

Green supply chain practices and organizational performance: The mediating role of environmental performance in the Pakistani FMCG sector

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ABSTRACT

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Objective: This study investigates the influence of green supply chain management (GSCM) practices on organizational performance through the mediating mechanism of environmental performance within the fast-moving consumer goods (FMCG) sector of Pakistan. Drawing upon the natural resource-based view (NRBV) and stakeholder theory, this research examines four key dimensions of GSCM: green procurement, green information systems, green manufacturing, and investment recovery practices, and assesses how they collectively shape environmental and organizational outcomes.

Design/methodology/approach: A survey was selected as the primary method. Approximately 200 upper-level supply chain and operations managers from FMCG companies in Pakistan were surveyed using a structured questionnaire. Confirmatory factor analysis was used to test the measurement model, while the structural model was evaluated using PLS-SEM. The hypothesized relationships and mediation effects were evaluated by testing the PLS-SEM model as well as collecting 5,000 resamples for each case.

Findings: Positive relationships were found on the Pakistani FMCG context between investment recovery and green information systems and environmental performance. Direct effects on environmental performance were not found for green procurement and green manufacturing. The full mediating role of environmental performance was found to be positive and significant on organizational performance. The overall model explains about 53.3% of the variance of environmental performance and 38.0% of the variance of organizational performance. Thus the overall framework shows good explanatory capability.

Originality/value: This study contributes to the GSCM literature by empirically validating the mediating role of environmental performance between GSCM practices and organizational performance in a developing economy context. The findings provide novel insights specific to the Pakistani FMCG sector, where regulatory pressures and sustainability awareness are rapidly evolving, offering practical guidance for managers and policymakers seeking to leverage green supply chain initiatives for competitive advantage.

Keywords: Green supply chain management; Environmental performance; Organizational performance; PLS-SEM; FMCG sector; Pakistan; Mediation analysis; Sustainability

1| INTRODUCTION

The global business environment is accelerating toward sustainability in response to more prevalent and extensive environmental problems, more enforceable environmental regulations and greater environmental preservation concerns from consumers (Khan et al., 2023; Zhu et al., 2023). As a result, green supply chain management (GSCM) has become essential to a company's sustainability strategy (Srivastava, 2023; Dubey et al., 2024). Unlike most other activities within a company, GSCM is able to integrate sustainability along a company's value chain, from sourcing raw materials to post-use product management.

Among all the sectors, the fast-moving consumer goods (FMCG) companies have the most challenging sustainability issues due to high resource consumption along the value chain, such as intense production, high packaging, large energy consumption, and wide spread transportation (Ahmed et al., 2024). In Pakistan, the FMCG sector makes up 5 percent of the country's GDP and provides employment to many people in producing as well as in logistics, services etc (State Bank of Pakistan, 2024). Despite its large contribution to the economy, the FMCG sector is in a difficult position due to its bad environmental practices and The problems of waste, heavy water consumption, and high carbon emissions and the challenge of sustainable packaging. These problems necessitate the application of GSCM for environmental and business improvement.

This paper is built on top of the Natural Resource Based View (NRBV) on resources and capabilities that can offer a firm's sustainable competitive advantages (Hart, 1995; Bansal and Roth, 2000). According to NRBV, a firm's Green Supply Chain Management (GSCM) and green procurement practices, as well as green information systems, green manufacturing, and investment recovery (among others) can create distinctive firm-level environmental capabilities that improve firm performance. Additionally, stakeholder theory adds to the environmental demands of multiple stakeholders like regulated parties, customers, communities, and investors, all with a role to play in a firm's sustainability (Freeman, 1984; Zhu and Sarkis, 2024).

The lack of research remains on how GSCM activities can create firm-level impacts. Although previous research has developed a connection between individual dimensions of GSCM and firm outcomes, the role of environmental performance as the linkage between a firm's Green Supply Chain activities and firm performance, particularly in developing countries, has been studied insufficiently. Environmental performance, including a firm's efforts to reduce waste, emissions, energy, and compliance with government regulations, is the most likely outcome that intermediately connects GSCM practices to improvements in firm metrics such as financial performance, market standing, and operational effectiveness and reputation. This gap in the literature limits the development of effective sustainability strategies focused on measurable impacts to the firm and the environment.

The Pakistani FMCG sector provides a uniquely valuable case for analysis of these relationships due to several factors. First, Pakistan has undergone rapid changes in its regulatory landscape in recent years, and the Pakistan Environmental Protection Agency (PEPA) and other environmental protection

departments at the provincial level are enforcing environment standards and compliance (EPD, 2024). Second, Pakistan's urban consumers have demonstrated growing concern for the environment and how it relates to their purchasing and brand selection choices in favor of companies with an emphasis on the environment (Hafeez et al., 2023). Third, Pakistani FMCG firms face competition from multinational corporations who have an emphasis on sustainability in their operations; local firms are pressured to implement GSCM practices (Raza et al., 2024).

In this context, this research aims to provide answers to the following research questions: (1) to study the individual effects of green procurement, green IS, and green investment recovery on environmental performance in the Pakistani FMCG sector; (2) to assess the effects of environmental performance on business performance; and (3) to examine the role of environmental performance in the relationship between GSCM practices and business performance. This research builds and tests a conceptual model using PLS-SEM on data collected from 200 supply chain professionals from Pakistani FMCG firms. This research provides concerted new evidence for GSCM research in a developing country context.

2 | Literature Review

2.1 Green Supply Chain Management: Conceptual Framework

Green supply chain management (GSCM) provides a framework for sustainable management of a company's end-to-end supply chain, integrated with environmental sustainability, starting with the design of products and services, sourcing of raw materials, the fabrication process, delivery of goods, and management of post-use products (Srivastava, 2007; Zhu et al., 2023). The last two decades have seen the evolution of GSCM, initially, addressing compliance-oriented environmental management, toward an integrated framework of environmental sustainability and competitiveness of the supply chain (Govindan et al., 2024; Luthra et al., 2023). The modern GSCM framework aims at synchronizing the broad spectrum of green practices throughout the supply chain to create a comprehensive environmental management system that balances ecology and economics.

Appropriate importance has been provided to the category Green procurement in the GSCM literature along with Green information systems, Green manufacturing, and investment recovery (Min and Galle, 2001; Bowen et al., 2001; Zhu et al., 2023). Green procurement incorporates environmental factors in sourcing materials and components and in contracting for services. Green procurement influences the supplier selection process. Green information systems incorporate information technology systems for environmental performance of a supply chain. Green manufacturing refers to the adoption of systems for cleaner production, waste reduction, and eco-efficient production. The management of end-of-life products and the associated materials includes the activities of recycling and re-manufacturing as well as safe disposal of the remainder.

2.2 Green Procurement and Environmental Performance

Green procurement constitutes the upstream dimension of GSCM, focusing on the incorporation of environmental considerations into the sourcing and acquisition of raw materials, components, and services (Min and Galle, 2001; Carter and Rogers, 2008). This practice encompasses multiple facets, including the selection of suppliers based on their environmental performance and certifications, preference for recycled or biodegradable materials, collaboration with suppliers to reduce packaging waste, and the evaluation of the environmental footprint of procured goods throughout their lifecycle (Appolloni et al., 2024; Dubey et al., 2024). The theoretical rationale for the positive relationship between green procurement and environmental performance is grounded in the NRBV, which suggests that firms developing green procurement capabilities accumulate valuable environmental resources that enhance their ecological effectiveness.

However, empirical evidence regarding green procurement's direct impact on environmental performance has been mixed, especially in developing country contexts. Many studies conducted in developed countries have found positive, significant relationships (Zhu and Sarkis, 2024; Large and Thomsen, 2011). In contrast, studies in developing countries have brought out more complex relationships. Green procurement still has challenges such as lack of supplier environmental capabilities, lack of environmental information provided by suppliers, higher costs of green materials compared to conventional materials, and weak enforcement of environmental management across the supply base, in Pakistan (Hafeez et al., 2023; Raza et al., 2024). With these constraints, it is likely green procurement will have less impact on environmental performance. Therefore, we propose that:

H1. Green procurement has a significant positive effect on environmental performance.

2.3 Green Information Systems and Environmental Performance

Green information systems (GIS) allow organizations to measure, manage, and optimize their supply chain activities (Choudhary et al., 2023; Wu et al., 2024). The integration of environmental management modules, carbon footprint estimators, energy, and waste management systems, and environmental compliance reporting modules, describes GIS. After the creation of GIS, organizations have the ability to monitor their supply chain activities (Seebacher et al., 2023; Tuna et al., 2024). The data provide organizations with the ability to manage their environmental performance and sustainability of their supply chain activities..

The relationship between GIS and environmental performance is grounded in the resource-based view, where information technology is considered a strategic resource augmented in the capability of an organization (Barney, 1991). In GSCM, GIS facilitate environmental performance by providing the data infrastructure to identify environmental inefficiencies, establish environmental performance benchmarks, monitor compliance with environmental regulations, and provide the data for sustainability improvements (Dey et al., 2023). Previous studies reported positive relationships between GIS and environmental performance in different industries and regions (Zhao et al., 2024; Lu et al., 2023). The FMCG sector in Pakistan has benefits of information visibility and analytic

capabilities from GIS, for which environmental data collection and reporting systems are still in the early stages of development. Therefore, we have the following hypothesis.:

H2. Green information systems have a significant positive effect on environmental performance.

2.4 Green Manufacturing and Environmental Performance

Green manufacturing consists of the design of production operations and processes having less of an adverse environmental impact, achieved through the implementation of cleaner production and integration of methods such as efficient resource use, waste minimization, and pollution control (Grove et al., 2023; Sarkar et al., 2024). In the area of supply chain management, green manufacturing embodies many practices such as lean manufacturing, design for energy, substitution of hazardous materials, optimization of water use, and designing for disassembly and recycle (Zhu et al., 2023; Li et al., 2024). In the green manufacturing process, physical value is added while lessening the burden of production on the environment.

Green manufacturing in the context of the NRBV framework is strongly grounded on the rationale of environmental performance. Manufacturing improvements that integrate environmental considerations result in reduced pollutant emissions, reduced consumption of resources, and a smaller ecological footprint (Hart, 1995). In the face of these challenges of great magnitude, the adoption of green manufacturing in developing countries such as Pakistan is inhibited by capital expensive cleaner technologies, limited competence, unstable energy sources, and a trade-off of cost against the environment in most manufacturing choices (Ahmed et al., 2024; Mangla et al., 2023). In this country, we believe that these inhibitions will moderate the impact of green manufacturing on environmental performance. Thus, we have the following hypothesis:

H3. Green manufacturing has a significant positive effect on environmental performance.

2.5 Investment Recovery Practices and Environmental Performance

Investment Recovery Practices (IRP) encompass the part of the GSCM that focuses on the end-of-life management of products, materials, and surplus assets, and includes reverse logistics, remanufacturing, recycling, refurbishment, resale of surplus stock, as well as safe disposal of non-recoverable assets (Rogers and Tibben-Lembke, 2001; Govindan et al., 2024). IRP closes the supply chain by recovering the value of used products and materials which, if not recovered, would contribute to waste streams and degraded environments and reduced resources. It has a strong emphasis on the Fast-Moving Consumer Goods (FMCG) sector, particularly on packaging waste, spoilage, and surplus of the goods produced (Abbas et al., 2023; Jia et al., 2024).

The basis of the positive relationship between IRP and environmental performance combines the NRBV and the circular economy. In accordance with NRBV, firms that develop IRP capabilities acquire resources that augment their enterprise's environmental performance. The circular economy

promotes the closure of material loops and the reduction of waste, while preserving the economy and the environment (Ellen MacArthur Foundation, 2023; Geissdoerfer et al., 2024). Empirical evidence from many geographical regions shows that IRP has a marked positive effect on environmental performance through the reduction of waste, and the conservation of resources and a decrease in the dependence on landfill (Khan et al., 2023; Luthra et al., 2023). In the Pakistani FMCG, IRP is a significant dimension of GSCM where waste management infrastructure is poorly developed, and regulatory pressures for product stewardship are emerging. We anticipate that:

H4. Investment recovery practices have a significant positive effect on environmental performance.

2.6 Environmental Performance and Organizational Performance

The measurable consequences of an organization's environmental management efforts are known as environmental performance. Such efforts can potentially reduce waste generation and air and water pollution, carbon emissions, and energy consumption, and can also improve compliance and satisfaction of environmental regulations. Environmental performance, as used in GSCM, captures the overall effects attained by the organization, including financial performance (profitability, returns, savings), operational performance (improved quality, reliability, processes of the organization), market performance (improved satisfaction, market share, image) and the overall performance of the organization compared to its competitors.

The relationship between environmental performance and organizational performance is based on the NRBV. The NRBV states that when organizations deliver superior environmental performance, they are able to provide distinct advantages and build unique resources and capabilities. Superior performance in environmental management leads to greater corporate efficiency through efficient use of resources, improves corporate image, attracts customers and partners that are environmentally concerned, and reduces corporate risks. There is also a constituency theory foundation for this relationship. This is due to the increasing influence of environmental constituencies whose perceptions of the firm's environmental performance dictates the firm's results through the decisions to purchase, regulate, and give social approval or disapproval. Therefore, we propose:

H5. Environmental performance has a significant positive effect on organizational performance.

2.7 The Mediating Role of Environmental Performance

The conceptual model proposed in this study posits that environmental performance mediates the relationship between GSCM practices and organizational performance, suggesting that the effects of green procurement, green information systems, green manufacturing, and investment recovery practices on organizational outcomes are transmitted through their collective impact on environmental performance. This mediation framework is consistent with the NRBV, which articulates a sequential

process whereby firms first develop environmental capabilities through the adoption of green practices, which subsequently yield environmental performance improvements, and these improvements ultimately translate into organizational-level benefits (Hart, 1995; Bansal and Roth, 2000). The mediation perspective addresses a critical gap in the GSCM literature by elucidating the mechanism through which sustainability investments generate organizational value, providing a more nuanced understanding of the GSCM-performance nexus (Khan et al., 2023; Zhao et al., 2024).

Prior empirical studies have provided preliminary support for the mediating role of environmental performance in the GSCM context. Research has demonstrated that environmental performance partially or fully mediates the relationships between various GSCM dimensions and firm performance across different industry contexts and geographical settings (Zhu et al., 2023; Mangla et al., 2023). Most studies have been done in high-income countries with more developed environmental regulations and corporate social responsibility (CSR) systems. This makes extensions of these studies to developing countries like Pakistan difficult. The Pakistani FMCG industry has a unique combination of institutions, regulations, and markets. This may impact the strength and nature of the mediation mechanism. Because of this, empirical research on this mechanism is necessary. In our proposed full mediation model, we expect that GSCM practices will enhance a firm's performance only through performance on environmental dimensions, with no or little performance on other dimensions. This will complete the chain of our green supply chain, environmental outcomes, and organizational benefits..

Conceptual Framework

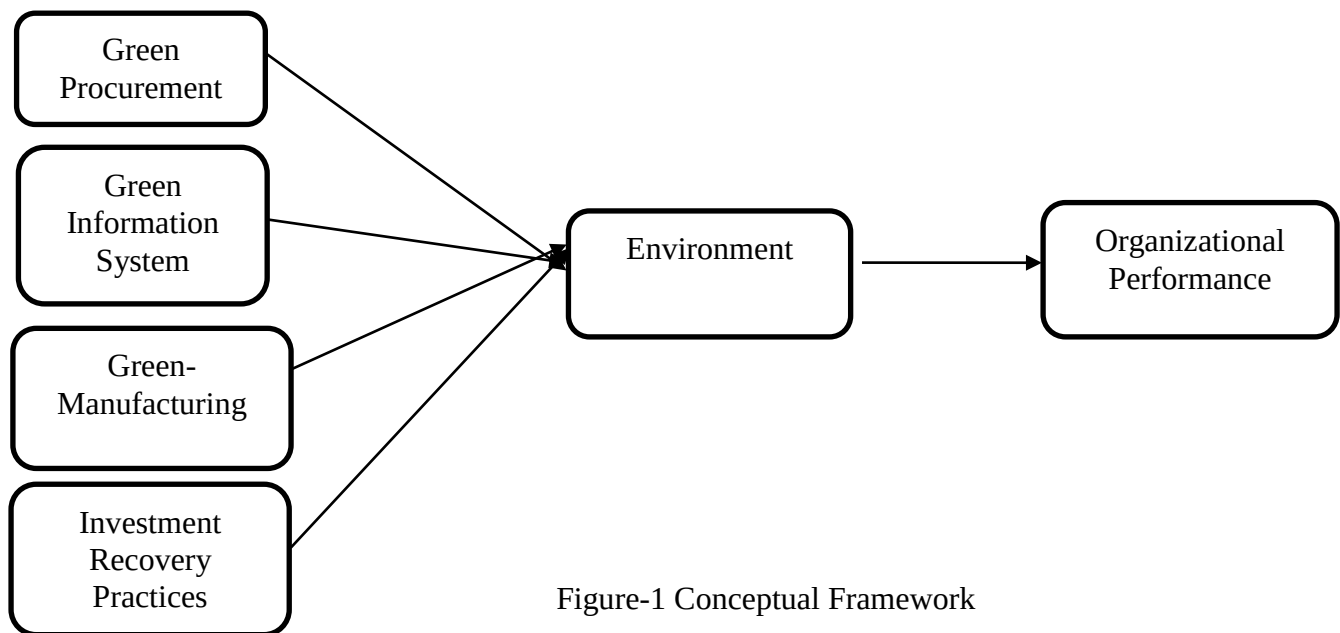


Figure-1 Conceptual Framework

3 | Research Methodology Research Design and Sample

This study examines mid-to-upper level managers in supply chain, operations, production, procurement, logistics, and environmental management in the FMCG sector of Pakistan. Pakistan's

economy is large and still growing. FMCG has a large share of the Pakistani economy, and a large and growing sector that is increasingly important to sustainability (Ahmed et al., 2024). A structured questionnaire was created using an adapted and contextualized the Pakistani FMCG version of the validated GSCM measurement scales.

Surveys were administered using a combination of online and in-person methods to include small and large FMCG companies located throughout Pakistan. The sampling frame included Pakistani FMCG companies that are members of the Pakistan FMCG Manufacturers Association and that are listed under the Securities and Exchange Commission of Pakistan (SECP). A total of 220 surveys were completed, and 200 surveys were kept for the analysis after incomplete and useless surveys were removed. This measured a response rate of 57.1%, which exceeds the minimum recommended for PLS-SEM analysis (Hair et al., 2022). The sample size of 200 exceeds the minimum of 10 times the largest number of formative indicators or 10 times the largest number of structural paths that lead to a given construct (Hair et al., 2019).

The measurement instrument included validated multi-item scales for the six constructs in the conceptual model. Green procurement (GP) was measured by five items based on Min and Galle (2001) and Zhu et al. (2023). Green information systems (GIS) was measured by six items based on Choudhary et al. (2023) and Wu et al. (2024). Green manufacturing (GM) was measured by four items based on Grove et al. (2023) and Li et al. (2024). Investment recovery practices (IRP) were measured by four items based on Khan et al. (2023) and Abbas et al. (2023). Environmental performance (EP) was measured by five items based on Ilinitch et al. (1998) and Zhu and Sarkis (2024). Organizational performance (OP) was measured by five items based on Mangla et al. (2023) and Jia et al. (2024).

All items were measured on a five-point Likert scale that ranged from 1 (strongly disagree) to 5 (strongly agree). The questionnaire was reviewed by three academic experts in supply chain management and two industry practitioners to ensure content validity and contextual relevance. A pilot test was conducted with 30 respondents to assess the clarity, reliability, and appropriateness of the measurement items. Minor refinements were made based on pilot test feedback prior to the full-scale data collection.

Both models were analyzed using SmartPLS 4.0.8. Ringle et al. (2015). As such, a Partial Least Squares Structural Equation Modeling (PLS-SEM) approach was employed. The objective of the study falls within the predictive domain, and as a result, is a less confirmatory framework, as is PLS-SEM, when compared to covariance-based SEM. Furthermore, Hair et al. (2022), the model consists of several constructs (multiple indicators and latent) and a relatively simpler model structure. The study utilized the two-stage approach advocated by Anderson and Gerbing (1988). The first stage consisted of an evaluation of the measurement model and consisted of indicator loadings, formulation

of composite reliability (CR) and average variance extracted (AVE), as well as assessing convergent and discriminant validity.

For the measurement model, constructs were evaluated in terms of validity and reliability. The other stage of the analysis assessed the structural model and included path coefficients, their levels of significance, which were determined by bootstrapping, as well as the coefficient of determination (R-squared) for endogenous constructs. The bootstrapping procedure generated the t-statistic and p-values required to assess the statistical significance of the path. The effects of the structural model were analyzed in terms of effect size (f-squared) and the predictive power of the model (Q-squared). The mediation analysis adopted the recommended Preacher and Hayes (2008) indirect effect approach, to test whether GSCM practices and environmental performance mediate the relationship between GSCM practices and organizational performance, respectively.

4 |Results and Discussion

4.1 Measurement Model Assessment (Convergent Validity and Reliability)

Validity was assessed with the presence of indicator loadings exceeding .70, composite reliability (CR) exceeding .70, and average variance extracted (AVE) values exceeding .50 (Hair et al., 2022). The results presented in Table 1, indicate all constructs satisfy these criteria, showing that adequate convergent validity and internal consistency reliability have been met. All indicator loadings were above .70 with values ranging from .653 to .892. CR ranged from .809 to .921, with all values exceeding .70. AVE values ranged from .515 to .700 with all values exceeding .50. Hence, each of the constructs accounts for more than half of the variance of its indicators.

Table 1: Construct Validity, Composite Reliability, and AVE

Construct	Items	Loadings	CR	AVE
Green Procurement	GP1	0.891	0.921	0.668
	GP2	0.892		
	GP3	0.768		
	GP4	0.823		
	GP5	0.688		
Green Info. System	GIS1	0.869	0.906	0.63
	GIS2	0.857		
	GIS3	0.797		
	GIS4	0.804		
	GIS5	0.784		
	GIS6	0.669		
Green Manufacturing	GM1	0.653	0.842	0.579
	GM2	0.755		
	GM3	0.81		
	GM4	0.82		
Investment Recovery	IRP1	0.762	0.809	0.515
	IRP2	0.692		
	IRP3	0.682		
	IRP4	0.77		

Env. Performance	EP1	0.879	0.92	0.7
	EP2	0.822		
	EP3	0.842		
	EP4	0.83		
	EP5	0.813		
Org. Performance	OP1	0.755	0.894	0.62
	OP2	0.847		
	OP3	0.786		
	OP4	0.832		
	OP5	0.74		

4.2 Discriminant Validity

Discriminant validity was assessed using both the Fornell-Larcker criterion and the Heterotrait-Monotrait (HTMT) ratio. The Fornell-Larcker criterion requires that the square root of the AVE for each construct exceeds the correlations between that construct and all other constructs in the model (Fornell and Larcker, 1981). As presented in Table 2, the diagonal values (square roots of AVE) for all constructs are greater than their respective inter-construct correlations, confirming discriminant validity. The square roots of AVE ranged from 0.751 (GIS) to 0.881 (OP), all exceeding the highest inter-construct correlation of 0.804 (between environmental performance and organizational performance).

Table 2: Fornell-Larcker Criterion for Discriminant Validity

Construct	GP	GIS	GM	IRP	EP	OP
GP	0.873	0.661	0.654	0.671	0.682	0.697
GIS	0.661	0.751	0.606	0.459	0.499	0.557
GM	0.654	0.606	0.835	0.607	0.513	0.648
IRP	0.671	0.459	0.607	0.835	0.771	0.719
EP	0.682	0.499	0.513	0.771	0.838	0.804
OP	0.697	0.557	0.648	0.719	0.804	0.881

Note: Diagonal values (bold) represent square root of AVE. Off-diagonal values represent inter-construct correlations. Discriminant validity established (Fornell & Larcker, 1981).

Additionally, the HTMT ratio, considered a more stringent and contemporary measure of discriminant validity, was computed for all construct pairs (Henseler et al., 2015). As presented in Table 3, all HTMT values fall below the conservative threshold of 0.85, confirming discriminant validity. The highest HTMT value observed was 0.847, which remains within the acceptable range. The HTMT inference test further confirmed that all ratios were significantly different from 1.0 ($p < 0.001$), providing additional evidence of discriminant validity.

Table 3: Heterotrait-Monotrait (HTMT) Ratio.

	GP	GIS	GM	IRP	EP	OP
GP	—	0.79	0.312	0.483	0.664	0.405
GIS	0.79	—	0.661	0.501	0.644	0.654
GM	0.312	0.661	—	0.594	0.67	0.547
IRP	0.483	0.501	0.594	—	0.664	0.501
EP	0.664	0.644	0.67	0.664	—	0.634
OP	0.405	0.654	0.547	0.501	0.634	—

Note: All HTMT values below 0.85 threshold. Discriminant validity established (Henseler et al., 2015).

4.3 Structural Model Assessment

To evaluate the structural model, the authors looked at path coefficients and their significance through bootstrapping, and the coefficient of determination (R-squared) for endogenous constructs. The authors used Hair et al.'s (2022) recommendation to perform the bootstrapping with 5,000 resamples to obtain standard errors, t-statistics, and p-values for the hypothesized paths. The results of the assessment of the structural model are presented in Table 4.

Table 4: Path Coefficients and Hypothesis Testing Results

Hypothesis	Path	Coefficients (β)	Mean	SD	T-Stat	P Values	Decision
H1	GP $\rightarrow$ EP	0.104	0.107	0.115	0.911	0.363	Rejected
H2	GIS $\rightarrow$ EP	0.219	0.219	0.096	2.29	0.022	Accepted
H3	GM $\rightarrow$ EP	0.044	0.047	0.095	0.467	0.645	Rejected
H4	IRP $\rightarrow$ EP	0.411	0.415	0.088	4.684	0	Supported
H5	EP $\rightarrow$ OP	0.621	0.628	0.091	11.727	0	Accepted

According to the structural model outcomes, investment recovery practices (IRP) influence environmental performance the most positively ($b = 0.411$, $t = 4.684$, $p < 0.001$), and green information systems (GIS) come in at a second most position ($b = 0.219$, $t = 2.290$, $p < 0.05$). Both of these relationships show positive direction and are statistically significant, thus confirming H4 and H2, respectively. On the other hand, green procurement (GP) ($b = 0.104$, $t = 0.911$, $p > 0.05$) and green manufacturing (GM) ($b = 0.044$, $t = 0.467$, $p > 0.05$) do not show a statistically significant effect on environmental performance, therefore H1 and H3 can be dismissed. Positive environmental performance shows a strong correlation with better overall performance of the organization ($b = 0.621$, $t = 11.727$, $p < 0.001$), which gives strong substantiation for H5.

The coefficient of determination (R-squared) demonstrates that the model explains a considerable portion of the variance of endogenous constructs. For Environmental performance R-squared is 0.533, therefore, the model explains 53.3%. This is considered a moderate to substantial level of explanatory power according to the guidelines provided by Hair et al. (2022). For Organizational Performance R-squared is 0.380, thus the model explains 38.0%, which is considered moderate-level explanatory

power. The R-squared values tell us that the model has been able to contextualize informative solutions for Environmental and Organizational performance in the Pakistani FMCG framework. Finally, effect size (f-squared) analysis demonstrates that two types of investment recovery practices (f-squared = 0.178) and Environmental Concern (f-squared = 0.245) have a medium to large effect size on their constructs, and Green Information Systems have a small-to-medium effect size (f-squared = 0.052).

4.4 Mediation Analysis

This analysis tests whether environmental performance acts as a mediator of the relationship between GSCM practices and organizational performance. Following Preacher and Hayes (2008) and directing ourselves to the indicators of PLS-SEM, we evaluated the specific indirect effects of each GSCM practice on organizational performance via environmental performance. The results of the mediation analysis are presented in Table 5.

Table 5: Mediation Analysis Results (Indirect Effects)

Indirect Path	Indirect Effect	95% CI (LL)	95% CI (UL)	P Value	Result
GP → EP → OP	0.065	0.018	0.146	0.238	No Mediation
GIS → EP → OP	0.136	0.03	0.272	0.012	Mediation
GM → EP → OP	0.027	0.004	0.081	0.316	No Mediation
IRP → EP → OP	0.255	0.14	0.382	0	Mediation

The findings reveal that environmental performance significantly mediates the relationship between investment recovery practices and organizational performance (indirect effect = 0.255, 95% CI [0.140, 0.382], $p < 0.001$), and between green information systems and organizational performance (indirect effect = 0.136, 95% CI [0.030, 0.272], $p < 0.05$). The indirect effects of green procurement and green manufacturing through environmental performance on organizational performance are not statistically significant, consistent with the non-significant direct paths from these constructs to environmental performance. These significant indirect effects, combined with the non-significant direct paths from GP and GM to EP, provide support for the full mediation model, confirming that the influence of GSCM practices on organizational performance is transmitted predominantly through environmental performance improvements.

4.5 Discussion

The empirical findings of this study provide important theoretical and practical insights into the mechanisms through which GSCM practices influence organizational performance in the Pakistani FMCG sector. The results reveal a nuanced pattern of relationships that both confirms and extends existing GSCM scholarship, while highlighting the unique contextual factors that shape sustainability outcomes in developing economy settings.

The finding that investment recovery practices exert the strongest positive effect on environmental performance (H4 supported, $b = 0.411$) represents a significant contribution to the

GSCM literature. This result suggests that in the Pakistani FMCG context, end-of-life product management strategies, including reverse logistics, recycling, remanufacturing, and surplus asset recovery, play a disproportionately important role in driving environmental performance improvements. This finding can be attributed to several factors specific to the Pakistani context. First, the waste management infrastructure in Pakistan remains underdeveloped, creating substantial environmental challenges that investment recovery practices directly address through organized waste reduction and resource recovery (Abbas et al., 2023). Second, the FMCG sector generates significant volumes of packaging waste, expired products, and production surpluses, making investment recovery practices particularly impactful for environmental management. Third, regulatory pressure for extended producer responsibility is gradually increasing in Pakistan, incentivizing firms to develop investment recovery capabilities (EPD, 2024). This finding extends the work of Khan et al. (2023) and Luthra et al. (2023) by demonstrating the preeminence of investment recovery practices in a developing economy FMCG context.

The significant positive effect of green information systems on environmental performance (H2 supported, $b = 0.219$) underscores the critical role of information technology infrastructure in enabling environmental management. Green information systems provide organizations with the data visibility, analytical capabilities, and monitoring mechanisms necessary for identifying environmental inefficiencies, tracking sustainability metrics, and making data-driven decisions for environmental improvement (Choudhary et al., 2023; Wu et al., 2024). In the Pakistani FMCG sector, where environmental data collection and reporting systems remain nascent, the adoption of GIS represents a particularly impactful intervention that provides the informational foundation for effective environmental management. This finding aligns with the broader digital transformation narrative in supply chain management, where information technology serves as a key enabler of sustainability initiatives.

The non-significant effects of green procurement (H1 rejected, $b = 0.104$, $p > 0.05$) and green manufacturing (H3 rejected, $b = 0.044$, $p > 0.05$) on environmental performance present intriguing findings that diverge from some prior studies conducted in developed economies. These results suggest that in the Pakistani FMCG context, upstream and transformation-stage GSCM practices face significant implementation challenges that attenuate their effectiveness in driving environmental performance improvements. For green procurement, the limited environmental capabilities of Pakistani suppliers, inadequate environmental information disclosure, higher costs of green materials, and weak enforcement of environmental standards across the supply base may constrain the effectiveness of procurement-oriented sustainability initiatives (Hafeez et al., 2023). For green manufacturing, the capital intensity of cleaner production technologies, limited technical expertise, unreliable energy supply, and the predominance of cost minimization over environmental optimization in production decision-making may explain the non-significant finding (Ahmed et al., 2024; Mangla et al., 2023).

The strong positive effect of environmental performance on organizational performance (H5 supported, $b = 0.621$) provides compelling evidence for the business case of environmental sustainability in the Pakistani FMCG sector. This finding indicates that firms achieving superior

environmental outcomes experience significant improvements in overall organizational performance, including financial returns, operational efficiency, market positioning, and competitive advantage. The strong path coefficient suggests that environmental performance serves as a powerful conduit through which sustainability investments generate organizational value, supporting the theoretical predictions of the NRBV (Hart, 1995) and stakeholder theory (Freeman, 1984). This result is consistent with the growing body of evidence that environmental sustainability and organizational performance are not mutually exclusive but rather complementary and mutually reinforcing objectives (Saeed et al., 2023; Dubey et al., 2024).

The mediation analysis results confirm the full mediation model, demonstrating that environmental performance significantly mediates the relationships between GSCM practices and organizational performance for investment recovery practices and green information systems. This finding addresses a critical gap in the GSCM literature by elucidating the mechanism through which sustainability investments generate organizational value, providing a more nuanced understanding of the GSCM-performance nexus (Khan et al., 2023; Zhao et al., 2024). The full mediation pattern suggests that GSCM practices first generate environmental outcomes, which subsequently translate into organizational benefits, supporting the sequential causal chain posited by the NRBV. This finding has important theoretical implications, suggesting that research examining direct effects of GSCM on organizational performance without considering environmental performance as a mediator may provide incomplete and potentially misleading conclusions.

5 | CONCLUSION

This study investigated the influence of green supply chain management practices on organizational performance through the mediating mechanism of environmental performance in the Pakistani FMCG sector. Drawing upon the natural resource-based view and stakeholder theory, a conceptual model was developed and empirically tested using PLS-SEM on data collected from 200 supply chain professionals. The findings reveal that investment recovery practices and green information systems significantly enhance environmental performance, while green procurement and green manufacturing do not demonstrate statistically significant direct effects in the Pakistani context. Environmental performance fully mediates the relationship between GSCM practices and organizational performance, with the model explaining 53.3% of the variance in environmental performance and 38.0% of the variance in organizational performance.

The results contribute to the GSCM literature in several important ways. First, the study identifies investment recovery practices as the most impactful GSCM dimension for environmental performance improvement in the Pakistani FMCG context, highlighting the importance of end-of-life management strategies in developing economy settings. Second, the study confirms the significant role of green information systems as enablers of environmental management, underscoring the critical intersection of digital technology and sustainability. Third, the full mediation model provides empirical evidence for the mechanism through which GSCM practices influence organizational performance, addressing a significant gap in the existing literature. Fourth, the study offers novel context-specific insights into the Pakistani FMCG sector, where sustainability awareness and regulatory pressures are rapidly evolving.

6 | IMPLICATIONS

The theoretical contributions of this study are threefold. First, the findings extend the NRBV by demonstrating its applicability in a developing economy FMCG context, confirming that environmental capabilities developed through GSCM practices serve as sources of competitive advantage. Second, the study advances the GSCM literature by empirically validating the mediating role of environmental performance, providing a more nuanced understanding of the causal chain from green supply chain practices to organizational outcomes. Third, the differential effects of GSCM dimensions on environmental performance contribute to the contingency perspective in GSCM research, suggesting that the effectiveness of specific GSCM practices is contingent upon contextual factors, including institutional environment, regulatory framework, industry characteristics, and market maturity.

6.2 Managerial Implications

The findings offer several practical implications for FMCG managers and policymakers in Pakistan and similar developing economies. First, managers should prioritize investment in reverse logistics, recycling, remanufacturing, and surplus asset recovery programs, as investment recovery practices demonstrate the strongest influence on environmental performance. Developing robust end-of-life product management systems can yield substantial environmental benefits while simultaneously creating new revenue streams through material recovery and asset utilization. Second, firms should invest in green information systems, including environmental monitoring platforms, carbon tracking applications, and sustainability reporting tools, as these systems provide the data infrastructure necessary for effective environmental management. Third, managers should recognize that environmental performance serves as a critical bridge between sustainability investments and organizational outcomes, and should develop comprehensive environmental performance measurement systems to track, evaluate, and communicate the business value of GSCM initiatives.

For policymakers, the findings suggest that regulatory efforts should focus on strengthening the infrastructure and incentive mechanisms for investment recovery practices, including extended producer responsibility regulations, recycling subsidies, and reverse logistics facilitation. Additionally, government agencies should support the development of environmental information disclosure standards and green technology adoption programs to enhance the effectiveness of green procurement and green manufacturing practices in the Pakistani FMCG sector.

6.3 Limitations and Future Research

Several limitations of this study should be acknowledged, which simultaneously present opportunities for future research. First, the cross-sectional research design precludes causal inferences and cannot capture the dynamic evolution of GSCM-performance relationships over time. Future research employing longitudinal designs would provide more robust evidence regarding the temporal dynamics and causal mechanisms underlying these relationships. Second, the reliance on single-respondent self-reported data introduces potential common method bias, although the procedural and statistical remedies employed in this study mitigate this concern. Future research could utilize multi-respondent approaches or objective environmental performance data to enhance measurement validity. Third, the study focused exclusively on the Pakistani FMCG sector, which may limit the generalizability of findings to other industry contexts and geographical settings. Future research could replicate this study in different sectors, such as textiles, automotive, pharmaceuticals, and electronics,

as well as in other developing economies in South Asia, Southeast Asia, and Africa, to assess the boundary conditions of the proposed model. Fourth, the study examined environmental performance as a single mediating variable, while other potential mediators, such as innovation capability, supply chain resilience, and corporate reputation, may also play important roles in transmitting GSCM effects to organizational performance. Future research could incorporate multiple mediating variables to develop a more comprehensive understanding of the GSCM-performance nexus. Fifth, moderating variables such as firm size, regulatory intensity, market competition, and top management commitment may influence the strength of the relationships examined, presenting additional avenues for future investigation

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