Impact of Green Supply Chain Management Practices on Operational Performance in Logistics Companies in Sri Lanka

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Abstract *- To improve organizational performance and gain a competitive advantage, businesses today realize that environmental sustainability and becoming green are key basic principles. The objective of this study is to investigate how Green Supply Chain Management Practices (GSCMP) would affect the operational performance of logistics companies in Sri Lanka. A questionnaire was used to gather primary data from the sample, which consisted of 152 logistics companies. Statistical Package for Social Sciences (SPSS) software was used to analyze the data using multiple linear regression. According to the study's findings, green packaging and green transportation have a significant impact on operational performance, whereas green purchasing has no significant impact. The contribution of this study addresses a gap in existing literature concerning the combined analysis of green purchasing, green packaging, green warehousing, and green transportation variables in relation to their impact on operational performance in the Sri Lankan context. And it is the first study to focus specifically on the Sri Lankan logistics sector. Also, the study identifies GSCMP adoption limitations in the logistics sector and lays out the foundations for future research to address those barriers.*

Keywords**:** Green Supply Chain Management Practices, Logistic Companies, Operational Performance and Sri Lanka.

I. INTRODUCTION

Going green in the supply chain and logistics has an immediate influence on how businesses run and help with ethical sustainability. Therefore, the purpose of this study is to research how practices of green supply chain management affect operational performance in logistics companies in Sri Lanka. To compete successfully and exhibit long-term sustainability, organizations must manage their supply chain activities effectively. Conducting GSCM helps to improve firm efficiency while safeguarding the environment ethically. There is potential for green improvements across the supply chain, from manufacturing and purchase through distribution, warehousing, and transportation. GSCMPs, according to Sharma, et al., (2017), have been raised as a modern method to achieve productivity, higher revenues, brand identity, and market share, as well as to reduce the physical space of goods, as environmental issues are becoming increasingly important in managing trade today.

According to Mitra and Datta (2014), Sri Lanka was recognized as a critical nation to investigate the aforementioned themes due to its status as a logistics center. However, there is little information concerning GSCMP implementation and its impact in the context of Sri Lanka. As a result, investigating the GSCMP's influence on operational performance in Sri Lanka is critical.

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The logistics sector of Sri Lanka has been specifically chosen as it contributes to comparatively greater levels of waste disposal and resource usage. When considering Supply Chain Management (SCM), the logistics sector acts as a significant part of delivering goods to the ultimate customer. This study is important for the owners, top management, employees, and non-users of GSCMPs in organizations. Sri Lankan businesses are still lacking an understanding of the green concept and its benefits. Therefore, many businesses have failed to implement green supply chain practices. Many businesses are unclear about whether adopting a green concept can improve their operational performance. Therefore, the researchers decided to use this as the research problem and emphasize the significance of GSCMPs on operational performance.

With that point, researchers have planned to determine the impact of GSCMPs on organizational performance in terms of operational performance. Most of the studies have investigated the influence of the practices of green supply chain management on the performance of organizations in the manufacturing sector, both locally and globally. However, the literature does not provide a thorough analysis of how GSCM practices affect operational performance in the logistics sector in the Sri Lankan context. This study sets itself apart from other studies for two major reasons. It first introduces novelty by addressing a gap in existing literature concerning the combined analysis of green purchasing, green packaging, green warehousing, and green transportation variables in relation to their impact on operational performance in the Sri Lankan context. Second, this is the first study to focus specifically on the logistics sector in Sri Lanka. As a result, the study findings contribute to filling such research gap.

The primary objective of this research is to investigate the influence of green supply chain management practices on operational performance in Sri Lankan logistics companies. The study's sub-objectives are as follows:

1. To assess the effect of green purchasing on operational performance in Sri Lankan logistic companies.
2. To assess the effect of green packaging on operational performance in Sri Lankan logistic companies.
3. To assess the effect of green warehousing on operational performance in Sri Lankan logistic companies.
4. To assess the effect of green transportation on operational performance in Sri Lankan logistic companies.

A. Literature Review

In recent years, the level of research on sustainability in supply chains and logistics has steadily increased. A thorough literature review presented here is to show how earlier, and more recent, studies have contributed to the current study's base and directly contributed to identifying its knowledge gaps. The operational impact of GSCMPs in the context of Sri Lanka is poorly explored. To assess the consideration of GSCMPs and the relevance of operational performance in GSCMPs, a review of the literature is undertaken here. Green purchasing, green packaging, green warehousing, and green transportation are considered the main practices used in the logistics industry from the top to the bottom of the supply chain, respectively. Therefore, the above-mentioned practices were only considered in this study.

1) Green Supply Chain Management: The term "green supply chain management" has a variety of definitions that are based on different works of literature. Green production, packaging, distribution, and marketing are all included in the term "green supply chain management". Its application focuses on minimizing or eliminating waste, whether it takes the form of energy, pollutants, dangerous chemicals, or solid trash (Astawa et al., 2020). Furthermore, they indicated that, from a management standpoint, GSCM is a source of competitive advantage since it simultaneously lowers costs while enhancing delivery, quality, and flexibility. All competitive priorities are positively impacted by GSCM, therefore the more competent a firm is, the better it will perform across all the dimensions indicating cost, delivery, quality, and flexibility.

Since there has been a rise in environmental awareness in recent years, it has become widely accepted that the problems of GSCM and environmental pollution must be combined. To do this, suppliers' environmental performance must be evaluated, environmentally friendly products must be developed, and transportation-related carbon emissions must be reduced. Due to severe rivalry, quick technological advancements, and the increasing complexity of products throughout the globalization period, businesses must constantly enhance their supply chain rules. The idea and practices of the "green supply chain" are one of the numerous applications created to satisfy this need (Liu et al., 2020).

A different idea was stated by Sellitto, *et al*., (2015), compared to the past researchers which is that GSCM entails the incorporation of environmental and economic goals into the management of the supply chain's operational strategy. Such integration boosts financial return and profitability while reducing the carbon footprint. According to the latest findings, Priyashani and Gunarathne (2021) elaborated that the concept of GSCM is becoming more and more well-known around the world as an environmental idea. It has been regarded as the newest and most creative management theory. Many organizations are trying to demonstrate their real commitment to sustainability by adopting GSCM practices in their operations. So, the challenge to managers of logistics companies is to identify and understand the correct way of incorporating those 'green' initiatives or practices Lee, Kim and Choi (2012) into their daily processes of decision-making.

However, it is clear from comparing the definitions of the green supply chain and its management that it entails integrating the production process and customer distribution, working together to create new green products, using technologies to prevent pollution, and minimizing waste during energy-using activities.

2) Green Supply Chain Management Practices: The operationalization of GSCM practices by researchers has taken various forms. GSCM activities include green purchasing, green manufacturing, green marketing, Green Distribution, Eco Design, environmental education, Investment Recovery, Customer engagement, and Green Information Systems, according to Rizki and Augustine (2022). GSCM practices, on the other hand, comprise Green Policy, Green Purchasing, and Green Packaging, according to Indrianto, Kusmantini and Sugandini's (2022) study. Onyango et al. (2014) claim that four different GSCM methods, including green manufacturing, green purchasing, and green material management, are used by the Kenyan tea processing business. According to Diab et al., (2015), companies in the sector of food and drink are more likely to emphasize GSCM ideas namely green purchasing, green building, internal environmental management, and green warehousing. The primary activities involved in GSCM,

according to Sharma, et al., (2017), include green design, green purchasing, green manufacturing, green transportation, and reverse logistics. According to Petljak et al. (2018), GSCM practices consist of green distribution, green reverse logistics, green production, green supplier selection, green purchasing, and green design.

Green manufacturing, green design, reverse logistics, green sourcing, and green distribution are some of the categories of green practices, according to Foo et al. (2019). The investigation of Sharma (2022) highlights the essential components of GSCM, which are mentioned as green purchasing agreements, green delivery mechanisms, green manufacturing processes, green suppliers, green materials management, remanufacturing, technological innovation, green designs, waste management, and so on. GSCM has developed into a crucial management instrument and corporate structure that aims to achieve two important development goals: productivity enhancement and environmental conservation.

In the study, Sharma (2022), he has identified that past scholars have suggested adopting green purchasing, green warehousing, green production, and green distribution in enterprises besides the operational activities or routine activities in order to achieve eco-efficiency. According to Sharma (2022), productivity is concerned with continuous improvement, but environmental conservation is the framework for sustainable development.

There are different dimensions to GSCM practices, according to many researchers. Most of the researchers have focused on many industries, but thorough literature could not be found on the logistics industry. After following a thorough review of the literature, consideration is given to the most popular GSCM practices such as green purchasing, green warehousing, green packaging, and green transportation that are suitable for the logistics industry. The following validates the decision to use these practices: They are recognized as the most important practices in GSCM, with the ability to reduce the negative environmental consequences of any organization's supply chain process. These GSCM practices have been highlighted multiple times in literature and many studies. These practices encompass both internal and external activities.

3) Green Purchasing: In recent years, the idea of purchase has been considered a bottom-line financial factor. It has been noticed that, in addition to economic and environmental considerations, eco-friendly purchasing criteria have a substantial influence on the increased performance of organizations globally (Ahmad et al., 2022).

The society of today is increasingly centered on sustainable energy, green products, green technologies, and organic foods. According to Arshad Ali et al. (2020), the literature focuses on the factors that may motivate customers to acquire environmentally friendly goods or participate in more eco-friendly decision-making.

The company's performance may be maximized, in the opinion of Indrianto, *et al*., (2022), if it pays attention to environmental considerations (environmental performance) while being profit-oriented (economic performance). If the business uses green supply chain management, it can accomplish both goals. They also noted that the green supply chain idea encompasses every stage of a product's life cycle, from the extraction of raw materials through the design, production, and distribution phases to the consumer's usage of the product and its eventual disposal.

Green purchasing was stated by Agyabeng-Mensah et al. (2021) as the most sensitive and necessary green task in supply chain management. It includes many operations like planning, procurement, subcontracting, material and supplier selection,

transportation, and materials management. Green purchasing also known as green sourcing, according to Sharma, et al., (2017), encompasses everything supplied by suppliers, subcontractors, service providers, and so on which includes environmental considerations that may be implemented throughout the sourcing process. According to Sharma, et al., (2017)), management systems as well as their environmental goals and policies are all included in green purchasing. Motivating suppliers to use recyclable packaging, eco-labeling products, and adhering to green purchasing practices is an important factor in green purchasing.

Green purchasing may therefore be defined as the purchase of items and services that have a lower impact on human health and the environment when compared to competitive products or services serving the same function. Based on the findings of the above studies, the following hypothesis is suggested:

H1: There is a significant impact of Green Purchasing on Operational Performance.

4) Green Packaging: As per the idea of Agyabeng-Mensah et al. (2020), through adopting GSCM strategies such as developing environmentally friendly packaging strategies, the solid waste volume that is released into the landfill can be reduced. Green packaging is a form of green practice in which manufacturers are required to create goods that use as little energy and resources as possible, which makes it easier to reuse, recycle, and recover components, and avoid a lot of or utilize less dangerous materials throughout production. Further, they indicated that green packaging uplifts to eliminate the usage of materials and to optimize the utilization of space in warehouses, which will help to improve the warehousing activities to become green. It includes collaboration among suppliers to verify the packaging standardization, use of green packaging raw materials, promote reuse and recycling programs, and reduction of unpacking time.

Packaging for a product is used to prevent the product from getting damaged. The use of this packaging can give a considerable amount of waste to the environment and can increase the amount of solid waste (Shi et al., 2012) that is entered into the land. In the past 20 years, packaging waste has grown up to 400 percent around the world mostly due to diverse plastic containers and cardboard and the landfill is over 90 percent due to worldwide plastic consumption according to a study by Shi et al. (2012).

As a result, green packaging, also known as sustainable packaging, employs materials and production processes to minimize energy consumption and the environmental effects of packaging. Based on the findings of the above studies, the following hypothesis is suggested:

H2: There is a significant impact of Green Packaging on Operational Performance.

5) Green Warehousing*:* As said by(Agyabeng-Mensah et al., 2020), Carbon dioxide (CO_2) emissions in the environment increase due to the activities related to warehousing such as vehicle movements from one warehouse to another warehouse. Therefore, it is implied that warehousing as an area of logistics needs activities of sustainability to satisfy customer requirements and to achieve organizational competitive advantage. So, green measures should be implemented in warehouses because sustainable warehouse operations will help businesses lower their utility costs and cut carbon emissions. The collaborative effort of the supply chain parties is required for achieving the expected performance outcomes through green warehousing such as ensuring that the provided

materials are green, and the effort of suppliers to provide green materials to promote green warehousing activities according to (Agyabeng-Mensah et al., 2020). In their study, some scholars have stated that to manage the warehouse and the issues of the warehouse through using green energy sources and adopting energy-efficient handling techniques and technologies.

Integrating and implementing the managerial concept of environmentally sustainable practices to minimize energy cost, consumption of energy, and Green House Gas (GHG) emissions in a warehouse are called green warehousing (Bartolini et al., 2019). Green initiatives like turning off the lights in empty warehouse spaces can significantly save electricity costs, which can range from 60% to 80% of total energy use (Bartolini et al., 2019). According to Patil et al. (2018), the best place to reduce, recycle, and reuse is the warehouse and most of the elements used to reduce material wastage or energy consumption that can be implemented in a warehouse are greening elements. Furthermore, they identified that the use of natural ventilation and lighting, using reusable containers or storage equipment, and using solar panels are some of the elements.

Many businesses are struggling to develop novel approaches to achieve the primary goal of maximizing efficiency while minimizing environmental effects at the lowest possible cost to enhance warehouse performance according to Kamarulzaman et al. (2012). They found that impacts on the environment from warehouses are mostly due to the use of energy and the indirect influence of CO_2 emissions from energy production.

Therefore, the present study defines green warehousing as implementing changes that minimize the amount of energy needed, employ sustainable energy sources and materials, and limit the quantity of non-recyclable trash generated during warehouse operations. Based on the findings of the above studies, the following hypothesis is suggested:

H3: There is a significant impact of Green Warehousing on Operational Performance.

6) Green Transportation: Green transportation, according to Appiah et al. (2022), is about avoiding energy waste while improving efficiency. Improving efficiency could be done through many possibilities such as optimizing energy efficiency, packaging the trucks efficiently, and efficient packaging of containers in road transportation or ground transportation. Green transportation leads to reduced carbon emissions and savings of energy. According to Yassine (2022), GT is an important component in managing green supply chains due to its potential to have a large beneficial impact on the environment. As per the investigation of Agyabeng-Mensah et al. (2020), it is mentioned that the global carbon footprint should be reduced by adopting proper routing systems and by using clean fuel by developing and implementing energy-efficient logistics practices. They further indicated that firms could ensure that the harm to human lives and pollution is reduced by optimizing transportation routes and by using clean fuels. As stated by the research done by Sharma, et al., (2017), the transportation sector is an essential component of every supply chain. They addressed how the transportation industry has one of the biggest greenhouse gas emissions, and how to lessen the effect of transportation by using fewer polluting modes of transportation such as shipping, rail, or combination transportation such as railroad, and sea-road.

A green vehicle is considered a clean, eco-friendly vehicle that does not use diesel or gasoline but uses other fuels to operate and has internal combustion (Patil et al., 2018). They moved on to state that some of the activities to implement green transportation

include transportation route optimization, the use of hybrid vehicles or electric cars, the use of fuel-efficient vehicles, the use of clean idle trucks, collaboration with logistics providers, and the optimization of distribution hubs.

According to Maaz and Ahmad (2022), there is no proper literature regarding the relationship between organizational performance and green transportation and it is stated that the results are conflicting. However, Khan et al. (2022) stated that the connection between green transportation and organizational performance is positive. On the other hand, Maaz et al.,(2022), have found a positive concern of green transportation on economic performance due to optimal packaging size, mode of transportation, and collaboration between cold storage and warehouses in the supply chain.

Hence, based on the prior literature, the current study defines green transport, also known as sustainable transport, as forms of transportation that do not have a detrimental influence on the environment, such as fossil fuels. Based on the findings of the above studies, the following hypothesis is suggested:

H4: There is a significant impact of Green Transportation on Operational Performance.

7) Impact of GSCMP on Operational Performance: Operational performance for services companies includes actions taken by service providers. It is critical for all businesses as it enables them to evaluate objectively whether both financial and non-financial resources are effective in achieving their targets as stated by Agyabeng-Mensah et al. (2021).

Astawa et al. (2020), conducted research that examined the environmentally friendly supply chain management strategies used by the hotel sector and how these practices affect operational performance. The findings demonstrated a positive relationship between operational performance and environmentally friendly supply chain practices. Similar to this, research by Ahmad et al. (2022), on evaluating the impact of green supply chain management practices on the sustainable performance of the textile, automobile, and tobacco industries demonstrated that the impact of GSCMP including green manufacturing, eco-design, green purchases, and green information system is significant and positive on the sustainable performance of the organizations, whereas the impact of customer cooperation is insignificant.

Most of the earlier research showed that the GSCMP significantly affects the operational performance of businesses Sharma (2022), Khan et al. (2022); Ali et al. (2017); Lee *et al.*, (2012). Following a thorough review of the literature, this study considers cost savings, service quality, and flexibility as operational performance metrics Mallikarathna and Silva (2019).

II. METHODOLOGY AND EXPERIMENTAL DESIGN

For this study, a survey tool that had been used in earlier research was modified. A questionnaire served as the main tool for collecting data for the study. Questions from earlier research articles were used to create the questionnaire (Patil et al., 2018). Most participants filled out the questionnaire online, though some agreed to take part in the study by meeting them in person instead of online.

The population of the study consists of all Sri Lankan logistics companies. The research population was chosen from among the logistics companies listed in the Sri Lanka Logistics and Freight Forwarders Association (SLFFA), the Export Development Board (EDB), and Google Maps, respectively (Sri Lanka Export Development Board,

2023) (Sri Lanka Logistics & Freight Forwarders Association, 2021) (Google, 2023). According to these sources, Sri Lanka had 250 logistics companies at the time of the study, which served as the study's population.

One hundered and fifty two companies were selected as the study's sample size, according to the Morgan table (Krejcie and Morgan, 2012). The current study attempted to cover the entire population to provide higher reliability and validity because its goal was generalizability across the entire logistics sector. However, the sample could only be utilized to collect 122 responses to the current study. Using the simple random sample method, the questionnaire was sent to the complete sample of 152 companies. Using internet resources like email and WhatsApp, 74 responses were gathered. The remaining 48 responses came from physical discussions with workers at those companies. Internet sources such as email and WhatsApp were used as it was a convenient method for both parties, while physical discussions were arranged to collect real-time data from the respondents. Only 122 responses were obtained after the data collection was finished. Table 1 shows that of the 122 respondents to the survey, 17.2% held the position of general manager, 44.3% held the position of manager, 25% held the position of supervisor, and the remaining 36.1% of the employees' held positions in other company positions.

Table 1. Demographic information of the respondents

Measure	Item	Count	Percentage
Gender	Male	82	67.2%
	Female	40	32.8%
Age	25 years or less	11	9%
	26 - 30 years	34	27.9%
	31 - 35 years	29	23.8%
	36 - 40 years	23	18.9%
	41 or above	25	20.5%
Years of Experience	Less than 03 years	9	7.4%
	03 - 05 years	23	18.9%
	06 - 10 years	40	32.8%
	11 - 15 years	24	19.7%
	Above 15 years	26	21.3%
Job Position	General manager	21	17.2%
	Manager	54	44.3%
	Supervisor	3	2.5%
	Other	44	36.1%
Are you working in a Multi-National Company?	Yes	70	57.4%
	No	52	42.6%

Source: Authors' compilation.

The collected dataset was analyzed using multiple linear regression to assess the study's hypotheses. Regression analysis is a statistical method for determining the relationship between variables that are connected to cause and effect, according to Uyanık and Güler (2013). SPSS software was used for the analysis.

III. RESULTS

A. Reliability Statistics

Reliability is the extent to which measurement and process findings can be duplicated (Last, 2001). In this study, Cronbach Alpha coefficients were utilized to evaluate the reliability of the data. From 0 to 1, Cronbach's alpha rates the reliability of a questionnaire. A score of 1 denotes a reliable questionnaire. A reliability coefficient (alpha) of 0.70 or above is regarded as satisfactory in SPSS. According to Dijkstra and Henseler (2015), the composite reliability must be more than 0.60 and 0.70. This theory applies to all independent and dependent variables, and if any variable does not achieve this score, it is not relevant to the study. The Cronbach alpha values for each of the variables are presented in Table 2 as follows.

Table 2. Cronbach Alpha Values of the Variables

Variable	Cronbach's Alpha	No. of Items
GP	.706	4
GK	.789	5
GW	.812	5
GT	.763	5
OP	.866	12

Source: Authors'compilation.

Note: GP = Green Purchasing, GK = Green Packaging, GW = Green Warehousing, GT = Green Transportation, OP = Operational Performance.

When considering the variable green purchasing, Cronbach's alpha is 0.706, which shows a great level of reliability for the scale. Cronbach's alpha is 0.789 when the variable green packing is considered, which indicates a great level of scale reliability. Given that Cronbach's Alpha value for the variable green warehousing is greater than 0.7 (0.812> 0.7), which is the coefficient alpha value accepted in SPSS, it can be regarded to be a reliable variable. When considering the variable green transportation, Cronbach's alpha is 0.763, which shows a great level of reliability for the scale. With all the questions asked about this variable, that value is good to be accepted. When operational performance is taken into consideration, Cronbach's Alpha score is 0.866, which is more than 0.7 (0.866 > 0.7). In conclusion, the results suggest that all the independent and dependent variables are reliable and have internal consistency, enabling the study to keep going.

B. Validity Statistics

The validity, according to Ghauri et al., (2020), describes how effectively the acquired data covers the real area of study. Researchers together assess discriminant and convergent validity to establish construct validity. Before assessing discriminant validity, convergent validity must be assessed first.

1) Convergent Validity: According to Hamid, W and Sidek (2017), the measurement of the degree of correlation between different indicators of the same construct is known as convergent validity. Indicator factor loading, and average variance extracted (AVE) can be utilized to assess convergent validity. To assure convergent validity, the AVE value needs to be greater than 0.50. In this study, AVE was used to assess the questionnaire's validity.

Table 3. Average variance extracted

Variable	L	L^2	AVE
GP4	0.812	0.659444	0.614263
GP5	0.754	0.569083	
GK1	0.559	0.312631	0.503393
GK2	0.799	0.63767	
GK3	0.748	0.559068	
GK4	0.720	0.517796	
GK5	0.700	0.489802	
GW1	0.803	0.645432	0.512818
GW3	0.622	0.386631	
GW4	0.711	0.504867	
GW5	0.717	0.514343	
GT1	0.710	0.503468	0.506538
GT2	0.662	0.437918	
GT3	0.798	0.636532	
GT4	0.802	0.643066	
GT5	0.558	0.311705	
CS1	0.639	0.407744	0.513672
CS3	0.685	0.469191	
SQ1	0.723	0.522177	
SQ3	0.693	0.480013	
FL1	0.838	0.702593	
FL2	0.681	0.463092	
FL3	0.742	0.550892	

Source: Authors' compilation.

Note: Note: GP = Green Purchasing, GK = Green Packaging, GW = Green Warehousing, GT = Green Transportation, CS = Cost Savings, SQ = Service Quality, FL = Flexibility.

Convergent validity for each of the five constructs is assessed using the AVE technique while considering the table. All the constructions, including GP, GK, GW, GT, and operational performance, are considered valid because they have values which are greater than 0.5. Overall, these findings demonstrate satisfactory convergent validity.

2) Discriminant Validity: Discriminant validity according to Hamid, W and Sidek (2017), relates to how much the constructs vary from each other in experiments. It evaluates how different the overlapping constructs are from one another. The Fornell and Larcker criterion, Cross-loading of the indicator, and the Heterotrait-monotrait (HTMT) correlation ratio might all be used to evaluate the discriminant validity.

The Fornell-Lacker criteria (Fornell and Larcker, 1981) was employed in this study to evaluate discriminant validity. In this technique, the correlation of the variables is contrasted with the square root of the extracted average variance. Each variable's square root of the AVE ought to be greater than its correlations with other hidden variables. It should be compared to the correlation of the variable constructs generating the square

root of the extracted average variance of the constructs. The Fornell Larcker criterion values for each variable are shown in the following Table 4.

Table 4. Fornell – larcker criterion (FLC)

	OP	GP	GK	GW	GT
OP	**0.784**				
GP	.259**	**0.710**			
GK	.432**	.246**	**0.716**		
GW	.154	-.017	0.176	**0.712**	
GT	.441**	.397**	.144	.113	**0.717**

Source: Author's compilation.

Since all the correlated values are less than the square root of the extracted average variance of the variables, the preceding Table 4 demonstrates that none of the variables are particularly highly correlated with one another. The results show that there is not much correlation between the variables that represent distinct constructions. The fact that the variables have a poor correlation suggests that the questionnaire is measuring many unique constructions. The square root of the AVE was greater than the inter-construct correlations, which suggests that the discriminant validity was acceptable.

Isolating the link between each independent variable and the dependent variable is one of the main objectives of regression analysis. When all other independent variables are held constant, a regression coefficient is interpreted as the average change in the dependent variable for each change in an independent variable of 1 unit.

Regression models with linked independent variables exhibit multicollinearity. This is a problem since the regression model used in the study will not be able to correctly link the variation in the outcome variable to the appropriate predictor variable, resulting in confusing findings and false conclusions. Since this assumption only applies to multiple linear regressions with multiple predictor variables, multicollinearity analysis should be performed before doing multiple linear regression analysis in this study. Both correlation coefficients and Variance Inflation Factor (VIF) values can be used to test multicollinearity.

C. Correlation Coefficients

A comparison of the Pearson correlation coefficients for each independent variable can be used to test for multicollinearity using an inter-correlation matrix. There is a possibility of multicollinearity if there is a significant correlation (Pearson coefficient of 0.9 or higher) between any two independent variables. There is extremely little chance of multicollinearity if the Pearson coefficient is low (about 0).

Table 5. Pearson correlation coefficient values

	OP	GP	GK	GW	GT
OP	1				
GP	.259**	1			
GK	.432**	.246**	1		
GW	.154	-.017	.176	1	
GT	.441**	.397**	.144	.113	1

Source: Authors' compilation.

The intercorrelation matrix's Pearson correlation coefficient was found to be less than 0.9. Therefore, as shown in Table 5 the Pearson coefficient values between any two independent variables are low, indicating that the regression model does not have issues with multicollinearity.

D. Comparing Tolerance Values and Variance Inflation Factor (VIF)

Lower tolerance values (0< Tolerance value < 0.2) and larger VIF values (VIF > 5) are indicators of higher levels of multicollinearity. To minimize multicollinearity, the tolerance value should be greater than 0.2 and the VIF value should be less than 5.

Table 6. Tolerance values and variance inflation factor values

Model	Collinearity Statistics	
	Tolerance	VIF
Green Purchasing	.797	1.254
Green Packaging	.907	1.103
Green Warehousing	.951	1.052
Green Transportation	.828	1.208

Source: Authors' compilation.

When tolerance values and variance inflation factors were compared, it was discovered that the tolerance values were more than 0.2 and the VIF values were lower than 5. The tolerance values and VIF values are therefore within the anticipated range that avoids multicollinearity, indicating that multicollinearity is not an issue in the regression model. Hence, it is possible to perform multiple linear regression analysis.

E. Multiple Linear Regression Analysis

Table 7. Residual statistics

	Min	Max	Mean	Std. Deviation
Std. Residual	-1.846	3.310	.000	.983

Source: Authors' compilation.

The standard residual values are -1.834 and 3.310, respectively, and they do not exceed -3.29 and 3.29. Therefore, as a result, it suggests that the study's data set has no outliers.

Table 8. R Square value

OP	R	R-square	R-square adjusted
	.580a	0.336	0.313

Source: Authors' compilation.

The summary of the model is given in this table. The correlation between the dependent and independent variables is represented by the R-value. A number larger than 0.4 is used for further investigation. The present study's value is 0.580, which is satisfactory. R squared in this table is 0.336 or 33.6%, with a statistical significance of P< 0.05, when

considered. According to this, the GSCMP (Predictors) accurately predicted 33.6% of the variations in the performance operation (Outcome).

Table 9. ANOVA values of OP

	Sum of Squares	df	F	Sig
Regression	5.316	4	14.805	.000[b]
Residuals	10.503	117		
Total	15.819	121		

Source: Authors' compilation.

Note: Predictors - (Constant), Green Transportation, Green Warehousing, Green Packaging, Green Purchasing

The total regression model's fit to the data is evaluated using the F ratio in the ANOVA table. The dependent variable is statistically predicted by the independent variables, as shown in this table by F (4,117) =14.805, P<0.0005, demonstrating that the regression model provides a good fit to the data.

Table 10. Beta Coefficient Values of Independent Variables

	Unstandardized Coefficients		t	Sig.
	B	Std. Error		
(Constant)	.663	.160	4.137	.000
Green Purchasing	.014	.055	.247	.805
Green Packaging	.206	.045	4.611	.000
Green Warehousing	.024	.040	.617	.538
Green Transportation	.232	.051	4.532	.000

Source: Authors' compilation.

When all other independent variables are maintained constantly, unstandardized coefficients illustrate how much the dependent variable changes with a particular independent variable. Considering the above table, the unstandardized coefficient, B1 for GP, is equal to 0.014. Accordingly, there is an increase in operational performance of 0.014 units for every unit increase in GP. The unstandardized coefficient B2 for GK is 0.206. Therefore, there is a 0.206-time rise in operational performance for every unit increase in GK. For GW, the unstandardized coefficient, B3, is equal to 0.024. This implies that there is an increase in operational performance, 0.024 units for every unit increase in GW. For GT, the unstandardized coefficient, B4, is equal to 0.232. Therefore, there is a 0.232-time improvement in operational performance for every unit increase in GT. The GP, GK, GW, and GT have unstandardized coefficients of 0.014, 0.206, 0.024, and 0.232, respectively, as shown by the findings above. The following regression equation may be developed from the data available to forecast the operational Performance from GSCMP.

Y = Operational Performance (Dependent variable)
X1 = Green Purchasing
X2 = Green Packaging
X3 = Green Warehousing
X4 = Green Transportation

e = Error term

$$Y = 0.663 + (0.014)X1 + (0.206)X2 + (0.024)X3 + (0.232)X4 + e \quad (1)$$

The current study used SPSS to do regression and looked at the p-value of the coefficient b. If the p-value is less than 0.05, the null hypothesis should be rejected and it indicates that the variable is significant; otherwise, the null hypothesis should not be rejected, and it indicates that the variable is not significant.

Green purchasing has a significant impact on operational performance, according to H1. Because the p-value is 0.805, the data reveal that GP has no significant influence on operational performance, and hence H1 is rejected.

Green packaging, according to H2, has a significant impact on operational performance. With the p-value of 0.000, there is a significant positive relationship between GK and OP. As a result, H2 has been approved.

According to H3, green warehousing has significant impacts on operational performance. The statistics show that GW has no significant effect on operational performance since the p-value is 0.538, hence H3 is rejected.

H4 indicates that green transportation has a significant impact on operational performance. For the current study, H4 is accepted because the p-value for GT is 0.000, which is less than 0.05. As a result, the conclusion is that there is a significant relationship between GT and OP. As a result, among these four independent variables, GK and GT have a significant effect on operational performance, while GW and GP have an insignificant impact.

IV. DISCUSSION AND CONCLUSION

The current study aimed to discover how green supply chain management practices influence operational performance in Sri Lankan logistics firms. Several previous research studies have demonstrated that GSCMP can improve operational performance. The current research focuses on the total effect of GSCMP on operational performance to determine how each of these independent elements affects operational performance independently.

According to the outcomes of testing the first hypothesis, green purchasing has no significant impact on a company's operational performance. This study follows up on the conclusions of a previous study conducted by Rizki and Augustine (2022), which discovered that green purchasing had no significant influence on sustainability performance.

Green packaging has a substantial impact on the company's operational performance, including service quality, flexibility, and cost savings, according to the findings of the second hypothesis. A positive result for the unstandardized coefficients shows that as the amount of green packaging grows, so does the company's operational performance. This study is similar to prior research by Indrianto, *et al*., (2022), which discovered that green packaging considerably enhanced operational performance.

According to the conclusions of the H3, there is no significant impact of green warehousing on a company's operational performance, which includes cost savings, flexibility, and service quality. The findings of Akandere's (2016) study, which found that green warehousing had no significant impact on operational performance, supported the current study's findings. The conclusions of this study contradicted those of Diab et al.,

(2015) research, which showed that green warehousing would significantly enhance operational performance.

According to the findings of the fourth hypothesis, green transportation increases the company's operational performance. The findings of Patil et al. (2018) research confirmed those of the current study since they proved the significance of green transportation to company operational performance.

To encourage Sri Lankan logistics organizations, this study aims to expose the green supply chain management strategies being implemented by these companies and their influence on operational performance. This study offers empirical support for the link between GSCMP and operational success in the context of the industrial sector. The logistics industry in Sri Lanka, as well as the logistics sectors of other emerging and developed nations, are anticipated to gain a thorough understanding of the links between green practices and operational performance outlined in this study.

Numerous past research studies have demonstrated that GSCMP may improve operational performance. The current study is the first of its sort to be conducted in Sri Lanka employing the multiple leaner regression analysis approach. To assess how each of these independent variables individually affects operational performance, it was focused on the total impact of GSCMP on operational performance. Green packaging and green transportation have a significant impact on operational performance, according to the present study's findings, whereas green purchasing and green warehousing have no significant impact on operational performance.

Some limitations in this study may require more investigation in the future. The primary limitation of the current study was that it only included logistics companies that were listed by the Export Development Board (EDB) and the Sri Lanka Logistics and Freight Forwarders Association (SLFFA). Researchers had to use Google-listed businesses as a result. If researchers find a reliable source of company information, the data will be more accurate. Since this study just examined online resources to discover relevant literature, it is possible that it is missing an offline database. If researchers looked through offline databases to obtain a better understanding of the literature, they would be more likely to find valuable information there. The green purchasing variable had to be eliminated from the study after the reliability test was completed since its reliability and validity did not meet the required level. Researchers need to alter the questionnaire to conduct further research due to that issue.

This research is confined to a few components, including green purchasing, packaging, warehousing, and transportation. Therefore, a more thorough investigation of GSCM practices, such as green manufacturing, green procurement, eco-design, investment recovery, or investment recovery, can be more trustworthy for future studies. To validate the model's accuracy, future research can also think about performing the study in various industries. Future research may examine how the GSCMP affects other performance metrics including environmental and social performance to see how the model performs in different economies.

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