

Nexus between Sustainable Supply Chain and Sustainability Performance of the Pharmaceutical Industry: Evidence from Pakistan

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Abstract

We examine how sustainable supply chain (SC) practices shape the sustainability performance (SP) of Pakistan's pharmaceutical sector, and whether commitment to sustainability (CS) and management preparedness (MP) carry part of that effect. A structured questionnaire was completed by 298 middle- and senior-level SC managers in pharmaceutical firms across Pakistan, and the data were analyzed with Partial Least Squares Structural Equation Modeling (PLS-SEM). Green SC (GSC), reasons for sustainable supply chain management (RSC), managerial approaches (MSS), supplier characteristics (CSS), and performance criteria (PCS) increased CS, while barriers (BRS) and benefits and motivation (BMS) reduced it. For MP, only GSC, BRS and BMS had significant effects, all positive. CS was positively linked to both MP and SP, and MP was positively linked to SP. Through CS, GSC, MSS, CSS and PCS improved SP; through CS, GSC, RSC, MSS, CSS and PCS improved MP; and through MP, GSC, BRS, BMS and CS improved SP. The remaining indirect paths were not significant. The results suggest that managers should build commitment and preparedness through planning, leadership, training, collaboration, and capability development.

Keywords: Managerial Preparedness, Commitment to Sustainability, Sustainability Performance, Pharmaceutical Industry, Pakistan, PLS-SEM.

Introduction

The implementation of pharmaceutical supply chains (SCs) aligned with Sustainable Development Goals (SDGs) has become more apparent as a viable solution to improving environmental and social outcomes. Dahinine et al. (2024) attribute the concept of green SC to various aims including good health, responsible consumption

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and climate action, while citing that when HRM is green along with transformational leadership green procurement and waste reduction are promoted. Sun et al. (2024) further point out that digital transformation simplifies the operations of SCs, reduces resource consumption, and enhances transparency, thus promoting innovation and infrastructure.

The adoption of green SC management practices (GSCMPs) is gaining momentum in Pakistan and one of the significant groups involved in this transition are pharmaceutical companies. With the help of green technology and managerial innovation these practices contribute to sustainable performance for manufacturing and service industries, including pharmaceuticals, primarily via the inclusion of green production, waste minimization and regulatory closeness. In line with this, Khan et al. (2024b) also demonstrate that any attempt towards developing sustainable service quality in SME logistics further enhances SC sustainability by curbing environmental uncertainty and ensuring the achievement of three bottom-line results. There are some notable exceptions to this progress, however. Some firms are not yet incorporating sustainability in the procurement, production, or distribution processes, and heavy energy usage, excessive chemical usage, weak waste management, and limited use of environmentally friendly SC practices are noted as the drags on SP in pharmaceutical (Junejo et al., 2025; Nazir & Fan, 2024). The situation is even poorer in developing economies, lack of managerial commitment, immaturity of technology, and poor enforcement of environmental regulations (Khan et al., 2024b).

Previous research has focused on examining other environments, such as automotive suppliers (Caniëls et al., 2013), electronics (Ong et al., 2019), food manufacturing (Raza, 2026), and manufacturing or services (Latif & Siddiqui, 2026; Mahar et al., 2025). Pharmaceuticals differ. Practices that can be adopted and the results they achieve are determined by the need for strict regulation, hazardous chemical handling, and temperature-controlled logistics (Khan et al., 2023; Mahar et al., 2025; Mastrantonas et al., 2024; Riaz et al., 2023; Riedel, 2024).

Previous research investigating sustainable SCs has largely focused on operational aspects of SCs and their direct impact on SP (Latif & Siddiqui, 2026; Salman & Siddiqui, 2026; Suwarna et al., 2026). Though in complementary ways, few studies of sustainable pharmaceutical SCs utilize the resource-based view (RBV) or institutional theory (Mastrantonas et al., 2024; Riaz et al., 2023; Riedel, 2024), RBV indicating internal resources and competencies (Salman & Siddiqui, 2026), and institutional theory to external pressures such as regulation and industry norms (Cancela et al., 2026). Their combination helps to describe the sustainable SC relationships

more effectively than either one or the other individually (Gupta et al., 2025; Türkeş et al., 2024).

These gaps can have serious impact if these continue. Weak practices include increased carbon emissions, depletion of resources, pollution, decreased operational efficiency and diminished competitiveness. International sustainability KPIs, which are included in the SDGs, can also lead to reputational risks and monetary consequences for firms that are not meeting them (Dahinine et al., 2024). Thus, it becomes more important to have a better understanding of the impact of sustainable SC practices on SP in the pharmaceutical industry. In Pakistan, the present study investigates this linkage by mediators of commitment to sustainability and preparedness for management.

The emphasis on commitment and preparedness requires a look at what a company must do within itself in order for sustainable SC practices to be effective. The findings can inform SC managers in the Pakistani pharmaceutical industry in making decisions on focus for effort (whether collaboration with the suppliers, risk management, transparency, or internal integration) and can align with the SDGs in the pharmaceutical industry, providing empirical evidence to promote SP.

The paper continues in the following way. A literature review, theory, and hypotheses are conducted in Section 2; a description of the sample, data collection, and measures is included in Section 3; results are presented in Section 4; a discussion of the results in comparison to existing research is included in Section 5; and recommendations, limitations, and future research directions are provided in Section 6.

Literature Review

Resource-Based View (RBV) Theory

The RBV was introduced into strategic management by Barney (1991) who claimed that firms can consistently outperform each other because they possess resource capabilities that other firms lack. The internal assets and capabilities that lead to sustainable competitive advantage are those resources that possess the characteristics of being valuable, rare, inimitable, and non-substitutable (VRIN) (Lockett et al., 2009). The theory has since shifted to dynamic capabilities and intangible assets. In this context, the ability of Pakistani pharmaceutical companies to develop their own competencies and preparedness to undertake the SC in achieving enhanced performance of the SP (Khan et al., 2024a).

Institutional Theory

Institutional Theory (IT) was first developed by DiMaggio and Powell (1983) and is extensively used in organizational studies. It assumes that social norms and cultural values influence organizational

structures and practices: organizations adopt them in order to be legitimate and survive (Amenta & Ramsey, 2010). Institutional isomorphism occurs when firms in the same industry end up resembling each other as a result of coercive, mimetic, and normative pressures. The latest research approaches IT to understand why companies get involved in environmental activities when subject to stakeholder and regulatory pressures (Willmott, 2015). In our perspective, these pressures compel Pakistani pharmaceutical organizations in the direction of sustainable SC practices that, in turn, increase commitment and preparedness and ultimately lead to an increase in SP (Nazir et al., 2024).

Sustainable Supply Chain Practices and Commitment to Sustainability

Expected change in CS as a result of greening the SC. Environmentally responsible companies that actively pursue sustainable procurement, waste minimization, and streamlined logistics often demonstrate a higher level of commitment to sustainability (Abbas, 2026), as they aim to gain legitimacy and fulfill the expectations of their stakeholders (Olaleye & Mosleh, 2025). Firms are placing more importance on sustainability, with regulatory compliance, cost efficiency, competitive pressures, and stakeholder expectations influencing this trend (Cuong et al., 2025). Another challenge for firms is high implementation cost, limited technological expertise, and insufficient infrastructure (Marculetiu et al., 2026), which can be addressed by recognition and action, supporting commitment. Perceived benefits like cost reduction, higher efficiency, improved reputation and competitive advantage go together (Abbas, 2026). Managers who follow systematic approaches to sustainable supply chain management show higher commitment (Gattiker et al., 2014). Supplier characteristics such as environmental compliance, reliability, ethical conduct, and quality standards also influence how sustainability-oriented a firm is (Abbas, 2026), and measures such as environmental efficiency, waste-reduction targets, and sustainability goals help firms assess and improve their practices (Qureshi, 2022). The following hypotheses are therefore proposed:

- H1: Greening the supply chain significantly affects commitment to sustainability.
- H2: Reasons for SSCM significantly affect commitment to sustainability.
- H3: Barriers to SSCM significantly affect commitment to sustainability.
- H4: Benefits and motivation for SSCM significantly affect commitment to sustainability.

- H5: Managerial approaches to SSCM significantly affect commitment to sustainability.
- H6: Supplier characteristics significantly affect commitment to sustainability.
- H7: Performance criteria for SSCM significantly affect commitment to sustainability.

Sustainable Supply Chain Practices and Managerial Preparedness

Green procurement, environmentally friendly logistics, waste reduction, and sustainable production strengthen managers' readiness to handle environmental and operational challenges (Mattar, 2025). From the RBV, green SC practices build internal capabilities and managerial skills that feed into management preparedness (Abbas, 2026). Regulatory pressure, cost efficiency, competitive advantage, and stakeholder expectations can also push firms toward greater readiness (Piyathanavong et al., 2024), and when firms see peers succeed, normative and mimetic pressures lead them to adopt similar practices, raising managerial readiness (Mohamed et al., 2025). Leadership, strategic planning, resource allocation, and sustainability-oriented decision-making enhance managers' capacity to put sustainable practices into effect (Shahzad et al., 2025; Suwarna et al., 2026). Supplier attributes, including reliability, environmental compliance, quality, and ethics, are likewise central to readiness for a sustainable SC (Abbas, 2026; Tay et al., 2025). Institutional theory explains why: coercive and normative pressure from industry regulation and expectations pushes firms to select responsible suppliers, which raises preparedness for sustainable SC management (Salman & Siddiqui, 2026). The following hypotheses are therefore proposed:

- H8: Greening the supply chain significantly affects management preparedness.
- H9: Reasons for SSCM significantly affect management preparedness.
- H10: Barriers to SSCM significantly affect management preparedness.
- H11: Benefits and motivation for SSCM significantly affect management preparedness.
- H12: Managerial approaches to SSCM significantly affect management preparedness.
- H13: Supplier characteristics significantly affect management preparedness.
- H14: Performance criteria for SSCM significantly affect management preparedness.

Linking Sustainability Commitment, Managerial Preparedness, and Sustainability Performance

Organizations committed to sustainability tend to weigh environmental, social, and economic concerns when they formulate and execute strategy (Islam et al., 2025). Strong commitment pushes firms to build the managerial skills, planning processes, and coordination mechanisms that sustain responsible operations (Sheikh et al., 2025). Well-prepared managers, in turn, can plan, coordinate, and carry out sustainable SC practices more effectively, which sharpens resource and risk decisions and yields better environmental, social, and economic outcomes (Ahmad et al., 2016).

The RBV emphasizes that commitment to sustainability is an internal capacity that can increase SP by coordinating activity and ensuring efficient use of resources (Nauman & Siddiqui, 2026). RBV also acknowledges the significance of CS to enhance competency of the managers and to prepare them in sustainable practices for SC (Abbas, 2026). Management preparedness is another important internal capability and it enables organizations to utilize resources and carry out a strategy effectively which results in increased SP (Raza et al., 2021). The following hypotheses are therefore proposed:

- H15: Commitment to sustainability significantly affects sustainability performance.
- H16: Commitment to sustainability significantly affects managerial preparedness.
- H17: Management preparedness significantly affects sustainability performance.

Commitment to Sustainability as a Mediator Between Sustainable Supply Chain Practices and Sustainability Performance

GSC practices reinforce a firm's commitment to sustainability (Abbas, 2026). Regulations, cost efficiency, competition, and stakeholder expectations are often cited as reasons for taking up sustainable practices, and such reasons heighten CS and so improve SP (Latif & Siddiqui, 2026). Obstacles such as high implementation costs, limited technical expertise, resistance to change, and weak infrastructure probably shape how organizations respond (Cuong et al., 2025); firms that handle these barriers effectively often strengthen their commitment and achieve better SP. Perceived benefits such as cost savings, efficiency, reputation, and competitive advantage push organizations toward more sustainable practices (Abbas, 2026) and also deepen commitment, which then supports SP. Commitment is nurtured by leadership, strategic planning, and sustainability-related decision-making (Gattiker et al., 2014). Supplier attributes, namely environmental compliance, ethical behavior, reliability, and quality standards, shape an organization's SP (Amer, 2026), and Abbas (2026)

reported that well-defined SP criteria, for instance environmental and efficiency targets and compliance standards, increase firms' focus and accountability.

Institutional theory argues that pressure from regulators and stakeholder expectations drives organizations to safeguard their legitimacy and deepen their commitment to sustainability (Marculetiu et al., 2026). Coercive and normative pressures lead firms to adopt formal standards and evaluation systems, which improves their SP (Cuong et al., 2025). RBV, by contrast, maintains that commitment driven by motivation builds valuable internal capabilities that let firms use their resources effectively and perform better on SP (Cuong et al., 2025). Working with capable and responsible suppliers builds relationships and capacity, which may increase CS and improve SP (Zhang et al., 2025). The following hypotheses are therefore proposed:

- H18: Commitment to sustainability significantly mediates the relationship between greening the supply chain and sustainability performance.
- H19: Commitment to sustainability significantly mediates the relationship between reasons for SSCM and sustainability performance.
- H20: Commitment to sustainability significantly mediates the relationship between barriers to SSCM and sustainability performance.
- H21: Commitment to sustainability significantly mediates the relationship between benefits and motivation for SSCM and sustainability performance.
- H22: Commitment to sustainability significantly mediates the relationship between managerial approaches to SSCM and sustainability performance.
- H23: Commitment to sustainability significantly mediates the relationship between supplier characteristics and sustainability performance.
- H24: Commitment to sustainability significantly mediates the relationship between performance criteria for SSCM and sustainability performance.

Commitment to Sustainability as a Mediator Between Sustainable Supply Chain Practices and Management Preparedness

Through stronger organizational commitment to sustainability, GSC practices improve managers' planning, coordination, and decision-making abilities to deal with environmental and operational challenges (Fajar et al., 2026). Regulatory pressure, cost efficiency, competitive advantage, and stakeholder expectations drive firms toward sustainable practices. How firms respond to sustainability is shaped by obstacles such as high implementation

costs, a lack of technical expertise, resistance to change, and inadequate infrastructure (Macek & Vitásek, 2024). Perceived benefits and motivations, for example savings, efficiency, reputation, and competitive advantage, likewise encourage firms to adopt sustainable practices. Leadership, planning, resource allocation, and related decision-making underpin sustainability commitment in organizations (Suwarna et al., 2026). The attributes of suppliers, specifically environmental compliance, ethics, reliability, and quality, reflect a firm's sustainability agenda (Macek & Vitásek, 2024). Well-specified performance criteria, such as environmental protection and efficiency targets and compliance standards, bring greater focus, accountability, and consistency to sustainability efforts (Bowick et al., 2026).

Under the RBV, GSC practices, by increasing commitment to sustainability, build valuable internal capabilities that enable managers to implement sustainable SC strategies (Macek & Vitásek, 2024). Close supplier relationships also provide resources and internal skills that strengthen sustainability commitment and enhance MP (Fajar et al., 2026). Institutional theory, by contrast, holds that institutional pressures can move organizations toward sustainability and thus show their commitment (Dahinine et al., 2024), which further raises their commitment and managerial preparedness to implement sustainable SC practices (Fajar et al., 2026). The following hypotheses are therefore proposed:

- H25: Commitment to sustainability significantly mediates the relationship between greening the supply chain and management preparedness.
- H26: Commitment to sustainability significantly mediates the relationship between reasons for SSCM and management preparedness.
- H27: Commitment to sustainability significantly mediates the relationship between barriers to SSCM and management preparedness.
- H28: Commitment to sustainability significantly mediates the relationship between benefits and motivation for SSCM and management preparedness.
- H29: Commitment to sustainability significantly mediates the relationship between managerial approaches to SSCM and management preparedness.
- H30: Commitment to sustainability significantly mediates the relationship between supplier characteristics and management preparedness.
- H31: Commitment to sustainability significantly mediates the relationship between performance criteria for SSCM and management preparedness.

Managerial Preparedness as a Mediator Between Sustainable Supply Chain Practices and Sustainability Performance

GSC practices give managers planning, coordination, and decision-making skills, enabling them to manage environmental initiatives effectively and thereby improve SP (Suwarna et al., 2026). Regulatory pressure, cost efficiency, competitive advantage, and stakeholder expectations push firms toward sustainability. The reasons for SSCM raise managers' awareness and preparedness by building the planning, coordination, and decision-making resources required to implement sustainable initiatives (Cancela et al., 2026). Heavy implementation costs, scarce technical expertise, resistance to change, and weak infrastructure may lead organizations to reinforce their managerial readiness (Shahzad et al., 2025). Perceived benefits, including cost savings, efficiency, reputation, and competitive advantage, build managerial awareness and preparedness (Suwarna et al., 2026). Leadership commitment, planning, resource allocation, and sustainability-oriented decision-making further improve managerial readiness (Shahzad et al., 2025). Supplier attributes such as sustainability compliance, ethical practices, reliability, and quality standards strengthen an organization's readiness for sustainable operations (Abbas, 2026), and well-defined performance criteria, such as environmental and efficiency goals and compliance standards, do likewise for managers (Shahzad et al., 2025). Organizations with a deep commitment to sustainability develop managerial capabilities (Abbas, 2026). Under the RBV, GSC practices develop valuable internal management skills that, once established, lead to superior SP (Wabanhu et al., 2026). Institutional theory adds that coercive, normative, and mimetic pressures encourage firms to adopt sustainable practices that strengthen MP and therefore SP (Abbas, 2026), and that these pressures also lead firms to adopt performance standards (Cancela et al., 2026). The following hypotheses are therefore proposed:

- H32: Management preparedness significantly mediates the relationship between greening the supply chain and sustainability performance.
- H33: Management preparedness significantly mediates the relationship between reasons for SSCM and sustainability performance.
- H34: Management preparedness significantly mediates the relationship between barriers to SSCM and sustainability performance.
- H35: Management preparedness significantly mediates the relationship between benefits and motivation for SSCM and sustainability performance.

- H36: Management preparedness significantly mediates the relationship between managerial approaches to SSCM and sustainability performance.
- H37: Management preparedness significantly mediates the relationship between supplier characteristics and sustainability performance.
- H38: Management preparedness significantly mediates the relationship between performance criteria for SSCM and sustainability performance.
- H39: Management preparedness significantly mediates the relationship between commitment to sustainability and sustainability performance.

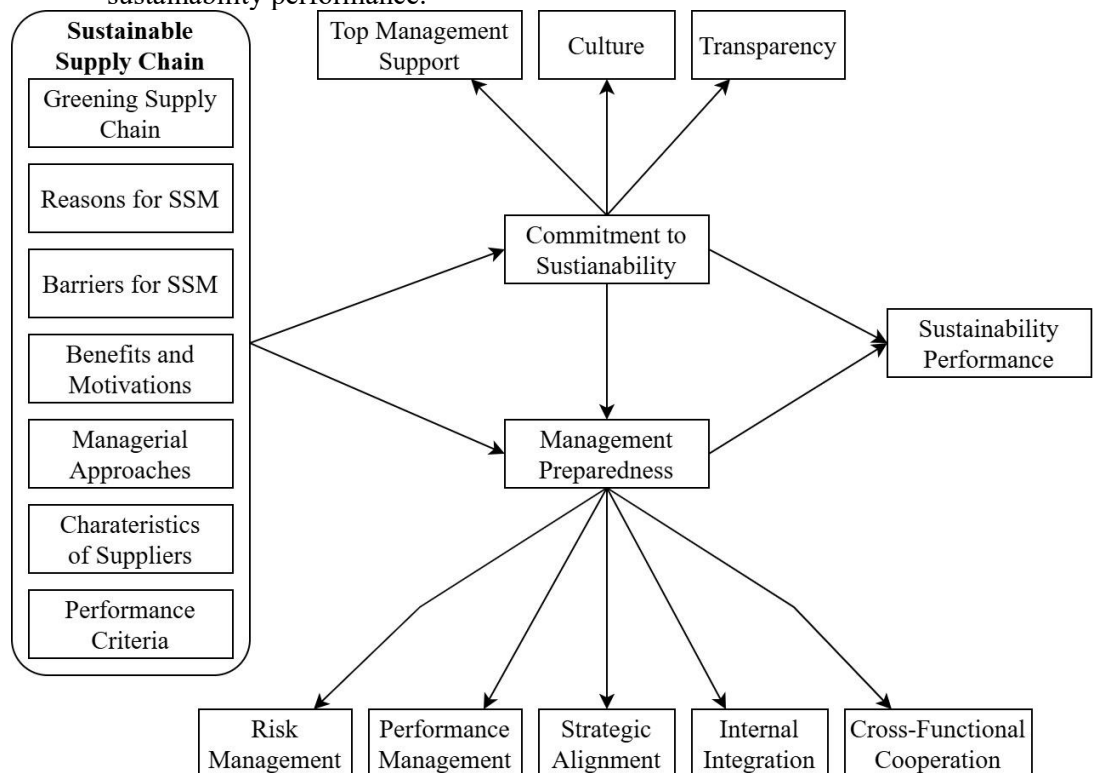


Figure 1: Research Model

Methodology

Sample and Population

The target population was mid- to senior-level managers working in the SC departments of Pakistani pharmaceutical companies. These managers take a direct part in planning, executing, and controlling SC activities, such as sustainable operations, supplier management, and organizational sustainability initiatives (Riaz et al., 2023). Their roles give them wide insight into the operational and strategic management of SCs, including management readiness and

CS (Khan et al., 2023). Non-probability purposive sampling was applied because the study focused on a particular group: mid- and senior-level SC managers in pharmaceutical firms operating in Pakistan, who had the knowledge and experience to answer appropriately (Vehovar et al., 2016). The sample size was set using the N10 rule (Hair et al., 2011), which requires at least ten times as many responses as constructs. As the study has 18 constructs, a minimum of 180 responses was required, and 298 were collected.

Table 1 presents the demographic profile of the 298 respondents.

Table 1:

Respondent Profile (n = 298)

		Frequency	Percent
Gender	Male	185	62.1
	Female	113	37.9
Age Group	25-30 years	203	68.1
	31-35 years	41	13.8
	36-40 years	24	8.1
	41-45 years	24	8.1
	46+ years	6	2
Education Level	Bachelor's Degree	144	48.3
	Master's Degree	124	41.6
	PhD / Doctorate	30	10.1
	Others	156	52.3
Job Position	Supply Chain Manager	71	23.8
	Operations Manager	41	13.8
	Logistics Manager	18	6
	Procurement Manager	12	4
	Others	156	52.3
	Others	156	52.3
Work Experience	3-5 years	197	66.1
	6-8 years	23	7.7
	9-12 years	30	10.1
	13+ years	48	16.1
Certifications	Six Sigma Green Belt	108	36.2
	Six Sigma Black Belt	23	7.7
	Certified Supply Chain Professional	36	12.1
	Project Management Professional	131	44
Company Size	Less than 250 employees	156	52.3
	250 to 500 employees	70	23.5
	501 to 1000 employees	24	8.1
	More than 1000 employees	48	16.1

ISO 14001 Certified	Yes	168	56.4
	No	130	43.6

Data Collection

Demographic information such as education, years in the industry, job position, and company size was recorded in section A of the questionnaire. For every construct, items were rated in Section B on a 5-point Likert scale from strongly disagree to strongly agree based on the traditions of subjective constructs (Joshi et al., 2015). Items were adapted from previous studies and restated for the pharmaceutical environment, to promote validity, reliability, and consistency (Taherdoost, 2019). Table 2 lists the constructs, the number of items, and their sources.

Table 2:
Instrument Constructs, Items, and Sources

Variable Name	N Items	Source(s)
Greening Supply Chain	11	(Tundys & Wiśniewski, 2018)
Reasons for SSCM	7	(Tundys & Wiśniewski, 2018)
Barriers for SSCM	10	(Tundys & Wiśniewski, 2018)
Benefits and Motivation for SSCM	8	(Tundys & Wiśniewski, 2018)
Managerial Approaches to SSCM	8	(Hu & Hsu, 2010)
Characteristics for Suppliers	13	(Tundys & Wiśniewski, 2018)
Performance Criteria for SSCM	7	(Tundys & Wiśniewski, 2018)
Commitment to Sustainability		
<i>Top Management Support</i>	6	(Men et al., 2023)
<i>Culture</i>	6	(Dubey et al., 2017)
<i>Transparency</i>	7	(Kaptein, 2008)
Management Preparedness		
<i>Risk Management</i>	8	(Sodhi et al., 2012)
<i>Performance Management</i>	8	(Na-nan et al., 2018)
<i>Strategic Alignment</i>	8	(Walter et al., 2013)
<i>Internal Integration</i>	6	(Oubrahim et al., 2023)
<i>Cross-Functional Cooperation</i>	6	(Luo et al., 2006)
Sustainability Performance	7	(Oubrahim et al., 2023)

A questionnaire was created using Google Forms, enabling a wide number of SC professionals from multiple pharmaceutical firms in Pakistan to be contacted within a short period of time and the data collected in a standard format (Groves et al., 2011). The platform also shortened response time and automatically generated the answer, mitigating data entry errors and saving time (Jansen & Corley, 2007).

Results and Findings

The model has numerous latent constructs and mediation paths, which is why we chose to use the PLS-SEM method. By combining the measurement and the structural model, the relationships between sustainable SC practices, CS, MP and SP can be tested simultaneously (Hair et al., 2011). It also is robust enough to deal with moderate sample sizes and even non-normal data (Hair et al., 2013), and can use explanation and prediction so direct and indirect effects can be studied within the same analysis (Hair et al., 2019).

Measurement Model

The measurement model specifies the relationships between the indicators and the latent constructs. Factor loads, internal consistency and convergent and discriminant validity were examined to determine whether the components of the instrument measure the constructs of interest reliably (Hair et al., 2012).

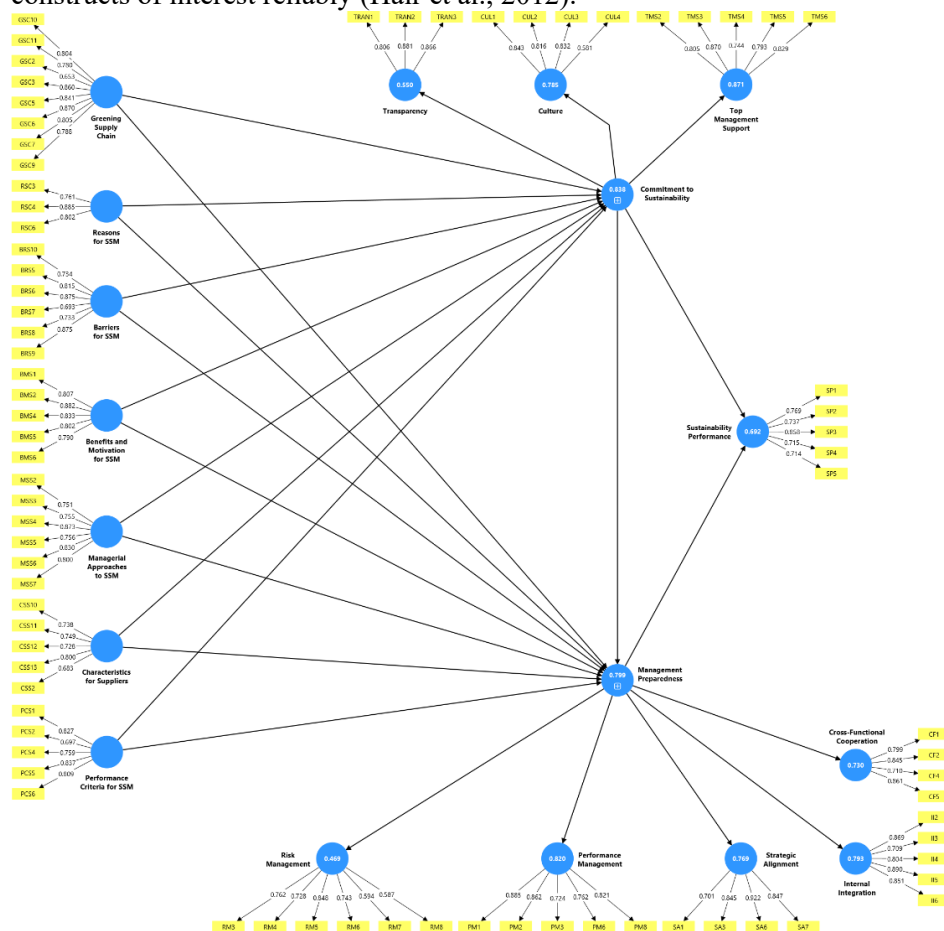


Figure 2: Graphical Representation of PLS Algorithm using SmartPLS version 4

Indicator Reliability

Indicator reliability shows how well each item represents its construct. Loadings between 0.40 and 0.70 are acceptable, and loadings above 0.70 indicate good reliability at probability levels below 5% (Hair et al., 2022). Table 3 reports the loadings from the PLS algorithm.

Table 3:

Outer Loadings of Retained Indicators

Constructs	Items	Loadings	Prob.	Constructs	Items	Loadings	Prob.
Benefits and Motivation for SSCM	BMS1	0.807	0.00	Performance	PC S1	0.827	0.00
	BMS2	0.882	0.00	Criteria for SSCM	PC S2	0.697	0.00
	BMS4	0.833	0.00		PC S4	0.759	0.00
	BMS5	0.802	0.00		PC S5	0.837	0.00
	BMS6	0.790	0.00		PC S6	0.809	0.00
	BRS10	0.734	0.00	Performance	PM1	0.885	0.00
Barriers for SSCM	BRS5	0.815	0.00	Management	PM2	0.862	0.00
	BRS6	0.875	0.00		PM3	0.724	0.00
	BRS7	0.693	0.00		PM6	0.762	0.00
	BRS8	0.733	0.00		PM8	0.821	0.00
	BRS9	0.875	0.00	Risk Management	RM3	0.762	0.00
	CF1	0.799	0.00		RM4	0.728	0.00
Cross-Functional Cooperation	CF2	0.845	0.00		RM5	0.848	0.00
	CF4	0.710	0.00		RM6	0.743	0.00
	CF5	0.861	0.00		RM7	0.594	0.00
	CSS10	0.738	0.00		RM8	0.587	0.00
Characteristics for Suppliers	CSS11	0.749	0.00		RS C3	0.761	0.00

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	CSS 12	0.728	0.00	Reasons for	RS C4	0.885	0.00
	CSS 13	0.800	0.00	SSCM	RS C6	0.802	0.00
	CSS 2	0.683	0.00	Strategic Alignment	SA 1	0.701	0.00
Culture	CUL 1	0.843	0.00		SA 3	0.845	0.00
	CUL 2	0.816	0.00		SA 6	0.922	0.00
	CUL 3	0.832	0.00		SA 7	0.847	0.00
	CUL 4	0.581	0.00	Sustainability	SP1	0.769	0.00
Greening Supply Chain	GSC 10	0.804	0.00	Performance	SP2	0.737	0.00
	GSC 11	0.780	0.00		SP3	0.858	0.00
	GSC 2	0.653	0.00		SP4	0.715	0.00
	GSC 3	0.860	0.00		SP5	0.714	0.00
	GSC 5	0.841	0.00	Top Management Support	TM S2	0.805	0.00
	GSC 6	0.870	0.00		TM S3	0.870	0.00
	GSC 7	0.805	0.00		TM S4	0.744	0.00
	GSC 9	0.788	0.00		TM S5	0.793	0.00
Internal Integration	II2	0.869	0.00		TM S6	0.829	0.00
	II3	0.709	0.00	Managerial	MS S2	0.751	0.00
	II4	0.804	0.00	Approaches to	MS S3	0.755	0.00
	II5	0.890	0.00	SSCM	MS S4	0.873	0.00
	II6	0.851	0.00		MS S5	0.756	0.00
Transparency	TRA N1	0.806	0.00		MS S6	0.830	0.00
	TRA N2	0.881	0.00		MS S7	0.800	0.00
	TRA N3	0.866	0.00				

Convergent Validity

Convergent validity assesses whether a construct's indicators share a high proportion of variance (Hair et al., 2020). Cronbach's alpha and CR were above 0.70 for all latent constructs and mostly above 0.80 (Hair et al., 2019). AVE values were also higher than the recommended threshold of 0.50, showing adequate convergence between the indicators and their latent constructs (Hair et al., 2011; Hair et al., 2013). Table 4 reports the construct reliability and convergent validity results.

Table 4:

Reliability and Convergent Validity of Constructs

Constructs	Cronbach's Alpha	Composite Reliability	Average Variance Extracted
Benefits and Motivation for SSCM	0.884	0.913	0.678
Barriers for SSCM	0.878	0.908	0.625
Cross-Functional Cooperation	0.820	0.881	0.650
Characteristics for Suppliers	0.794	0.858	0.549
Culture	0.775	0.856	0.602
Greening Supply Chain	0.920	0.935	0.645
Internal Integration	0.882	0.915	0.684
Managerial Approaches to SSCM	0.883	0.911	0.633
Performance Criteria for SSCM	0.845	0.890	0.620
Performance Management	0.870	0.906	0.661
Risk Management	0.808	0.861	0.513
Reasons for SSCM	0.757	0.858	0.669
Strategic Alignment	0.848	0.899	0.693
Sustainability Performance	0.817	0.872	0.578
Top Management Support	0.868	0.905	0.655
Transparency	0.810	0.887	0.725

Discriminant Validity

Discriminant validity verifies that the constructs in the model are empirically distinct, meaning that items do not measure the same latent variable as other constructs (Hair et al., 2022).

Heterotrait-Monotrait (HTMT) Ratio

The HTMT ratio evaluates discriminant validity using correlations between distinct constructs. Discriminant validity exists when HTMT is below 0.90, since the constructs are then adequately distinct (Hair et al., 2012; Henseler et al., 2016). Table 5 shows that the highest HTMT value, 0.895, was found between SA and BMS, so discriminant validity is met under the HTMT criterion.

Fornell-Larcker Criteria (FLC)

FLC is a further discriminant validity test. It is met when the square root of a construct's AVE is greater than its correlations with all other constructs (Hair et al., 2012). In Table 6, the bold diagonal values (square roots of AVE) exceed the corresponding inter-construct correlations (Ab Hamid et al., 2017; Fornell & Larcker, 1981). Discriminant validity is therefore established under the FLC as well.

Structural Model

The structural model analyzes the relationships among latent constructs. It tests the hypotheses by evaluating the strength, direction, and significance of direct and indirect effects (Hair et al., 2020).

Modeling the Higher-Order Constructs

Table 7 reports the higher-order construct results for managerial preparedness.

Table 7:

Second-Order Model of Managerial Preparedness

	Estimate	S. D.	t-Stats	Prob.
MP -> CF	0.855	0.020	42.493	0.000
MP -> II	0.890	0.012	74.275	0.000
MP -> PM	0.905	0.011	82.139	0.000
MP -> RM	0.685	0.031	22.296	0.000
MP -> SA	0.877	0.012	71.421	0.000

MP = Management Preparedness; CF = Cross-Functional Cooperation; II = Internal Integration; PM = Performance Management; RM = Risk Management; SA = Strategic Alignment

According to Table 7, MP operates as a higher-order construct with significant positive effects on CF ($\beta = 0.855$; $p < 0.05$), II ($\beta = 0.890$;

$p < 0.05$), PM ($\beta = 0.905$; $p < 0.05$), RM ($\beta = 0.685$; $p < 0.05$), and SA ($\beta = 0.877$; $p < 0.05$).

Table 5:
Heterotrait-Monotrait (HTMT) Ratio

	BMS	BRS	CF	CSS	CUL	GSC	II	MSS	PCS	PM	RM	RSC	SA
BMS													
BRS	0.864												
CF	0.795	0.792											
CSS	0.853	0.725	0.782										
CUL	0.566	0.551	0.719	0.798									
GSC	0.803	0.787	0.862	0.731	0.870								
II	0.701	0.693	0.893	0.725	0.716	0.819							
MSS	0.774	0.794	0.855	0.860	0.650	0.806	0.747						
PCS	0.674	0.801	0.730	0.827	0.895	0.782	0.620	0.783					
PM	0.736	0.712	0.798	0.645	0.815	0.883	0.897	0.673	0.715				
RM	0.557	0.766	0.559	0.550	0.497	0.513	0.537	0.493	0.607	0.552			
RSC	0.601	0.805	0.461	0.501	0.812	0.880	0.545	0.523	0.657	0.747	0.606		
SA	0.895	0.853	0.765	0.785	0.703	0.811	0.764	0.737	0.807	0.894	0.677	0.743	
SP	0.734	0.810	0.743	0.729	0.791	0.768	0.776	0.723	0.839	0.893	0.700	0.699	0.883
TMS	0.654	0.692	0.804	0.824	0.894	0.887	0.738	0.816	0.832	0.696	0.410	0.646	0.751
TRAN	0.699	0.646	0.727	0.813	0.631	0.599	0.816	0.828	0.644	0.603	0.380	0.382	0.570

Table 6:

Fornell-Larcker Criterion (FLC)

	BMS	BRS	CF	CSS	CUL	GSC	II	MSS	PCS	PM	RM	RSC	SA
BMS	0.823												
BRS	0.778	0.791											
CF	0.723	0.698	0.806										
CSS	0.714	0.601	0.644	0.741									
CUL	0.508	0.476	0.578	0.651	0.776								
GSC	0.766	0.720	0.763	0.638	0.739	0.803							
II	0.645	0.617	0.771	0.618	0.589	0.742	0.827						
MSS	0.708	0.706	0.739	0.728	0.564	0.743	0.658	0.795					
PCS	0.605	0.693	0.615	0.685	0.737	0.691	0.535	0.679	0.787				
PM	0.685	0.632	0.694	0.543	0.674	0.802	0.791	0.599	0.616	0.813			
RM	0.494	0.658	0.481	0.452	0.371	0.460	0.460	0.413	0.516	0.497	0.716		
RSC	0.536	0.669	0.420	0.399	0.644	0.753	0.477	0.446	0.533	0.628	0.490	0.818	
SA	0.791	0.742	0.673	0.641	0.593	0.727	0.666	0.648	0.684	0.777	0.586	0.618	0.833
SP	0.634	0.684	0.624	0.606	0.642	0.676	0.673	0.627	0.700	0.754	0.583	0.546	0.746
TMS	0.599	0.606	0.675	0.701	0.759	0.796	0.642	0.726	0.713	0.613	0.349	0.550	0.647
TRAN	0.604	0.552	0.602	0.670	0.511	0.532	0.694	0.705	0.546	0.509	0.304	0.313	0.485

Table 8 reports the higher-order construct results for commitment to sustainability.

Table 8:

Second-Order Model of Commitment to Sustainability

	Estimate	S. D.	t-Stats	Prob.
CS -> TRAN	0.741	0.054	13.814	0.000
CS -> TMS	0.934	0.007	135.946	0.000
CS -> CUL	0.886	0.012	71.616	0.000

Table 8 indicates that, as a higher-order construct, CS has significant positive effects on TRAN ($\beta = 0.741$; $p < 0.05$), TMS ($\beta = 0.934$; $p < 0.05$), and CUL ($\beta = 0.886$; $p < 0.05$).

Direct Effects (Path Coefficients)

Table 9 reports the direct-effect results.

Table 9:

Results of the Direct Path Analysis

	Estimate	S. D.	t-Stats	Prob.	Result
GSC -> CS	0.415	0.049	8.493	0.000	Accepted
GSC -> MP	0.396	0.083	4.792	0.000	Accepted
RSC -> CS	0.092	0.039	2.381	0.017	Accepted
RSC -> MP	-0.081	0.046	1.750	0.080	Rejected
BRS -> CS	-0.132	0.065	2.019	0.044	Accepted
BRS -> MP	0.302	0.045	6.672	0.000	Accepted
BMS -> CS	-0.134	0.065	2.055	0.040	Accepted
BMS -> MP	0.162	0.057	2.813	0.005	Accepted
MSS -> CS	0.187	0.047	3.942	0.000	Accepted
MSS -> MP	-0.048	0.048	0.996	0.319	Rejected
CSS -> CS	0.338	0.045	7.589	0.000	Accepted
CSS -> MP	0.043	0.051	0.847	0.397	Rejected
PCS -> CS	0.263	0.038	6.948	0.000	Accepted
PCS -> MP	0.014	0.035	0.395	0.693	Rejected
CS -> MP	0.193	0.060	3.235	0.001	Accepted
CS -> SP	0.347	0.062	5.582	0.000	Accepted
MP -> SP	0.533	0.054	9.941	0.000	Accepted

As Table 9 reports, GSC exerts significant positive effects on both CS ($\beta = 0.415$; $p < 0.05$) and MP ($\beta = 0.396$; $p < 0.05$). RSC has a significant positive effect on CS ($\beta = 0.092$; $p < 0.05$), while its

negative effect on MP is not significant ($\beta = -0.081$; $p > 0.05$). BRS negatively and significantly influences CS ($\beta = -0.132$; $p < 0.05$) but positively and significantly influences MP ($\beta = 0.302$; $p < 0.05$). BMS follows the same pattern: its effect on CS is significant and negative ($\beta = -0.134$; $p < 0.05$), and its effect on MP is significant and positive ($\beta = 0.162$; $p < 0.05$). MSS has a significant positive effect on CS ($\beta = 0.187$; $p < 0.05$), but its negative effect on MP is not significant ($\beta = -0.048$; $p > 0.05$). CSS significantly and positively influences CS ($\beta = 0.338$; $p < 0.05$), whereas its positive effect on MP is not significant ($\beta = 0.043$; $p > 0.05$). In the same way, PCS significantly and positively influences CS ($\beta = 0.263$; $p < 0.05$), with a non-significant positive effect on MP ($\beta = 0.014$; $p > 0.05$). Lastly, CS has significant positive effects on MP ($\beta = 0.193$; $p < 0.05$) and SP ($\beta = 0.347$; $p < 0.05$), and MP has a significant positive effect on SP ($\beta = 0.533$; $p < 0.05$).

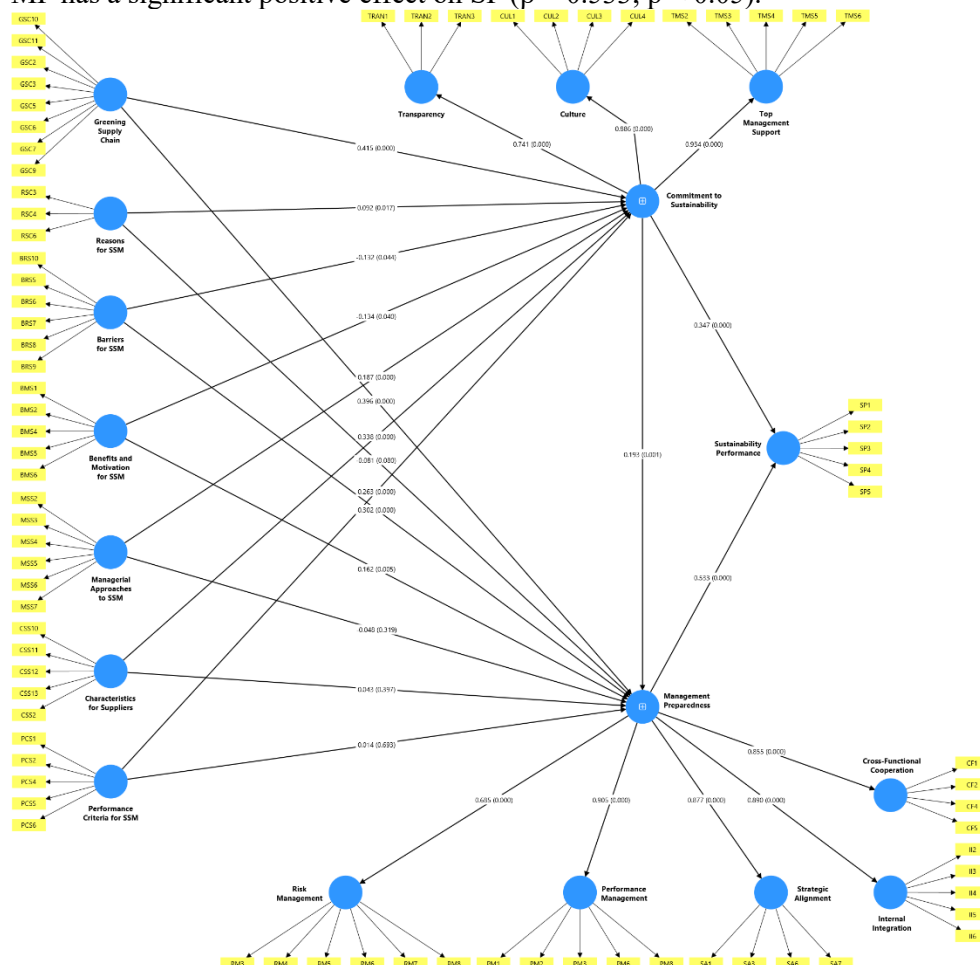


Figure 3: Graphical Representation of PLS Bootstrapping using SmartPLS version 4

Mediation Analysis: Specific Indirect Effects

Table 10 reports the specific indirect-effect results.

Table 10:

Results of the Specific Indirect Paths

	Estimate	S. D.	t-Stats	Prob.	Result
GSC -> CS -> SP	0.144	0.025	5.839	0.000	Accepted
RSC -> CS -> SP	0.032	0.016	1.947	0.052	Rejected
BRS -> CS -> SP	-0.046	0.026	1.794	0.073	Rejected
BMS -> CS -> SP	-0.046	0.024	1.893	0.058	Rejected
MSS -> CS -> SP	0.065	0.022	2.894	0.004	Accepted
CSS -> CS -> SP	0.117	0.029	3.989	0.000	Accepted
PCS -> CS -> SP	0.091	0.020	4.649	0.000	Accepted
GSC -> CS -> MP	0.080	0.027	3.011	0.003	Accepted
RSC -> CS -> MP	0.018	0.008	2.181	0.029	Accepted
BRS -> CS -> MP	-0.025	0.013	1.954	0.051	Rejected
BMS -> CS -> MP	-0.026	0.013	1.910	0.056	Rejected
MSS -> CS -> MP	0.036	0.013	2.740	0.006	Accepted
CSS -> CS -> MP	0.065	0.019	3.521	0.000	Accepted
PCS -> CS -> MP	0.051	0.019	2.704	0.007	Accepted
GSC -> MP -> SP	0.211	0.037	5.777	0.000	Accepted
RSC -> MP -> SP	-0.043	0.024	1.805	0.071	Rejected
BRS -> MP -> SP	0.161	0.027	6.042	0.000	Accepted
BMS -> MP -> SP	0.086	0.036	2.410	0.016	Accepted
MSS -> MP -> SP	-0.026	0.026	0.986	0.324	Rejected
CSS -> MP -> SP	0.023	0.027	0.843	0.399	Rejected
PCS -> MP -> SP	0.007	0.019	0.390	0.697	Rejected
CS -> MP -> SP	0.103	0.038	2.713	0.007	Accepted

Table 10 shows that CS is a significant positive mediator of the effects of GSC ($\beta = 0.144$; $p < 0.05$), MSS ($\beta = 0.065$; $p < 0.05$), CSS ($\beta = 0.117$; $p < 0.05$), and PCS ($\beta = 0.091$; $p < 0.05$) on SP. Its mediation of the effects of RSC ($\beta = 0.032$; $p > 0.05$), BRS ($\beta = -0.046$; $p > 0.05$), and BMS ($\beta = -0.046$; $p > 0.05$) on SP is not significant. Where MP is the outcome, CS is a significant positive mediator for GSC ($\beta = 0.080$; $p < 0.05$), RSC ($\beta = 0.018$; $p < 0.05$), MSS ($\beta = 0.036$; $p < 0.05$), CSS ($\beta = 0.065$; $p < 0.05$), and PCS ($\beta = 0.051$; $p < 0.05$), whereas its mediation for BRS ($\beta = -0.025$; $p > 0.05$) and BMS ($\beta = -0.026$; $p > 0.05$) is negative and not significant. MP is a significant positive mediator of the effects of GSC ($\beta = 0.211$; $p < 0.05$), BRS ($\beta = 0.161$;

$p < 0.05$), and BMS ($\beta = 0.086$; $p < 0.05$) on SP, while its mediation of RSC ($\beta = -0.043$; $p > 0.05$), MSS ($\beta = -0.026$; $p > 0.05$), CSS ($\beta = 0.023$; $p > 0.05$), and PCS ($\beta = 0.007$; $p > 0.05$) is not significant. Finally, MP significantly and positively mediates the link between CS and SP ($\beta = 0.103$; $p < 0.05$).

Explanatory and Predictive Power

Table 11 presents the predictive power and predictive relevance of the endogenous latent constructs.

Table 11:

R² and Q² Values of the Endogenous Constructs

	R Square	Q Square
Commitment to Sustainability	0.838	0.829
Management Preparedness	0.799	0.794
Sustainability Performance	0.692	0.560

R² shows how much of the variance in each endogenous construct the model explains. Following Hair et al. (2011), values higher than 0.75 correspond to high predictiveness, values higher than 0.50 correspond to medium predictiveness, and higher than 0.25 correspond to low predictiveness. Commitment to sustainability (0.838) and management preparedness (0.799) are thus in the strong range and sustainability performance (0.692) is in the moderate range. Predictive relevance is evaluated in Q², which values greater than 0 indicate relevance, and higher values indicate greater relevance (Hair et al., 2013). Commitment to sustainability had the highest Q² (0.829), followed by management preparedness (0.794) and sustainability performance (0.560).

Discussions

Greening the supply chain was the strongest driver of commitment to sustainability ($\beta = 0.415$), in line with Qiao et al. (2022), who argue that applying environmental practices across purchasing and operations lets firms show commitment through efficiency gains and a lighter footprint. Supplier characteristics ($\beta = 0.338$) and performance criteria ($\beta = 0.263$) came next. Reliable, responsible, and compliant suppliers foster sustainable procurement (Qiao et al., 2022), and well-defined criteria improve evaluation, monitoring, and accountability (Qureshi, 2022). Managerial approaches ($\beta = 0.187$) also raised commitment, consistent with Gattiker et al. (2014), who found that effective managerial approaches improve sustainability decision-making, collaboration, and employee participation. Reasons for SSCM had a smaller positive effect ($\beta = 0.092$), which fits Narimissa et al. (2020) on the role of drivers in encouraging adoption. Two predictors worked against commitment.

Barriers had the expected negative effect ($\beta = -0.132$): scarce resources, high costs, and weak management support impede implementation and weaken commitment (Narimissa et al., 2020). The negative effect of benefits and motivation ($\beta = -0.134$) is less intuitive. Liu et al. (2020) suggest that perceived benefits do not translate into commitment when implementation is inconsistent or incentives do not match sustainability goals, which may be what happens here, although we did not test it.

Preparedness showed a different pattern. GSC raised it ($\beta = 0.396$), as Tjahjadi et al. (2023) would expect, since green practices build managerial awareness, planning, and coordination. Interestingly, both barriers ($\beta = 0.302$) and benefits and motivation ($\beta = 0.162$) were found to positively influence preparedness while adversely affecting commitment. It can be argued that managers with real resource constraints are better at planning and resource allocation, while managers with awareness of the benefits of sustainable SCM are committed to it, and they perform better in these managerial aspect (Matsoso, 2023; Zayed & Yaseen, 2021). With some further research perhaps, we can find examples of this growing case of preparation even if there is not an expressed commitment, an area that might be worth exploring. Reasons ($\beta = -0.081$), managerial approaches ($\beta = -0.048$), supplier characteristics ($\beta = 0.043$), and performance criteria ($\beta = 0.014$) had no significant effect on MP. However, Schulze et al. (2019) warn that positive perceptions of sustainable SC are not strong enough to promote readiness when implementation is weak or supplier relationships are firm dominated, whereas Schulze and Bals (2020) argue that similarly managers' approaches with limited resources or weak strategic support are not sufficiently strong to build readiness. However, internally continual coordination and planning need to be supported to boost managerial preparedness, as observed by Lee (2008) and Qureshi (2022) concluded that performance criteria sharpen the evaluation of preparedness but requires implementation mechanisms to increase managerial preparedness further. Commitment to sustainability positively influenced SP ($\beta = 0.347$) and preparedness ($\beta = 0.193$) and preparedness was the most significant of the three to influence SP ($\beta = 0.533$).

Commitment to sustainability had a positive effect on both SP ($\beta = 0.347$) and preparedness ($\beta = 0.193$), and preparedness had the strongest effect on SP ($\beta = 0.533$). Syed et al. (2020) indicate that firms with sustainability as a value attribute are more sustainable in terms of their environment and social practices and achieving better performance. Ahmad et al. (2016) discovered that high commitment enables managers to prepare for strategy, the use of resources, and decision-making, and that well-prepared management facilitates strategy, the allocation of resources and the implementation of sustainability initiatives in time.

The mediation results show where commitment matters. CS carried the effects of GSC ($\beta = 0.144$), managerial approaches ($\beta = 0.065$), supplier characteristics ($\beta = 0.117$), and performance criteria ($\beta = 0.091$) on SP. Al Masri and Wimanda (2024) demonstrate how commitment is displayed by firms through environmental policies, and GSC boosts this commitment through environmental initiatives, which leads to an improvement in SP; Ali (2026) seeks to tie effective management practices with the implementation of sustainability-related policies, leadership and coordination of resources, which also promotes commitment and consequently SP; Foerstl et al. (2015) report that the implementation of a responsible and reliable supplier system leads to an improvement in SP through commitment; and Kähkönen et al. (2018) indicate that performance criteria have positive impacts on commitment, which in turn improves SP through monitoring, evaluation and continuous improvement. SP through CS was not significantly related to any of the indirect effects of reasons ($\beta = 0.032$), barriers ($\beta = -0.046$), or benefits and motivation ($\beta = -0.046$). This agrees with Kähkönen et al. (2018) that recognizing reasons for sustainable SCM is not enough on its own to raise commitment and SP, with Zayed and Yaseen (2021) that barriers weaken commitment but add little indirect effect on SP, and with Matsoso (2023) that benefits and motivation may encourage adoption without raising commitment enough to improve SP.

Where preparedness was the outcome, CS significantly mediated the effects of GSC ($\beta = 0.080$), reasons ($\beta = 0.018$), managerial approaches ($\beta = 0.036$), supplier characteristics ($\beta = 0.065$), and performance criteria ($\beta = 0.051$). Ahmad et al. (2016) explain that these practices strengthen commitment, which in turn yields better planning, coordination, and readiness among managers, and Gattiker et al. (2014) make a similar argument for managerial approaches. Mediation by CS was not significant for barriers ($\beta = -0.025$) or benefits and motivation ($\beta = -0.026$). Escoto et al. (2022) noted that barriers can lower commitment without a significant indirect influence on preparedness, and Matsoso (2023) observed that benefits and motivation may encourage adoption without raising commitment enough to improve preparedness.

Preparedness also carried part of the effect on SP. MP significantly mediated the effects of GSC ($\beta = 0.211$), barriers ($\beta = 0.161$), benefits and motivation ($\beta = 0.086$), and CS ($\beta = 0.103$). Hervani et al. (2005) show that GSC strengthens managers' readiness, planning, and coordination, which boosts SP through environmental efforts, and Zayed and Yaseen (2021) and Matsoso (2023) suggest that barriers and motivation can strengthen planning and readiness, which then raise SP. Mediation by MP was not significant for reasons ($\beta = -0.043$), managerial approaches ($\beta = -0.026$), supplier characteristics ($\beta = 0.023$), or performance criteria ($\beta = 0.007$). Kähkönen et al. (2018)

concluded that reasons for SSCM may trigger awareness but do not build enough preparedness to improve SP, and that performance metrics set evaluation goals but have only a weak indirect effect unless translated into readiness. Ali (2026) found that managerial approaches encourage sustainability decision-making but may not improve preparedness where implementation is limited and resources are scarce, and Raza et al. (2021) argue that supplier reliability and compliance can improve coordination without producing preparedness that significantly raises SP.

Conclusion and Recommendations

Sustainable SC practices contribute to the sustainability performance of Pakistan's pharmaceutical sector, largely through commitment to sustainability and management preparedness. The individual practices behave differently. Greening the supply chain, managerial approaches, supplier characteristics, and performance criteria raised commitment, which in turn improved SP, while greening the supply chain, barriers, and benefits and motivation worked through preparedness. For the sustainable SC initiatives to become effective sustainable outcomes, there is a need for organizational commitment as well as managerial preparedness.

Based on the theoretical perspective RBV and institutional, the study attempts to explain the relationship between SSCM practices and SP in the Pakistani pharmaceutical industry, which suffers from a scarcity of empirical evidence. It explores the relationships of the direct effects of sustainable SC practices with CS, the direct effects of CS with MP, and the direct effects of MP with SP and the providing path between these three variables to confirm that CS and MP act as mediation variables for the improvement of SP by implementing sustainable SC practices (Qureshi, 2022; Raza et al., 2021). The combination of both theories allows for a more comprehensive understanding of SP in an emerging economy than would either theory would provide on its own.

Pakistani pharmaceutical companies' SC managers should consider the issue of environmental sustainability in procurement, production, warehousing, transportation, inventory management and distribution for practicing. The goal of Green procurement policies is to require suppliers to adhere to environmental and sustainability criteria and the assessment of suppliers should include environmental initiatives, product quality, adherence to regulations and ethical principles besides the cost. SC resilience and sustainability are being enhanced through long-term partnerships with green suppliers.

Furthermore, by integrating sustainability targets into day-to-day practices and incorporating them into SC planning, logistics, and measurement, managers should help create a sense of commitment, specifically regarding sustainability goals. The same takes care of

obstacles: financial problems, internal resistance to change, lack of technical expertise and of coordination between SC partners can be addressed through careful planning and allocating resources. Companies can allocate their sustainability budgets per year towards investments in environmentally friendly technologies, energy saving infrastructure, waste management and sustainable mobility.

Lastly, companies require measurement systems that have well-defined KPIs for environmental, social, and operational performance that are assessed routinely via internal audits, supplier assessment, and performance reviews. These steps combined with green SC practices will help enhance SP, establish commitment, prepare managers, overcome barriers to implementation and enable ongoing monitoring.

There are certain limitations that exist in the study. It is limited to pharmaceutical companies in Pakistan, and results cannot be largely extrapolated to other industries or other countries because it did not have cross-industry or cross-country comparisons; other future studies should be conducted in different industries and countries, with the ability of longitudinal design to be able to trace changes over time. Purposive sampling included middle and senior level SC managers which may not be fully representative, and future research could be undertaken with a broader array of respondents including additional levels of management and organizational functions. Lastly, only mediators CS and MP are examined whereas other forms of mediators or moderators which could regulate the outcomes are not examined.

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