

Uncertain Supply Chain Management

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The effect of green supply chain practices on firm sustainability performance: Evidence from Pakistan

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ABSTRACT

Environmental issues are most important among the current global concerns, and business activities are seen as a cause of significant threat to the environment due to environmentally non-friendly practices by various industries that cause pollution. However, the implementation of green supply chain management (GSCM) practices in developing countries like Pakistan is still inconclusive. The purpose of this paper is to investigate the impact of GSCM dimensions on economic, environmental, and social performance. The five dimensions covered in this research are green purchasing, green manufacturing and remanufacturing, environmental education, internal environmental management, and investment recovery. A survey questionnaire was prepared that consists of green practices as well as a performance indicator. Factor analysis maximum likelihood method was used to examine the survey data of Pakistani organizations. The results of this study indicate that GSCM practices have a positive impact on environmental, economic, and social performance. This research shows organizations are aware of improving their performance while adopting green supply chain practices.

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1. Introduction

The rapidly increasing green concerns in the ultimate customer markets, as well as the pressure from the government, compel the organizations to adopt an ecological perspective in their supply chain activities (Lin & Ho, 2011). Besides the product's cost, quality, lead-time organizations need to improve environmental performance as a competitive priority. In the earlier, firms focused on implementing internal green practices to minimize pollution as well as lessen environmental impacts on their production. Recently, the firms have begun to implement external green practices such as green purchasing, eco-design due to environmental crises (Corbett, Klassen, & Management, 2006). The green practices and environmental concerns within the supply chain management have become an important topic in academia. In the competitive world, sustainability becomes the challenging issue as a result of socio-economics and environmental problems caused by irresponsible or unethical business operations in the process of acquiring raw material, manufacturing, logistics, and disposal of products at the end of their useful life (Fornasiero et al., 2016). Green supply chain management is a new thought for today's organization to minimize degradation and the violation of human rights (Kirchoff, Tate, Mollenkopf, & Management, 2016). Green supply chain management can be stated as the process of improving environmental performance along with supply chain practices: product design, operations management, and customer relationship. Supply chain management is the integration and coordination of business processes in the supply chain to satisfy the ultimate consumer (Pourjavad & Shahin, 2018). The business process includes various phases: purchasing, manufacturing, marketing, logistics, and information systems. Business strategic imperative includes product quality, customer focus, efficiency, and responsiveness (Vanalle, Ganga, Godinho Filho, & Lucato, 2017). The studies suggested that the consideration of green practices has a significant and positive impact on the organization's performance (Çankaya & Sezen, 2019; Chan, He, Chan, & Wang, 2012). Green supply chain management is similar to important concepts such as sustainable supply chain

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management that assist the firms to gain their objectives while minimizing the negative effects of the operation on the environment (Beske, Koplin, Seuring, & Management, 2008). In literature, it has been shown green supply chain management is a key factor for a firm's sustainable development and competitiveness. Environmental management not only reduces the firm cost of production but also enables them to fulfill their social responsibility as well as environment-friendly activities. Manufacturing firms are the main culprit responsible for the environmental issues that lead to health and safety problems for the workers and the community (Ahmed & Najmi, 2018; Beamon & Mgmt, 1999).

The subject green supply chain management has been increasingly discussed and incorporated by the firms. The objective of these debates to identify the barriers, pressure, and motivation to adopt GSCM practices (Eltayeb, Zailani, Ramayah, & recycling, 2011). All over the world, industries are implementing GSCM techniques to minimize environmental pollution. The concept of GSCM is to induce environment thinking into supply chain activities (Çankaya & Sezen, 2019; Eltayeb et al., 2011). In developed countries, the concept of GSCM is well-known and successfully implemented. In Pakistan, GSCM is new and its implementation is still at the initial phase. Social pressure and environmental constraints are forcing industries to implement GSCM practices as environmental pollution is a growing concern in Pakistan. In Pakistan, due to lack of research on GSCM and its effect on industrial performance is the reason why an only a small portion of the industry is implementing green practices. Thus, the objective of this research is to investigate the performance of industry after implementing green practices. For this research, the Pakistani organization implementing GSCM practices have been considered to measure the impact of GSCM on economics, environmental, and social performance. Further, in detail, five dimensions have been analyzed i.e. green purchasing, green manufacturing and remanufacturing, internal environmental management, environmental education, and investment recovery. The impact of the above dimensions has been determined by the social, economics, and environmental performance of the Pakistani industry (Grimm, Hofstetter, & Sarkis, 2014) stated, it is the reality the implementation of GSCM practices has numerous difficulties, while it enables the organization to increase profitability and eliminate environmental pollution. It provides new opportunities that can help to compete and add new values in the business. Unfortunately, research on this issue in Pakistan is still immature. With the implementation of GSCM practices, organizations can choose from a variety of suppliers and reduce the environmental impacts on the entire supply chain activities. It brings new thought in the business and enables to compete in the market (Ahmed et al., 2020).

2. Literature Review and Hypothesis

Industrialization plays a prominent role in the economic success of a county as well as it is also the responsibility of the industry to minimize the negative impact on the environment. In this context, GSCM enables the industry to increase profit while overcoming environmental issues. GSCM is a process to integrate environmental thinking into the supply chain, including, green design, green purchasing, green manufacturing, green distribution, logistics, marketing, and reverse logistics (Sarkis, Gonzalez-Torre, & Adenso-Diaz, 2010). The concept of Green supply chain management covers all sets of practices include supply chain management and environmental management. Thus, GSCM practices are extremely important.

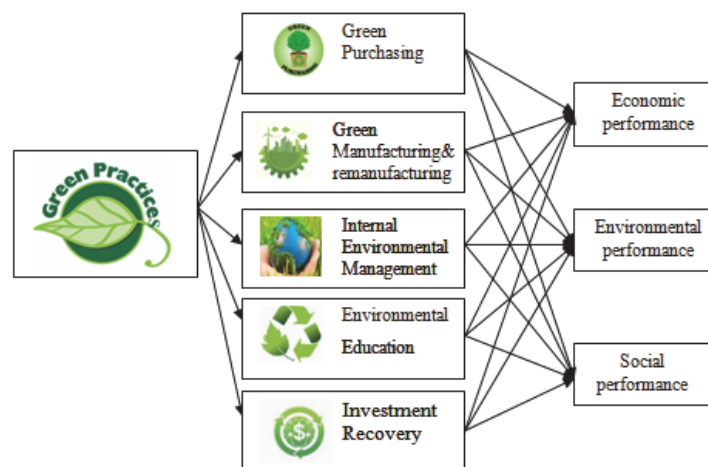


Fig. 1. Research framework and hypothesis

In this research, various five GSCM practices identified (green purchasing, green manufacturing and remanufacturing, internal environmental management, environmental education, investment recovery) and objective to explore the influence of these practices on environmental, economic, and social performance. These GSCM measurements are briefly defined based on the literature (Bu, Dang, Wang, Liu, & Health, 2020; Chan et al., 2012; Choi, Min, Joo, Choi, & Applications, 2017; Das, 2018; Mutingi, Mapfira, & Monageng, 2014; Xie & Breen, 2012; Sammalisto & Brorson, 2008) as follows:

Table 1
Independent Variables

Factors	Dimensions	Description
Green purchasing	GP1	Providing design specification to suppliers which include an environmental requirement for purchase items
	GP2	Ensure that the purchased product does not contain environmentally unacceptable substances such as lead and other harmful or hazardous materials.
	GP3	Consideration of suppliers having ISO 14001 certification
	GP4	Environmental assessment for the supplier's internal management.
	GP5	Suppliers are required to utilize environmental packaging: i.e. degradable and non-hazardous.
Green manufacturing and remanufacturing	GM1	Monitor and control environmental pollution such as drain emission
	GM2	Reduce noise pollution during the manufacturing process.
	GM3	Controlling hazardous substances in the manufacturing process and exploitation of the available resources.
	GM4	Process design focuses on minimizing the consumption of energy and natural resources in operations
	GM5	Recycling and reuse/recover valuable materials and components in the field of product design after the end of theirs.
	GM6	Emphasizes the proactive and preventative maintenance to increase the operational efficiency of the equipment
Internal environmental management	IEM1	The commitment of GSCM from senior managers
	IEM2	Support from mid-level managers for GSCM
	IEM3	Cross-functional collaboration to attain environmental improvements
	IEM4	Conduct a seminar for awareness of the environment.
	IEM5	Creation of environmental reports for internal assessment.
Environmental education	EE1	Environmental awareness seminar for suppliers
	EE2	Natural environmental seminars for executives/top management
	EE3	Environmental training and education programs for managers and employees
	EE4	Participation in government-subsidized natural environmental programs
Investment recovery	IR1	Investment recovery (sale) of excess inventories/materials
	IR2	Establishing a recycling system for used and defective products
	IR3	Sales of scrap and used materials.
	IR4	Sales of excess capital equipment.
	IR5	Collecting and recycling end of life products and materials

Moreover, the dependent variables are defined according to (Das, 2018; Laari, Töyli, Solakivi, & Ojala, 2016; Mutingi et al., 2014; Qorri, Mujkić, Gashi, & Kraslawski, 2018) as follows,

Table 2
Dependent variables

Factor	Dimension	Description
Economic performance	EP1	Lower/Minimize the cost of purchase material
	EP2	Lower/ Minimize the cost of energy consumption
	EP3	The decrease in treatment and waste expulsion costs
	EP4	Reduction of penalty for violating environmental laws
	EP5	Reduction of waste disposal costs
Social performance	SP1	Employee's health and safety workplace
	SP2	Contribution to social investments projects (education, culture, sports)
	SP3	Enhance community health and safety
	SP4	Reducing the adverse impact of products and process on the local community
Environmental performance	EP1	Reduce the discharge of noxious chemicals into the air and water
	EP2	Reduction in wastage and recycling of materials in the manufacturing process
	EP3	Enhancement of company's environmental position
	EP4	Decrease the frequency of environmental accidents/mishaps
	EP5	Lower the consumption of harmful/toxic/hazardous material.

- **Green purchasing:** Green purchasing is also called Environmentally Preferable Purchasing. It may be defined as integrating environmental concerns in procurement (Mutingi et al., 2014; Younis, Sundarakani, & Vel, 2016). The objective of green purchasing is to ensure that procured material has a positive environmental impact such as the absence of hazardous material (Carter, Kale, Grimm, & Review, 2000). The selection of optimal suppliers plays a dynamic role in an organization's environmental performance. It is also important to examine that the supplier meets the green criteria of the organization (Bu et al., 2020).
- **Green manufacturing and remanufacturing:** Green manufacturing and remanufacturing is one of the most dimension of GSCM. The purpose of green manufacturing and remanufacturing is to improve the industrial processes and products to minimize soil, water, and air pollution (Das, 2018). Furthermore, it is beneficial to reduce cost, scrap rate, wastage, maximize product efficiency, reuse, recycle, and positive environmental impact on supply chain activities. In the nutshell, it aims to produce eco-friendly products with minimum utilization of resources (material, energy, and water) (Rajeev, Pati, Padhi, & Govindan, 2017).
- **Internal environmental management:** Internal environmental management is a company's own environmental protection policies. It is a strategic organizational commitment and support from upper, mid-level managers and departmental cooperation for setting up an environmental improvement (Chan et al., 2012). It develops an environmental management system to deal with environmental issues (Xie & Breen, 2012).

- **Environmental education:** Environmental education is an important tool to ensure the development of a sustainable society and human resources (Routroy, 2009). The studies emphasized environmental education is very important for companies to be successful. It aims to demonstrate the employees the environmental policies of the organization (Choi et al., 2017).

Investment Recovery: It is a traditional firm's practice where excess material/inventories or scraped material and excess capital equipment are resold (Xie & Breen, 2012). It is a green dimension to get the highest benefits from the existing investment that was considered as wastage. The purpose of investment recovery is to recover maximum value from the end life cycle and obsolete (Ayres, Ferrer, & Van Leynseele, 1997).

2.1 GSCM practices and environmental performance

This dimension relates to the environmental impact on firm activities. Past research shows a perception of the positive relationship between GSCM practices and environmental performance (Beamon, 1999). The implementation of green practices has reduced environmental accidents (material, waste production, liquid waste) and improved organization performance and society health (Das, 2018). A firm needs to identify environmental issues such as procurement, manufacturing, and transportation (Azevedo, Carvalho, Machado, & review, 2011). The firm utilizes minimum resources and reasons for environmental pollution through interfering hazardous waste, soil, air, and water. Environmental performance ensures the firm ability to reduce hazardous substances, pollution, environment accidents and solid waste (Esfahbodi, Zhang, & Watson, 2016). The following hypotheses are proposed:

H_{1a}: Green purchasing has a positive relationship with environmental performance.

H_{1b}: Green manufacturing and remanufacturing have a positive relation with environmental performance.

H_{1c}: Internal environmental management has a positive relationship with environmental performance.

H_{1d}: Environmental education has a positive relationship with environmental performance.

H_{1e}: Investment recovery has a positive relationship with environmental performance.

2.2 GSCM practices and economic performance

Economic performance is concerned about the firm's manufacturing ability to cut down the costs related to material, water treatment, energy consumption, waste discharge, and lesser environmental accident (Micheli, Cagno, Mustillo, & Trianni, 2020). In this dimension, sales and profitability are considered. (Mutingi et al., 2014) stated that green practices improved the economic performance in an organization. While other proposed that GSCM practices have no positive impact on an organization in the short-term means sales and profitability performance. It is also stated that green purchases increase the product cost which negatively affects financial performance (Cousins, Lawson, Petersen, Fugate, & Management, 2019). NRBV states the implementation of green practices enables an organization to achieve economic benefit by reducing energy cost, wastage, and increasing corporate reputation and loyalty. Therefore, the hypothesize that:

H_{2a}: Green purchasing has a positive relationship with economic performance.

H_{2b}: Green manufacturing and remanufacturing have a positive relation with economic performance.

H_{2c}: Internal environmental management has a positive relationship with economic performance.

H_{2d}: Environmental education has a positive relationship with economic performance.

H_{2e}: Investment recovery has a positive relationship with economic performance.

2.3 GSCM practices and social performance

Social performance means an organized set of principles and policies of GSCM to improve organization image, protection worker's safety, health, as well as ensure customer satisfaction and loyalty. However, in the GSCM topic, social performance generally was ignored. It is important to raise awareness on corporate social responsibility that is equally significant in social issues while managing supply chain activities (Cousins et al., 2019). It will increase the positive image in the eyes of the government, society, stakeholders, and customers. (Laari et al., 2016) stated that GSCM makes it possible for the organization to improve brand image and build up a strong relationship with the stakeholder. Therefore, the hypothesize that:

H_{3a}: Green purchasing has a positive relationship with social performance.

H_{3b}: Green manufacturing and remanufacturing have a positive relationship with social performance.

H_{3c}: Internal environmental management has a positive relationship with social performance.

H_{3d}: Environmental education has a positive relationship with social performance.

H_{3e}: Investment recovery has a positive relationship with social performance.

3. Material and Method

3.1 Construction of instrument and measure

In this research Pakistani firms are considered to investigate how green practices are implemented. Due to pollution and climate change in the country, the policies regarding GSCM practices are an important part of the industry. Before the development of the questionnaire, three academicians and 10 supply chain managers were asked which dimensions of GSCM practices should be considered. As a result of these practitioners, five dimensions are considered to be analyzed.

These GSCM practices were: green purchasing, green manufacturing and remanufacturing, internal environmental management, environmental education, and investment recovery. These five practices are further divided into 25 items. These practices are addressed according to the current literature of GSCM dimensions (Beamon & Mgmt, 1999; Bu et al., 2020; Xie & Breen, 2012). Three performance indicators are determined as economic, environmental, and social performance. A questionnaire was developed based on the relevant literature to measure GSCM dimensions. The questionnaire was sent to the individual who had at least a bachelor's degree. It consists of supply chain managers, plant managers, logistics managers, purchasing managers, operations managers, and manufacturing managers. Data were collected through direct survey methods due to unawareness of green practices in Pakistan. One hundred and forty-five questionnaires were considered for analysis of results. Factor analysis maximum likelihood method was developed to confirm the grouping of collected data and linear regression was used to analyze the hypothesis.

3.2 Factor Analysis

Factor analysis was conducted to measure overall green practices by using IBM SPSS Statistics Software to further confirm the grouping of GSCM practices from the survey data. Factors are extracted using the maximum likelihood method, followed by varimax rotation. Kaiser criterion (Eigenvalue >1) is used. It identifies the number of various factors to retain and get a sensible variance. Factor analysis was developed for both variables (independent and dependent). Five factors are identified for the rotation of independent variables and three for the dependent variables.

4. Results and discussions

4.1 Independent variables

Factor analysis was executed to determine GSCM practices (Independent variables) using the method of maximum likelihood analysis with varimax rotation. Five factors were extracted, and the total variance extracted also presented in Table 3.

Table 3

The total variance of GSCM practices

Factor	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	5.560	22.241	22.241	2.970	11.881	11.881	4.522	18.088	18.088
2	3.801	15.205	37.446	3.447	13.788	25.668	2.528	10.110	28.198
3	2.916	11.663	49.109	3.207	12.826	38.495	2.516	10.064	38.261
4	1.990	7.959	57.068	2.249	8.996	47.490	2.268	9.074	47.335
5	1.104	4.415	61.483	1.206	4.824	52.314	1.245	4.979	52.314

As displayed in Table 3 Kaiser Criterion (Eigenvalue >1) is satisfied by five-factor. These five factors contribute 61.483% of the total variance. Fig. 2 rotated factor matrix represents the correlation between variables and their factors. Research results demonstrated that GP2, GP3, GP4, and GP5 have strongly correlated with factor 1 than other factors, therefore factor 1 shows the variable of green practices. Factor 2 indicates the environmental education variable, EE1, EE2, EE3, and EE4 have strongly correlated with factor 2. So, besides, factor 3 represents the investment recovery variable because IR1, IR2, IR3, and IR4 have a strong correlation with factor 3. Factor 4 indicates internal environmental management and factor 5 have a strong relationship with green manufacturing and remanufacturing. Additionally, Cronbach's alpha of these five factors is 0.84, 0.844, 0.759, 0.810, and 0.805 respectively, as shown in fig. 2 indicates that the construct chosen for the study is reliable.

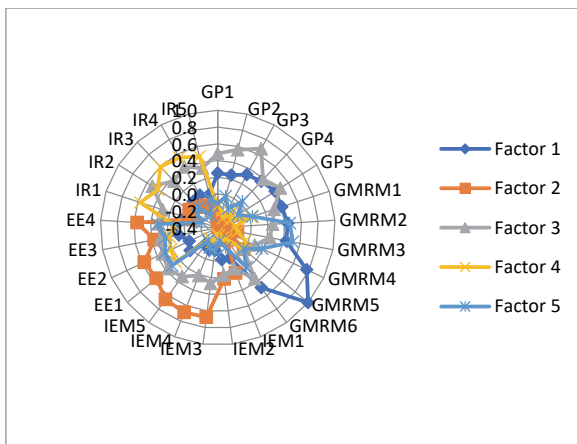


Fig. 2. Rotated factor matrix (varimax rotation)

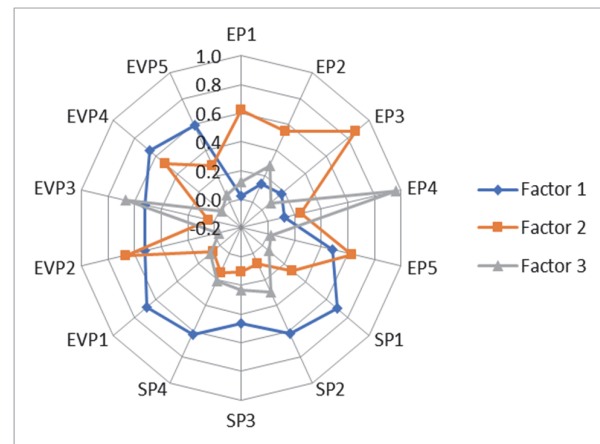


Fig. 3. Rotated Factor Matrix (varimax rotation)

4.2 Dependent variables

The performance indicators (dependent variables) of an organization are shown in Table 3. These items present the performance of firms. Factor analysis was conducted to determine GSCM performance (dependent variables) using the method of maximum likelihood analysis with varimax rotation. Three factors were extracted for GSCM performance. Table 4 reveals that maximum likelihood extracted three factors for GSCM performance with Eigen values >1. These three factors explain 66.144% of the variance in data.

Table 4
The total variance of performance indicator

Factor	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	5.962	42.588	42.588	2.476	17.688	17.688	3.593	25.667	25.667
2	1.843	13.164	55.752	4.231	30.221	47.909	2.829	20.208	45.874
3	1.455	10.392	66.144	1.384	9.883	57.793	1.669	11.918	57.793

Fig. 3 rotated matrix represents the correlation between performance indicators of GSCM performance. The result points out that SP1, SP2, and SP4 confirm strong correlations with factor 1; therefore factor 1 represents the social performance. Similarly, Economic performance and environmental performance have strong correlations with factors 2 or 3 as shown in Fig 2.

4.3 Regression analysis

After determining GSCM practices and performance regression analysis is used to test the proposed hypothesis to verify the relationship between the independent and dependent variables.

4.3.1 Environmental performance

Table 5 presents the result of 1st proposed hypothesis regarding Environmental performance how the implementation of GSCM practices influences environmental performance. Proposed Hypothesis 1a, 1b, 1c, 1d, and 1e hypothesize implementation of GSCM practices has a positive effect on environmental performance. Table 5 shows that the all GSCM practices have a significant positive influence on Environmental performance because all dimensions P-value is less than 0.05 with a positive beta value of Green purchasing 0.290, Green manufacturing and Remanufacturing 0.305 Internal environmental management 0.148 Environmental education 0.173, and Investment recovery 0.210. The result of this study found that the proposed hypotheses 1a, 1b, 1c, 1d, and 1e are supported. Therefore, organizations can increase their environmental performance by increasing these practices.

Table 5
Regression analysis of environmental performance

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Results
	B	Std. Error	Beta			
GP	.290	.081	.291	3.597	.000	Accepted
GMRM	.305	.083	.295	3.664	.000	Accepted
IEM	.148	.073	.139	2.012	.046	Accepted
EE	.173	.072	.165	2.414	.017	Accepted
IR	.210	.075	.184	2.802	.006	Accepted

a. Dependent Variable: EVP

4.3.2 Economic performance

Economic performance is considered the second variable of performance. According to the proposed hypothesis, GSCM practices positively influence on economic performance. Therefore, proposed Hypotheses 2a, 2b, 2c, 2d, and 2e hypothesize the implementation of GSCM practices has a positive effect on economic performance. Table 6 result shows that P-value 0.00, 0.00, and 0.001 which is less than 0.05 of Green purchasing, Green manufacturing & remanufacturing, and Environmental education is highly significant with a positive beta value of 0.396, 0.406, and 0.208. Therefore, hypothesis 2a, 2b, 2d are supported for this particular GSCM practices. Internal environmental management and Investment recovery have a negative beta for economic performance. Therefore, the proposed hypothesis 2c and 2e are rejected for this particular GSCM practices. Table 7 presents the result for implementation of GSCM practices on social performance proposed Hypothesis 3a, 3b, 3c, 3d, and 3e hypothesize implementation of GSCM practices have a positive influence on social performance Table 7 results show that the beta value of Green purchasing 0.276, Green manufacturing and Remanufacturing 0.322, internal environmental management 0.193 and Environmental education 0.250 indicates a positive correlation with social performance. The P-value of Green purchasing is 0.001, Green manufacturing 0.000, internal environmental management 0.013, and Environmental education is 0.001 which is less than 0.05, therefore the hypothesis 3a,3b,3c,3d are accepted. Finally, positive beta value 0.116 demonstrated that Investment recovery positively correlated with social performance, and P-value 0.141 which is greater than 0.05 hence hypothesis 3e is not supported.

Table 6
Regression Analysis of economics performance

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Results
	B	Std. Error	Beta			
GP	.290	.081	.291	3.597	.000	Accepted
GMRM	.305	.083	.295	3.664	.000	Accepted
IEM	.148	.073	.139	2.012	.046	Accepted
EE	.173	.072	.165	2.414	.017	Accepted
IR	.210	.075	.184	2.802	.006	Accepted

a. Dependent Variable: EVP

4.3.3 Social performance

Table 7
Regression analysis of social performance

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Results
	B	Std. Error	Beta			
GP	.276	.084	.268	3.274	.001	Accepted
GMRM	.322	.087	.300	3.684	.000	Accepted
IEM	.193	.077	.175	2.510	.013	Accepted
EE	.250	.075	.231	3.329	.001	Accepted
IR	.116	.078	.098	1.479	.141	Rejected

Dependent Variable: SP

5. Conclusions

In a developing country, the objective of industrial is to improve their economic performance while considering environmental sustainability. Implementation of GSCM practices in an organization is a relatively new concept in Pakistan. This research has contributed to investigate the relationship between GSCM practices and the organization's sustainability performance. GSCM practices on the three performance indicators (economics, social, and environmental) are analyzed. These appropriate green practices will enable the organization to strengthen the performance. The industrial sector is shaky to implement green practices. The findings of this research show that implementation of all green supply chain management practices has a significant positive impact on environmental performance and lead to environmental improvement. However, GSCM dimensions are also affecting positively on social performance. In this study, only three of five GSCM dimensions were correlated with economic performance. It may be due to the reason that the initiative of GSCM has usually required huge investment which may negatively impact on Pakistani organization because of newly implementing green practices. The results of this study will motivate the organization to implement green practices that can minimize environmental pollution, cost-effective, and improve social performance as well.

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