

The Impact of GSCM Practices and Green Innovation on Economic and Environmental Performance: A Case of Manufacturing Sector of Pakistan

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Abstract

Purpose/Objective: The goal of this analysis is to investigate the position of GSCM activities in environmental and economic performance as well as green innovation, while the effect of green innovation on these two outcomes.

Methodology: The study collected data from 142 respondents. The purposive sampling was adopted as the sampling technique. The target population consisted of the professionals from the supply chain industry in Karachi, Pakistan.

Findings: Results revealed that the affiliation between GSCM and green innovation and environmental performance is substantial and affirmative. However, green innovation has had a positive impact on environmental efficiency. Moreover, green innovation facilitated the partnership between GSCM and environmental efficiency.

Implications: It is recommended to manufacturer that reused, recycled or reassembled before the product is manufactured for detection of materials. It can help to minimize waste by organizing. Green procurement is a sustainable acquisition in which products are reduced, reused and recycled in the purchasing process.

Keywords: GSCM • Green innovation • Environmental performance • Supply chain management • Environment

Introduction

Nowadays, the emerging disturbance or issues of environment and resource depletion problem known to be a challenging problem for organization. Moreover, the role of GSCM was known to be an imperative factor for controlling and managing the environmental performance and economic as well. Similarly, this particular aspect was highly related with green innovation because when implementing the GSCM practices the innovating factor was deemed essential. However, stated that innovation concept was notably used to manage the environmental performance of the organization and boost the business in a positive and significant way. In addition, suggested that implementing various techniques of greening the supplier could highly increase the green production and green innovation via GSCM [1].

The concept of having a successful and enhanced environmental aspect was below averagely possible. However, various countries had to face different environmental issues because of growth in economy and hence this economic growth is an important step in

development of a country so this environmental issue had to be resolved. Despite the presence of various studies in the aspect of GSCM and innovation this relationship was known to be still inconclusive or not studied at a maximize strength. Hence, in order to fill this gap and to provide an enhanced understanding this study examined the process in which organizations could manufacture with improve environmental performance via using GSCM practices and innovation [2].

The goal of this analysis is also to investigate the role of GSCM activities in environmental and economic performance as well as green innovation, whereas the impact of green innovation on these two performers. Similarly, GSCM practices include IEM, green purchasing, environmental cooperation with customers and Reverse Logistics (RL). Green manufacturing, though, encompasses renewable goods, green methods, green management and creativity in sustainability marketing. In addition, this study used quantitative approach and the estimated sample size 200 responses. The respondents were selected using purposive sampling. The data was analyzed using PLS-SEM [3].

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Moreover, the study will be consisting of five chapters. The first chapter will be consisting of introduction, problem statement, research objective and question. Additionally, the second chapter will be including theory, literatures and hypothesis. The third chapter will be including research approach, design, sampling and data analysis technique. In addition, the fourth chapter will be including the interpretation of results. The fifth chapter will be consisted of conclusion and recommendation [4].

Green SCM and performance

Sinaga, et al., conducted a study to examine the performance of organization through external and internal drivers. They also studied the mediating effects of management of GSC on the manufacturing sector of Indonesia. It was found in this study that there are many different factors that affect organizational performance; however the most effective are the external, internal variables and the practices of GSCM. Hamdy, et al., investigated if the application of the sustainable SCM has significant impact on the performance measures of organizations. It was found in this study that the practices of sustainable SCM have positive and significant impact on the performance of organizations. Further it was found that the these practices of sustainable SCM have a very important role to play as a mediator between the performance of organizations and their practices related to GSCM. Ali, et al., conducted a literature review study to investigate the articles. Through this literature review, it was noticed that supplier cooperation is important for the firm's GSCM activities and in particular for small and medium-sized businesses [5].

Laari, et al., investigated the indirect and direct associations between the management of GSC driven by customers and the financial and environmental practices by the manufacturing firms. The analysis results showed that the manufacturing firms can transfer their requirements in environment in the upstream SC due to requirements of customers. This can be done through monitoring or collaborating with the environmental performance of the suppliers. Another study by Chin, et al., examined the relational capability of environmental collaboration to improve the execution and formulation of the GSCM strategies. It was found through literature review that the sustainability performance and the GSCM have strong relationship with the SCM concepts [6]. Vasudevan, et al., conducted an examination of the effects of GSCM practices on the SME's business performance in the manufacturing sector of Western India. It was revealed in this study that GSCM practices are known to the manufacturing sector of Indian SMEs but still it is in its starting stage. Feng, et al., also examined the mediating impact of the operational and environmental performance of the organizations on the association between financial performance and GSCM practices. It was found in this study that the environmental and operational performance of the organizations have mediating impact on the association between financial performance and GSCM.

- GSCM activities have a huge impact on performance in the workplace.
- GSCM practices have a significant impact on economic performance.

Green innovation and performance

Shafique, et al., conducted a study focusing on the management practices of GSC under green innovation. They studied if the green innovation enhances the process of organization and also the products that develop environmental and economic performance. The analysis results revealed that there is an effect of management practices of GSC on the performance of organizations. Further, another study by Albort-Morant Shafique, et al., investigated that how external and internal drives of knowledge have impact on the green innovation performance of the organizations [7]. They investigated the associations between absorptive capacity, relationship learning and the performance of green innovation. They noticed that the learning partnership and absorptive ability had a strong and important impact on the performance of the company. Abdullah, et al., determined the external and internal barriers related to the green innovative initiatives in context of Malaysian manufacturing firms. The analysis result revealed that there are differences among the barriers related to systems innovations, green processes and green products. The major barriers to innovation of green products were found to be government support, business practices, perceptions and attitudes, environmental issues and the demand of customers. Albort-Morant, et al., investigated the relationship between relationship learning, knowledge base and the performance of green innovation in the coopetitive model. It was found in this study that mediating effect of learning orientation found significant amid green innovation and knowledge orientation [8].

GSCM practices have significant effect on green innovation

A research conducted by Tariq, et al., explored the effects of innovation performance of green products on the financial performance of organizations (that is the organizational risk and profitability). It was found in this study that the innovation performance of green products has positive and significant impact on financial performance of the organizations. Huang and Li, also investigated the moderating effects of the resource alignment and investigated the associations between green innovation performance, resource alignment and the innovation strategy. It was found in this study that the alignment of resources among partners and the environmental strategy of innovation have positive relationship with the green innovation performance [9]. Fang, et al., worked on refining the effective factors of the evolution and formation of the networks related to collaborative innovation and also the evolution indicators related to performance of green innovation. It was found in this analysis that there is a diminishing marginal impact of green innovation performance (Figure 1).

- GSCM innovation has significant effect on environmental performance.
- GSCM innovation has significant effect on economic performance.

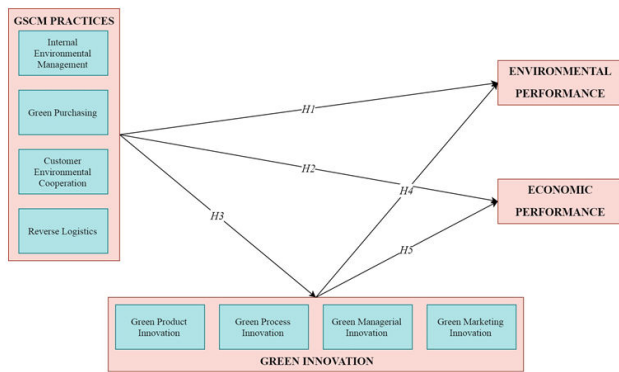


Figure 1. Conceptual framework.

Materials and Methods

Quantitative methods are more applicable in the positivism philosophy including surveys conducted socially, structured questionnaires and statistical analysis as the quantitative approach is more reliable as well as more generalizable. The positivism focuses on quantitative approach as it better represents the society and reveals social tradition like association among different variables. It is a type of philosophy that is emphasizes on patterns and trends instead of people individually. The positivistic quantitative approach is used in the study as the study is using numerical data and statistical analysis to reach certain conclusions that can be generalized [10].

The study also uses the deductive approach. The deductive approach starts with the development of hypotheses as well as testing those hypotheses that are based on the existing theories and applying them on the research model developed by the researcher. The deductive approach focuses on the reasoning. The deductive approach examines assertions and finds reasoning in those assertions to reach particular conclusions. The deductive approach is used in the study because this study deals with the confirmation or rejection of hypotheses that are developed with the help of a theory [11].

There are several types of non-probability sampling techniques including snowball, convenience, purposive sampling. The purposive sampling is a sampling technique where questionnaires are distributed among the target population that consists mainly of the experts or professionals from the industry due to the fact that the data needs to be rich and accurate. The study adopted the purposive sampling because the study will collect data from the supply chain experts and professionals for the data to provide rich information. The study has selected sample population that is consisted of SC professionals from the manufacturing sector of Pakistan. The sample size of the study is 142 participants from the manufacturing firms of Karachi [12].

The study adopted the survey questionnaire method for the collection of data. The questionnaires comprised of the closed ended questions. The questionnaire used the five-point likert scale and respondents answered the close ended questions using the five

point likert scale with the answers ranging from strongly agree to strongly disagree. The survey method was used due to the fact that it allows the researcher to collect significant amounts of data at faster speeds and less costly. Moreover, the five-point likert scale was used as more people are likely to answer them due to the fact that it is less confusing [13].

The results and findings were evaluated using PLS-SEM. The PLS-SEM is a technique that makes the analysis of complex relationship between the variables of the study with significant accuracy. The study adopted the PLS-SEM technique as the data analysis technique because it enables assessment of relationship among the study variables that is the central to this research. PLS-SEM technique was used on the SmartPLS software version 3.2.8.

Results and Discussion

Demographics profile of the respondents

In the collected data, there were 142 participants. This included 118 (83.1%) males and 24 (16.9%) were females. Also, 130 (91.5%) were aged 21 to 30, 6 (4.2%) aged 31 to 40 and 6 (4.2%) aged 41 to 50. Moreover, 16 (11.3%) were managers, 12 (8.5%) were assistant managers and 114 (80.3%) were executives. Of the respondents, 6 (4.2%) had diploma, 78 (54.9%) had bachelors, 52 (36.6%) had masters and 6 (4.2%) were MPhil/PhD. Lastly, 6 (4.2%) had 1 or less years experience, 85 (59.9%) had 2 to 4 years experience, 33 (23.2%) had 5 to 8 years experience and 18 (12.7%) had more than 8 years experience [14].

Measurement model

In the measurement model, has recommended that outer loadings should be greater than 0.70 for retaining the item/measure, whereas loadings ranging between 0.40 and 0.70 should be retained on the basis of acceptable convergent validity of the particular construct and lastly, factor loadings less than 0.40 should be deleted [15]. Henceforth, outer loadings have shown that six measures were loaded in the construct ranging between 0.637 (CEC 1) and 0.808 (CEC 3); four measures of economic performance ranging between 0.632 (ECP 4) and 0.870 (ECP 5); four measures of environmental performance ranging between 0.763 (EP 5) and 0.915 (EP 4); four measures of green managerial innovation ranging between 0.706 (GM I 4) and 0.881 (GMI 2); eight measures of green marketing innovation ranging between 0.718 (GMKI 3) and 0.906 (GMKI 8); nine measures of green purchasing were loaded ranging between 0.491 (GP 6) and 0.820 (GP 4); only two measures were loaded in the green product innovation ranged between 0.897 (GPI 2) and 0.926 (GPI 4); four measures were loaded in the green process innovation construct with loading coefficients ranging between 0.806 (GPIV 3) and 0.906 (GPIV 4); four measures were loaded in internal environmental management with factor loadings ranged between 0.643 (IEM 6) and 0.826 (IEM 4) and lastly, five measures loaded in RL were ranged between 0.615 (RL 5) and 0.782 (RL 1). However, following Table 1 provides result of convergent validity (Table 1).

Variables	Composite reliability	Average Variance Extracted (AVE)
Customer environmental cooperation	0.869	0.526
Economic performance	0.855	0.6
Environmental performance	0.911	0.721
Green managerial innovation	0.861	0.61
Innovation in green marketing	0.936	0.647
Innovation in green process	0.929	0.767
Innovation in green product	0.908	0.831
Green purchasing	0.902	0.512
Internal environmental management	0.837	0.563
Reveres logistics	0.837	0.509

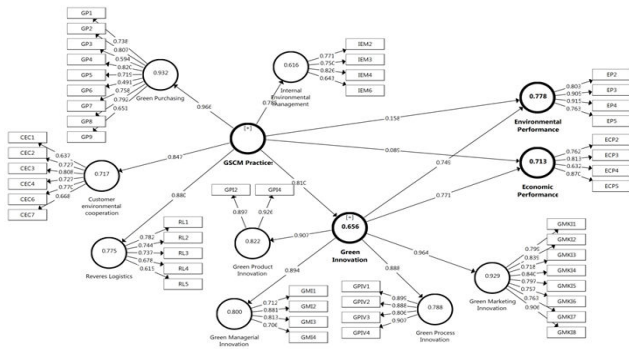
Table 1. Convergent validity.

It has been shown in the above tabulation that internal environmental management has least composite reliability of 83.7 percent while green marketing innovation has highest reliability coefficient of 93.6 percent. Moreover, RL has least degree of convergence represented by 50.9 percent of AVE while green product innovation has the highest degree of convergence of 83.1 percent represented by AVE coefficient. Therefore, the convergent validity has been achieved in accordance with the recommended thresholds.

In the following Table 2, the result of DV using HTMT ratio has been provided based on the recommended criterion of it was clearly shown that the largest HTMT ratio in the relationship between GP innovation and GM innovation of 0.998 and therefore, it has been recommended by that HTMT ratio should be less than 1.00 for D.V. (Figure 2).

Customer environmental cooperation	CEC	ECP	EP	GMI	GMKI	GPIV	GPI	GP	IEM	RL
Economic performance	0.911	-	-	-	-	-	-	-	-	-
Environmental performance	0.917	0.85	-	-	-	-	-	-	-	-
Green managerial innovation	0.876	0.956	0.879	-	-	-	-	-	-	-
Green marketing innovation	0.884	0.897	0.96	0.953	-	-	-	-	-	-
Green process innovation	0.754	0.952	0.845	0.889	0.826	-	-	-	-	-
Green product innovation	0.707	0.849	0.987	0.932	0.998	0.904	-	-	-	-
Green purchasing	0.891	0.818	0.823	0.633	0.852	0.829	0.809	-	-	-
Internal environmental management	0.588	0.684	0.672	0.604	0.931	0.639	0.811	0.882	-	-
Reveres logistics	0.817	0.581	0.681	0.495	0.74	0.613	0.612	0.97	0.836	-

Table 2. Discriminant validity using Heterotrait Monotrait ratio (HTMT).



Structural model

Following Tables 3 and 4 provides result of reflective higher-order construct development using PLS bootstrapping at 5000 subsamples and 95 percent confidence interval.

Figure 2. The diagrammatic representation of DV using Heterotrait Monotrait ratio (HTMT).

GSCM practices	Estimate	Prob
Customer environmental cooperation	0.847	0
Green purchasing	0.966	0
Internal environmental management	0.785	0
Reverse logistics	0.88	0

Table 3. Reflective higher-order construct (GSCM practices).

It has been postulated by the above tabulation that customer environmental cooperation (0.847, $p < 0.001$), green purchasing (0.966, $p < 0.001$), internal environmental management (0.785, $p < 0.001$) and

reverse logistics (0.880, $p < 0.001$) have been significantly and positively related to GSCM practices (Table 4).

Green innovation	Estimate	Prob
Green managerial innovation	0.894	0
Green marketing innovation	0.964	0
Green process innovation	0.888	0
Green product innovation	0.907	0

Table 4. Reflective higher-order construct (green innovation).

Above tabulation showed that green management innovation (0.894, $p < 0.001$), green marketing innovation (0.964, $p < 0.001$), green process innovation (0.888, $p < 0.001$) and green product

innovation (0.907, $p < 0.001$) have been significantly and positively reflected from the green innovation (Table 5).

Variables		Estimate	Prob
GSCM practices	Economic performance	0.089	0.092
	Environmental performance	0.158	0.008
	Green innovation	0.81	0
Green innovation	Economic performance	0.771	0
	Environmental performance	0.749	0

Table 5. Hypothesis-testing using path analysis.

Above table for hypothesis-testing has provided that GSCM practices has significantly positive effect on economic performance (0.089, $p < 0.10$), environmental performance (0.158, $p < 0.01$) and green innovation (0.810, $p < 0.001$). Moreover, the impact of green

innovation (0.771, $p < 0.001$) on economic performance and green innovation (0.749, $p < 0.001$) on environmental performance have also found positively significant (Table 6).

Variables	R Square	R Square adjusted	Q Square
Economic performance	0.713	0.709	0.391

Environmental performance	0.778	0.774	0.528
Green innovation	0.656	0.654	0.355

Table 6. Predictive relevance.

Above table showed that economic performance and environmental performance can be explained upto 71.3 percent and 77.8 percent by the combine effect of GSCM practices and green innovation, whereas green innovation upto 65.6 percent by GSCM practices.

Conclusion

The study seek to deliver scientific outcomes related to the results and findings providing that performance of the firms can be improved by the combine effect of GSCM practices as well as green innovation and allow companies to adopt such practices. However, this work examines the relationship in the manufacturing industry amid GSCM operations and ecological engineering practices and the environmental impact influence of these practices. The results and findings of the study showed strong and optimistic relationship between GSCM activities and green innovation and environmental success. Green tech, though, had a positive impact on the sustainability of the community. Nevertheless, the relationship amid GSCM operations as well as environmental performance was driven by green innovation. Therefore, the present paper confirmed GSCM activities that have a significant impact on improving the green creativity of companies and industrial institutions that eventually improve the environment. In brief, the results of this study provide a better understanding of the important role green innovation plays in manufacturing in increasing their GSCM and environmental efficiency in the enterprise.

Findings

The findings of this paper will not only help manufacturers identify important positive implementation metrics and other measures that need further growth, but will also strategically establish new indicators or strategies for efficient adoption of GSCM practices and green innovation. Green manufacturing is a very important area of green operations as it can result in less energy and resource, lower cost of raw materials and lower environmental impact. So, it is recommended to manufacturer that reused, recycled or reassembled before the product is manufactured for detection of materials. It can help to minimize waste by organizing. Green procurement is a sustainable acquisition in which products are reduced, reused and recycled in the purchasing process. The decision on procurement is very significant because it will affect the green supply chain when products are purchased. So, manager should select those products or services that can minimize environmental impact and eliminate waste. Better packaging is followed by rearranged loading patterns, may minimize the use of products, reduce the amount of handling needed and improve warehouse space utilization. Manufacturers will use green packaging materials when adopting green marketing, follow returnable packaging practices, deliver products directly to the customer site and sell items together rather than in smaller lots. RL is a vital part of GSCM practices. The process of returning the end of life product from the end user to the manufacturer is RL. The

manufacturer should know how to plant, harvest, recycle and repair the material. It also involves collection, selection, re-processing, redistribution and disposal.

Limitations

This work has had several limitations. Firstly, the results were cross-sectional rather than longitudinal in nature. Cross-sectional analyses of a set of complex principles (e.g. GSCM practices and green innovation) include research at a specific time point and not overall performance over time. The relationships between cause and effect cannot therefore be inferred. So, the future researcher can use the longitudinal approach to collect data. Secondly, the respondents are from only the manufacturing industry of Karachi Pakistan so the result may be biased or subjective. So the future researcher can take respondents from other cities of Pakistan as well in order to get the wider view on this topic. Thirdly, the sample size is small of this present study future researcher can examine this topic on a large sample size.

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