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## GSCM PRACTICES AND ITS RELATIONSHIP WITH ECONOMIC PERFORMANCE IN SELECT ISO 14001 CERTIFIED COMPANIES IN (GUJARAT) INDIA

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### ABSTRACT

*India is a developing country with a tremendous scope to grow. It is believed that in coming future India is going to be the Manufacturing hub among Asian countries, hence increasing the negative impact on the environment, as manufacturing sector is the main polluter of the environment. Due to the globalization, and increased pressure from global partners, India has realized the importance of Green practices in the supply chain. Many companies have already started practicing it on proactive basis but still it is in nascent stage as Indian companies are not sure of the benefits derived from its implementation. This study is an attempt to identify the green practices adopted by Indian manufacturing companies and their relationship with economic performance. Results show that Green practice implementation on proactive basis has a positive relation with the economic performance.*

### KEYWORDS

green Practices, economic performance, ISO certification, manufacturing companies.

### INTRODUCTION

Green supply chain management practices adoption is regarded as a solution to increased problem of environmental pollution to some extent. GSCM practice definition itself suggest the inclusion of the environmental criteria into the various business functions throughout the supply chain thereby leading to cost savings in the long run through waste elimination, energy saving, etc. Many researchers have identified various types of green practices which can be implemented throughout the supply chain including suppliers in the up streams and including customers down streams. They are Green purchasing, green design, green manufacturing, green packaging, green distribution, Investment recovery, reverse logistics, customer cooperation, internal environment management and internal green policy. Performance indicators are something that measures the various aspects of outputs resulting from the application of various inputs. These measures are environmental performance, economic performance, operational performance, social performance, competitive performance and company image measures. Zhu et al. (2007)[1] indicates that enterprises implementing GSCM in China have only slightly improved environmental and operational performance, and GSCM practices have not resulted in a significant economic performance improvement. However, some anecdotal evidence showed that substantial environmental management performance leads to lower manufacturing costs by eliminating waste (Allen, 1992)[2]. Rao and Holt (2005)[3] pointed out that organizations adopting GSCM in the South East Asian region ultimately enhanced both competitiveness and economic performance. A study indicated that environmental performance positively affected financial performance of the firms through both increasing the market share and decreasing cost (Klassen and Mclaughlin, (1996)[4]. The reasons why the results of these studies differ from each other may be due to the heterogeneity of environmental management practices adopted by organizations and industries (Elsayed and Paton, (2005)[5]. Numerous studies have tried to find the relationship between GSCM practices implementation and performance but result are confusing and hence require to be empirically tested further. This study focuses mainly on five green practices commonly practiced in manufacturing companies in India and their relationship with Economic performance, as economic gains are the main motivators for GSCM adoption in India.

### RESEARCH STATEMENT

Gujarat is an industrially developed state of India and is a hub for many large manufacturing companies with ISO 14001 certification. This study aims to identify the various green practices practiced by these companies and what is their relationship with economic performance.

### HYPOTHESIS

There is a relationship between GSCM practice adoption and economic performance.

### OBJECTIVES

1. To identify the green practices adopted by of Indian manufacturing companies.
2. To know the relationship between various green practices and economic performance.

### LITERATURE REVIEW

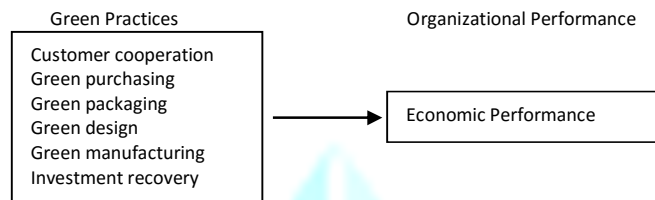
Green supply chain management (GSCM) is an emerging field that differentiates itself from the traditional supply chain perspective The 'greening' here refers to everything that is ecologically thought (Svensson, (2007))[6]. Mudgal et al. (2009)[7] also refers that "greening the supply chain is considered as a process of integration of the environmental values into supply chain". This leads us to the simple definition of green supply chain management (GSCM) by adding "green" to the supply chain management practices. It can be defined as "green procurement+ green manufacturing+ green distribution+ reverse logistics" (Sekshan et al, (2010), Sarkis (1995))[8]. The ultimate purpose is to eliminate or minimize waste (energy, emissions, and chemical/hazardous, solid wastes) along the supply chain. (Hervani et al (2005))[9]. GSCM has been quoted by many researchers as an emerging approach to balance both economic and environmental performance of organizations (Zhu & Sarkis (2004))[10]. The key practices worth noting from the previous research work are The concepts of green design, green operations, reverse logistics, waste management and Green manufacturing (Guide & Srivastava, (1998)[11]; Srivastava, (2007))[12]. Many researchers have identified four kinds of GSCM practices, including internal environmental management, external environmental management, investment recovery and eco-design (Zhu et al., (2007)[13] and later adopted by Ninlawan et al.,(2010)[14]. Most of the research work on GSCM practices are fragments of a part of the Porter's value chain model. Emmet and Sood (2010)[15] have classified GSCM practices as Green procurement and supply, Green production, Green packaging, Green marketing, Green Logistics and Supply loop.

Many studies has studied the relationship between GSCM practice adoption and Economic performance. (Bowen, Cousins, Lamming, & Faruk, 2001)[16] studied the relationship between green practices and economic performance in Japanese manufacturing firms. Xianbing Liu , Leina Wang , Yanli Dong , Jie Yang , Cunkuan



Bao (2011) [17] also found a positive relationship between GSCM practices and economic performance. Qinghua Zhu, Joseph Sarkis, Kee-Hung-Lai (2010) [18] also found the positive relationship between external and internal GSCM practices and economic performance. (Eltayeb, Zailani and Ramayah (2011)) [19] assessed the actual environmental, economic and intangible outcomes resulting from the adoption of green supply chain initiatives. Choudhary (2011) [20] developed the relationships among performance measurement criteria using analytic hierarchy process. Performance criteria were based upon five factors namely, internal environment management, green purchasing, customer cooperation, investment recovery and eco-design. To take it further this study tries to find the relationship between GSCM adoption and Economic performance. Based on the literature following research framework was developed.

**RESEARCH FRAMEWORK**



**RESEARCH METHODOLOGY**

The study focused on the GSCM practices and their impact on Economic performance in Indian manufacturing industries. Based on the literature review the instrument was developed to measure GSCM practices and Economic performance with some alteration with expert consultations. The instrument was tested for reliability and validity. Total of twenty six factors were identified as green practices based on the studies of (Zhu , Sarkis and Kee-Hung Lai (2011) [21] Ninlawan (2010) [22] , and Tritos Lasirihongthong, Keach-ChoonTan, Dotun Adebajo (2010)) [23] We conducted principal component analysis to confirm the groupings of GSCM practices, which resulted into six GSCM practice factors. Similarly total of seven variables were identified as economic performance indicators based on Zhu & Sarkis (2004) [24] and Ninlawan (2011) [25]. The instrument used for the study consists of three parts, Part 1: The company profile that documented the demographics of the industry type, organization size, turnover, products manufactured. Part 2: The Green practices adopted in the companies. on a five point scale to indicate the extent in which each item was practiced in the organization. Part 3: The effect of GSCM practice implementation, economic performance were captured on a five point scale. The Reliability is tested by the Cronbach’s alpha values which were all above the acceptable value of .7. The list of the items for the Green practice factors and economic performance items with their mean values ,standard deviations, factor scores , KMO, variance explained by each factor and their alpha values are shown in table 1.

**TABLE 1: FACTOR ANALYSIS OF GREEN SUPPLY CHAIN PRACTICES AND PERFORMANCE**

Sr. No.	Green supply chain practices & performance	Mean values	Std. Deviation	Factor loadings	Variance explained	Cronbach's Alpha values	KMO
1.	Customer Cooperation (CC) Cooperation with customer for cleaner production (CC-1)	4.15	.799	.837	52.613	0.881	.788 Sig.000
2.	Cooperation with Customers for Green Packaging (CC-2)	4.13	.892	.778			
3.	Cooperation with customers for eco design (CC-3)	3.98	.911	.777			
4.	Cooperation with Customers for Environmental procurement (CC-4)	4.20	.798	.739			
5.	Cooperation with Customers for using less energy during Transportation (CC-5)	4.23	.767	.737			
6.	Recovers or sells access Inventories / material (CC-6)	4.13	.873	.719			
7.	Integrated production with recovery (CC-7)	4.10	.986	.677			
8.	Design of the product is to reduce waste and cost (CC-8)	4.50	.597	.635			
9.	Carryout life cycle analysis of the product (CC-9)	4.05	.981	.597			
1.	<b>Green purchasing: (GPu)</b> Environmental Audit for suppliers for Internal Management (GPu-1)	4.18	.983	.916	75.068	0.832	0.667 Sig.000
2.	Second Tier Supplier Environmental Friendly Practice Evaluation (GPu-2)	3.70	.979	.892			
3.	Procurement from ISO 14001 Certified Suppliers (GPu-3)	4.08	.979	.785			
1.	<b>Green Packaging (GPa)</b> Minimized use of Packaging material (GPa-1)	3.95	.982	.861	59.054	0.766	0.727 Sig.000
2.	Re-collects and plans for Packaging material (GPa-2)	3.93	1.00	.771			
3.	Customers are environment Conscious and Help in returns handling (GPa-3)	4.05	.946	.737			
4.	Centralized Inspection and collection facilities (GPa-4)	3.97	.974	.696			
1.	<b>Green design (GD)</b> Design of the product is with easy and quick dis-assembly	4.30	.156	.853	64.668	.815	0.761 Sig.000
2.	Design of the Parts of the product is for extended use, easy repair & increased efficiency	4.35	.137	.846			
3.	Design of product is for re-use ,re-cycle ,recovery of material and component parts	4.22	.154	.759			
4.	Identifies, Collects and distributes products and parts that will be re-cyclable and re-usable	3.93	.130	.754			
1.	<b>Green manufacturing (GM)</b> Design of Products is for Reduced Consumption of material/energy or Bio-degradable material I(GM-1)	4.27	.821	.857	67.606	0.743	0.679 Sig.000
2.	Design of product is to support regulation (GM-2)	4.55	.565	.827			
3.	Design of Products is to avoid or reduce use of hazardous material in products & their manufacturing process (GM-3)	4.25	.856	.781			
1.	<b>Investment recovery: (IR)</b> Sells scrape and used materials (IR-1)	4.38	.846	.800	60.914	0.675	0.660 Sig.000
2.	Sells Access capital equipment (IR-2)	3.95	1.111	.793			
3.	Applies reverse Logistics in Stock Planning (IR-3)	3.85	1.039	.747			
1.	<b>Economic performance: (ECO.P)</b> Decreased use of total Packaging Material (Eco.P.1)	4.00	.921	.894	65.798	0.9.11	0.836 Sig.000
2.	Decrease in the cost for energy consumption (Eco.P.-2)	4.32	.725	.871			
3.	Decrease in the Fees for Waste Treatment (Eco.P.-3)	3.98	.948	.858			
4.	Decrease in the fees for waste discharge (Eco.P.-4)	3.97	.920	.826			
5.	Decrease in fine fees for environmental accidents (Eco.P.-5)	4.25	.773	.769			
6.	Decrease in use of Physical Resources (Eco.P.-6)	4.03	.843	.733			
7.	Decrease the cost for materials Purchasing (Eco.p.7)	4.01	.853	.708			

**RESEARCH FINDINGS**

Construct validity: Table 1 shows the results from factor analysis. The indicators for green purchasing explain 75.06 % of variance in the data followed by customer cooperation 52.613%, green packaging 59.054%, green design 64.668%, green manufacturing 67.606 %, investment recovery 60.914% and economic performance 65.798% respectively. Factor loadings for all indicators are above 0.5. A Kaiser-Meyer-Olkin measure of sampling adequacy (KMO) close to 1 indicate the sum of partial correlations is relatively compact. The KMO values of greater than .50 are acceptable and a values of all the seven constructs are higher. Hence suggesting that factor analysis is appropriate for data. Table 1 shows that means for each of the constructs components. With respect to the practices it is clear that green design is the most adopted practice followed by green manufacturing, then customer cooperation, then green purchasing, investment recovery and least adopted is green packaging. While weakest indicator of economic performance is decrease in fees for waste discharge which means that investing in waste treatment is considered as wasteful activity and waste of funds by Indian companies.

**TABLE 2: COORELATION ANALYSIS**

Green Practices& Performance	CC	GPu	GPa	GD	GM	IR
Customer cooperation (CC)	--					
Green purchasing (GPu)	.107	--				
Green packaging (GPa)	.508**	.238	---			
Green Design (GD)	.249	.423**	.251	---		
Green manufacturing (GM)	.328*	.299*	.326*	.531**	---	
Investment recovery (IR)	.152	.308*	.311*	.336**	.224	---
Economic Performance (ECO.P)	.331**	.256*	.600**	.247	.300*	.241

Significant at 0.01\*\*(2 tailed) Significant at 0.05\* (2 tailed)

Table 2. shows the correlation between GSCM practices and economic performance. Here it is found that customer cooperation, green purchasing, green packaging, and green manufacturing are positively co-related to economic performance significant at 0.05 and 0.01 level of significance.

**TABLE 3: MULTIPLE REGRESSION ANALYSIS**

Model					Change statistics		
	R	R square	Adjusted R square	Standard error of the estimate	R square change	F change	Sig.
1	.618	.382	.312	4.02488	.382	5.454	.000

a. Predictors: (Constant), IR, CC, GP, Gm, GPA, GD Practices

b. Dependent Variable: Eco. Performance .

**TABLE 4: ANOVA**

Model	Sum of Squares	df	Mean square	F	Sig.
1 Regression	530.151	6	88.359	5.454	.000
Residual	858.582	53	16.200		
Total	1388.733	59			

a. Predictors: (Constant), IR, CC, GP, Gm, GPA, GD Practices

b. Dependent Variable: Eco. Performance .

**TABLE 5: COEFFICIENTS**

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Tolerance	VIF
	B	Std. Error	Beta				
(Constant)	8.590	4.929		1.743	.087		
CC	.123	1.019	.016	.121	.904	.703	1.422
GP	.500	.703	.087	.711	.480	.773	1.294
GP	3.458	.861	.534	4.016	.000	.660	1.514
GD	.135	.748	.025	.180	.858	.613	1.632
Gm	.608	1.047	.077	.581	.564	.660	1.516
IR	.041	.248	.020	.165	.870	.809	1.237

Dependent variable Eco. Performance

A multiple regression analysis was conducted to determine if GSCM affects Economic Performance. The results were as shown in table 3. From table 2, R square value indicates the explanatory power of the regression model. It is the percentage of variance of the dependent variable (Economic Performance) explained by the independent variables (Green Supply Chain Management Practices). The value of 0.382 indicates that green supply chain management explains (affects) organizational performance to 38.2 %.ANOVA test was conducted to test the statistical significance of the effect of GSCM on Economic Performance. The results were as shown in table 4 .From table 4, the significance value (p) of 0.000 gives the test on the entire model. Since the value of p<0.001, this implies that there is positive effect of Green Supply Chain Management on Economic Performance, the effect is statistically significant. Table.5 shows the significance (p) values for each independent variable (green supply chain management practices). Significance value (p) of 0.904 shows that the effect of customer cooperation on economic performance is statistically insignificant, significance value (p) of 0.480 shows that the effect of green purchasing on economic performance is statistically insignificant and significance value (p) of 0.000 shows that the effect of green packaging on economic performance is statistically significant. Similarly, significance value (p) of 0.858 shows that the effect of green design on economic performance is statistically insignificant and 0.564 shows that green manufacturing and 0.870 investment recovery have statistically insignificant effect on economic performance. Most manufacturing companies started serious adoption of green supply chain management in the recent past. It is important to understand the effect on economic performance that can be attributed to green supply chain management practices so far. From the findings, the equation for the regression model can be given by;

$$Y = 8.590 + 0.123X_1 + 0.500X_2 + 0.3.458X_3 + 0.135X_4 + 0.608X_5 + .041X_6 + \text{error term}$$

Where; Y - Economic Performance

β0 - Constant

β1 - β5 - Regression coefficients

X<sub>1</sub>- Customer cooperation

X<sub>2</sub> - Green purchasing

X<sub>3</sub> - Green packaging

X<sub>4</sub> – Green design

X<sub>5</sub> – Green manufacturing

X<sub>6</sub>- Investment recovery

---Error term

## CONCLUSIONS AND RECOMMENDATIONS

Based on the findings of the study, the following conclusions were made: There is positive relationship between Green Supply Chain Management Practices; Customer cooperation, Green Purchasing, Green packaging, Green Design, Green Manufacturing, and investment recovery and Economic Performance. From the regression analysis it was concluded that Green Supply Chain Management practices has a positive effect on Economic Performance. Organizations that adopt green supply chain management practices experience cost savings and reduced waste thereby enhancing their economic performance. However, the effect of green supply chain management on economic performance for green packaging is statistically significant which implies that company collects its packaging material and reuses it for further packaging there by reducing the overall cost. This result could be attributed to the fact that most manufacturing companies started adoption of green supply chain strategies in the recent past and the effects of these practices may not have fully been realized. The study therefore recommends that other manufacturing companies should consider adopting green supply chain management practices. They should embrace green strategies in their purchasing, manufacturing, packaging, designing cooperating with customers and Investment recovery.

## RECOMMENDATIONS FOR FURTHER STUDY

Areas of further study that were identified in this study include: Studies in other manufacturing companies, studies to relate GSCM with other aspects of performance such as operations, environment which is the very basic purpose of GSCM implementation and social performance and studies to explore other GSCM practices other than green purchasing, green manufacturing, green design customer cooperation, green packaging, investment recovery like green distribution, green marketing, reverse logistics and internal environment practices etc which are the recent developments in the field of GSCM to cover whole of the supply chain to have more effective results.

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