE), Reverse Logistics (RL), Investment Recovery (IR), Environmental Performance (EP), Operational Performance (OP), and Financial Performance (FP). As the initial measurement model portrayed a poor fit, the model was improving using modification indices. Stepwise deletion of items below 0.5 factors loading was applied to further refine the initial model.

During the modification process, following items were removed due to low standardized regression weights. Further, covariances were drawn between the error terms of several items for improvement purpose.

#### **Green Purchasing (GP)**

GPd- Suppliers ISO 14000 certification

GPf- Adapting just in time logistic system for supplier cooperation

GPg- Selecting suppliers using environmental criteria

GPi- Requesting suppliers to use environmental packaging

Internal Environment Management (IE)

IEd- Total Quality Management

Investment Recovery (IR)

IRE- Establishing a recycling system for used and defective products

Financial Performance (FP)

FPa- Decrease of cost for materials purchasing

FPc- Decrease of fee for waste treatment

FPd- Decrease of fee for waste discharge

FPh- Decrease in cost of raw materials or components

After removing those items the complete final refine model showed in Figure 2.

**Result (Default model)**

Minimum was achieved

Chi-square = 1070.439

Degrees of freedom = 791

Probability level = .000

IMPACT OF GREEN SUPPLY CHAIN MANAGEMENT PRACTICES ON ORGANIZATIONAL PERFORMANCE OF THE MANUFACTURING SECTOR IN SRI LANKA

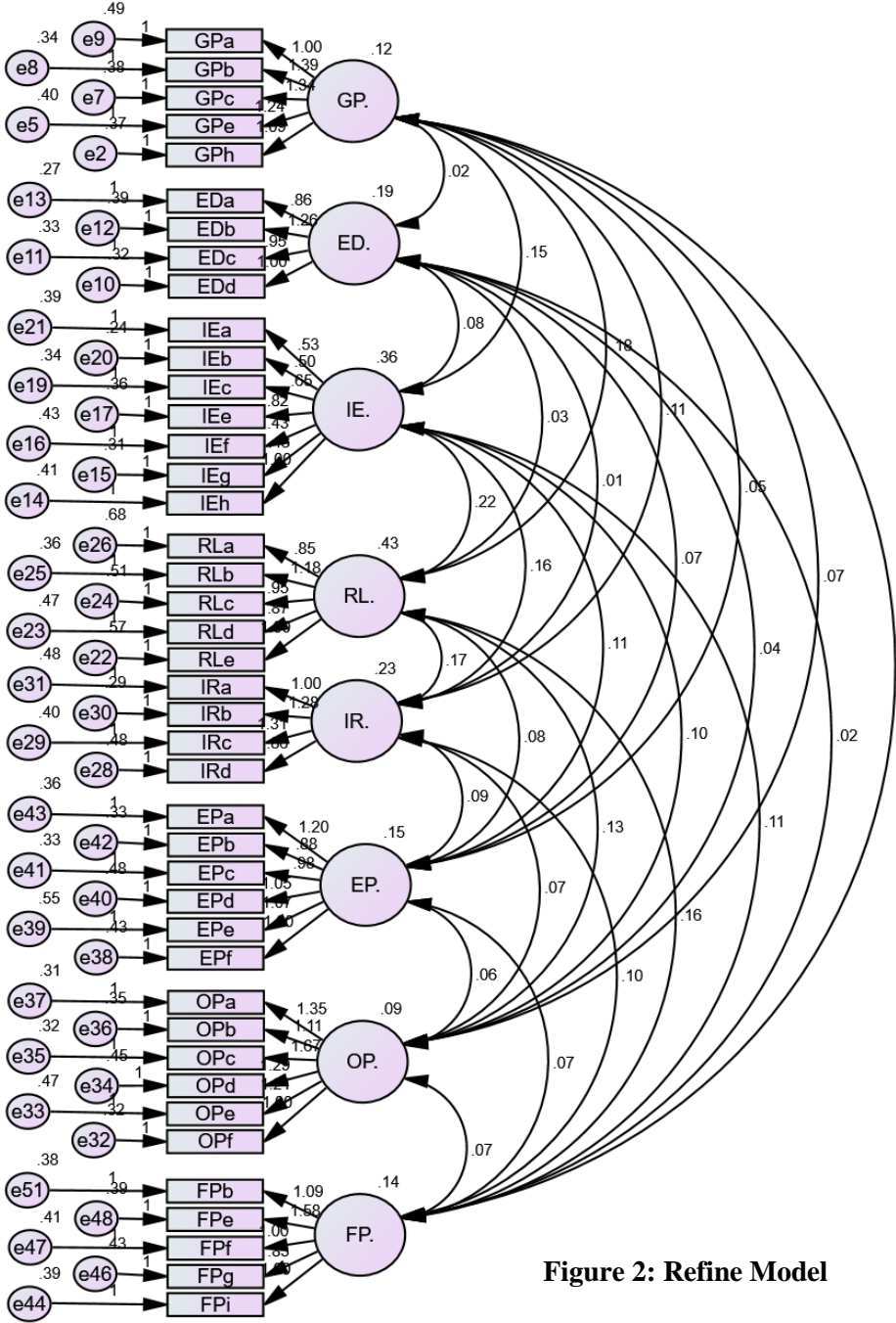


Figure 2: Refine Model

After the testing the refine model, it shows acceptable fit. According to Hair et al., (2010), CMIN/DF ( $X^2/df$ ) value close to one and not exceeding 3, Comparative Fit Index (CFI) value close to 1 and Root Mean Square Error of Approximation (RMSEA) value of about 0.08 or less indicates a good model fit. As further recommended by Hair et al., (2010), the stated GOF (goodness of fit) must include at least one absolute measure ( $X^2/df$ / p value/GFI/RMSR/RMSEA), one incremental measure (NFI/CFI/TLI/RNI). As shown in Table Number 1, the CIMIN/DF of the measurement model is close to 1 and below 3, the RMSEA is 0.052, thus providing absolute model fit.

**Table 1: Model Fit Measures**

<b>Measures</b>	<b>Values</b>
CMIN/DF	1.353
GFI	0.918
CFI	0.921
RMSEA	0.052

The Confirmatory Factor Analysis (CFA) was used to further test convergent and discriminant validity of the constructs. As explained by Malhotra & Dash (2011), 0.5 or higher factor loading and 0.5 or greater Average Variance Extracted (AVE) assures satisfactory convergent validity. In addition, Composite Reliability (CR) must be 0.7 or higher. Generally, discriminant validity can be ensured if the square root of the AVE is larger than the correlation coefficients (Malhotra & Peterson 2006).



**Table 2: Convergent Discriminant Validity Results**

	AV	CR								
	E		GP	ED	IE	RL	IR	EP	OP	FP
<b>GP</b>	0.50	0.86	<b>0.5031</b>							
<b>ED</b>	0.62	0.97	0.0084	<b>0.6281</b>						
<b>IE</b>	0.65	0.93	0.2633	0.0453	<b>0.6529</b>					
<b>RL</b>	0.51	0.83	0.3496	0.0041	0.1807	<b>0.5122</b>				
<b>IR</b>	0.58	0.85	0.2269	0.0057	0.1546	0.1484	<b>0.5797</b>			
<b>EP</b>	0.53	0.89	0.0758	0.0881	0.1118	0.0516	0.1244	<b>0.526</b>		
<b>OP</b>	0.53	0.89	0.2433	0.0612	0.1604	0.2168	0.1071	0.122	<b>0.5347</b>	
<b>FP</b>	0.53	0.94	0.2162	0.0099	0.1008	0.2321	0.1672	0.110	0.1939	<b>0.5294</b>

*Note: Diagonal entries (in bold) are the square root of AVE for all constructs*

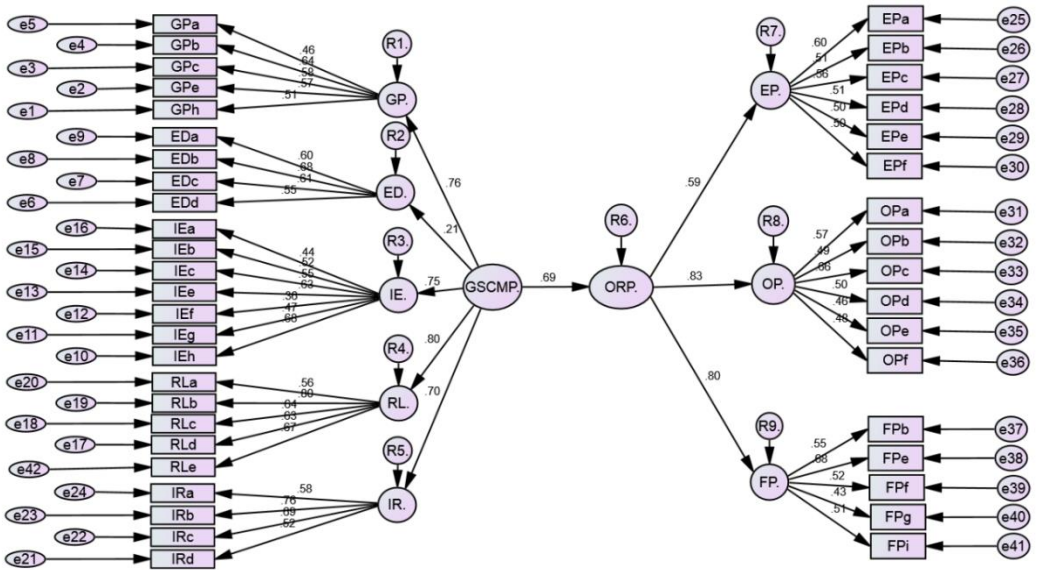
### *The Structural Model*

The structural model examines the direct relationships among the constructs. Structural model was developed to test the impact of GSCM Practices on Organizational Performance in Sri Lankan manufacturing firms. The output path diagram of the structural model 1 is shown in Figure 3. All hypotheses were tested at the 95% confidence level.

**Table 3: Model-fit statistics of structural model 1**

Absolute					Incremental		Parsimony
CIMIN/DF	GFI	AGFI	RMSEA	IFI	TLI	CFI	PRATIO
1.156	.923	.862	.031	.988	.985	.988	.931

Model fit statistics for the structural model 1 are summarize in Table 3. Accordingly, model fit statistics values of structural model 1 shows a good model fit. (CIMIN/DF 1.156, GFI .923, RMSEA .031, IFI .988, TLI.985, CFI .988). CIMIN/DF is less than 3. GFI is greater than 0.9 and RMSEA shows a good absolute model fit. Further, incremental measures (IFI, TLI, CFI) also shows a good model fit. In addition, parsimony indices confirm the satisfactory level of model fit. Hypothesis testing (H1) result of direct path is depicted in Figure 3.



**Figure 3: Structural Model 1**

As shown in Figure 3, it was hypothesized that Green supply chain management practices (GSCMP) have an impact on organizational performance (OP). The result of hypothesis 1 shows that GSCMP have a significant positive impact on OP. ( $\beta = 0.69, p = 0.113$ ) at the 95% confidence level. Further variance of Environmental performance (EP), Operational performance (OP) and financial performance (FP) is explained by Organizational performance as 0.59, 0.83 and 0.80.

**Discussion**

The above findings revealed that under structural model, there is a 69% significant positive relationship of GSCM practices on Organizational performance in Sri Lankan Context regarding Manufacturing Sector. Based on those results it can be concluded that Sri Lankan Manufacturers are highly engaged with the Green Supply Chain Management Practices. Higher the adaptation of GSCM practices, higher will be the organizational performance in Sri Lankan Context. Further, it is also concluded that higher the adaptation of GSCM practices, higher will be the environmental, operational and financial performance. This suggests that the impact of GSCM practices lead to reduce air emission, wastage of water and solid wastages and decrease the consumption of hazardous materials, frequency of environmental accidents under the

environmental performance. When considering operational performance, the impact of GSCM practices lead to increase amount of goods delivered on time, decrease inventory levels and scrap rate, promote products quality, reducing and eliminating waste, increased product line and finally improved capacity utilization. Decrease of cost for energy consumption, cost for environmental accidents, and decrease in level of production costs, decrease in packing costs can be considered under the financial performance. This claim is highly supported by previous research studies which have been conducted based on several industries, including Automobiles, Food and Beverages, Tea Processing and Pharmaceutical etc. The majority of the studies indicate that there is a positive relationship between the two constructs as mentioned in the literature review.

It had been argued that firms around the globe are becoming aware of the green concept and hence tries to focus on adapting green practices for the betterment of the firms, as the top management realizes the importance of adapting GSCM to cope with the future.

Muma et al. (2014) in one of their studies based on the tea processing industry had observed that GSCM practices have a positive influence on performance. In addition, as far as the food industry is concerned, Diab et al. (2015) had proven similar results.

Further research suggests that collaboration with all parties of the supply chain is likely to influence positively on performance of firms (Seman et al. 2012). According to the Zhu & Sarkis (2004), Rao & Holt (2005), Green et al. (2012) suggest that there is also a positive relationship with GSCM Practices and the Organizational Performance.

Also, past Studies include that some Asian Countries identified positive relationship with GSCM Practices and Organizational Performance (Laosirihongthong, Adebajo & Tan 2013; Zhu & Sarkis 2004). However, despite the lack of research studies based on the green concept of Sri Lanka, the results of this analysis ensure its applicability in this country.

Further Muma et al. (2014), Diab et al. (2015), Seman et al. (2012) argued that Environmental performance dimension has the more impact from GSCM Practices among the organizational performance dimensions. Also, Amit & Pratik (2012) discussed that both Environmental and Financial Performance dimensions are at top when considering the impact from GSCM Practices among the organizational performance dimensions. In addition to that Zhu & Sarkis (2007)

also argued that financial performance dimension has the largest impact from the GSCM Practices among the overall performance dimensions.

According to my study, it can be concluded that Operational performance has the highest value of impact from GSCM Practices than the other two dimensions. It presented 83% of impact from the GSCM Practices (Figure 3: Structural Model 1). According to that conclusion, that suggests impact of GSCM Practices leads to increase operational performance in terms of increasing the amounts of goods delivered on time, decreasing inventory levels and scrap rates, promoting product quality, reducing and eliminating waste and increasing product lines and capacity utilization.

### **Managerial Implications**

This study plays an important role for managers and firms, also this study is contributing in increasing the sales through understanding the green supply chain management and got the highest benefits from it. Higher the adaptation of GSCM practices, higher will be the GSCM performance.

As such it is important for managers to formulate and implement strong supply chain management strategies in order to cope with severe competition which is dynamic in nature. According to the findings, it shows that Green supply chain management practices more important for companies in ever changing business environment.

### **Recommendations**

In order to achieve the maximum output from the implementing Green supply chain management practices, there should be a better coordination between the different administrative levels in an organization. There are some recommendations for the organization to continue coordination between the different administrative levels to implement the green supply chain, They have to find the most friendly environmental raw materials and continuing in Safety environmental design and packaging, create an annual training plan according to the workers training needs related to the green supply chain, increased the budget allocated for scientific research in the field of green supply chain, and finally activate the Governmental rules and regulations to be more careful about the safety of the environment.

### **Limitations**

Major limitation of this study is that it focused on firms in the manufacturing sector in Sri Lanka. Because these findings are specific to the manufacturing sector, the findings may not be applicable to other sectors in Sri Lankan context. The impact of GSCM Practices in the long run, is not captured since this cross-sectional study has been done only for a short period of time.

### **Further Research**

Crucially, this study has some limitations that have the potential to lead to future research and the significance of the study can be further enhanced by the future implication of the study. This study limits its findings to the relationship between GSCM practices and environmental, operational and financial performance. Further research could be done to study the influence of GSCM practices on other dimensions of performance such as social performance, and economic performance. Similarly, different aspects of GSCM practices other than green purchasing, eco design, investment recovery, internal environment management and reverse logistics can also be evaluated.

A longitudinal study with a much larger sample, focusing on the influence of other factors such as top management commitment, organizational learning and level of Training and Development on GSCM performance can be studied in depth. In addition, the influence of sustainable green supply chain management on performance can also be studied in depth, since firms are emphasizing more on the sustainable aspect of the firms, without being profit oriented. Moreover, this study has only considered the manufacturing sector of Sri Lanka. An exploratory study can also be done to examine the influence of GSCM practices on GSCM performance based on the services sector of Sri Lanka.

### **Declaration of Conflicting Interests**

The authors declared no potential conflicts of interest with respect to the research, authorship, and publication of this article.

### **References**

- Alvarez Gil, MJ, Jimenez, JB & Lorente, JC. (2001), 'An Analysis of Environmental Management, Organizational Context and Performance of Spanish Hotels. *Omega journal*, 29, 457-471.
- Amit, R & Pratik, M. (2012), 'An empirical study of green supply chain management drivers, practices and performances': with reference to the

- Pharmaceutical Industry of Ankleshwar (Gujarat), *International Journal of Engineering and Management Sciences*, 3, 39-355.
- Azevedo, S., Carvalho, H., & Cruz-Machado, V. (2011). The influence of green practices on supply chain performance: A case study approach. *Transportation Research Part E: Logistics and Transportation Review*, 47, 850-871. doi:850-871. 10.1016/j.tre.2011
- Christopher, M. (2005), 'Logistics and supply chain management: Creating value networks', London, UK: Prentice Hall
- Dheeraj, N & Vishal, N. (2012), 'An overview of green supply chain management in India', *Research Journal of Recent Studies*, 1, 77-82.
- Diab, SM, Bourini, FAA & Rumman, AHA. (2015), 'The impact of green supply chain management practices on organizational performance', *Journal of Management and Sustainability*, 5, 149— 157.
- Gibson, B.J, Mentzer, J.T & Cook, R.L. (2005), 'Supply chain management: the pursuit of a consensus definition'. *Journal of Business Logistics*, 26, 17-25.
- Giovanni, D. P., & Vinzi, E. V. (2012), Covariance versus component based estimations of performance in Green Supply Chain Management. *International Journal of Production Economics*, 135(2), 907-916. doi:10.1016/j.ijpe.2011.11.001
- Green, K, Zelbst, P, Meacham, J & Bhadauria, V. (2012), 'Green supply chain management practices: impact on performance, Supply Chain Management'. *An International Journal*, 17, 1-44.
- Hasan, M. (2013), 'Sustainable supply chain management practices and operational performance', *American Journal of Industrial ad Business Management*, 3, 42-48.
- Hair, J. F, Black, W. C, Babin, B. J & Anderson, R. E. (2010), '*Multivariate data analysis: A global perspective*' (7th Ed.). London: Pearson.
- Hervani, A, Helms, M & Sarkis, J. (2005), 'Performance measurement for green supply chain management Benchmarking', *An International Journal*, 12, 330-353.
- Hines, T. (2004), 'Supply chain strategies: Customer driven and customer focused. Oxford: Elsevier', *the international Entrepreneurship and Management Journal*, 1, 519-537.
- Huang, X, Tan, B. L & Ding, X. (2012), 'Green supply chain management practices: An investigation of manufacturing SMEs in China', *International journal of Technology Management and Sustainable Development*, 11, 139-153.

- Kumar, R & Chandrakar, R. (2012), 'Overview of green supply chain management: operation and environmental impact at different stages of the supply chain', *International Journal of Engineering and Advanced Technology*, 1, 1-6.
- Lambert, D.M & Cooper, M.C. (2000), 'Issues in supply chain management', *Industrial Marketing Management*, 29, 65–83.
- Laosirihongthong, T, Adebajo, D & Tan, KC. (2013), 'Green supply chain management practices and performance', *Industrial Management and Data Systems*, 113, 1088 -1109.
- Li, S, Nathan, BR, Ragu-nathan, TS & Rao, S.S. (2004), 'The impact of supply chain management practices on competitive advantage and organizational performance', *The International Journal of Management Science*, 34, 107-124.
- Lin, CY & Ho, YH. (2011), 'Determinants of green practice adaption for logistics companies in China', *Journal of Business Ethics*, 98, 67 -83.
- Malhotra, NK. & Dash S. (2011), "*Marketing Research: An applied Orientation*", 6<sup>th</sup> ed. Pearson Education.
- Malhotra, NK. & Peterson, M. (Eds.). (2006), *Basic marketing research*, (2<sup>nd</sup> ed.), Pearson Education.
- Melnyk, S.A, Sroufe, R.P & Calantone, R. (2003), 'Assessing the impact of environmental management systems on corporate and environmental performance'. *Journal of Operations Management*, 21, 329–351.
- Miguel, PLDS & Brito, LAL. (2011), 'Supply chain management measurement and its influence on operational performance', *Journal of Operations and Supply Chain Management*, 4, 56-70
- Mitra, S & Datta, PP. (2014), 'Adoption of green supply chain management practices and their impact on performance': an exploratory study of Indian manufacturing firms, *International Journal of Production Research*, 52, 2085-2107
- Muma, BO, Nyaoga, RB, Matwere, RB & Nyambega, E. (2014), 'Green supply chain management and environmental performance among tea processing firms in Kericho County Kenya, International Journal of Economics', *Finance and Management Sciences*, 2, 270 - 276.
- Oliver, R, & Webber, W. (1982), *Supply-chain management: Logistics catches up with strategy*.
- Onyango, MB, Nyaoga, RB, Matwere, RB & Onyango, JO. (2014), 'Green supply chain management and economic performance: A review of tea

- processing firms in Kericho and Bomet Countries, Kenya', *International Journal of Science and Research*, 3, 2462- 2466.
- Remenyi, D. (2002), 'Research strategies—beyond the differences', *Electronic Journal of Business Research Methods*, 1, 38-41.
- Rao, P & Holt, D. (2005), 'Do green supply chains lead to competitiveness and economic performance?', *International Journal of Operations & Production Management*, 25(9 and 10), 898-916.
- Sekaran, U & Bougie, M. (2009), *Research methods for business: A skill building approach*, UK: John Wiley & Sons.
- Seman, NAA, Zakuran, N, Jusof, A & Shoki, M. (2012), 'Green supply chain management: a review and research direction', *International Journal of Managing Value and Supply Chains*, 3, 01-18.
- Shultz, C.J. II & Holbrook, M.B. (1999), 'Marketing and tragedy of the commons: a synthesis, commentary and analysis for action', *Journal of Public Policy and Marketing*, 18, 218-29
- Storey, J, Emberson, C, Godsell, J & Harrison, A. (2006), 'Supply chain management: theory, practice and future challenges', *International Journal of Operations & Production Management*, 26(7), 754-74
- Toyin, AI. (2012), 'Supply chain management (SCM) practices in Nigeria today: impact on SCM performance', *European Journal of Business and Social Sciences*, 1, 107 - 115
- Vachon, S & Klassen, R. (2007), 'Supply Chain Management and environmental technology: the role of integration', *International Journal of production research*, 45, 401-425.
- Walker, H, Sisto L.D & McBain, D. (2008), 'Drivers and barriers to environmental supply chain management practices: Lessons from the public and private sectors', *Journal of Purchasing & Supply Management* 14, 69–85.
- Wu, Z & Pagell, M. (2011), 'Balancing priorities: Decision-making in sustainable supply chain management', *Journal of Operations Management*, 29, 577-590.
- Xiao, X. (2006), 'Green supply chain management in the UK and China construction industry', (Unpublished Masters Dissertation). University of East Anglia.
- Yang, CS. (2013), 'Research on the performance measurement of green supply chain management in China', *Proceedings of the Eastern Asia Society for Transportation Studies*, 4, 101
- Zhu, Q & Sarkis, J. (2004), 'Relationships between operational practices and performance amongst early adopters of green supply chain management



- practices in Chinese manufacturing enterprises' *Journal of Operations Management*, 22, 265- 289.
- Zhu, Q, Sarkis, J & Lai, KH. (2012), 'Examining the effects of green supply chain management practices and their mediations on performance improvements', *International Journal of Production Research*, 50, 1337-1394.
- Zhu, Q, Sarkis, J & Lai, KH. (2008), 'Confirmation of a measurement model for green supply chain management practices implementation' *International Journal of Production Economics*, 111, 261-273.
- Zhu, Q, Sarkis, J & Geng Y. (2005), 'Green supply chain management in China: pressures, practices and performance', *International Journal of Operations and Production Management*, 25, 449-468
- Zhu, Q, & Sarkis, J. (2006), 'An inter-sectorial comparison of green supply chain management in China: Drivers and practices', *Journal of Cleaner Production* 14, 472- 486.
- Zhu, Q., & Sarkis, J. (2007), The moderating effects of institutional pressures on emergent green supply chain practices and performance. *International Journal of Production Research*, 45(19), 4333-4355.