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A linear regression approach to evaluate the green supply chain management impact on industrial organizational performance

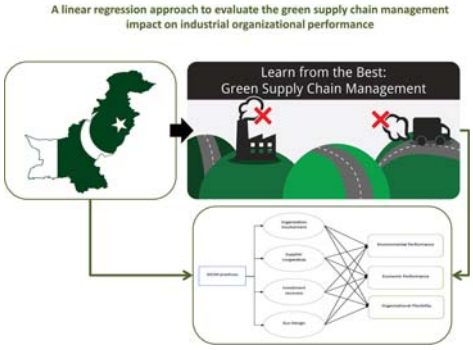
Ubaidullah Mumtaz [a], Yousaf Ali [b], Antonella Petrillo [c,*]

[a] Master in Engineering Management, Faculty of Management Sciences, Ghulam Ishaq Khan Institute of Engineering Sciences and Technology, Pakistan
[b] Department of Management Science & Humanities, Ghulam Ishaq Khan Institute of Engineering Sciences & Technology, Topi, Swabi, KPK, Pakistan
[c] University of Naples "Parthenope", Department of Engineering, Isola C4, Centro Direzionale Napoli, Italy

HIGHLIGHTS

- Developed a linear regression framework regarding GSCM and firm performance
- Provided empirical evidence on relationship between GSCM and performance practices
- Analysis of GSCM practices in the industrial sector of Pakistan
- Findings of this paper show that GSCM leads to green innovation.

GRAPHICAL ABSTRACT



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ABSTRACT

The increase in the environmental pollution is one of the most important topic in today's world. In this context, the industrial activities can pose a significant threat to the environment. To manage problems associate to industrial activities several methods, techniques and approaches have been developed. Green supply chain management (GSCM) is considered one of the most important "environmental management approach". In developing countries such as Pakistan the implementation of GSCM practices is still in its initial stages. Lack of knowledge about its effects on economic performance is the reason because of industries fear to implement these practices. The aim of this research is to perceive the effects of GSCM practices on organizational performance in Pakistan. In this research the GSCM practices considered are: *internal practices*, *external practices*, *investment recovery* and *eco-design*. While, the performance parameters considered are: *environmental pollution*, *operational cost* and *organizational flexibility*. A set of hypothesis propose the effect of each GSCM practice on the performance parameters. Factor analysis and linear regression are used to analyze the survey data of Pakistani industries, in order to authenticate these hypotheses. The findings of this research indicate a decrease in environmental pollution and operational cost with the implementation of GSCM practices, whereas organizational flexibility has not improved for Pakistani industries. These results aim to help managers regarding their decision of implementing GSCM practices in the industrial sector of Pakistan.

* Corresponding author.
E-mail addresses: yousafkhan@giki.edu.pk (Y. Ali), antonella.petrillo@uniparthenope.it (A. Petrillo).

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1. Introduction

Environmental pollution is a growing concern all around the world. The increase in greenhouse emissions has an adverse effect on the environmental integrity of the planet (Wang and Song 2017). The major cause of environmental degradation is the increase of industrialization around the world. In 2016 there has been a significant rise in pollution, Pakistan is among the worst 30 counties which are affected by air pollution. In addition Pakistan has two of its cities in the top 10 most polluted cities of the world (Vidal 2016). This is having an adverse effect on the climatic conditions of the country. On the other hand, Pakistan is a developing country and the progress of industrialization is a strategic issue for the economic growth of the country.

In this year, to balance both economic and environmental performance the managerial approach of green supply chain management (GSCM) has been developed (De Felice et al. 2013). The concept of GSCM aims to integrate environment thinking into supply chain management, as highlighted by several authors (Chang et al. 2018; Chin et al. 2015; Srivastava 2007). Industries all over the world are implementing GSCM techniques to address the problem of environmental degradation. In most of the developed counties GSCM is a well-known concept, and is being implemented with great success. In Pakistan the concept of GSCM is relatively new and its implementation is contradictory. In fact, on one side the social pressures are forcing industries to implement these practices as the environmental pollution has become a growing concern in Pakistan. But at the same time, there is a general fear concerning how these factors will affect the economic performance.

For the above reasons it is important to develop a sustainable development of the industrial sector identifying GSCM practices as pointed out by some other authors among which is worthy to note Nidumolu et al. 2009 and Markley and Davis, 2007. Addressing the environmental aspect helps in recognizing new opportunities, which leads towards competitive advantage (Choi and Hwang, 2015). Instigating policies such as recycle of waste, reuse of material, cleaner production, and waste management can help in accomplishing the environmental objectives. It has been proved that GSCM can be an important element in the improvement of general performance of an organization with an additional benefit on improving market competition (Sarkis, 2006; Chan et al. 2012). Adopting GSCM and the combination of *internal factors* (i.e. organizational support) with *external factors* (i.e. supplier support, and collaboration) is very productive for the global performance of a manufacturing organization (Cheng et al. 2008). In other words, the implementation of GSCM has both monetary and non-monetary benefits (Geffen and Rothenberg 2000; Seuring and Müller 2008).

In Pakistan, the lack of research on GSCM and its impact on the organizational performance is the reason why only a small portion of the companies is implementing these practices. Thus, the aim of this research is to evaluate the performance of an organization after implementing GSCM practices. For this purpose, in the present research, the Pakistani industries implementing GSCM have been considered in order to evaluate the influence of GSCM on the financial, and environmental performance. In detail, four dimensions have been analyzed, i.e. *organizational involvement*, *supplier cooperation*, *investment recovery*, and *eco-design*. The effect of these dimensions has been evaluated on the economic and environmental performance of the industries in Pakistan. The motivation behind the study is due to awareness that there has been an increase in metal contamination of surface soil in the industrial city of Sialkot, increase in the concentration of Cadmium (Cd), Nickel (Ni), chromium Cr), zinc (Zn) and lead (Pb) has been highlighted (Malik et al. 2010).

The rest of the paper is organized as follows: Section 2 identifies the relevant literature review; in Section 3 the hypothesis of the research are defined; Section 4 describes the materials and methods proposed; Section 5 explains data analysis; Section 6 discusses the results of the study and finally in Section 7 main benefits of the study are summarized.

2. Literature review

Industrialization plays an important role in the economic progression of a country. But it is responsible of environmental impacts. In the current industrial environment, GSCM is being considered as an important "philosophy" in order to improve profits while reducing the negative impact of industrial processes on the environment. GSCM practices are linked to the concept of "*Industrial Ecology*" (Graedel and Allenby, 2003). Industrial Ecology was defined by Lowe as "*a systematic organizing framework for the many facets of environmental management. It views the industrial world as a natural system - a part of the local ecosystems and the global biosphere. Industrial ecology offers a fundamental understanding of the value of modeling the industrial system on ecosystems to achieve sustainable environmental performance* (Lowe 1993)."

GSCM practices performed by an organization, also known as the internal practices are considered serious for the improvement of organizational performance. Managing the internal factors lead to the improvement of organization's environmental performance (Zhu et al. 2008c). External factors such as customer and suppliers involvement, are studied as factors affecting organizational performance. Developing connections with external influences such as the government, suppliers, customers and even competitors lead to superior environmental supply chain performance (Carter and Ellram 1998; Choudhary et al. 2017) In addition to the internal and external factors, the product must be designed such that the waste is reduced and can be recycled.

Various organizations are trying to implement GSCM (Ashton et al. 2017; Kirchoff et al. 2016). ISO 14001 environmental principles plays an important role in integrating GSCM into the organization's policies (Savita et al. 2016). According to several researchers (Green Jr et al. 2012; Linton et al. 2007; Preuss 2000), due to the increased environmental impacts, organizations are now focusing on the supply chain management. "*Environmental supply chain management*" as a process where products or services are produced by green processes in order to fulfill the customer demands (Seuring 2001). The implementation of GSCM can help an organization to gain competitive advantage over its competitors (Sen 2009; Barratt and Oke 2007; Handfield et al. 1997).

Numerous studies have been conducted to recognize the factors that assist or prevent the implementation of GSCM (Diabat and Govindan 2011; Nishat Faisal 2010). In 2018, Lie and Ho analyze six factors that influence the intention to adopt green innovations for logistics service providers. The determinant factors include technological, organizational and environmental dimensions (Lin and Ho 2008). While, in 2009 Bin and Jun propose a model in which various factors of a green supply chain are investigated, and their effect on all the production process are analyzed (Bin and Jun, 2009). Lee (2008) states that customer impact, government association, and green supply chain alertness are the main forces that helped in implementing GSCM practices (Lee 2008). In 2010, Hu and Hsu, identify twenty critical factors for implementing GSCM. The critical factors are grouped into four dimensions: (1) supplier management, (2) product recycling, (3) organization involvement, and (4) lifecycle management (Hu and Hsu 2010). Afterwards Shang et al. (2010) propose a Factor Analysis technique to reduce the number of critical factors to six.

A different point of view is proposed by Zhu et al., (2008b). In their study investigate GSCM practices implementation among Chinese manufacturers. After, in 2012, Zhu et al., investigate the effect of GSCM practices in China by considering ISO 14001 certification and eco-labeling. Green supply chain initiatives among certified companies in Malaysia and environmental sustainability is analyzed by Eltayeb et al. (2011). A GSCM model using a multi criteria approach based on Analytical Network Process (ANP) is proposed by Büyüközkan and Çifçi (2012). Similarly, Bhattacharya et al. (2014) use a multi criteria model based on fuzzy ANP) and balanced scorecard to measure green supply chain performance. Green Jr. et al., (2012) use a structural equation model to verify the performance of GSCM practices in US manufacturing companies, concluding that GSCM has a positive effect on economic, environmental,

and operational performance. A natural resource model based on GSCM is conceptualized by Cucciella et al., (2012) in order to define relevant performance measures and drivers. Interesting analysis is proposed by González-Torre et al., (2010). Their study points out that in order to implement GSCM, companies had to overcome their internal organizational barriers, such as absence of support from managers or lack of environmental knowledge. In addition, both Zhu et al., (2008a) and Ramus and Steger (2000) emphasize that an organization must have strong internal resources, such as commitment from senior managers, in order to implement the GSCM effectively. Of course, as highlighted by other authors (Bowen et al. 2001; Carter et al. 1998; Wu et al. 2012) also middle-level managers are considered vital in implementing GSCM by communicating with cross-departmental environmental operations.

All the research analyzed reveals interesting insights, but at the same time highlight the importance of developing analysis in relation to the national context. Our research, differently from the analyzed documents, aims to propose a systematic approach to evaluate the green supply chain management impact on industrial organizational performance within the Pakistani context, where scientific literature is poor.

3. Hypothesis development

3.1. GSCM practices and environmental performance

The previous literature analysis shows a perception of a positive relation between the GSCM practices and environmental performance (Geffen and Rothenberg 2000; Vachon 2007). Based on the existing literature in the present research it is assumed that implementation of GSCM practices ensures a reduction of environmental impacts, that represents a point of strength for an organization. The control of hazardous waste, reduction of solid waste and the use of green raw materials together with support of the organization ensure to reduce the level of environmental pollution. Hence the first set of hypothesis recommended is defined as follows:

Hypothesis 1a. Internal GSCM practices have a negative impact on the environmental pollution.

Hypothesis 1b. External GSCM practices have a negative impact on the environmental pollution.

Hypothesis 1c. Investment Recovery has a negative impact on the environmental pollution.

Hypothesis 1d. Eco-Design has a negative impact on the environmental pollution.

It is worthy to specify that "negative" is to be intended has a decrease in the performance parameters.

3.2. GSCM practices and economic performance

The existing literature reveals that there is a conflicting point of view regarding the improvement of economic performance after the implementation of GSCM practices (Seuring and Müller 2008). For example Rao and Holt claim that the GSCM practices improve the economic performance within an organization (Rao and Holt 2005). Whereas, others have proposed that GSCM practices have no effect on the economic performance of an organization especially in the short term (Bowen et al. 2006). More important it is to be noted that some researchers consider the lack of comprehensive relationship between implementation of GSCM practice and economic performance as a potential barrier (Stefan and Paul 2008). These conflicting views about how GSCM practices effect economic performance postulate. The economic performance of an organization can be improved if their operation costs are reduced. Henceforth the second set hypothesis is suggested, as follows.

Hypothesis 2a. Internal GSCM practices have a negative impact on the operational cost.

Hypothesis 2b. External GSCM practices have a negative impact on the operational cost.

Hypothesis 2c. Investment Recovery has a negative impact on the operational cost.

Hypothesis 2d. Eco-Design have a negative impact on the operational cost.

The negative impact of GSCM parameters specifies that operation cost decrease if these practices are implemented.

3.3. GSCM practices and organizational flexibility

Organizational flexibility is considered as one of the performance indicators of GSCM. Organizational flexibility refers to the ability of an organization to adjust with the instabilities of the market (Suarez et al. 1995). The existing literature gives a perception of a positive relationship between implementation of GSCM practices and organizational flexibility. According to Vijayvargh and Agarwal (2014), executing the internal and external GSCM practices help in achieving improved organizational flexibility. In addition, Jin Sung Rha state that internal, external and eco-design as the GSCM practices have a positive impact on organizational flexibility. While, Skinner, in his research mentioned flexibility as one of the most well-known performance indicator (Skinner 1969). Therefore based on the existing literature it can be assumed that GSCM practices have a positive impact in organizational flexibility, hence the following set of hypothesis are proposed.

Fig. 1. Research model and hypothesis.

Table 1
Factors of GSCM practices.

Dimensions	Variable	Description
Internal	INT 1	Commitment towards GSCM by the senior managers.
	INT 2	Commitment towards GSCM by mid-level managers.
	INT 3	Total quality environment management.
	INT 4	ISO 14001 certification and environmental compliance.
External	EXT 1	Cooperation with suppliers for environmental objectives.
	EXT 2	Environmental audit for suppliers' internal management.
	EXT 3	ISO 14000 certification, consideration of suppliers.
Investment recovery	INV 1	Investment recovery of excess material.
	INV 2	Sale of scrap and used material.
	INV 3	Sale of excess capital equipment.
Eco-design	ECO 1	Design of products such that it reduces consumption of material/energy.
	ECO 2	Design of products for reuses, recycle, recovery of material and component parts.
	ECO 3	Design of products to reduce use of hazardous products.

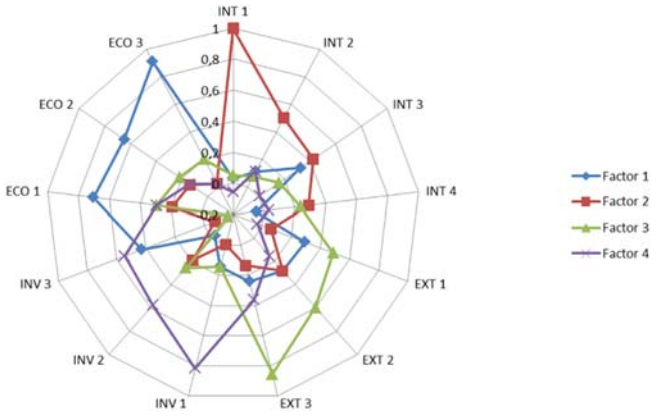

Fig. 2. Results of rotated component matrix (varimax rotation).

Hypothesis 3a. Internal GSCM practices has a positive impact on organization flexibility.

Hypothesis 3b. External GSCM practices has a positive impact on organization flexibility.

Hypothesis 3c. Investment recovery has a positive impact on organization flexibility.

Hypothesis 3d. Eco-design has a positive impact on organization flexibility.

4. Methods

4.1. Scenario under study

In this study the industrial sector of Pakistan is considered in order to examine how GSCM practices are implemented. Due the increase of pollution, the country has faced a drastic climatic change, hence the GSCM policies are becoming an important part of organizational management. In this research three performance measure indicators are considered, i.e. (i) reduction in operational cost, (ii) increase in flexibility, and (iii) reduction in environmental pollution. The research sample has been chosen from industries which are implementing the GSCM practices and that have an ISO 14001 environmental certification. The data collection is started on 15th January 2017. Several industries were considered. Questionnaires were distributed only among individuals who had at least a Bachelor's degree in engineering. This included plant managers, and head of departments, field engineers or maintenance engineers. Industries with employees >500 were selected for the survey (Fig. 1).

4.2. Questionnaire development

The survey questionnaire was developed to collect the relevant research data. Due to the novelty of GSCM practices in Pakistan, a direct (personal) data collection method was preferred over sending the questionnaires online. Hence, the researcher was always present and was able to assist the respondents in case they faced any difficulties or had an ambiguity about the questions. Research supervisor was consulted to review the questionnaire, and changes were made accordingly. Principle component analysis and linear regression are performed to test the suggested hypothesis.

The questionnaire developed for this study includes four GSCM practices: 1) internal practices, 2) suppliers, 2) investment recovery and 4) eco-design. The 4 practices are further divided into ten items. The items are defined according to the current literature on GSCM practices (Zhu and Sarkis 2004); and (Zsidisin and Hendrick 1998). The impact of items was considered on the performance of organizations implementing these practices.

The factors considered for the organizational performance were: 1) the operational cost, 2) flexibility and 3) the environmental pollution (Beamon 1999), (Zhu and Sarkis 2007), and (Zhu and Sarkis 2004).

A direct survey method was preferred over web-based surveys. Although web-based surveys are fairly easier, but due to the novelty of GSCM practices in Pakistan direct surveys were conducted. The data collection took four months. Seventy useable questionnaires were collected, factor analysis was conducted to confirm grouping of the data and finally linear regression was conducted to evaluate the hypothesis generated.

4.3. Factor analysis

Factor analysis was done using IBM SPSS Statistics Software V22.0 in order to confirm the groupings within the data. Kaiser criterion (Eigen value > 1) was used. It helps to identify the number of factors to retain in order to get sensible variance. Factor analysis was conducted for both the dependent and independent variables. Four factors were identified for the rotation of independent variables and three for the dependent variables.

4.4. The results are given in the following sub-sections

4.4.1. Independent variables

The items considered for the independent variables are shown in Table 1.

Table 2
Total variance of factor analysis.

Factor	Initial Eigen values			Extraction sums of squared loadings			Rotation sums of squared loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.337	33.365	33.365	1.79	13.769	13.769	2.295	17.657	17.657
2	1.825	14.036	47.401	3.38	25.997	39.766	1.707	13.134	30.79
3	1.45	11.156	58.557	1.116	8.588	48.354	1.704	13.108	43.899
4	1.135	8.729	67.285	0.998	7.68	56.033	1.577	12.134	56.033

Table 3
Organizational performance indicators.

Dimensions	Variables	Description
Operational cost	Cost1	Total cost increases after GSCM practices
	Cost2	Total manufacturing cost increases after GSCM practices
Flexibility	Flex1	Backorder/stock-out increases after GSCM practices
	Flex2	Customer response time increases after GSCM practices
	Flex3	Manufacturing lead time increases after GSCM practices
Environment pollution	Enviro1	Use of energy/water increases after GSCM practices
	Enviro2	Generation of waste increase after GSCM practices
	Enciro3	Emissions increase after GSCM practices

The factor analysis conducted to confirm the grouping of these factors was done using a maximum likelihood method, followed by varimax rotation.

As shown in Table 2 the Kaiser criterion (Eigen value > 1) is full filled by four factors. These factors contribute towards 67.285% of the total variance.

Fig. 2 shows results of Rotated Component Matrix (varimax rotation). The rotated matrix estimates the correlations between the variables on the left hand side and the factors displayed on the top (in Table 3). Results point out that INT1, INT2, INT3, and INT4 have stronger correlations with factor 2 as compared to other factors, hence factor 2 represents the internal variables of GSCM practices. Similarly, EXT1, EXT2 and EXT3 shows strong correlations with factor 3, therefore external variables are represented by factor 3. By examining the other correlations it is possible to conclude that factor 4 represents investment recovery and factor 1 represents eco-design. The Cronbach's alpha value is calculated for each factors. Alpha value for internal factors is 0.658, external factors are 0.781, investment recovery is 0.718 and for eco-design it is 0.852. Cronbach's alpha signifies the reliability of data, in other words higher is its value higher is the reliability.

4.5. Dependent variables

The items considered for the dependent variable are shown in Table 3. The items represent the performance of an organization.

Factor analysis using maximum likelihood method is conducted in order to verify the grouping of GSCM dimensions. Results are shown in Table 4. Followed by varimax rotation to identify the rotation matrix in order to recognize the grouped factors.

Table 5 verifies that three factors satisfy the Keiser criterion (Eigen value > 1).

These factors contribute towards 68.009% of the total variance. These performance indicating factors are identified with the help of Table 6.

Fig. 3 shows the rotated matrix. Results indicate that the correlations between GSCM performance indicators and the factors identified in Table 5.

In detail, COST1 and COST2 show strong correlations with factor 2; hence factor 2 represents the operational cost. Similarly, flexibility is denoted by factor 3 and environmental pollution is represented by factor 1.

After the identification of GSCM practices and the performance parameters, the next step is to test the suggested hypothesis. This is done using linear regression.

5. Results

Linear regression was used to test the suggested set of hypothesis. It is important to note that the independent variables were the GSCM practices or internal factors, external factors, investment recovery and eco-design. The dependent variables include operational cost, organizational flexibility, and environmental pollution. Regression was used to verify the relationship between the independent and dependent variables. The results are tabulated, and the correlation between the GSCM practices and performance is evaluated.

5.1. Environmental pollution

The first set of hypothesis analyzes how the GSCM practices affect the environmental pollution caused by an organization. Hypothesis 1a, 1b, 1c and 1d postulate a negative relationship between GSCM practices and environmental pollution. Table 5 shows the results and specifies the relationship between the GSCM practices and environmental pollution. The beta values suggest the nature of relationship between the independent and dependent variables. A positive beta value suggests that with increase in GSCM practices the environmental pollution increase, and vice versa.

As shown in Table 5 the internal factors have a beta value of −0.407 and a corresponding *p*-value of 0.001, which indicates that the results are significant. Hence, it is evident a negative relation between the internal GSCM practices and environmental pollution. Therefore, hypothesis 1a is supported. The beta value for external practices is −0.461, with a *p*-value of 0.001, this indicates a strong negative relationship between external GSCM practices and environmental pollution. The result supports hypothesis 1b. A negative beta value of −0.383 and a *p*-value of 0.001 predicts a strong negative relationship between investment recovery and environmental pollution. Hence, proving hypothesis 1c to be correct. Finally, hypothesis 1d is also proved by the results shown in Table 5, a negative beta value of −0.463 and a *p*-value of 0.001 proves a negative correlation. Definitively, all the factors with in the GSCM practices have a negative impact on environmental pollution. Hence, by enhancing these practices, environmental pollution decreases. Thus, the environmental performance of the organization improves.

5.2. Operational cost

The second performance indicator considered is operational cost. The proposed hypothesis suggests a negative correlation between the GSCM practices and operational cost, i.e. with increase in GSCM practices the operational cost has a tendency to decrease. Hence, hypothesis 2a, 2b, 2c, and 2d propose a negative relationship between the GSCM practices and operational cost of an organization. Table 6 presents the results indicating this correlation between the GSCM practice and operational cost. The beta values and the corresponding *p*-values are considered to verify the proposed hypothesis.

The results of linear regression indicate a negative correlation between the internal GSCM practices and the operational cost, with a beta value of −0.250, and a *p*-value of 0.037. This result proves the suggested hypothesis, hence hypothesis 2a is supported. Beta value for

Table 4
Total variance of factor analysis.

Factor	Initial Eigen values			Extraction sun of squared loadings			Rotation sums of squared loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.026	37.831	37.831	2.592	32.395	32.395	1.486	18.575	18.575
2	1.364	17.050	54.881	0.905	11.312	43.707	1.432	17.901	36.476
3	1.050	13.128	68.009	0.643	8.040	51.748	1.222	15.271	51.748

Table 5
Linear regression table for environmental pollution.

Model	Unstandardized coefficients		Standardized coefficients	t	Sig.
	B	Std. error	Beta		
Internal	−0.440	0.120	−0.407	−3.676	0.001
External	−0.360	0.084	−0.461	−4.288	0.001
Investment recovery	−0.317	0.093	−0.383	−3.416	0.001
Eco-design	−0.257	0.060	−0.463	−4.303	0.001

the external factors is −0.322 with a corresponding *p*-value 0.001 indicating a negative correlation between external GSCM practices and operational cost. This proves hypothesis 2b. A beta value of −0.158 indicates negative correlation between investment recovery, however a *p*-value of 0.192 advocates that his relationship is inconsequential hence hypothesis 2c is rejected. Finally, negative correlation between eco-design is suggested due to a beta value of −0.334. *P*-value of 0.005 demonstrates a significance of this result, hence hypothesis 2d is supported. Three of the suggested four hypotheses are supported. The results show that internal, external and eco-design have a significant negative effect on operational cost, whereas the effect of investment recovery is not considered significant. Definitively, GSCM practices helps organizations to reduce their operation cost.

5.3. Organizational flexibility

The final performance indicator suggested is organizational flexibility. The posit hypothesis, 3a, 3b, 3c, and 3d suggest a positive relationship between GSCM practices and organizational flexibility. This means that with the development of GSCM practices an organization's ability to cope with a fluctuating environment increase. The hypothesis can be verified by analyzing the regression results presented in Table 7.

Internal GSCM practices are considered first. The results indicate a beta value of −0.157 and a *p*-value of 0.195. Having a *p*-value >0.05, the results are determined to be not statistically significant, therefore the hypothesis 3a is rejected. External GSCM practices has a beta value of −0.322, and a *p*-value of 0.007. Even though the *p*-value is <0.05, the beta value indicates a negative correlation between external GSCM practices and flexibility whereas the hypothesis suggest a positive relationship, thus hypothesis 3b is rejected. Considering the relationship between investment recovery and flexibility, the results indicate a negative beta value and a *p*-value > 0.05 concluding the results to be not statistically significant. Therefore hypothesis 3c is rejected. Finally, the results for eco-design indicate a beta value of 0.010, this beta value specifies a positive correlation between eco-design and flexibility, but a *p*-value > 0.05 (0.993) invalidates this relationship, hence hypothesis 3d is also rejected. The results confirm that none of the suggested hypothesis is supported, hence we can propose that GSCM does not improve organizational flexibility in the industries of Pakistan.

The discussion above explained the results, and predicted whether the hypothesis suggested were supported or rejected. The decisions were made by considering the beta and *p*-values. *P*-values suggest whether the effect of independent variables on the dependent is significant or not. It helps in accepting or rejecting the null hypothesis. The second important factor to consider is the beta value. The results of this study indicate that most of the beta values are negative. This negative sign proves that with increase in independent variable, there will be a decrease in the dependent variable.

6. Discussion

In this research the GSCM practices were divided into four dimensions, internal factors, external factors, investment recovery and eco-design. The internal factors specify an organization's commitment towards GSCM, it includes factors such as commitment from senior and mid-level managers, total environmental quality management and ISO 14001 certification. The second dimension considered, is related to the suppliers of an organization. To make sure that GSCM practices are implemented, cooperation with suppliers is vital. The third dimension is investment recovery, this includes the sale of excess material or scrap, which if not sold might end up in landfills causing an increase in solid waste. The fourth dimension is eco-design. This dimension focuses on the environmental performance ~~on~~ of an organization. In this research the effect of GSCM on operational cost is considered. Finally the flexibility of an organization is also considered. Backorder, manufacturing lead time and customer response time are considered.

Three sets of hypothesis are suggested in order to comprehend the effects of GSCM practices on organizational performance. The organizational performance is perceived by testing the effect of GSCM practices on operational cost, organization's flexibility and environmental pollution.

The first set of hypothesis is associated to the environmental pollution. Effect of the four dimensions is considered towards environmental pollution, the positive hypothesis predict a negative relation between implementation of GSCM practices and environmental pollution. The results analyzed in the previous section confirm that all the four dimensions are negatively related to environmental pollution. The negative beta value and *p*-values < 0.05 proves that the suggested hypothesis are true. Hence, it is possible to conclude that GSCM practices reduce the environmental pollution and sequentially improves the environmental performance. These results are consistent with the results of (Lee and Klassen 2008) and (Cucciella et al. 2012). Hence, we can postulate that implementation of GSCM practices in Pakistani organizations will also reduce environmental pollution.

The second set of hypothesis suggests a negative relationship between GSCM practices and operational cost. The results from the previous section confirm that three of the GSCM practices have a negative impact on operational cost. These practices are identified as internal, external and eco-design. The negative beta values validate this perception. The results identified that investment recovery does not have a significant effect on the operational cost. A *p*-value > 0.05 confirms this, hence the hypothesis perceiving a negative relation of investment recovery to

Table 6
Linear regression table for operational cost.

Model	Unstandardized coefficients		Standardized coefficients	t	Sig.
	B	Std. error	Beta		
Internal	−0.199	0.094	−0.250	−2.129	0.037
External	−0.280	0.061	−0.485	−4.568	0.001
Investment recovery	−0.097	0.073	−0.158	−1.316	0.192
Eco-design	−0.137	0.047	−0.334	−2.926	0.005

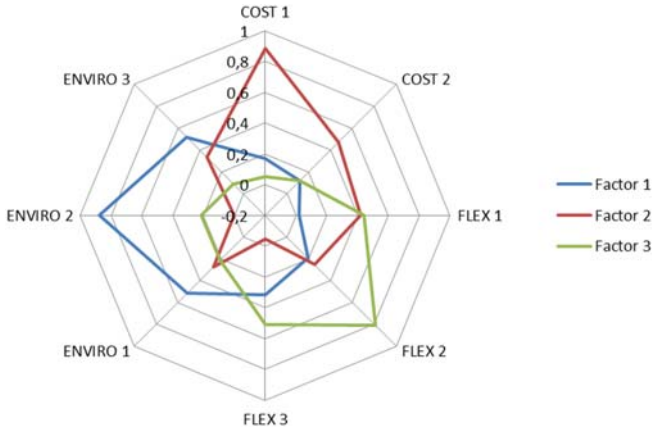

Fig. 3. Results of rotated component matrix.

operational cost is rejected. Therefore, three of the hypotheses are supported in the second set, we can conclude that GSCM practices helps in reducing the operational costs this will also result in improvement of the financial performance as well, these operational costs concentrate on the total cost of an organization and also the manufacturing cost. These results are also supported by the work of some previous researchers, (Cucchiella et al. 2012). Whereas some researchers have a mixed opinion concerning the effect of GSCM practices. It was concluded that eco-design and investment recovery are not positively related to the financial performance (Green Jr et al. 2012). Although there are mixed opinions among the researchers regarding how GSCM practices effects the firm performance, the results of this study concludes that operational cost will be prone to reduce, from this result we can perceive that the financial/economic performance of the organization will also improve.

The third and final set of hypothesis perceives that GSCM practices have a positive effect on organizational flexibility. Organizational flexibility refers the ability to cope with the changing demands of customers. It includes factors such as eliminating backorders, i.e. when a customer orders a product when it is out of stock. In addition to this it includes factors such as delivering to the customers on time, and improving the manufacturing lead time, lead time refers to the time delay between when the order is received and when it is delivered. Improving the organizational flexibility will also have a positive effect on customer satisfaction. The results of this study show that organizational flexibility does not improve with the implementation of GSCM practices. These results are contrast with to those presented by Jin Sung Rha, his work observed a positive effect of GSCM practices on performance (Rha 2010).

Whereas, there is no significant effect of GSCM practices on organizational flexibility, except external factors, which have a negative effect on it. The results of this study are generally consistent with the existent literature.

In addition to this GSCM is a novel concept in Pakistan, which is the foremost cause of slight inconsistency in the results.

The main results of the study are summarized in Table 8.

Table 8
Summary of all the hypothesis.

Hypothesis	Description	Result
H1a	Internal GSCM practices has a negative impact on the environmental pollution.	Supported
H1b	External GSCM practices has a negative impact on the environmental pollution.	Supported
H1c	Investment Recovery has a negative impact on the environmental pollution.	Supported
H1d	Eco-Design has a negative impact on the environmental pollution.	Supported
H2a	Organizational Involvement has a negative impact on the operational cost.	Supported
H2b	External Cooperation has a negative impact on the operational cost.	Supported
H2c	Investment Recovery has a negative impact on the operational cost.	Rejected
H2d	Eco-Design has a negative impact on the operational cost.	Supported
H3a	Internal GSCM practices have a positive impact on organizational flexibility.	Rejected
H3b	External GSCM practices have a positive impact on organizational flexibility.	Rejected
H3c	Investment recovery GSCM practices have a positive impact on organizational flexibility.	Rejected
H3d	Eco-design GSCM practices have a positive impact on organizational flexibility.	Rejected

7. Conclusion

The aim of most manufacturers in developing countries such as Pakistan is to improve their economic condition, and avoid economic risk However, due to the current environmental conditions of the planet, environmental sustainability has become a vital aspect to consider. Therefore, organizations are trying to implement practices to ensure both economic and environmental progress. GSCM practices are one way to ensure that economic and environmental progress concurrently. GSCM is a novel concept in Pakistan, the fear of economic insecurity is the main reason industrial organizations are anxious to implement these practices. Thus, this research shows, through an analysis conducted in Pakistani companies, how various GSCM practices affect organizational performance. The GSCM practices considered in this research are internal, external, investment recovery and eco-design. The organizational performance parameters considered are environmental pollution, operational cost and organizational flexibility. The results of this study indicate a relationship between GSCM practices and organizational performance. This study provides an insight that GSCM can help manufacturers to improve their organizational performance. It helps managers by explaining the interrelationships of GSCM practices and organizational performance. For instance the results of this research perceive that by implementing GSCM practices organizations can reduce environmental pollution and operational cost as well. From these results we can perceive that the organizational performance will also improve. These results will encourage organizations to implement the GSCM practices in Pakistan, furthermore the results helps organizations to acknowledge the benefits of GSCM. This will motivate organizations to embrace GSCM, which will help to improve both the economic and environmental performance. In addition to this the results also prove the

Table 7
Linear regression table for organizational flexibility.

Model	Unstandardized coefficients		Standardized coefficients	t	Sig.
	B	Std. error	Beta		
Internal	−0.194	0.149	−0.157	−1.308	0.195
External	−0.289	0.103	−0.322	−2.805	0.007
Investment recovery	−0.213	0.113	−0.224	−1.896	0.062
Eco-design	0.007	0.078	0.010	0.085	0.933

perception that environmental pollution decrease with GSCM practices. Hence, the objective of protecting both economic and environmental sustainability can be achieved by implementing the GSCM practices.

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