

Regression Analysis of GSCM Implementation on Corporate Environmental Performance in Manufacturing Firms

Dhruiti Sundar Sahoo, Manoranjan Dash, Ayass kanta Mohanty, Jyoti ranjan Das , Anita saho

Abstract: Exhaustion of natural resources and global warming have witnessed significant changes in the different organization produce and deliver their product and services., Now a day's green supply chain practices has gained attention of organizations in many countries. Implementation of GSCM practices in manufacturing firms and measuring the impact of these practices on corporate performance are still in a embryonic stage. Number of issues identified i.e. "Eco-design" , "Green purchasing", "Environmental Cooperation" and "Reverse Logistics" on different element of corporate performance. The different outcomes are environmental, operational economic and social. The objective is to explore the green supply chain practices and their relationship to corporate environmental performance in manufacturing firms. Multiple regression analysis has been used to study the impact of Eco-Design, Environmental Cooperation and Reverse logistics on corporate environmental performance in manufacturing firms. A number of recommendations are also provided for firms interested in improving their environmental performance through implementation of GSCM practices.

Keywords: Eco Design, Corporate Environmental Performance, Reverse Logistics

I. INTRODUCTION

In response to growing environmental awareness, increased consumer and community pressure, stricter regulation manufacturing organizations need to effectively integrate their environmental concern into supply chain management (Zhu at. el.2008, Geng at. el. 2017). Zhu and Sarkis,(2004), conceptualized GSCM as a combination of Environmental concern and organizations intra-inter firm management of upstream and down stream supply chain . Over the past couple

of decades (Sarkis 1995), these supply chain and environmental concerns within green supply chain management (GSCM) have evolved as an important strategy for manufacturing enterprises and their supply chains to improve their overall performance and competitive stance. At national and international level conservation of natural resource and protection of environment has emerge as an absolutely necessary. G.Kanan et al (2010) focused on minimizing the generation of hazardous waste , its management and recovery of materials from this waste Now a days every manufacturing firm are concerned of investing in recycling system in order to reduce the waste generated from the supply chain . Green supply chain management combines green design, green procurement, green transportation, green manufacturing, green distribution/marketing and reverse logistics.

II. LITERATURE REVIEW

Manufacturing firm focus on green design which involves designing products or services with emphasis on environmental issues taken into consideration which is associate with safety of health during the product life cycle . Its scope includes pollution prevention, conservation of natural resource, minimization of waste, improving occupational health and safety, managing the environmental risk (Fiksel 1996). Bhamra (2004) To accommodate the pressure from various groups for improving environmental performance, some industries tries to achieve it through clean up manufacturing process but proactive companies that try to achieve significant improvement focus on design of their products. This eco design of the products helps the organizations to improve their environmental performance. Donnelly at. el. (2006) found how the environment is affected in the entire product life cycle of producing wireless hardware products. Lucent's wireless business unit(Mobility Solutions) starts product-based environmental management system (PBEMS). Besides the environmental impacts firms also focus on conceptual design , development , consumption by customers as well as its disposal. In the system environmental processes are utilized in managing the product as well as they include sustainability practices during the product design . These eco-design tools include eco-road mapping, design for environment guidelines and checklists, and lifecycle assessments. Mobility Solutions continues to reap the value of sustainable product design that is both good for the environment and makes sound business sense.

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* Correspondence Author

Mr.Dhruiti Sundar Sahoo*, Research Scholar, Faculty of Management Sciences, Siksha O Anusandhan (Deemed to be University), Bhubaneswar,India

Dr.Manoranjan Dash, Associate Professor, Faculty of Management Sciences, Siksha O Anusandhan (Deemed to be University), Bhubaneswar,India

Prof.(Dr.) Ayasa Kanta Mohanty,Professor, Faculty of Management Sciences, Siksha O Anusandhan (Deemed to be University), Bhubaneswar,India

Prof.(Dr.) Jyoti Ranjan Das,Professor, Faculty of Management Sciences, Siksha O Anusandhan (Deemed to be University), Bhubaneswar,India

Mrs. Anita Sahoo,Assistant Professor, Faculty of Management Sciences, Siksha O Anusandhan (Deemed to be University), Bhubaneswar,India

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Carter and Ellaram (1998) defines reverse logistic as a process where manufacturer collects the previously used products from the position of utilization, for the reason of re-cycling and re-manufacturing it. It includes the reduction of materials during production so that fewer materials flow back, reuse and recycling of the end of the life product is possible. Srivastava (2007) focused collection as the initial stage in the process of recovery and the specified products are selected, collected and transported for the re-manufacturing process. Schultz (2002) describes the role of reverse logistics in management of hazardous materials, waste management and recycling. Looking into the future requirement reverse logistics is recently added to the Supply-Chain Operations Reference (SCOR) model. De Brito (2004) mention by involving all the layers of supply chain from different industry it becomes a world wide phenomenon. To capture the value in the products some take it proactively and some take it by force. In modern supply chain it becomes a key competence area. Green purchasing focus on purchasing material or products which meets requirements of environment like promoting reduction of the wastages reusing and recycling, substitute the material, which is set by purchasing firm. Paulraj [2011], defined Green procurement specifies effectively selecting suppliers on the basis of competency of environment competence, eco-design capability and ability to develop environmentally friendly goods. Mebratu (2001) For small and medium-sized enterprises (SMEs) in developing countries, environmental procurement is an important issue which is consider during decision making. It is because big buyers demand it, green products are more effective, it fulfills the legal requirement, customers also demand it. Potential benefits are reduce the cost, meet the environmental compliances, improve competitiveness. ZHU at el. (2002) Green purchasing is a key factor to improve enterprises' international competition ability. Raghavendra (2012) E-procurement use the electronic media and avoids extensive use of paper and printing, so this also comes under purview of Green purchasing. For Indian SME even if they use internet and email to access the information about the supplier but at the time of purchasing they prefer traditional method of procurement. Among the small manufacturing firm online procurement has not yet gain interest. According to Paulraj [2011], environmental collaboration includes cooperation with suppliers to achieve environmental objectives i.e. waste reduction initiatives, eco design principles, green purchasing, cleaner production and with aim of environmental objectives supporting firms golas.. Vachon (2007) Over the last decade pressure on the manufacturing firm to produce the green product significantly increasing. To accommodate the environmental issues manufacturing firms look forward for innovative solution from the supplier and from customer. environmental collaboration with suppliers is positively associated with better investment in pollution prevention technologies. Chin at el. (2015) seen environmental group effort as a input relational capability to facilitate the GSCM strategic formulation and execution. Li Y (2011) in responses to environmental problems environmental collaboration is one of the initiatives which focus on environmental protection and promotes coordinated development of economic and environment perspectives. Eco-design has revealed the greatest impact on organizational performance.

RESEARCH OBJECTIVES

1. To study the impact of timely and necessary to achieve corporate environmental performance by applying the principles of GSCM.

III. RESEARCH METHODOLOGY AND ANALYSIS

The research takes into consideration of both stakeholder and Institutional theory. Stakeholder theory hypothesizes that firms endeavor to satisfy all stakeholders which in turn justifies the consideration of the economic dimension to meet stakeholder's expectation. The end-users who also need to be satisfied as per stakeholder theory are demanding environmentally friendly products and the operational dimension is taken into consideration and employed in our research model. Institutional theory firms always seek to adapt to the surrounding environment by adhering to government regulations and related rules and will continuously need to measure their environmental and social performance which are considered for the model. Four independent variable are taken into consideration i.e. eco-design, green purchasing environmental cooperation and reverse logistics in the research. The dependent variable is corporate environmental performance. EcoDesign is an important green supply chain initiative because at this stage every aspect of the product is determined including the type of raw material to be used, the energy consumed and the waste generated.

H¹: There is a optimistic association between implementation of Eco-Design practices and Corporate Environmental Performance.

H²: There is a optimistic association between implementation of Green Purchasing practices and Corporate Environmental Performance.

H³: There is a optimistic association between implementation of Environmental Cooperation Practices and Corporate Environmental performance.

H⁴: There is a optimistic association between implementation of reverse logistics practices and Corporate Environmental performance.

Based on the model the improvement in the environmental performance resulting from the implementation of GSCM practices can be expressed in the equation given below:

$$Y_1 = \beta_0 + \beta_1 * ED + \beta_2 * GP + \beta_3 * EC + \beta_4 * RL$$

The measurement for the independent variables was facilitated by items adopted from Environmental performance measured using 5 items adopted from Zhu et al (2005) A 5 point likert scale was used for the corporate performance scale was from 1 to 5 (1 not at all to Highly Significant). Random sampling was used and sample was taken from all ISO and Non ISO certified manufacturing firms from Odisha.

Table-1 Reliability

Variable	No of Items	Cronbach's alpha
Eco-design	4	.923
Green Purchasing	4	.732
Environmental Cooperation	7	.876
Reverse Logistics	3	.876
Environmental performance	5	.879

The reliability of overall scale was .975. The sample size was 118. Multiple regression analysis was used to test the relationship between independent and dependent variable because it analyses the relationship between a single dependent variable (Environmental Performance) and several independent variables (GSCM practices).

Table-2 Multiple Regression Analysis

Variables Entered/Removed^a

Model	Variables Entered	Variables Removed	Method
1	Green Purchasing, Eco-Design, Environmental Cooperation, Reverse Logistics ^b		Enter

a. Dependent Variable: Environmental Performance

b. All requested variables entered.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.430	.109	.078	.850	1.863

a. Predictors: (Constant), Green Purchasing, Eco-Design, Environmental Cooperation, Reverse Logistics

b. Dependent Variable: Environmental Performance

The model explains 7.8% of the variability in the Corporate environmental performance.

Coefficients^a

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics
	B	Std. Error	Beta			
(Constant)	.004	.087		.000	1.000	
Eco-Design	.192	.120	.192	1.764	.146	.786
Reverse Logistics	.212	.109	.212	.946	.254	.491
Environmental Cooperation	.178	.082	.178	1.160	.333	.373
Green Purchasing	.110	.080	.014	.225	.901	.451

a. Dependent Variable: Environmental Performance

The above table shows the values for the t statistic for the four independent variables are all more than 0.05, therefore they are not significant. This means they are not able to predict the dependent variable that is Corporate environmental performance. The hypothesis formulated is not supported.

Hypothesis	β	Status
Eco design -> Corporate Environmental Performance	.192	Not Supported
Green Purchasing -> Corporate Environmental Performance	.212	Not Supported
Environmental cooperation -> Corporate Environmental Performance	.178	Not Supported
Reverse Logistics-> Corporate Environmental Performance	.014	Not Supported

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Collinearity Diagnostics^a

Model	Eigenvalue	Condition Index	Variance Proportions				
			(Constant)	Eco-Design	Reverse Logistics	Environmental Cooperation	Green Purchasing
1	4.873	1.000	.00	.00	.00	.00	.00
	.091	7.302	.00	.00	.01	.57	.06
	.021	15.267	.02	.25	.00	.34	.42
	.010	21.770	.00	.16	.74	.00	.51
	.004	35.144	.98	.59	.25	.09	.01

a. Dependent Variable: Environmental Performance

IV. CONCLUSION

The study focused on understanding of the green supply chain practices in manufacturing firms .The four dimension considered for the study i.e eco design , green purchasing , environmental cooperation and reverse logistics to find the impact on environment corporate performance were found to be insignificant ad thus there is no relation among the four with the environmental corporate performance. There was some limitation in the study as it was confined to the manufacturing firm only . It didn't consider the differentiation between the early and late adopters of green supply chain practices. Exploring this in the study had a practical implications how the performance of other firms is impacted by the implementation of green supply chain practices and how they coupe with the present global environmental scenario.

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