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Impact of Green Supply Chain and Green Innovation on Business Performance and Environmental Sustainability

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Abstract: *This paper examines how Green Supply Chain Management (GSCM) is relevant to enhancing company performance and environmental sustainability in Pakistani industries. The study is conducted using a quantitative and cross-sectional research design, and primary data were collected through a structured questionnaire from 200 participants working in various industrial sectors in Pakistan. Analysis of the responses was done using SmartPLS 4, with Partial Least Squares Structural Equation Modelling. The results of the measurement model established that the constructs were within the required standards of reliability, validity, and collinearity. The structural results revealed that GSCM was positively related to business performance, environmental sustainability, and green innovation. The findings also revealed that green innovation positively impacted business and environmental performance. The strongest overall relationship was between GSCM and environmental sustainability, whereas the model fit was reasonable, with an SRMR value of 0.065. In general, the results indicate that GSCM is not only helpful in improving the environment, but also acts as an organisational capability that can promote innovation and business development. The research adds empirical evidence from Pakistan and provides practical implications for managers and policymakers who want to enhance sustainability and organisational performance simultaneously.*

Keywords: Green Supply Chain Management, Green Innovation, Business Performance, Environmental Sustainability, Pakistani Industries, SmartPLS

Introduction

One of the greatest global issues of the twenty-first century has been environmental degradation (Singh & Singh, 2016). The sudden industrialization, world energy demands, inefficient production systems, and over-dependence on fossil fuels have all added to the unprecedented pressure on the environment (Lamb, 2016). The constant increase in greenhouse gas (GHG) emissions is one of the most noticeable signs of this crisis (Shen et al., 2020). Although countries have made global commitments to mitigate climate change, a very limited percentage of countries have sustained and realized significant cuts in GHG emissions. Lamb et al. (2022) emphasize that the long-term emission reductions are noted in the countries that have gone through structural changes to renewable energy systems, enhanced legislative systems, and have implemented innovations in the energy and industrial sectors. In the case of developing countries such as Pakistan, environmental performance keeps declining as the country is experiencing much industrialization, poor environmental governance, and urbanization (Munir & Ameer, 2020).

Problem Statement

Despite the universal applicability of the GSCM concept, its application in developing nations like Pakistan is still very poor and uneven. The Pakistani industries have several structural, financial, and organizational issues that limit the adoption of environmentally friendly supply chain practices in the industry (Mahar et al., 2025). There are some structural and behavioural obstacles to sustainability progress. The companies are characterised by outdated production processes, a low level of knowledge of the current sustainability projects, an insufficient technological basis, and strong resistance to organisational change. Existing

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environmental policies, often in a token or piecemeal form, leave room in terms of not adhering to the regulatory requirements, and undermine the incentive to actually go green in terms of the industrial operations.

Research Objectives

Based on the above problem, this study has the following main objectives:

- To examine how GSCM practices, directly and indirectly through green innovation, influence organisational performance.
- To assess how GSCM practices, directly and indirectly through green innovation, influence environmental sustainability outcomes in Pakistani industries.
- To provide recommendations for managers and policymakers on how to use GSCM and green innovation to improve both business performance and environmental outcomes in Pakistan.

Research Questions

1. To what extent do Green Supply Chain Management (GSCM) practices affect business performance in Pakistani industries?
2. What is the relationship between GSCM practices and environmental sustainability in Pakistani industries?
3. How far does green innovation explain the link between GSCM practices and business performance?
4. How far does green innovation explain the link between GSCM practices and environmental sustainability?

Research Gap

The majority of studies on GSCM and green innovation have been done in developed economies where companies are often better regulated, more technologically advanced, and have mature systems of sustainability. Results of such environments cannot be extrapolated directly onto Pakistan, where industries tend to be resource-constrained, unequally enforced in environmental regulations, and with poorer technological capability. Despite the rising number of studies on the developing economies, the Pakistani context is still underrepresented in direct empirical research.

Literature Review

Empirical Evidence on Green Innovation Adoption in Pakistani SMEs

The empirical literature on sustainability in operations shows that firms rarely achieve environmental improvements in isolation from broader organisational and supply-chain changes. Studies on green innovation in Pakistani SMEs indicate that adoption is strongly shaped by internal capabilities and institutional conditions rather than by generic awareness of environmental issues. Jun et al. 2021 of manufacturing SMEs in Pakistan shows that organisational and human-resource factors, customer and market pressure, and government and technological support significantly drive green innovation adoption, whereas external partnerships and regulatory pressure are statistically insignificant (Jun et al, 2021).

Green Intellectual Capital as an Antecedent of Green Innovation

A similar stream of research examines green intellectual capital (GIC) as a precursor of green innovation. Shahbaz et al. (2025) examine Pakistani SMEs and find that green human, structural, and relational capital support green innovation, which in turn improves environmental performance, while green creativity further strengthens this relationship. While this supports the idea that intangible knowledge resources are crucial for environmental outcomes, their framework is largely intra-firm and omits explicit supply-chain practices and financial or competitiveness indicators. The current study complements this by shifting attention from knowledge stocks to green supply-chain practices and by jointly modelling environmental and business performance.

Linking GSCM, Green Innovation, and Sustainable Performance

More recent work has begun to connect GSCM, green innovation, and sustainable performance in a single framework. Watto et al. investigate Pakistani entrepreneurial firms and report that green dynamic capability, GSCM practices, and green entrepreneurial orientation all enhance sustainable firm performance, with green innovation playing a mediating role (Watto et al., 2025). Similarly, Novitasari and Agustia (2021) find in Indonesian listed firms that green innovation fully mediates the relationship between GSCM and firm performance, suggesting that supply-chain greening alone may not deliver performance gains unless it is translated into concrete innovative activities, but they do not examine environmental performance as a separate outcome. In contrast, Abu Seman et al. (2019) show that, in Malaysian manufacturers, green innovation mediates the effect of GSCM on environmental performance, but their model does not consider business or financial outcomes. As a result, it cannot show whether improvements in environmental performance are accompanied by gains in competitiveness. Their findings are important because they identify green innovation as a transmission channel between supply-chain-related capabilities and performance. However, the existing literature often combines sustainable performance as a broad concept, lacks clarity in the distinction between environmental and business performance, and focuses on entrepreneurial ventures rather than established industrial companies. This research builds on the literature by clearly distinguishing between environmental sustainability and organisational performance, which will simplify the analysis of trade-offs and synergies.

Sustainable Supply Chain Practices and Performance Evidence in Pakistan

Empirical studies on sustainable supply chain management support the performance relevance of green practices, but more often than not, the research is based on aggregate sustainability constructs. Shahid et al. prove that internal and external sustainable supply chain management practices significantly increase the overall sustainable performance of Pakistani manufacturing companies, with process innovation mediating the influence (Shahid et al., 2020). A similar outcome is stated by Rahman et al. (2023), who indicate a significant impact of GSCM on sustainable performance, strengthened by managers' awareness of opportunities associated with the China-Pakistan Economic Corridor. However, these papers use a composite performance index that combines environmental, social, and economic indicators, thus making the distinction between business and environmental performance difficult.

Evidence from Other Developing-Country and Cross-Country Studies

Studies in other developing-country contexts offer additional insights into how supply-chain practices shape financial outcomes via environmental factors. Jum'a et al. analyse Jordanian manufacturing companies and find that supply-chain practices such as customer relationships, information sharing, and postponement significantly improve environmental sustainability, which in turn enhances financial performance (Jum'a et al., 2021). Using data from Chinese manufacturers, Feng et al. (2018) similarly demonstrate that GSCM improves financial performance indirectly through both environmental and operational performance, but they treat innovation only implicitly and therefore do not explain which kinds of green innovations underpin those gains.

Implementation Challenges and Measurement Gaps in Developing Economies

Case-based and review studies from other developing economies underline the implementation challenges of GSCM. An investigation of Thai electronics manufacturers finds that firms engage in green procurement, green manufacturing, green distribution, and reverse logistics, but these practices are largely driven by external pressures from foreign customers and regulations, and measurement of environmental and financial benefits remains limited (Ninlawan et al., 2010). Similarly, a review of GSCM in developing countries notes that although many organisations claim to be "going green", environmental considerations are often added onto traditional supply-chain systems rather than integrated, and empirical evidence is concentrated in a few sectors with fragmented performance metrics (Ojo et al., 2013). These observations highlight the risk of

GSCM being treated as compliance-driven or symbolic, with limited innovation and unclear performance implications.

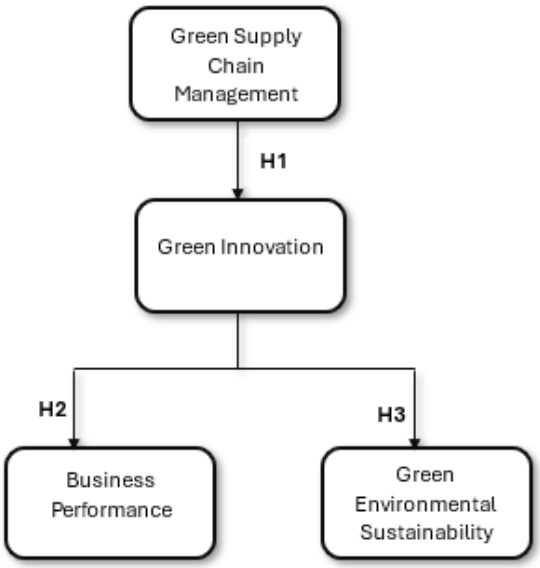
Conceptual Framework and Hypotheses

Based on the available literature, the current research proposes a model in which GSCM functions as an upstream force that has both a direct and indirect impact on business performance, as well as environmental sustainability, through green innovation. Figure 1 illustrates this model. In line with prior findings that GSCM improves performance outcomes (e.g., Rupa and Saif, 2022) and that green innovation mediates the relationship between GSCM and performance (e.g., Rahman et al., 2023; Gelmez et al., 2024), the following hypotheses were formulated:

H1: Green Supply Chain Management (GSCM) has a significant positive effect on business performance.
H2: Green Supply Chain Management (GSCM) has a significant positive effect on environmental sustainability.
H3: Green Supply Chain Management (GSCM) has a significant positive effect on green innovation.
H4: Green innovation has a significant positive effect on business performance.
H5: Green innovation has a significant positive effect on environmental sustainability.
H6: Green innovation mediates the relationship between GSCM and business performance.
H7: Green innovation mediates the relationship between GSCM and environmental sustainability.

Figure 1

Conceptual Model of the Impact of GSCM on Green Innovation, Business Performance, and Environmental Sustainability in Pakistan



Methodology

Research Design

This study adopted a quantitative, explanatory, and cross-sectional survey design. The design was selected because the study aimed to test the hypothesised relationships among Green Supply Chain Management (GSCM), green innovation (GI), business performance (BP), and environmental sustainability (ES) at one point in time. A structured questionnaire and a PLS-SEM approach were appropriate because the model contains latent constructs measured through multiple indicators and includes both direct and mediating relationships.

Population, Sampling, and Sample Size

The target population consisted of organisations operating in Pakistan in industries where supply-chain decisions have visible environmental implications. The final survey covered respondents from ten sectors, including textiles, services, construction, pharmaceuticals, consumer goods, food, automotive, health, academia/research, and schools. Respondents were approached in managerial, supervisory, or professionally informed roles so that they could provide meaningful judgements about green practices and performance outcomes in their organisations.

Research Instrument

The data were gathered through a structured questionnaire, which was specifically designed for the current research after a thorough analysis of the earlier literature related to green supply chain management, green innovation, and sustainability-related performance. The instrument was designed as a brief survey format to make it easier and more consistent for respondents to complete. The substantive items were all measured on a five-point Likert scale, with 1 (strongly disagree) being the lowest and 5 (strongly agree) the highest. The questionnaire had a background section and four main construct parts. The background section captured industry type, while the main sections were Green Supply Chain Management (GSCM), Green Innovation (GI), Business Performance (BP), and Environmental Sustainability (ES), based on reflective indicators aligned with the conceptual framework and the hypotheses of the study.

Table 1

Operationalisation of the Final Study Constructs

Construct	Indicator codes	No. of items	Measurement focus
Green Supply Chain Management (GSCM)	GSCM1-GSCM5	5	Supplier environmental criteria, supplier collaboration, green operations, logistics/resource reduction, recycling/reverse logistics
Green Innovation (GI)	GI1-GI5	5	Green product and process innovation, sustainable R&D, innovative green solutions, and employee green ideas
Business Performance (BP)	BP1-BP2	2	Profit improvement and cost reduction
Environmental Sustainability (ES)	ES1-ES4	4	Waste, energy, material, and greenhouse-gas reduction

The major form of data collection was an online questionnaire administered through Google Forms. The survey link was sent out to the relevant respondents within the target areas, and reminder messages were sent out to improve the response rates. The electronic version provided better geographical coverage and made it easy to export the responses to Excel, where they could be further coded and cleaned. The first page of the questionnaire included an information and consent statement, which explained the aims of the study, emphasised the voluntary character of participation, explained how the data would be used for academic purposes, and guaranteed confidentiality. It was also indicated to the respondents that they could discontinue the study at any time before submission.

Results and Discussions

This chapter presents the empirical results of the final SmartPLS analysis. The final cleaned dataset contained 200 usable responses and no missing values in the analytical indicators used for model estimation. The results are reported in two main stages: first, the assessment of the reflective measurement model, and second, the assessment of the structural model, including mediation analysis.

Table 2

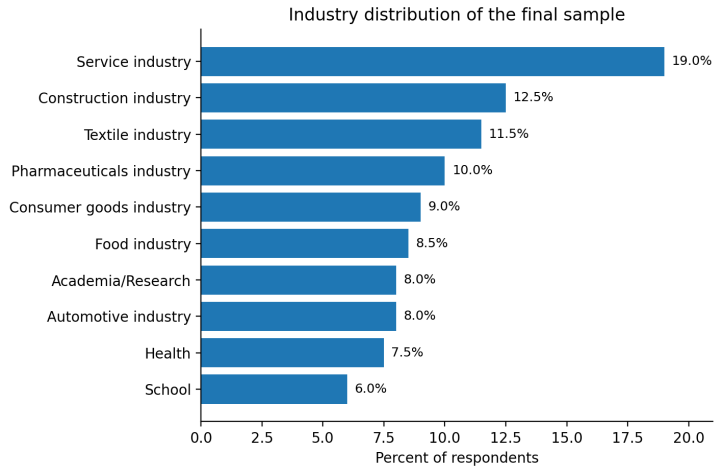
Industry Profile of the Final Sample (n = 200)

Industry	Frequency	Percent
Academia/Research	16	8.0%
Automotive industry	16	8.0%
Construction industry	25	12.5%
Consumer goods industry	18	9.0%
Food industry	17	8.5%
Health	15	7.5%
Pharmaceuticals industry	20	10.0%
School	12	6.0%
Service industry	38	19.0%
Textile industry	23	11.5%

As can be seen in Table 2 and Figure 2, the sample was drawn from an unequal composition of industrial sectors, with the service sector taking the largest share (19.0%), followed by construction (12.5%) and textiles (11.5%). This sectoral distribution covers multiple sectors.

Figure 1

Industry Distribution of the Final Sample



Measurement Model Assessment

The measurement model was assessed before hypothesis testing. The assessment covered outer loadings, internal consistency reliability, convergent validity, discriminant validity, and collinearity diagnostics.

Table 3

Outer Loadings of the Reflective Measurement Model

Construct	Indicator	Loading
Business Performance	BP1 Profit	0.896
Business Performance	BP2 Cost	0.863
Environmental Sustainability	ES1 Waste	0.749
Environmental Sustainability	ES2 Energy	0.832
Environmental Sustainability	ES3 Material	0.785
Environmental Sustainability	ES4 GHG	0.816
Green Innovation	GI1 Product innovation	0.812
Green Innovation	GI2 Process innovation	0.765
Green Innovation	GI3 Supply solutions	0.797
Green Innovation	GI4 RD sustain tech	0.746
Green Innovation	GI5 Employee Green Ideas	0.851

Construct	Indicator	Loading
Green Supply Chain Management	GSCM1 Supplier environmental criteria	0.763
Green Supply Chain Management	GSCM2 Supplier collaboration for the environment	0.830
Green Supply Chain Management	GSCM3 Green operations	0.807
Green Supply Chain Management	GSCM4 Logistics resource reduction	0.805
Green Supply Chain Management	GSCM5 Recycling/reverse logistics	0.745

All retained indicators loaded satisfactorily on their intended constructs. The loadings ranged from 0.745 to 0.896, which indicates acceptable indicator reliability for the final reflective model.

Table 4

Internal Consistency, Reliability, and Convergent Validity

Construct	Cronbach alpha	rho_A	Composite reliability	AVE
BP	0.708	0.716	0.872	0.773
ES	0.804	0.809	0.872	0.630
GI	0.855	0.863	0.896	0.632
GSCM	0.850	0.854	0.893	0.625

Table 4 shows that all constructs met the recommended thresholds for internal consistency and convergent validity. Cronbach's alpha values ranged from 0.708 to 0.855, composite reliability ranged from 0.872 to 0.896, and all AVE values were above 0.50. These results indicate that the final instrument was reliable and that the indicators converged well on their intended constructs.

Table 5

Discriminant Validity based on the HTMT Criterion

Construct	BP	ES	GI	GSCM
BP				
ES	0.470			
GI	0.649	0.641		
GSCM	0.423	0.716	0.439	

Discriminant validity was established because all HTMT values were below 0.85. The highest HTMT value was 0.716, which remained within the acceptable range. In addition, outer-model VIF values ranged from 1.429 to 2.205, showing no problematic multicollinearity among the reflective indicators.

Structural Model Assessment

After confirming the adequacy of the measurement model, the structural model was assessed using bootstrapping with 10,000 resamples. The analysis focused on direct effects, explanatory power, effect sizes, and overall model fit.

Table 6

Direct Effects and Hypothesis Testing

Hypothesis	Path	Beta	t-value	p-value	Interpretation
H1	GSCM -> BP	0.157	2.460	0.014	Positive but weak direct effect
H2	GSCM -> ES	0.457	8.707	<0.001	Strong positive direct effect
H3	GSCM -> GI	0.384	6.494	<0.001	Moderate positive effect
H4	GI -> BP	0.451	7.185	<0.001	Strong positive effect
H5	GI -> ES	0.364	5.857	<0.001	Moderate positive effect

All direct hypotheses were supported. GSCM had significant positive effects on BP, ES, and GI, while GI had significant positive effects on BP and ES. The strongest direct path was GSCM -> ES (beta = 0.457), whereas the weakest but still significant path was GSCM -> BP (beta = 0.157).

Figure 2

SmartPLS Structural Model

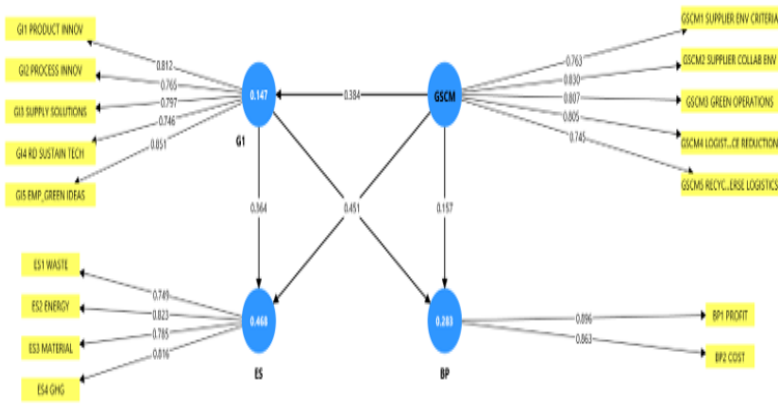


Figure 3

Direct Path Coefficients of the Final Structural Model

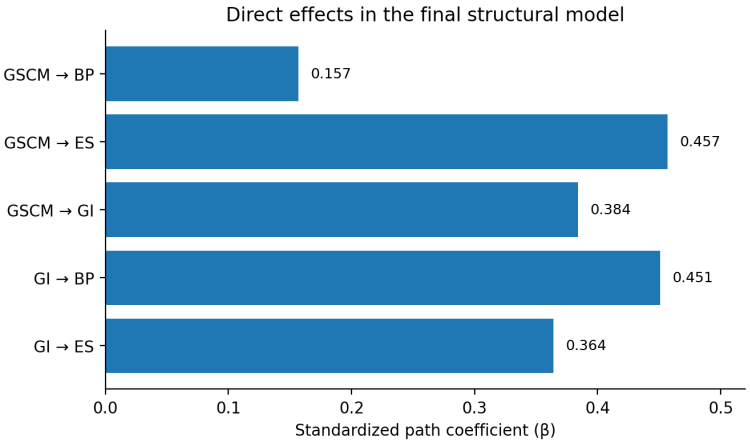
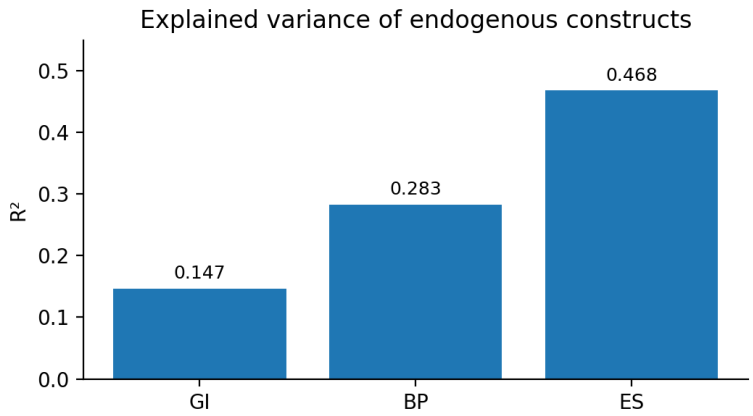


Figure 4

Explained Variance (R-square) of the Endogenous Constructs



The model explained 14.7% of the variance in GI, 28.3% of the variance in BP, and 46.8% of the variance in ES. This shows that the model had the strongest explanatory power for environmental sustainability.

Table 7

Explanatory Power, Effect Sizes, Collinearity, and Model Fit

Metric	Target/Path	Value	Interpretation
R-square	GI	0.147	Modest explanatory power
R-square	BP	0.283	Low to moderate explanatory power
R-square	ES	0.468	Moderate explanatory power
f-square	GI -> BP	0.242	Moderate effect size
f-square	GI -> ES	0.212	Moderate effect size
f-square	GSCM -> BP	0.029	Small effect size
f-square	GSCM -> ES	0.334	Moderate effect size
f-square	GSCM -> GI	0.173	Moderate effect size
Outer VIF	Maximum observed	2.205	No collinearity concern
SRMR	Estimated model	0.065	Good model fit

The effect-size results show that GI made a moderate contribution to both BP and ES. GSCM had a moderate effect on ES and GI, but only a small direct effect on BP. The model-fit result was acceptable, with SRMR = 0.065.

Mediation Analysis

The mediating role of green innovation was assessed through the specific indirect effects of GSCM on BP and ES. The results are presented in Table 8.

Table 8

Specific Indirect Effects and Mediation Decisions

Hypothesis	Indirect path	Indirect beta	t-value	p-value	Direct beta	Mediation type
H6	GSCM -> GI -> BP	0.173	5.019	<0.001	0.157	Partial complementary
H7	GSCM -> GI -> ES	0.140	4.521	<0.001	0.457	Partial complementary

Both indirect paths were statistically significant. This means that GI significantly mediated the relationship between GSCM and BP and also between GSCM and ES. Because the direct and indirect effects were all positive and significant, the mediation pattern is best described as partial complementary mediation in both cases.

Table 9

Total Effects of the Final Model

Path	Total beta	t-value	p-value	Comment
GI -> BP	0.451	7.185	<0.001	Strong overall effect
GI -> ES	0.364	5.857	<0.001	Moderate overall effect
GSCM -> BP	0.330	5.489	<0.001	Positive overall effect through direct and indirect paths
GSCM -> ES	0.596	13.633	<0.001	Strongest overall effect in the model
GSCM -> GI	0.384	6.494	<0.001	Positive overall effect

The total-effects results confirm that GSCM had a meaningful overall impact on both organisational outcomes. Its total effect on ES (beta = 0.596) was stronger than its total effect on BP (beta = 0.330), which suggests that the environmental pathway of GSCM was particularly strong in the final sample.

Discussion

This chapter interprets the empirical findings presented in Chapter 4 and links them with the literature reviewed in Chapter 2. The purpose of this chapter is not to repeat the statistical results, but to explain what they mean for Pakistani industries and for the wider discussion on green supply chain management, green innovation, business performance, and environmental sustainability. The study found that Green Supply Chain Management (GSCM) had a positive and significant effect on green innovation. This means that firms that adopt greener supplier criteria, work more closely with suppliers on environmental matters, improve internal green operations, reduce resource use in logistics, and support recycling or reverse logistics are more likely to introduce greener products, cleaner processes, and stronger sustainability-oriented ideas. Put simply, the adoption of better green supply chain practices can provide a practical foundation for innovation.

This observation is in line with the available literature that argues that environmental practices in the supply chain often catalyze innovative behaviour at the firm level. Feng et al. (2022) explain that green supply chain innovation materialises when companies go beyond mainstream business activities and redesign sourcing, production, and logistics in a green way. The result is supported by Gelmez et al. (2024) and Watto et al. (2025), who show that green supply chain initiatives support green innovation and overall sustainable performance.

The direct effect of GSCM on business performance was found to be positive and significant, but not as strong as some of the other paths in the model. This is a remarkable finding which shows that green supply chain practices have the potential to increase business performance and that the financial and operational benefits may not be realised immediately or may be limited in nature in the initial phase of implementation. Green programs in most companies require new systems, coordination of suppliers, training, and investment; therefore, the benefits may appear gradually rather than immediately.

GSCM and environmental sustainability had the strongest direct connection in the model. Such a discovery highlights that green supply chain practices are especially effective in improving environmental performance, including minimised waste, decreased energy use, less material use, and minimised greenhouse gas emissions. This outcome is of high importance as it proves that GSCM goes beyond symbolic or image-building functions. GSCM in the sampled firms was positively related to measurable environmental improvement. This discovery goes a long way in supporting the arguments by Abu Seman et al. (2019), Khan et al. (2020), and Feng et al. (2018) that show that increased environmental performance can be achieved through greener supply chain practices. It also supports the general reasoning of the literature review, where the concepts of upstream and downstream environmental integration were assumed to reduce pollution levels and improve resource efficiency. The discovery has particular relevance in the Pakistani context, where the growth of industries is often associated with the use of a lot of energy, the production of waste, and the insufficiency of environmental systems.

Green innovation, too, had positive and significant impacts on business performance and environmental sustainability. It means that eco-friendly products, cleaner processes, sustainable research and development, and green ideas produced by employees are at once beneficial to the environment and to firms commercially. The results indicate that innovation is a channel that connects environmental commitment and actual organisational performance. The statement of Zheng and Iatridis (2022) is supported by the positive impact of green innovation on business performance since the researchers discovered that eco-innovation is likely to positively influence the performance of firms, but the extent of such an impact might be context-dependent. The positive effect on environmental sustainability can also be consistent with Abu Seman et al. (2019) and Watto et al. (2025), who reveal that innovation can help firms convert sustainability intentions into tangible results.

Among the key aims of the current research was to investigate whether green innovation mediates the relationship between GSCM and the two outcome variables. The results have shown that green innovation plays a major mediating role in the connection between GSCM and business performance, and between GSCM and environmental sustainability. Because both the direct and indirect effects remained positive and

significant, the mediation pattern in both cases was partial complementary mediation. This means that GSCM improves outcomes in two ways. First, it has a direct effect. Second, it creates conditions that stimulate green innovation, and that innovation then improves performance further. This is an important theoretical and practical result. It shows that firms gain more value from GSCM when they do not stop at implementation, but use it as a platform for new green ideas, process improvement, and product development.

The mediation findings are consistent with Novitasari and Agustia (2021), Abu Seman et al. (2019), and Watto et al. (2025), all of whom highlight the role of green innovation as an important transmission mechanism between green practices and performance outcomes. The present study extends that logic to Pakistani industries and shows that the same mechanism is relevant in a developing-country context where sustainability systems are still uneven and often resource-constrained. The fact that it provides a more detailed explanation of the work of GSCM is important because of the partial mediation result. In case the relationship had been taken care of by green innovation entirely, this would imply that GSCM only enhances performance in the process of innovation. Nonetheless, the results reveal that there is a partial complementary mediation, indicating that GSCM not only generates its own value but also generates additional value in the form of green innovation. This comes in handy since it demonstrates that companies can be advantaged by the simple green supply-chain actions as well as more enhanced innovation-based actions.

Conclusion

This study examined the effect of Green Supply Chain Management (GSCM) on business performance and environmental sustainability, with green innovation serving as a mediator, in the context of Pakistani industries. Based on 200 valid responses and analysis conducted in SmartPLS 4, the empirical results supported the proposed model. The measurement model met the main requirements of reliability and validity, the structural model showed significant positive relationships in the hypothesised directions, and the overall model fit was satisfactory. The findings highlight GSCM as an important strategic capability for Pakistani organisations. It directly improves environmental sustainability, supports green innovation, and also contributes to business performance. Green innovation further strengthens this framework by improving both business and environmental outcomes and by partially mediating the effect of GSCM on these outcomes. As a result, organisations that combine green supply chain practices with an innovation-oriented approach are in a better position to achieve balanced sustainability and performance gains than organisations that rely only on routine environmental compliance.

The first research question asked how GSCM influences organisational performance in Pakistani industries. The findings showed that GSCM has a positive and significant direct effect on business performance, and an even stronger overall effect when green innovation is included as a mediating mechanism. The second research question asked how GSCM influences environmental sustainability in Pakistani industries. The results showed a strong and significant positive effect of GSCM on environmental sustainability, indicating that greener supply chain practices improve waste reduction, energy efficiency, material efficiency, and greenhouse gas reduction. The third research question asked whether green innovation mediates the relationship between GSCM and organisational performance. The answer is yes. Green innovation significantly mediated the relationship, and the mediation pattern was a partial complementary mediation. The fourth research question asked whether green innovation mediates the relationship between GSCM and environmental sustainability. The answer is again yes. Green innovation significantly mediated this relationship as well, which shows that environmental gains are stronger when GSCM is supported by innovation.

Recommendations

These empirical findings justify a number of operational suggestions. To start with, managers should consider green requirements as an integral part of the supplier selection and evaluation process, rather than as a peripheral element of procurement decisions. Second, companies must strengthen their partnerships with

suppliers to save resources, reduce wastage, and streamline operations, since empirical evidence has shown a link between operational green activities and improved innovation and sustainability performance. Third, organisations should invest in green innovation capabilities by encouraging employee-generated green ideas, cleaner process redesign, and the allocation of resources towards sustainable product and process development. Fourth, companies should pursue a more systematic tracking of environmental performance through indicators such as energy consumption, waste reduction, material efficiency, and emissions, since stronger internal measurement can help turn green initiatives into operational learning and performance benefits.

Limitations of the Study

Like any empirical research, this study has certain limitations. To start with, the data were gathered at a single point in time; thus, they capture associations rather than long-term causal relationships. Second, the study relied on self-reported survey responses, which may reflect respondents' perceptions rather than objective firm records. Third, purposive sampling was appropriate in order to reach knowledgeable respondents, but generalisability to the wider population of Pakistani firms remains limited. Lastly, the deliberately narrow business performance construct allowed the model to remain simple, but captured only part of the broader performance dimensions.

Future Research Direction

This work can be extended in future research in a number of ways. Longitudinal designs could examine whether the performance gains of GSCM increase over time. Sector-specific research may evaluate whether the same model behaves differently across manufacturing, services, healthcare, or construction. Further research could strengthen the model by including objective environmental or financial data, adding moderators such as firm size, digital capability, or regulatory pressure, or examining other possible mediators such as green dynamic capability or green intellectual capital. All in all, the study shows that green supply chain management is not just an environmental requirement. In Pakistani industries, it provides a practical route to stronger innovation, better business performance, and improved environmental sustainability. The central message of the thesis is therefore clear: when firms combine green supply chain practices with proactive green innovation, they are better positioned to compete responsibly and grow in a sustainable manner.

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