Green Supply Chain Management and CSR: An Empirical Analysis of Sustainable Practices

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Abstract

The growing significance of sustainability has prompted organizations to integrate green supply chain management (GSCM) practices into organizational strategies to remain sustainability-driven as well as stay compliant with Corporate Social Responsibility (CSR). However, there is a lack of concrete empirical evidence on the impact of these green initiatives on CSR, particularly within the bounds of Pakistan. Thus, this study aims to analyze the impact of Green Supply Chain Management (GSCM) practices, including sustainable product design, reverse logistics, and green manufacturing, on firm's Corporate Social Responsibility (CSR) through a structured survey questionnaire. The research considered convenience-sampling technique to collect data from the employees of organizations belonging to different sectors from Karachi. The sampling size is 310 and the data collected has been tested through Smart PLS analysis tool. Research findings suggests that social performance mediates the relationship between corporate social responsibility and sustainable practices like reverse logistics, sustainable product design, and green manufacturing, with eco-design strengthening the relationship between social performance and corporate social responsibility. This study contributes to the growing body of literature on GSCM by providing a comprehensive understanding of its relationship with CSR as well as emphasizing the importance of adopting integrated green practices to achieve sustainability objectives and enhance corporate reputation. In future research, other variables can also be used such as green purchasing, green packaging, and environmental sustainability etc.

Keywords: *Green Supply Chain Management (GSCM), Corporate Social Responsibility (CSR), sustainable product design, reverse logistics, green manufacturing, eco-design, social performance, sustainability strategies, green practices, environmental sustainability.*

Introduction

The rate of issues such as environmental pollution, global warming, and absence of non-renewable resources has been growing; in response to these pressing issues, organizations around the globe, the corporate world and their stakeholders have increasingly been concerned about the environment as well as ensuring compliance with their corporate social responsibility (CSR) (Micheli et al., 2020). Corporate social responsibility (CSR) entails three dimensions: internal, external, and environmental responsibilities. The internal perspective on CSR is centered on employee wellbeing (workplace safety, health benefits, etc.) to enhance their quality of life. External responsibilities of firms, on the other hand, focus on recognizing and addressing the social issues of communities and societies with effective solutions. The environmental responsibilities of the organizations are determinant on reducing emissions of harmful gases such as carbon dioxide gases (CO2), reducing wastage of natural resources such as water, energy, and power, lessening the consumption of paper, and increasing the preservation of natural resources (Mughal et al., 2023).

Firms are likely to remain competitive and stay on the path toward sustainability with the initiation and incorporation of green supply chain management practices (GSCM) into their operations (Micheli et al., 2020). The increasing awareness about environmental degradation, depletion of natural resources, and social inequalities, combinedly have affected how organizations plan and align their daily operations with sustainable and green practices (Mughal et al., 2023).

The adoption of green supply chain management activities such as waste reduction and resource optimization allow firms to better their social responsibility all while focusing on the well-being of employees, customers, and the border community; just as well as minimizing their environmental footprint (Holling & Backhaus, 2023). GSCM practices combined with technological advancements and collaboration among stakeholders, also help firms achieve their CSR objectives, maintain competitive advantage, and align their business operations with global sustainability goals so that they can work upon improving their corporate image all while positively influencing the brand loyalty among key stakeholders (Nguyen, 2023).

Research Objectives & Questions

Green supply chain management brings about improvement in firms' CSR activities in terms of environmental concerns as well as economic and community welfare (Zhang et al., 2023). To diligently satisfy their stakeholders, maintain regulatory compliance and reinforce CSR initiatives, organizations need to practice GCSM (Susitha, 2023). However, the association between GCSM and corporate social responsibility is subject to challenges unique to each industry (Wiredu et al., 2024). Strategic implementation of GCSM initiatives to meet CSR goals in various fields requires a deeper understanding. Pertaining to the following questions, the present study is directed at determining the link between GCSM application and subsequent CSR outcome.

i. What can be the impact of GSCM practices such as sustainable product design, reverse logistics and green manufacturing on Corporate Social Responsibility (CSR)?

ii. What can be the impact of social performance as a mediator between reverse logistics and corporate social responsibility?
iii. What can be the impact of social performance as a mediator between sustainable product design and corporate social responsibility?
iv. What can be the impact of social performance as a mediator between green manufacturing and corporate social responsibility?
v. What can be the impact of eco-design as a moderator between social performance and corporate social responsibility?

In regard to these questions, systematic analysis of importance of GCSM and how it's various functions influence CSR must be undertaken, thereby offering practical and data-driven strategies to meet goals like sustainability and social responsibility. Appraisal as to whether the connection between independent variables (reverse logistics, sustainable product design, and green manufacturing) and the dependent variable (corporate social responsibility) is modified by social performance, and whether eco-design variables act as moderating variable between social performance and corporate social responsibility are also explored through this study.

Literature Review

Corporate Social Responsibility

Corporate Social Responsibility (CSR) is a business approach that integrates social and environmental considerations into a company's operations and interactions with stakeholders. It reflects the responsibility of businesses to make positive contributions to society while reducing adverse impacts on the environment and communities. Practicing ethics, involving the community, creating environmental sustainability, creating economic accountability, and making sure that companies balance profitability with societal well-being, are the core of maintaining a good corporate social responsibility (Xu et al., 2022).

Companies take conserving environmental initiatives to reduce the footprints of their businesses through sustainable practices, while for ethical responsibility companies make sure to be fair and maintain integrity. Charitable activities and community support are usually undertaken by companies to aid for societal betterment. Economic accountability is held by companies to create a balance between profitability and the welfare of stakeholders (Dzage et al., 2024). CSR has now played a very crucial part in businesses, ensuring stakeholders societal and environmental concerns. Companies that undertake CSR take huge benefits from an improved reputation and public perception which creates stronger brand loyalty. This marks the competitive edge and stands out among competitors while maintaining or preserving the society and environment. Engaging in CSR also helps businesses mitigate risks by ultimately avoiding the potential legal and ethical risks associated in businesses (Xu et al., 2022).

CSR and Green Supply Chain Management are the two drivers aiming to the mutual goal. GSCM and CSR gained significant attention in sustainable business practices. GSCM focuses on adopting practices that will conserve the environment and aids to the society across the supply chain, which

is same focused by CSR that to maintain a good corporate image undertaking practices that are beneficial for society and environment (Weng et al., 2020).

Sustainable Product Design

Sustainable product design means curating products that create a balance between social and environmental responsibility and maintaining good economies. The aim is to minimize harm to the environment and improve the quality of life of living things. This approach originated in the Triple Bottom Line (TBL) framework, which concerns environmental care, social responsibility, and financial success into a single strategy (Rahdari et al., 2020).

This concept hints hinting to the creation of sustainable product attributes (SPA). These are the attributes that make a product sustainable. These features can be environmentally friendly, like environmentally friendly design that reduces product waste and lowers harmful emissions during the whole process of transporting the product. These attributes can be social, such as concern about fair trade, and better product safety. Adopting these attributes in business operations assists firms to gain customer satisfaction and trust while fulfilling the rising concern of sustainability(Rahdari et al., 2020).

Sustainable product design (SPD) is a key aspect of corporate social responsibility. Sustainable product design is an effort of the firm to manufacture products based on sustainable environmental principles to achieve a competitive advantage in the market. Development of such products would help companies to overcome ongoing social and environmental issues and aid in establishing an image in the customer's minds.(Rahdari et al., 2020). Research indicates a significant relationship between sustainable product design and corporate social sustainability efforts. It has shown that today customer purchasing decisions highly rely on how the products are manufactured and the processes involved during the conversion of raw material into final products. Therefore, we can conclude that sustainable product design encourages customers to purchase products that not only fulfill their needs but are also stable from an environmental perspective (Vu et al., 2022).

Studies showed that companies who build sustainable practices in their business operations are gaining more shares in the market. This situation rising pressure on all firms to include social, and ethical practices in daily work environments to resolve the current environmental issues. This would help companies to improve their processes ,fulfill their corporate social responsibility while gain competitive edge in global market (Ullah et al., 2021).

Nowadays, a paradigm shift has been observed in global trade towards adopting environmentally friendly practices. International firms include corporate social responsibility as an important element of managing the international exchange of goods and services. These new initiatives in business are producing significant impacts on performance of employees and customers retention. Customers are showing positive behavior to buy products that are produced based on ethical practices. It would add value to the product and thereby satisfy customer expectations. Social performance of firm in this context appeared as dominant factor to design product that can fulfill consumer demands and on the other side help business to achieve strategic objectives. (Anser et

al., 2020). Social performance plays a mediating role in helping firm in manufacturing environmentally sustainable products. It requires the implementation of standard operating procedures that could provide guideline in designing process of products. These rules would help to reduce any ambiguity among workers during design and manufacturing processes. Development of such a sustainable product would one side beneficial for the companies in gaining competitive edge in the market while on the other side reduce carbon footprint to promote social wellbeing (Scholar et al., 2024).

Designing of sustainable product requires a cautious monitoring mechanism to produce a product that not only compatible with environment but also match the need of customer. In this perspective demand analysis is first step to aware about the need of customers. For this purpose, company need to do market analysis and extract out the most dominant trends that could incorporate in firm's daily operations. Secondly, company need to be improved efficiency of their processing by implementing quality checks at each step of manufacturing to ensure that the final product fulfill the desired criteria. By doing this company will be capable to produce a product that meet global standard design (Saher, 2023).

In the last, we can say that social performance and corporate social responsibility is a twin concept in developing of a sustainable product. The rising concern of environmental pollution also demands every business to fulfill their social responsibility by investing in the product that would not be harmful for environment to achieve global sustainability goals. Thus, we can hypothesize that:

H1: Social performance mediating the relationship between sustainable product design and corporate social responsibility.

Eco Design

Globally, international firms have been rising their apprehension to design product that are ecofriendly and biodegradable. This concern pressurize firm to adopt eco design in their manufacturing practices to maintain their international operations The studies has also showed that that firms that focus on environmental friendly approaches in their operations gaining more positive image among customers, which lead to increase its revenue and a build strong market position (Güven et al., 2024). Companies can reduce their overall carbon footprints by relying on sustainable materials and environmentally concerned production processes (Sattar et al., 2023)

To induce eco-design efforts within supply chains, companies can adopt various key practices. Partnering with local suppliers or tiers that account for sustainability promotes community growth and enhances green supply chains (Hsu & Bui, 2022). By deploying eco-design into a firm's CSR practices, businesses can contribute well to sustainable and lucrative future growth with improved operational efficiency setting them apart among competitors. Therefore, we hypothesize that:

H2*: Eco Design moderates the relationship between social performance and corporate social responsibility.*

Reverse Logistics

With the rapid growth of the population, consumption rates have increased significantly, leading to a rise in waste generation. This has created a pressing need to adopt approaches that enable products to be reused multiple times before final disposal. In this context, reverse logistics is gaining importance as it involves managing the return of products from the point of consumption back into the supply chain for recycling, reuse, and remanufacturing (Alkhayyal, 2019). Reverse logistics and traditional logistics are almost similar but the reverse logistics itself is considered as the backward pass where good/feedback from customers is taken back to the warehouse store or factory. The main is try to be cost effective and maintain a cost effective operation process (Richnák & Gubová, 2021).

Reverse logistics has become a key focus for modern companies seeking to lower their carbon footprint. An MIT study on logistics and sustainability shows that businesses can cut costs by up to 10% when they bring sustainability into their reverse logistics operations. This can be achieved by the Companies can achieve this with the help of various approaches in their reverse logistics processes, it could be like sustainable energy usage which is now modernly termed as renewable energies (Letunovska et al., 2023). Accounting for sustainability in supply chain practices creates an immense impact on company's economic, social, and environmental aspects as well.

This new thought of greener environment with the help of supply chain has now made easier for businesses to meet their corporate social responsibility (CSR) goals. CSR defines how much company is responsible and conscious towards society and environment (Dey & Giri, 2023). It asks organizations to think about not just profits, but also the social, ethical, and environmental results of what they do. Using CSR practices helps create better relationships with stakeholders, lowers risks in keeping supply chains running, and improves the value customers get (Xu et al., 2022).

From the studies it is evident that social responsibility is actually a closed loop chain, social responsibility first focuses on the economic understandings of people in supply chain. In contrast to it dual loop supply chain system offers a little advance approach where SC members and other parties involved in the process are equally accountable and responsible towards environmental aspects as well (Dey & Giri, 2023). When manufacturers incorporate sustainability into product redesign and recycling, it improves the quality of the finished product, increases customer attraction, and enhances the brand image in the market. Furthermore, optimizing reverse logistics reduces waste, retrieves value from returned products, ensures compliance with environmental regulations, and boosts customer satisfaction and trust in the brand (Tian et al., 2024).

Reverse logistics also includes the planning and control of the inward flow of the product for disposal or for other means. This servicing of customer's needs assists a business in waste reduction. However, it is not sufficient for a company to have reverse logistics in place in order to achieve its CSR objectives (Hyder et al., 2023) . It is only the cost associated with reverse logistics that is perceived to be performed in a much narrower manner. The specific focus here is on the

social welfare objectives for which CSR stands out. These are the interests of customers, employees and other stakeholders in the locality of the business. If a company has strength in the social performance, it is easier for the company to implement reverse logistics that help the environment and the society (Hyder et al., 2023). The consideration of social performance alters perceptions of reverse logistics practices. If a company is concerned about social issues and adopts practices like fair trade conditions, community service, and accountability, it can reinforce its reverse logistics. As an illustration, a company that practices recycling and waste minimization oriented reverse logistics will enhance its CSR performance to the extent that its efforts are directed towards the social performance of the business (Chen et al., 2023). This convinces the public, consumers, and other stakeholders that the company is serious about the protection of the environment as well as about society in general.

In this sense, social practices not only facilitate the reverse logistics, but also influence how they are put into practice. It makes certain that reverse logistics is not only about waste minimization, It is more about the need to strengthen society and preserve the environment as a praiseworthy activity (Chen et al., 2023). When there is a strong social performance, and reverse logistics is practiced, it enhances the reputation of the organization, reinforces its CSR activities, and creates overall positive value to the firm and its stakeholders. The reverse logistics, CSR, and social performance triad is assisted by the increasing industrial trend towards sustainability and business ethics. Social performance acts as an intermediary between reverse logistics and CSR to assist the firms in achieving both their social and environmental objectives through reverse logistics more efficiently. Based on these insights, we hypothesize that:

H3: *Social performance mediates the relationship between Reverse logistics and corporate social responsibility.*

Social Performance

Social performance is a modern concept that requires stakeholders to consider ecological and social perspectives in their business operations. Protecting the natural environment has become a global concern. Numerous studies have been conducted to address the harmful impacts of advanced business activities on the environment. In response, organizations are now taking initiatives to meet the demands of environmental protection, aiming to gain a competitive edge (Anser et al., 2020).

By incorporating the concept of social performance into sustainable supply chain management, corporations adopt two distinct approaches: assessment practices and collaboration practices. In assessment practices, buyers monitor and control internal processes and actions of suppliers, such as working hours and employee health and safety. This allows businesses to set rules for acceptable supplier conduct. In some cases, companies might ask for certifications from key parties. The teamwork method, on the other hand, centers on the buyer's ties with suppliers to boost processes. This way, buyers can help to improve product design and present new ideas while making sure workers have safe places to work (Alghababsheh & Gallear, 2021).

Social performance sheds light on how a company is performing in social, environmental, and leadership areas. As the developed mindsets are now more concerned about making, packing, and shipping products in ways that don't harm the planet as much as older ways does. More precisely people are now more concerned regarding the fact that the product they are buying is must be from the industry that is investing on conserving the environment (Anser et al., 2020).

Most firms rank CSR based on their methods, not on the how well they meet environmental and social goals. However this makes it unclear which CSR effort would work best to boost the company's social impact (Halme et al., 2020). Also, in some cases it is also evident that, CSR reduces the environmental harm but without making social performance any better.

By adopting eco-design principles, companies often improve their social performance because these designs can promote environmental protection, create safer products, reduce waste, and show concern for stakeholders (Mughal et al., 2023). Therefore, organizations must adopt sustainable practices aligned with environmental standards to achieve their goals. As many prior studies have shown, companies with efficient CSR strategies demonstrate better social performance (Orazalin & Baydauletov, 2020). Therefore, we hypothesize that:

H4: *Social performance has a positive impact on corporate social responsibility*

Green Manufacturing

Green manufacturing is defined as the use of innovative methods in the production process aimed at reducing harmful effects on the environment. It includes waste reduction, recycling, and reusing products to better utilize natural resources and achieve a zero-waste stage (Haleem et al., 2023). Green manufacturing requires product design, materials, and processes to be sustainable to reduce environmental pollution and mitigate risks to human health. It helps organizations gain a competitive edge, as customers increasingly prefer products developed through sustainable practices (Yang et al., 2024).

With globalization, a firm's ability to manage the social and environmental impacts of its operations has become a major concern. Organizational performance is often measured in terms of its manufacturing processes. With the advent of green technologies, companies are increasingly investing in these innovations to create business opportunities and establish themselves as eco-friendly enterprises. These technologies help companies enhance their brand image, which, in turn, leads to increased revenue (Padilla-Lozano & Collazzo, 2022). Nowadays, the inclusion of manufacturing companies in social development programs helps improve their market share and reduce harmful emissions and waste accumulation. For this reason, many businesses now integrate green manufacturing techniques into their operations to gain a competitive edge (Abbas, 2020).

Green manufacturing centers on developing eco-friendly processes and practices and this is always regarded as a social dimension of CSR. For example, going green practices not only add to a company’s environmental footprint but also enhances its goodwill and relations with the local people (Etikan, 2024). Firms which practice green manufacturing are also more likely to practice social responsibility such as aiding in local growth, improving employee’s standard of living,

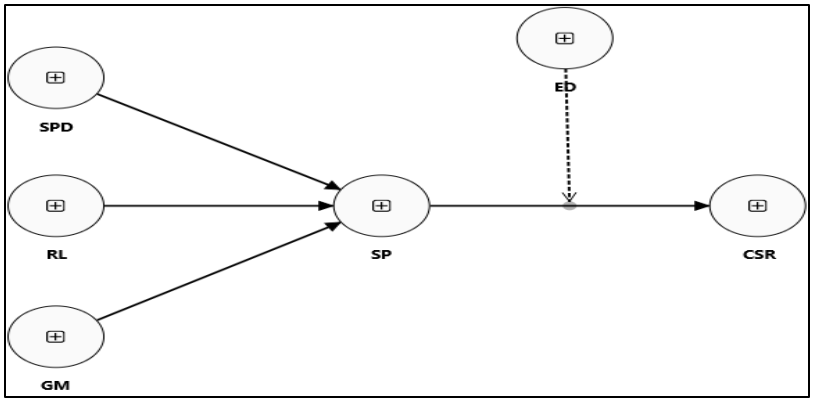
encouraging environmental literacy, and trust building with the stakeholders. Improvement in social performance can also affect the perception of green efforts by the public and other stakeholders. Forms of good social performance give companies more cause and justification to tell the green side of their manufacturing practices, and thus increase the contribution of their CSR efforts to global welfare. Studies show that the positive effects of green manufacturing become larger when the firm's managers openly explain their environmental measures and relate these initiatives to broader social objectives, thus enhancing CSR perception (Afum et al., 2020). It is further suggested that social aspects of green manufacturing such as enhanced health and safety, greater community relations, or enhanced transparency, contribute positively to corporate social responsibility and overall image of the company. Green manufacturing is important for improving CSR because it helps companies reduce their environmental impact while showing they care about social responsibility. Eco friendly methods can be used so that companies can create a good reputation leading to close relations with communities that endorses that company is adhering to social responsibility (Wiredu et al., 2024).

Organizations known for good social performance develop better CSR reputation this is in turn beneficial in the long run since it results in customer retention, and improved brand and favorable market position (Padilla-Lozano & Collazzo, 2022). At last, social performance is one of the most important elements that magnify the effect of green manufacturing ranges on CSR, that is, assists firms in adopting business practices that are environmentally friendly, enhance the relationship with stakeholders, and create value for the firm and the society in the long run. Hence this can be stated that green manufacturing has become an important driver of corporate social responsibility (CSR), with social performance primarily focusing relationships with CSR. Based on this literature, we can hypothesize that:

H5*: Social performance mediates the relationship between Green Manufacturing on corporate social responsibility.*

Conceptual Framework

Figure 1
Conceptual Framework



Research Methodology

The primary aim of this study is to explore the impacts of various Green Supply Chain practices on Corporate Social Responsibility (CSR). An explanatory research strategy has been adopted to analyze how, Sustainable Product Design, Eco-Design, Reverse Logistics, Social Performance, and Green Manufacturing influence CSR. As part of quantitative research, a deductive approach has been employed to test the hypotheses.

Population and Sample Size

The population selected for this study consists of professionals working in various sectors of Pakistan's industry in Karachi. According to Sekaran (2010), a minimum of 30 responses per variable is required for a quantitative study. This research includes a total of 6 constructs; therefore, based on Sekaran's guidelines, the minimum sample size should be 180. However, to account for potential outliers, a larger sample size of 400 was initially collected. After removing invalid responses, the final sample size was reduced to 310.

Sampling Technique

The study employed a non-probability sampling technique, specifically convenience sampling, due to the unavailability of a sampling framework (Muchaendepi et al., 2019). Convenience sampling facilitated the collection of data within short cross-sectional time intervals of one month.

Scale and Measures

The scales used in the study were adopted from prior literature and published studies. Data was collected through the online distribution of a Google Form. The questionnaire utilized a 5-point Likert scale to measure respondents' perceptions and was divided into two main sections. The first section focused on the demographic analysis of the respondents, gathering information such as age, gender, working sector, and income level. The second section examined the types of green supply chain practices that influence respondents in the context of corporate social responsibility.

Table 1

Scale and measure with reliability and source

Measure	Source	Items	Reliability
Sustainable product design	(Paulraj et al., 2017)	6	0.85
Eco-design	(Abdullah et al., 2019)	8	0.90
Corporate social responsibility	(Alam & Islam., 2021)	10	0.92
Reverse logistics	(Yang et al., 2024)	6	0.94
Social performance	(Yang et al., 2024)	5	0.88
Green Manufacturing	(Yang et al., 2024)	7	0.94

Data Collection and Analysis

For the analysis of the data, Smart PLS was utilized. Descriptive statistics, correction analysis, and hypothesis testing are employed to achieve the required objectives. For the research sample's characteristics, i.e., the demographic profile of respondents and their responses to the questionnaires, descriptive statistics was employed. Correlation analysis was used to analyze the strength of the relationship between the different green supply chain practices and corporate social responsibility. The relationship and effect between the constructions were tested through the bootstrapping method.

Profile of Respondents

A breakdown of the survey respondents' characteristics can be found in Table 1. Out of 310 respondents, there were 153 females and 146 males. Over 23% of the respondents were between 20 and 25 & 31-35 years old. These two age groups had the most participants while 41 and 40 - year-olds saw the fewest participants. In this study, the highest proportion consists of those participants associated with the service sector. Moreover, the survey included 27% of those respondents earning more than PKR 100 thousand while only 9.4% earned above PKR 200 thousand.

Table 2
Demographic Analysis

Characteristics	N	%
Gender		
Male	146	47.1
Female	158	51.0
Other	6	1.9
Age		
20-25	70	22.6
26-30	66	21.3
31-35	74	23.9
36-40	74	23.9
41 and above	26	8.4
Industry		
Manufacturing	45	14.5
Service	97	31.3
Retail	59	19.0
Technology	70	22.6
Other	39	12.6
Salary (PKR)		
50,000 or above	58	18.7
50,001- 100,000	63	20.3
100,001- 150,000	85	27.4
150,001- 200,000	75	24.2
Over 200,000	29	9.4

Descriptive Statistics

The normality of data collected through questionnaires was tested through mean, standard deviation, Skewness, and kurtosis values. Results are presented in Table 2. The Skewness values of all constructs lies between 0.491 to 0.653, the highest value is possessed by reverse logistics (Mean 2.245, SD 0.612), and the lowest is possessed by corporate social responsibility (Mean 2.238, SD 0.595). Social performance conveys the highest value of kurtosis which is 0.943(Mean 2.217, SD 0.6455) while the lowest value is reverse logistics (Mean 2.245, SD 0.612). The Skewness and kurtosis values of all constructs lie in the range of ±1 and ±3 respectively, so data is normally distributed.

Table 3

Descriptive Analysis

Constructs	Mean	Std deviation	Skewness	Kurtosis
SPDM	2.227	0.611	0.639	0.854
EDM	2.226	0.593	0.597	0.728
RLM	2.245	0.612	0.653	0.610
SPM	2.217	0.645	0.645	0.943
GMM	2.212	0.578	0.545	0.820
CSRM	2.238	0.595	0.491	0.634

Reliability Analysis

The internal consistency of the constructs was evaluated using Cronbach's Alpha Coefficient. The results in Table 3 demonstrate that Cronbach's Alpha values ranged from 0.751 to 0.829. Corporate social responsibility construct exhibited the highest value, 0.829, while Green manufacturing possessed the lowest value, 0.761. As all obtained Cronbach's Alpha coefficients surpass the standard threshold of 0.7, it can be concluded that the internal consistency of all constructs is reliable.

Table 4
Reliability Analysis

Construct	Cronbach Alpha	Std deviation	Mean
SPDM	0.761	0.611	2.227
EDM	0.786	0.593	2.226
RLM	0.776	0.612	2.245
SPM	0.762	0.645	2.217
GMM	0.751	0.578	2.212
CSRM	0.829	0.595	2.238

Construct Validity

It is a test to assess the validity of the construct. It demonstrates that items or indicators of each construct measured the same underlying concept. An average variance explained value greater

than 0.5 is considered standard (Fornell & Larcker, 1981). Table 4 shows that the AVE values of all constructs are above 0. 5 thus, satisfying the validity condition.

Table 5

Validity Analysis

Construct	Variance Explained	Std deviation	Mean
SPDM	0.516	0.611	2.227
EDM	0.551	0.593	2.226
RLM	0.536	0.612	2.245
SPM	0.516	0.645	2.217
GMM	0.501	0.578	2.212
CSRM	0.549	0.595	2.238

Discriminant Validity Test

It is a test to assess the distinctiveness of constructs (Hair et al., 2009). This test compares the square root of average variance extracted (AVE) for each variable to its correlation with other constructs. Table 5 indicates that all constructs satisfy the discriminant validity condition.

Table 6
Discriminant Validity

Constructs	CSR	ED	GM	RL	SP	SPD
Corporate Social Responsibility (CSR)	0.741					
Eco-design (ED)	0.526	0.742				
Green Manufacturing (GM)	0.570	0.489	0.708			
Reverse Logistics (RL)	0.571	0.409	0.446	0.732		
Social performance (SP)	0.559	0.421	0.489	0.519	0.719	
Sustainable Product Design (SPD)	0.663	0.514	0.501	0.585	0.512	0.719

Correlation Analysis

It measures the strength of the relationship between constructs. Zero value shows no relationship between variables. A value near one is considered a strong relationship while a value near zero reflects a weak relationship. According to Table 6, the highest value of correlation found between reverse logistics and corporate social responsibility is (0.587) while the lowest correlation exists between sustainable product design and corporate social responsibility is (0.170)

Table 7
Correlation Analysis

Constructs	CSR	ED	GM	RL	SP	SPD
Corporate Social Responsibility (CSR)	1.000					
Eco-design (ED)	0.514	1.000				
Green Manufacturing (GM)	0.570	0.492	1.000			
Reverse Logistics (RL)	0.587	0.414	0.457	1.000		
Social performance (SP)	0.562	0.430	0.490	0.517	1.000	
Sustainable Product Design (SPD)	0.170	0.510	0.501	0.246	0.514	1.000

Hypothesis Testing

The analysis was performed in PLS Smart. Factor loading of all constructs lies above the acceptable range of 0.5**.** Results are presented in Tables 8 and 9, showing that reverse logistics, sustainable product design, and green manufacturing significantly impacted corporate social responsibility. Bootstrapping was done to understand the mediating effect of social performance. The results of this study supported the specific indirect impact of social performance on independent and dependent variables. Moreover, the study also proved that eco-design moderates the relationship between social performance and corporate social responsibility.

Table 8

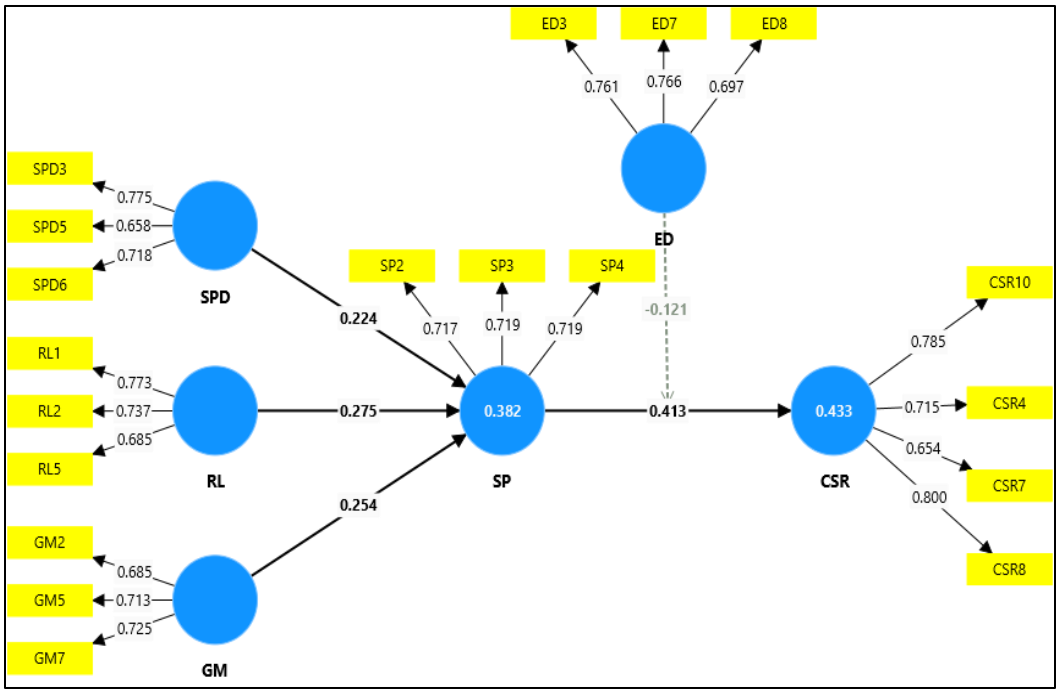
Path coefficient

	Beta coefficient	P Value	Hypothesis
ED -> CSR	0.369	0.000	Supported
GM -> SP	0.254	0.000	Supported
RL -> SP	0.275	0.000	Supported
SP -> CSR	0.413	0.000	Supported
SPD -> SP	0.224	0.004	Supported
ED x SP x CSR	0.121	0.009	Supported

Table 9
Specific Indirect Effect

	Beta coefficient	P value	Hypothesis
SPD -> SP -> CSR	0.093	0.018	Supported
GM -> SP -> CSR	0.105	0.001	Supported
RL -> SP -> CSR	0.114	0.003	Supported

Figure 2
Structural equation Modelling Using Smart PLS



5.

Discussion and Conclusion

Discussion

Through this study, we want to discuss the impact of green supply chain practices on corporate social responsibility, with the mediating role of social performance. The results of all hypotheses are coherent with the previous research. The major findings of this study are discussed below:

Direct Hypothesis:

The First hypothesis stated that social performance positively impacts corporate social responsibility. The outcome of this research indicates that the degree of improvement in social performance has produced a positive effect in fulfilling corporate social responsibility goals. This hypothesis is consistent with the previous study which showed that now companies are encouraging the inclusion of social and ecological perspectives in their business operations to gain a competitive edge in their respective market (Anser et al., 2020).

Mediating Hypothesis

Our study reveals that social performance can mediate the relationship between green supply chain practices such as green manufacturing, reverse logistics and sustainable product design and corporate social responsibility. The outcome of this research is also coherent with previous studies stating that social and environmental sustainability force companies to invest in green manufacturing technologies to enhance brand image (Padilla-Lozano & Collazzo, 2022).

The results confirm the findings derived in the study (Letunovska et al., 2023) that emphasized upon introduction of sustainability in reverse logistics to enhance business operations in multiple aspects. Strengthening customer-brand relationship and reducing environmental stress by introducing sustainable products is also pointed out (Rahdari et al., 2020).

Moderating Hypothesis

A study showed that integrating eco-design in supply chain practices became the basis of the corporate social responsibility principle (Güven et al., 2024). Our findings also proved this study, as eco-design strengthens the relationship between social performance and corporate social responsibility. Integrating eco-design principles in firm CSR practices would aid firms in improving their operational efficiency thereby leading to sustainable growth.

Theoretical Implication

The study at hand provides brings forth a very useful theoretical contribution with respect to the less-explored connection between Green Supply Chain Management (GSCM) practices and firms' Corporate Social Responsibility (CSR) within the scope of Pakistan. There are so many GSCM practices that have been analyzed for their implications on sustainability and CSR but all existing empirical studies factor in these green variables separately instead of an integrated approach. So, there is a lack of studies that have focus on the integrated impact of major GSCM practices (e.g. sustainable product design, eco-design, reverse logistics and green manufacturing) on CSR. To the best of our knowledge, very few studies are available how impactful the effect of each of these GSCM practices on CSR with the social performance as the mediator in the evolving economies like here in Pakistan. This is an informative aid for the organizations that account for green practicing in supply chain operations and creating this as their competitive edge in the industry.

Managerial Implication

The study concluded provides useful information and key insights for managers operating in all fields of organization that are concerned about their corporate social responsibility—particularly in the supply chain sector. Through the integration of green supply chain management practices including (but not limited to) green purchasing, eco-design, and reverse logistics, managers are able to establish supply chains that are in compliance with the environmental sustainability goals. In this regard, this study details the benefits like enhanced CSR performance, improved brand image, and long-term operational efficiencies for organizations that implement the GSCM practices. Managers can make use of these insights to devise strategies that contribute to environmental sustainability while offering a competitive advantage in the market.

In addition, supply chain managers can make use of a clear framework operationalize GSCM practices effectively that this research provides. The study at hand also shows the sector-specific dynamics that have some influence on the relationship between GSCM and CSR of a firm by providing information that are tailored for different industrial sectors. However, in particular, these insights come in handy for supply chain managers in optimizing processes, reducing costs, and improving sustainability efforts. The study, moreover, details a gap in the existing knowledge base.

It shares insights about how a comprehensive approach towards GSCM solves the problem of fragmented CSR efforts in Pakistan. Ultimately leading to improvised environmental and social outcomes for firms.

Limitations

Although beneficial for several reasons, this study also comes with some limitations and when managers are interpreting the findings, they should be mindful about these limitations. The first limitation is that the study has sole focus on the context of Pakistan which can easily limit the generalizability of the findings to regions outside the bounds of Pakistan. Particularly, regions that are different in terms of economic, cultural, and regulatory environments. The reason being that the challenges and opportunities in Pakistan are influenced by factors different from those in developed or other emerging economies. Furthermore, only a small sample size is used in the research which is focused on specific industries. This may affect the reliability and representation of the findings. Consequently, the conclusions may not be universally applicable to all sectors or larger populations.

The impact of Green Supply Chain Management (GSCM) practices on Corporate Social Responsibility (CSR) is examined in the study. Factors like organizational culture, government policies, or market forces, employee engagement and corporate governance are not studied in this study. For a deeper understanding of CSR outcomes, researchers can work on these aspects too. Also, only a limited number of variables are explored in the study which is why we can say that there is a need for further research, primarily evident by these limitations. A more complete view of the relationship between GSCM and CSR performance can be provided through a broader study that covers these gaps.

Future Research

Future research in this domain can be established on the results by expanding the scope to entail a broader range of sectors and regions. Broadening the scope of this study and exploring different sectors and markets outside of Pakistan can garner insights that tell the varying impact of GSCM initiatives on firm's CSR across diversified economic and regulatory aspects. Ultimately, this expansion of study can help the managers in increasing the generalizability of the findings. Not only that but the future study can also take into account a larger and more diverse sampling in order to comprehend how GSCM initiatives impact the CSR role of organization at a broader organizational and societal level. The researches can also explore the impact of other mediators and moderators like organizational culture, government policies, and market dynamics on the overall relationship of GSCM practices and CSR. Moreover, the role of digital innovations and advancements in green supply chain management area can lead to valuable information and useful insights about the ways that these innovations contribute to CSR goals and outcomes. To sum it all up, there is also a future possibility of longitudinal studies being conducted to define the long-term impact of GSCM on CSR performance of organizations, as the impact of sustainable practices may evolve over time.

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