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*Green Supply Chain Management, Environmental Collaboration and  
Sustainability Performance: Evidence from the Furniture Industry of Pakistan*



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## Abstract

This study investigates the effects of Green Supply Chain Management (GSCM) initiatives on Sustainability Performance in Pakistan's furniture production sector. Based on the Resource-Based View (RBV) and Natural Resource-Based View (NRBV) frameworks, the research explores how organizational environmental capabilities and cooperative approaches affect economic, environmental, and social sustainability results. While sustainability has become increasingly critical, research validating GSCM practices' effectiveness in Pakistan's furniture manufacturing industry remains scarce, especially within emerging market settings. The research utilized a quantitative methodology, gathering data through structured surveys from 150 management-level participants employed at prominent furniture manufacturing companies across Pakistan's key industrial centers, including Lahore, Chiniot, Gujrat, Karachi, Rawalpindi, and Peshawar. Data analysis was conducted using IBM SPSS Statistics version 25, implementing descriptive statistics, reliability testing, correlation analysis, regression analysis, and mediation assessment via the PROCESS Macro (Model 4) with bootstrapping. The results demonstrate that green procurement, green manufacturing, green distribution, and green logistics each demonstrate positive and statistically meaningful effects on sustainability performance. Furthermore, environmental collaboration shows a robust direct influence and significantly mediates the connections between all GSCM practices and sustainability performance. These findings underscore the necessity of combining internal green operational methods with collaborative environmental strategies to enhance sustainability outcomes. This research adds empirical knowledge to GSCM literature within a developing economy framework and offers actionable insights for industry leaders and policy developers by highlighting the strategic importance of environmentally conscious manufacturing processes and environmental partnerships in boosting sustainability performance in Pakistan's furniture manufacturing industry.

### Keywords

Green Supply Chain Management = GSCM, Green Procurement=GP, Green Manufacturing=GM, Green Distribution=GD, Green Logistics=GL, Environmental Collaboration=EC, Sustainability Performance=SP, Resource-Based View= RBV, Natural Resource-Based View=NRBV, Furniture Manufacturing= FM, Environmental Sustainability= ES.

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# Chapter 1: Introduction

## 1.1 Background of Study

The concept of sustainability has become a major center of focus in modern-day industrial settings in the world due to the high environmental standards, the depletion of natural resources, and the growing consumer preference for products produced in an environmentally friendly manner. The furniture production industry in the third world countries like Pakistan has significant potential of enhancing the economy and creating employment facilities; however, it also has its share of environmental degradation in the form of ineffective use of resources, a greater amount of waste produced, and staying behind with the old way of production. The problems described herein support the urgent need for furniture manufacturers to embrace environmentally sustainable practices that reduce environmental effects and at the same time improve efficiency.

Green Supply Chain Management (GSCM) has become a holistic approach that incorporates aspects of the environment in the process of supply chain management. Modern studies show that the use of green procurement, manufacturing, distribution, and logistics practices has a profound impact on the environmental, social, and economic impacts of industries. The recent research by Kumar et al. (2022) and Li and Zheng (2023) stipulates that GSCM practices help organizations to increase levels of efficiency, minimize the occurrence of waste, and create sustainable competitive advantages. The effectiveness of the practices is maximized further when it is coupled with environmental collaboration that leads to the sharing of knowledge, joint environmental planning, and joint decision-making between the supply chain partners. Research initiated by Hoang et al. (2023) also demonstrates that collaborative strategies enhance the efficacy of green programs since they balance the environmental goals among stakeholders.

Nonetheless, despite the comparatively low incidence of GSCM practices, there is increasing demand for environmentally conscious. In this study, the researcher examines the role of GSCM practices and ecosystem partnership in determining sustainability levels of operations in the Pakistani furniture production sector.

Green procurement is the process of procurement of materials, components, and supplies that could be least harmful to the environment. It has been characterized by sourcing greener materials, evaluating the environmental performance of suppliers, and ensuring that materials that are purchased are sustainability compliant. During furniture manufacturing, the environmental impact is predetermined to a significant extent by decisions on the supply of wood, types of adhesives, finishing resources, and packaging systems. According to research by Khan and Qian (2021) and Zhang et al. (2023), it is possible to conclude that green procurement significantly enhances the sustainability outcomes in the form of environmental concerns reduction at the source and promotion of the responsible supplier behavior, which makes it an important variable in sustainability performance measurement.

Green manufacturing focuses on manufacturing processes that minimize waste and emissions, as well as maximizing resource efficiency. This includes the use of cleaner technologies, recycling of wood waste, use of low-VOC materials, and minimization of the use of chemicals

in the production of furniture. Recent studies by Ahmed et al. (2023) and Vitale et al. (2024) suggest that green manufacturing may promote the efficiency of operations and environmental compliance and work reduce the operational costs at the same time. Since manufacturing is a key area in furniture making, a study of green manufacturing practices can give best information about the effects of sustainable manufacturing as far as the overall performance is concerned.

The concept of green distribution comprises environmentally oriented practices of dealing, packing, and travelling of finished furniture. This encompasses the adoption of sustainable outdoor packages, adoption of efficient delivery systems that are energy server and the maximization of transport routes so as to reduce the use and consumption of fuel and carbon emissions. Since most furniture pieces are often heavy and have to be transported using huge transportation systems, distribution processes also play an important role in making the industry have a wide impact on the environment. The current studies by Mutua et al. (2022) and Khoa et al. (2024), prove that not only does the introduction of green distribution practice help reduce emissions into the surrounding environment but also constitutes a significant amount of cost savings due to the efficiency of the working process and the improvement of its operations. Therefore, this variable is considered to be one of the essential elements when it comes to measuring sustainability performance on the whole.

Green logistics deals with the environmentally responsible manner of the warehousing process, material handling process, transportation planning system and even the reverse logistics management. In the furniture industry, packaging resources are highly wasted on logistics as it requires effective mechanisms of handling the product returns and refurbishment. The modern studies by Chan et al. (2021) and Rastegardebidi and Su (2025) confirm the fact that green logistics increase the level of environmental compliance, efficiency of recycling and decrease waste in the work of the operator. Thus, the concept of green logistics is an important issue to understand in order to determine the contribution made by sustainable logistical systems, towards greater sustainability performance.

Sustainability performance represents the environmental, economic and social impacts that organizations have attained in the course of their operation. It entails quantifiable decreases of pollution levels, increased resource utilization efficiency, reduced operational costs, improved community relations and increased employee wellbeing metrics. According to recent research by Agyemang et al. (2020) and Okay et al. (2024), sustainability performance indicates the ability of an organization in the long run about the responsible functioning of maintaining competitive advantage. The sustainability performance analysis on the furniture industry would indicate how efficiently the GSCM practices provide practical improvements.

## **1.2 Problem Statement**

The Pakistani furniture manufacturing sector faces a supply-chain sustainability problem: core upstream-to-downstream activities (procurement, manufacturing, distribution, and logistics) are still largely managed using conventional practices that increase waste, weaken resource efficiency, and contribute to poor environmental outcomes. In practical terms, firms struggle to embed environmental considerations into supplier selection, production processes, distribution operations, and logistics planning in a consistent and measurable way. As a

result, sustainability performance improvements remain uneven across the supply chain, despite growing market and regulatory pressure for greener operations. Although prior studies link Green Supply Chain Management (GSCM) practices with sustainability performance, sector-specific evidence in Pakistan's furniture industry remains limited. In addition, many studies emphasize direct effects and provide less clarity on how supply-chain relationships enable (or constrain) green practices to translate into measurable sustainability outcomes. In this context, environmental collaboration among supply-chain partners becomes a critical mechanism because it supports joint planning, problem-solving, and coordination of environmental efforts. Therefore, the research problem addressed in this study is: to determine how specific GSCM practices influence sustainability performance in the Pakistani furniture industry and whether environmental collaboration mediates these relationships.

### **1.3 Research Gap**

The existing academic literature has been associated with critical analysis of the application of Green Supply Chain Management (GSCM) in the automotive, electronic, and textile industries, but comparatively little focus has been made in relation to the furniture manufacturing industry in Pakistan despite its significant economic value. Recent works by Yuan et al. (2024) and Hoang et al. (2025) highlight the need to conduct sector-specific research studies to shed light on the effectiveness of GSCM practices in diverse industrial settings, specifically in emerging economies. Though the studies that have been carried out before measure the direct impact of green operations, which include procurement, production, distribution, and logistics on the sustainability measures, they do not provide enough clarity on the key operations that create the environmental and operational benefits. Specifically, little empirical focus has been given to the mediating capacity of the environmental collaboration, which is a key relational strength in knowledge sharing, resolution of problems and coordination of environmental efforts by supply-chain members in Pakistan. Such a gap in research makes it worth investigating how close processes affect the sustainability performance of both GSCM practices and whether environmental collaboration can mediate those to strengthen these relations in the sphere of the Pakistani furniture factories.

### **1.4 Research Questions**

This investigation explores the relationship between GSCM practices and sustainability performance through the following inquiries:

- Q1: What impact does green procurement have on sustainability performance?
- Q2: What is the influence of green manufacturing on sustainability performance?
- Q3: What contribution does green distribution make toward enhancing sustainability performance?
- Q4: What is the effect of green logistics practices on sustainability performance?
- Q5: What is the mediating effect of environmental collaboration on the relationship between GSCM practices and sustainability performance?

## **1.5 Research Objectives**

- Examine the effect of Green Procurement on Sustainability Performance in Pakistan's furniture Industry.
- Examine the effect of Green Manufacturing on Sustainability Performance.
- Examine the effect of Green Distribution on Sustainability Performance.
- Examine the effect of Green Logistics on Sustainability Performance.
- Test whether Environmental Collaboration mediates the relationship between GSCM practices (GP, GM, GD, GL) and Sustainability Performance.
- Provide recommendations for furniture manufacturers on improving sustainability performance through targeted GSCM practices and collaboration mechanisms.

## **1.6 Research Hypothesis**

H1: Green procurement has a positive and significant impact on sustainability performance.

H2: Green manufacturing has a positive and significant impact on sustainability performance.

H3: Green distribution has a positive and significant impact on sustainability performance.

H4: Green logistics has a positive and significant impact on sustainability performance.

H5: Environmental collaboration mediates the relationship between green procurement and sustainability performance.

H6: Environmental collaboration mediates the relationship between green manufacturing and sustainability performance.

H7: Environmental collaboration mediates the relationship between green distribution and sustainability performance.

H8: Environmental collaboration mediates the relationship between green logistics and sustainability performance.

## **1.7 Significance of Study**

- Helps furniture manufacturers identify which GSCM practices have the strongest influence on sustainability performance.
- Highlights the operational role of environmental collaboration (supplier/customer/logistics coordination) in improving outcomes.
- Supports managers in prioritizing green initiatives (procurement, production, distribution, logistics) with measurable performance implications.
- Extends GSCM performance evidence to a sector and country context that is underrepresented in the literature (Pakistan furniture industry).
- Contributes to theory by explaining sustainability performance through firm capabilities (GSCM practices) and relational mechanisms (environmental collaboration), consistent with your theoretical positioning.

## **1.8 Structure of the Study**

In this thesis, there are five chapters. Chapter One presents a background of the study, research gap identification, problem statement and specification of study variables and objectives. Chapter Two is a thorough review of the literature that is relevant to the study and it describes the underlying theoretical model of the study. Chapter Three explains the methodology used in the research such as sampling procedures, method of data collection, measurement tools and the statistical method of analysis. Chapter Four presents the data analysis and empirical results based on the IBM SPSS with the added descriptive statistics, reliability assessment, correlation analysis, multiple regression, and mediation analysis using the PROCESS Macro, version 4.2 (Model 4) built in Hayes (2022) with bootstrapping methods to test the statistical significance of the effects of indirectly correlated variables. Last but not the least, Chapter Five summarizes the major findings and outlines the practical implications and limitations of the study and finally gives recommendations on how the study should be conducted in the future.

# Chapter 2: Literature Review

## 2.1 Conceptual Background

### 2.1.1 Green Procurement

Green procurement is the programmed incorporation of the environment factor in the procurement decision-making, selection of suppliers, and material sourcing. It goes well beyond the conventional cost and quality indicators by introducing sustainability criteria, i.e., recyclability, energy efficiency, and compliance to the environmental standards (Li et al., 2024; Rejeb et al., 2023). As it is placed at the first stage in the supply chain, procurement decisions present trickle-down impacts to the activities in the downstream, thus it serves as an influential screw in the achievement of sustainability goals. Green procurement is sensitive to the external pressure, which is created by regulatory authorities, clients, and non-governmental organizations promoting the eco-logical approach to sourcing (Sharma et al., 2024). Coercive (legislation), normative (industry standards), and mimetic (benchmarking) are some of the pressures that drive adoption (Mishra and Singh, 2022). Competitive advantage is generated through strategic resources, i.e., supplier relationship and green sourcing capabilities (Li et al., 2024). The enforced law on green procurement in the public sector based on the European Union directives has greatly guided the individual business industry. China and India are taking a very proactive role in encouraging green procurement through policy support and certification programs and companies are starting to conduct supplier sustainability audits and life-cycle assessment as requirements to meet ESG reporting requirements.

Green procurement as a strategy in procurement involves the involvement of the environmental factor in all the facets of the procurement process beginning with the selection and assessment of the supplier and then the source of materials and management of contracts. This holistic strategy goes way beyond conventional parameters of costs and quality to an extensive set of sustainability indicators, such as product reusability, energy efficacy, lessening of waste, and compliance with environment-related requirements and certifications (Li et al., 2024; Rejeb et al., 2023). Being the main point of the supply chain, the procurement decisions spread the ripple effect on the operations downstream, making them an important leverage point of any organization that aims to meet its sustainability goals and commitments to the environment.

Green procurement represents a direct reaction to increasing external pressures of various stakeholders: the government regulators, environmental customers, environmental NGOs, and so on, who demand a more sustainable and environmentally friendly sourcing policy (Sharma et al., 2024). Green procurement practices take place in an organization via three main mechanisms, namely, coercive forces due to environmental regulations and laws, normative forces due to emerging industry standards and standards, professional expectations, and mimetic forces due to competitive benchmarking and best-practice adoption (Mishra and Singh, 2022). Good supplier relationships are also sustainable-oriented and advanced green sourcing capabilities, which are both forms of valuable strategic resources that the organizations can use to develop sustainable competitive advantages within their markets (Li et al., 2024).

Adoption of compulsory green public procurement policy through extensive EU directives has impacted highly on procurement practice in the private sector and this has produced an effect

throughout the industries. The big economies like China and India are also promoting green procurement using a number of policy incentives, tax credits as well as environmental certification programs that will encourage businesses to be sustainable.

Li et al. (2024) conducted a thorough analysis of 116 existing empirical studies to show that green procurement programs invariably provide solid environmental and social performance gains in addition to generating mediocre, though statistically important, economic gains. A research by Rejeb et al. (2023) has revealed five different research clusters in green procurement literature namely supplier assessment techniques and networked procurement techniques. The recent research by Benchekroun et al. (2024) was dedicated to the identification of the hindrances and motivation factors influencing the realization of green procurement in the post-COVID landscape in the context of the increasing role of supply-chain resilience and of risk management.

Green procurement is an all-inclusive process that involves making careful decisions related to environmentally friendly materials. It mainly emphasizes selecting materials, which meet certain sustainability requirements, i.e. recyclability, biodegradability, or renewable provenance. The process of selection of suppliers is also essential, and in this case, the suppliers undergo review in terms of their environmental compliance history and the degree of integration of sustainable practices throughout their processes. This examination entails evaluation of the production methods, waste-management, and the general environmental policies. Products are evaluated strictly and classified based on the effect they have to the environment, and special care is taken to the presence of any form of hazardous ingredient in a product. This methodical practice will make the whole procurement chain environmentally friendly.

Through co-operations with suppliers, organizations can strive to reduce the impact of the environmental harm correlated with raw materials, machinery, and other products used in manufacturing of the medicines. Yawar and Seuring (2017) emphasize that sustainability can be achieved only through supply-chain alliances.

Making standardized green procurement metrics makes it easy to benchmark global performance in a meaningful manner. Supplier sustainability monitoring and verification is more advanced by exploring digital technologies (blockchain and artificial intelligence). Tracing comparative studies done across industries and regions determine successful practices and situational success factor. The strategic focus on renewable material options, recyclable and biodegradable material options, and the introduction of the blockchain supplier visibility and AI total risk evaluation solutions are leading to the growing use of demanding supplier sustainability audits and life-cycle.

### **2.1.2 Green Manufacturing**

Green manufacturing refers to the process of designing and organizing manufacturing operations with the view of reducing adverse impact on the environment, saving energy, and natural resources, and securing the safety of workers and quality of the final product (Cláudio et al., 2025). This paradigm involves a wide range of practices that involve application of energy-efficient types of machinery, adoption of waste minimization techniques, overall

recycling policies and the use of renewable energy sources that will prevail across the manufacturing plants. Contrary to the traditional manufacturing where the major concern is cost reduction and volume maximization, in green manufacturing, environmental and social concerns are utilized in all aspects of decision-making. This is a holistic approach to evaluation of the complete product life cycle, the process of responsible sourcing of raw materials, sustainable end-of-life disposal and thus, sustainability at every part of the manufacturing process, without compromising on the integrity and performance of the product.

The current academic studies highlight the transformative effect of digital technologies on promoting and supporting green manufacturing capabilities, including the Internet of Things, artificial intelligence, and digital twins. Such advanced technologies allow functioning of the production processes in real-time, predictive maintenance of the equipment, and integrated optimization of processes, which overall leads to significant savings in consumption and emissions (Despeisse et al., 2022). Numerous manufacturers are moving toward the implementation of the principles of the circular economy, which focuses on recovering resources through the development of new approaches to recycling, extending products life through new design and maintenance, and closed-loop systems that reduce the impact of waste creation. This combined solution will reduce the wastes at every step of operation and encourage sustainability in the life cycle of the product. Moreover, sophisticated analytics and machine learning algorithms will help find the areas of operation that are inefficient and allocate resources in the future in real-time, which will equip manufacturers to make decisions based on data that will be environmentally conscious of production demands.

The efforts towards lightweight materials, electric vehicles, and assembly lines that are less energy consuming have taken the central stage in modern manufacturing. The increased attention towards reducing the effects of dangerous materials and increasing the capability to recycle the components further drives the progress of designing the products and processing the manufacturing. Implementation of water-saving systems and green-friendly dyes have reached a certain level of sophistication and effectiveness, especially in the automotive and the electronic industry, where issues of ecology increasingly feature in product designs and manufacturing policies.

An in-depth analysis of manufacturing companies functioning in Ghana reveals that the implementation of green manufacturing frameworks, i.e. reverse logistics and lean production, has a very strong positive effect on the organizational, social, and environmental performance measures, and rather a weak direct effect on the economic performance measures (Opoku & Li, 2025). The authors also note that the combination of lean and green strategy enhances triple-bottom-line results which seem to be included in the subterfuge of developing economies, possibly because of specific implementation issues (Abualfaraa et al., 2020). These results indicate that, even though the concept of green manufacturing has proven to be of great help to the environment, the financial viability of this concept depends on a set of variables that can be found in different contexts, such as the typology of the industry, marketed conditions, regulatory contexts, and infrastructural provisions. In addition, the literature highlights the instrumental role of the government support mechanisms and industrial partnership towards the promotion and maintenance of environmentally friendly manufacture processes.

One of the factors that makes small and medium-sized enterprises (SMEs) hesitant to have green technologies is the high capital outlays required at the early stages of its implementation.

The intensive introduction of high-tech technologies requires a very high level of professionalism and technological literacy, which means that constant training of a large number of personnel and the improvement of their productivity is required. Differences in environmental laws between jurisdictions also complicate the compliance forces, and will also devastate strategic planning initiatives. As a result, there is need to balance between environmental goals and financial assets, human needs and competition needs in an ever-environmentally-attentive marketplace.

The green manufacturing practice in our modern world simplifies the processes of production that consume as few resources as possible and minimizes the volume of waste materials significantly due to new technologies and methodology. Energy technologies such as solar and wind energy in their renewable form are progressively used in manufacturing plants, allowing cutting carbon emissions significantly, up to forty percent -reductions in emissions are recorded in some sites. Such international standards as ISO 14001 and LEED certification have achieved the leading position, and which provide the overall standard and framework of sustainable practices in manufacturing concerning the entire industry. Transformative tools like artificial intelligence, blockchain, and the Internet of Things have become a prevalent topic of research among the academic community and concrete challenges, where scholars and practitioners agree that these technologies can be used to increase the efficiency of green manufacturing to real-time monitoring and optimization. Empowerment of industry-specific adoption rates and performance outcomes is based on empirical studies, which show that there are varying success rates in industries. Sensitivity studies on government incentives and regulation systems prove that these tools are the key ones to support and enhance green manufacturing efforts. The balanced combination of advanced technologies and the international standards would help the firms to reach a higher level of sustainability and retain an advantage against their rivals in the ever-greener global market.

### **2.1.3 Green Distribution**

Green distribution applies environmental concerns into distribution operations that includes route optimisation, environmentally friendly packaging and reverse logistics. It tries to reconcile cost-effectiveness and environmental considerability, so that they can distribute products with the smallest ecological impact to their customers (Khoa et al., 2024). Green distribution in contrast to traditional distribution focuses on sustainability without hindering on service quality since speed and cost are secondary issues. All governments around are setting strict controls on carbon emissions and packaging wastes. Indicatively, the global environment requires companies to establish green ways of distribution due to the implementation of the Green Deal by the European Union necessitating the reduction of emissions originating in the transportation sector. The increasing awareness of consumers about environmental problems has raised the requirements of sustainable shipping, including carbon-neutral shipping and packaging made of recyclable materials. The increase in the e-commerce has also intensified the inevitable campaign of efficient distribution practices that are environmentally friendly because volumes of online shopping are growing at a very high rate all over the world.

The firms like Amazon and Alibaba allocate large amounts of money towards electric delivery trucks and efficient packaging innovation to minimize their carbon imprint. These market giants set the new standards by introducing complete green logics programmes such as solar powered warehouses and automated sorting system. The companies implement green logistics with temperatures controlled to reduce the amount of energy used in the distribution process

with the use of high-quality insulating materials and intelligent temperature-control systems with high efficiency in cooling food but using less power.

In their comprehensive research on Vietnamese companies, Khoa et al. (2024) discovered that the use of green distribution can greatly improve not only the economic performance indicators but also the environmental performance indicators. Their study found out that organizations that adopted the green distribution strategy had a cost in their operations cut by 15- 20 per cent. On the same note, Parmar and Kushwah (2024) also found positive associations between green logistics and the performance indicators of cost reduction, lead time and customer satisfaction. They have analyzed 200 manufacturing companies to show that green distribution programs resulted in the action to elevate customer satisfaction score by 25 per cent. The above findings confirm the strategic significance of green distribution in attaining both sustainability objectives and competitive edge.

High-precision algorithms and GPS technologies reduce the travelling range and consumed fuel using real-time routes and traffic analysis. The implementation of biodegradable, recyclable and reusable packaging material brings down waste like mushroom based packaging, seaweed based alternatives. There are in place extensive product returns, recycling and disposal systems which are applied in an environmentally responsible way which also takes into consideration the axioms of the circular economy. Multiple orders combined into one delivery cut back on the frequency of transportation and lower carbon-dioxide emissions employing advanced load optimisation software.

Poor transport network and the poor accessibility of improved technology in developing countries causes inability of implementing green distribution practices in these states. Electric cars and other packaging materials that are sustainable can cost SMEs a fortune especially in emerging markets where capital restrictions are very high. The difference in environmental laws between locations drives the multinational companies into compliance problems, and in this case, multinational companies must elaborate in adjusting the distribution strategy to suit various standards.

Recent studies indicate the major shifts and changes impacting the change of sustainable distribution system. Various research works discuss the common usage of electric vehicle delivery systems and autonomous aerial vehicles and the possibility to decrease transport emissions. Most of the shipping giants are quoted carrying promises to change to zero-emission vehicle fleets by 2030, which shows that the entire industry is shifting towards being more environmentally aware in terms of their delivery networks. In addition, complementary literature underlines the ability to improve visibility and responsibility in the eco-friendly supply chains with the help of distributed ledger system, namely, in terms of the greater responsibility of monitoring and confirming green initiatives.

#### **2.1.4 Green Logistics**

Green logistics refers to the planning, implementing and monitoring of the logistics operations namely; transport, warehousing, handling and packaging with the express objectives to reduce environmental degradation without affecting service levels and cost effectiveness. It encompasses an extensive range of operations (between supplier and manufacturer), inbound logistics, intra-plant operations, outbound logistics, and the reverse logistics on returns,

remanufacturing, and recycling (Mutua et al., 2022; Holling and Backhaus, 2023). Exemplary actions include strategic structural changes, such as the adoption of a more emission-cleaner mode of transport, state-of-the-art fuel-efficient routes, systematic electrification of delivery vehicles, energy-efficient warehouse solutions (solar rooftops, LED lighting, HVAC smartness, and solar panels), green and sustainable packaging innovations, and high-tech data-based consolidation strategies aimed at minimizing empty miles and improving the efficiency of the delivery loads (Hoang et al., 2025; Rastegardebidi and Su, 2025).

Green logistics is addressed in the light of the growing institutional and consumer pressure as regards to Scope5 emissions, particularly because the transportation and distribution activities tend to constitute the largest share of supply-chain carbon footprint in most industries, in terms of green logistics (Sharma et al., 2024; Holling and Backhaus, 2023). The Resource-Based View (RBV) also presents the organizational implementation of logistics digitalization projects, including AI-based routing, IoT-based telematics infrastructure, and advanced warehouse automation, among others, as unique organizational capabilities that provide both better eco-efficiency and improved service quality reliability in the same breath (Despeisse et al., 2022; Hoang et al., 2025).

The Relational View reveals the paramount significance of carrier-shipper-3PL partnership in terms of facilitating mutual load optimization, coordinated delivery schedules, as well as cost-effective cross-docking activities to realize simultaneous emissions and costs savings (Supanchanaburee et al., 2020; Chavez et al., 2022). The reviews regularly indicate strong positive correlations of supply-chain management practices related to green supply-chain management (GSCM), such as comprehensive green logistics initiatives, with several firm performance outcomes, although the relationship strength and nature varies significantly based on contextual influences, industry disposition and the performance measures applied (Holling and Backhaus, 2023; Mutua et al., 2022).

Empirical research reveals that the inbound and outbound green logistics practices have a significant contribution to better environmental, social and economic performance measure. Most effectively, inbound optimisation plans, including increased supplier integration and the use of greener inbound transport methods, are able to reduce upstream emissions and environmental harm, hereby outbound measures, including advanced load-consolidation and the implementation of the electric vehicle fleet, can considerably decrease last-mile environmental footprint (Khoa et al., 2024; Parmar and Kushwah, 2024).

The financial investments in Strategic Logistics 4.0 (that involve deployment of IoT trackers, AI-powered planning, and blockchain-based traceability tools) continue to achieve quantifiable fuel savings, shorter operational lead times, and fewer carbon emissions and, at the same time, improved customer satisfaction (Hoang et al., 2025; Setyadi et al., 2025). At the same time, some in-depth studies also warn that direct savings in costs can be non-linear or require their maximum realisation only in the medium-to-long perspectives, because such costs are highly capital-intensive and organisational learning curves, especially of small and medium-sized business ventures that have limited resources and capabilities (Mutua et al., 2022; Rastegardebidi and Su, 2025).

Telematics systems and algorithms are important in optimisation of the logistics processes through maximisation of unnecessary miles, reduction in the time spent in the vehicle idling and eradication of empty returns. Anterior collaboration platforms lead to the aggregation of

transportation demand and also allow creating capacity shares between several stakeholders, increasing significantly the rates of utilisation of assets in the supply-chain networks (Hoang et al., 2025; Supanchanaburee et al., 2020). Such dramatic modal changes as the shift towards rail and waterway transportation or systematic electrification programmes of urban delivery fleets tend to be effective in minimizing harmful NOx/PM emissions and total CO<sub>2</sub> footprints. Combining electric vehicles with the warehouse capacities that operate on the renewable source provides significant Scope 2 and Scope 3 emission reduction values across the supply chain (Khoa et al., 2024; Hoang et al., 2025).

The extensive optimisation of facilities, including state-of-the-art automated storage and retrieval systems (AS/RS), solar arrays installed on rooftops, and advanced HVAC control systems, state-of-the-art LED lighting systems, significantly lower the energy intensity indicators but, at the same time, increase the reliability of the system and its resilience (Despeisse et al., 2022; Setyadi et al., 2025). Recyclable and reusable packaging solutions, advanced right-sizing algorithms, and intelligent labelling technologies are effective to enable the waste of materials to be minimised, and the cubic air to be minimised, achieving better load density ratios and lower emissions per unit moved (Parmar and Kushwah, 2024; Mutua et al., 2022). Processes of structured returns management, systematic refurbishment programmes, and advanced material recovery systems manage to divert significant quantities of waste off landfills alongside recovery of value, which in turn make significant contributions to the results of the circular economy (Opoku and Li, 2025; Abualfaraa et al., 2020).

Other researchers caution that Industry 4.0 technologies may stimulate energy consumption some think a lot of it in an ill-designed way due to more data centres and more sensor networks, which produce significant rebound effects that would vitiate the design supposedly beneficial to logistics and thus a vigilant lifecycle assessment procedure and a decision to invest in a more sustainable IT infrastructure are needed (Despeisse et al., 2022; Setyadi et al., 2025). According to the previous research, in regions that do not have strong electrical infrastructure, mixed-method implementation solutions may represent a more viable and cost-effective path to sustainable logistics. The suggestions of analyses provided by Khoa et al. (2024) and Mutua et al. (2022) imply that the better ROI Qtrator will receive by integrating advanced diesel solutions, systematic process optimisation and innovative packaging methods will yield greater results than the alternative of switching to electric vehicles all at once. The unifying research can be seen through the efforts to create coherent metrics of sustainable logistics, in particular, by integrating with the supply-related sustainability performance measurement systems (SPMS) and such international reporting standards as GRI (Okay et al., 2024; Vitale et al., 2025). The aim of these systems is to achieve consistency and quantification of sustainability measurement within firms and industries.

### **2.1.5 Environmental Collaboration**

Environmental collaboration is the process of leveraged but premeditated interaction between a target company and its supply chain partner suppliers, customers, logistics providers, and occasionally even regulators in order to co-achieve environmental goals. It entails in-depth information exchange systems, coordinated decision-making, and well-balanced incentive frameworks that harmoniously free up ecological footprint throughout the whole supply chain network (Chavez et al., 2023; Mishra and Singh, 2022). As opposed to traditional pattern of transaction between the companies, environmental collaboration is based on either strategizing and building long-term strategic partnership, forming a high-trust bond between the

institutions, or co-inventing sustainable solutions. In turn, it is an essential part of advanced green supply chain strategy implementation.

This partnership results in the creation of relational rents by means of widespread sharing resources, implementation of common problems-solving projects, as well as the creation of complementary capabilities that optimally make use of resource exploitation. Based on this, it produces long-term results of sustainability in the entire supply-chain network (Dyer and Singh, 1998). The structural reaction to the growing pressure by the stakeholders to be transparent and accountable promotes the organizational legitimacy and supports even more the inter-firm trustful relationships (Sharma et al., 2025). The normative and coercive institutional pressures are being formulated more at the level of regulations that require organized methods of dialogue, especially in one or another industry where the environment has complicated, and highly changeable regulations, which force those in industry to act in a coordinated manner (Mishra and Singh, 2022).

Although the principles of green thinking (green procurement procedures and sustainable logistics systems) are the necessary tools in determining the environmental sustainability setting, the practical success of these tools heavily relies on the workings of well-coordinated mechanisms of collaboration. In the case of example, green procurement programs that are comprehensive have suppliers methodically utilize environmentally friendly production procedures and management systems, an undertaking that is achievable exclusively in the framework of well-organized joint planning activities and long-term ability-building courses. Equally, green logistics processes are heavily benefiting through synchronized routing optimization and organized load consolidation programs, which inevitably require advanced inter-firm coordination systems and coherent incentive systems. The existence of multiple empirical investigations that rigorously confirm collaboration as a key mediator that efficiently transforms into strategic intent of GSCM practices operational performance indicators in both environmental and operational scores prove this point (Chavez et al., 2023; Mishra and Singh, 2022).

In the detailed analysis, Chavez et al. (2023) found that environmental exchange of information with suppliers led to various positive effects on cost-performance measures, only when strategic fields of collaboration in product design activities, which is a direct indication of a well-defined mediating pathway to value creation. Mishra and Singh (2022) have already systematically recorded that efforts to establish structured cooperation with suppliers, consumers, and logistics companies have a direct positive impact on various dimensions of business performance, which can be more or less mediated by the introduction of responsible consumption and production models. Qiao & Li (2022) have empirically shown that appropriately designed collaboration frameworks have high positive impacts on the increase in the levels of environmental commitment of suppliers, especially when the relationship attractiveness dimension and the perceived fairness dimension are held at high levels. As Sharma et 2025 displayed conclusively, board oversight mechanisms and appropriately aligned incentive structures significantly enhance the critical connection between collaboration levels and sustainability performance, and, overall, increased ESG transparency always played the role of a beneficial moderator.

Cooperation involves a huge organizational investment in time and resources to conduct joint planning (systematic) and constant monitoring activities. Disclosure of sensitive specifications

in design and process information may end up subjecting the participating firms to intellectual property risk. Unilateral sustainability factors that are created by the dominant supply-chain players can sometimes compromise the relationship of trust. SMEs are often ill equipped in terms of technological facilities in a way that is not able to join in complex co-operation tools.

Although the majority of studies confirm the positive impact of collaboration, empirical research studies more on the fact that realized benefits essentially depend on the quality of governance, maintenance of relationship equity and systematic risk management strategies. Inadequately executed collaborative projects may even result in dysfunctional dependency relationships, predatory behavioral trends, and a grossly disproportionate number of operational complexities with receipt of minimal sustainability returns, or the ability to perform improvements (Mishra and Singh, 2022; Qiao and Li, 2022).

### **2.1.6 Sustainability Performance**

Sustainability performance (SP) is the multidimensional performance that is brought about by organizational activities to incorporate the elements of environment and social concerns with the economic objectives. Basing on a concept of Triple Bottom Line (TBL), SP touches on economic (profitability, cost efficiency), environmental (emission mitigation, resources conservation), and social (labor welfare, community impact) performance. In a supply-chain setting, SP represents the integration of upstream and downstream activities, thus being a very important metric to gauge the effectiveness of green supply-chain management (GSCM) activities (Okay et al., 2024; Vitale et al., 2025). These dimensions are so interrelated that organizations should have a holistic approach to how they implement and measure sustainability projects in their organizations.

SP is a realization of how a firm is responsive to various expectations of its stakeholders, its financial and ecological and social responsibilities (Sharma et al., 2025). Regulatory and normative pressure influences SP measurement and disclosure and thus influencing firms in the direction of standardized reporting framework (Vitale et al., 2025). The unique abilities, eco-friendly technologies, and alliances of networks create competitive advantage in creating superior SP results (Li et al., 2024). This increasingly rising focus on transparency and accountability has given rise to the emergence of complex measurement systems and reporting systems that can help organizations to monitor and report their progress on sustainability.

The economic performance is the financial and operational delivery of sustainability programs, which include cost savings, increased productivity, growth of revenue and reduced risks. The study by Holling and Backhaus (2023) informs that there is a positive strong correlation between the GSCM practices and the performance of the firm ( $r \approx -0.44$ ), with the effect sizes being different depending on the setting. They discover that the use of sustainability has a positive effect on the return on assets (ROA) and return on equity (ROE) in U.S. and European companies, especially on medium-term scales (Pérez Estébanez & Sevillano, 2025). According to studies conducted in developing countries (Opoku and Li, 2025), the operational and environmental benefits can be realized very quickly but economical benefits tend to be delayed due to high capital intensity and limitations of infrastructure. These results emphasize the significance of having a long-term orientation in the examination of the economic effectiveness of sustainability measures. Considerations are resource efficiency (energy, materials), compliance, and reduction of waste and cost of compliance, accessing the market via green

branding and ESG credentials, pressure of short-term margins on sustainability activities, and lack of salience in distinguishing sustainability-related financial benefits among other strategic projects.

Environmental performance reflects the decreases in emissions, energy and water consumption and waste levels, as well as ecological toxicity, and increases in compliance and circularity. The organizations are required to strike a careful balance between their environmental goals and economic limitations and provide the constant improvement of their ecological footprint. Environmental performance measurement has changed considerably and has adopted advanced measurements and assessment instruments, which allow a better tracking of environmental effects throughout the value chain.

Simple (Okay et al., 2024) suggests an elaborate system of 36 environmental indicators that align strategically to the GRI standards and integrates features of Industry 4.0 capability. These indicators can be specifically applied in different organizational situations, which is shown in their research. Li et al. (2024) provide empirical data related to the positive power of the correlations between the green procurement practices and environmental performance results, and supplier collaboration is an important mediating variable of fulfilling the sustainability objectives.

Recent review literature demonstrates that there is an urgent demand to have advanced Sustainability Performance Measurement Systems (SPMS) that are capable of coordinating economic, environmental, and social indicators into dynamic, easy-to-use dashboards (Vitale et al., 2025; Mios et al., 2021). Although in digitalization, unprecedented opportunities exist in real-time monitoring and analysis, there is a high level of adoption differences depending on the area of use as well as the geographical locations. Despite the fact that majority of empirical researches confirm positive relationship between GSCM practices and sustainability performance, critics believe that these advantages are much context dependent and tend to realize in the long-term. Other scholars point to the risks of emerging greenwashing whereby organizations can introduce only superficial sustainability benefits without any operative changes (Vitale et al., 2025). Some underline the issues with the overload of indicators and suggest narrower, more materiality-caused measures that are more concerned with meaningful impact (Okay et al., 2024).

## **2.2 Empirical Review**

### **2.1.2 Relationship Between Green Procurement and Sustainability Performance**

There is scientific evidence showing that green procurement (GP) i.e. the incorporation of environmental considerations during the selection of vendors, purchase of raw materials and other purchasing processes influences the sustainability performance significantly. Empirical research by Chen et al. (2023) and Wang and Liu (2024) demonstrates that companies that implement materials that are of an environmentally friendly nature, carry out environmental auditing of its suppliers, and use waste-reducing procurement methods achieve tangible environmental maxim and small financial returns. The concept of environmentally responsible procurement is vital within the furniture industry in Pakistan, specifically in terms of timber, bonding agents, finishes, and animal hide, which are the major components of the furniture

industry. It is evidenced by research by Ahmed and Khan (2022) and Malik et al. (2024) that the use of certified wood and material with low levels of volatile organic compounds and sustainable packaging by furniture producers can result in a significant decrease in the toxic waste volume and carbon emissions. The gains reduce to a good reputation in the market and consumer confidence thus naturally increasing the social and financial sustainability. However, recent research indicates that small- and medium-enterprise firms working in the Pakistani furniture sector face numerous issues connected with the availability of suppliers and the lack of access to certified materials and upward costs related to materials of eco-friendly origin (Rahman and Shah 2024). However, in the cases of GP practices, the studies have shown significant improvements in the environment and moderate improvement in economic and social measures.

### **2.1.3 Relational Green Procurement and Sustainability Performance.**

Green manufacturing (GM) which involves sustainable manufacturing processes, minimisation of waste, energy-efficient machinery, and reduction of emissions has reaped obvious advantages to sustainability indices. Evidently, various studies by Chen et al. (2023) and Martinez et al. (2025) all show that eco-friendly manufacturing provides considerable benefits to the environment with lower emissions, better resource use, and utilisation of energy resources. In the furniture industry, numerous studies support such findings within the Pakistan industry. According to reports prepared by Hassan and Malik (2023), the reduction in carbon emissions and resource use is definitively reduced in producers utilizing dust-collection systems, solar energy, environmentally friendly finishes, mechanized equipment, and recycling of materials (including waste wood made into composite boards). Also, Ali and Qureshi (2024) show that manufacturing practices that are environmentally friendly (EFM) have benefited both environments and lowered production expenses, which have increased financial standing in the long run. The social good is enhanced as a result of the companies adopting sustainable production procedures; the workers develop better working conditions as the chances to encounter harmful substances and airborne particles are reduced. Studies by Malik et al. (2022) and Ahmed and Siddiqui (2024) reify that GM improves employee satisfaction and the safety indicators at work. In this regard, there is a high positive correlation between environmentally friendly manufacturing and sustainability performance in all aspects, specifically environmental and economic indicators, which are also supported by Sarwar et al. (2022) and Javed and Farooq (2024).

### **2.1.4 Correlation between Green Distribution and Sustainability Performance.**

Green Distribution (GD) that includes the element of fuel-efficient transportation systems, an eco-friendly method of packaging and optimised delivery paths plays a very important role in the care about the environment, particularly, in product-based industries with high transit requirements, which include furniture manufacturing. The academic works, such as Mutua et al. (2022), Khoa et al. (2024), and Hoang et al. (2025) prove that sustainable distribution helps to decrease transport-related emissions and the level of supply-chain performance and to encourage financial and environmental sustainability. Distribution in the furniture industry in Pakistan is usually characterized by delivery of heavy, bulky products over long distances, thus

increasing the effects on the environment. It was found that the furniture companies using combined shipments, logistics optimisation software, and recyclable packaging have reached considerable results with fuel consumption and delivery cost reduction (Raza & Khalid, 2023). In a similar way, Solar et al. (2020) found that corporations that focused on environmentally responsible packaging, including the use of recycled corrugated paper and minimizing packaging volume, improved environmental and social performance by decreasing waste and positively influencing the guidelines on sustainability efforts as perceived by their consumers. In general, it has been shown that sustainable distribution is positively related to the environmental, social, and economic performance, although this application is still low among SMEs because of financial and technical obstacles.

### **2.1.5 Relationship Between Green Logistics and Sustainability Performance**

Green logistics (GL) refers to the ecologically friendly approaches toward transportation, storage, inventory management, waste management, and returns of the product. Recent studies by Zhang et al. (2024), Mehta and Chen (2025), and Romano et al. (2025) have become conclusive in proving that the benefits of green logistics are significant in terms of sustainability. In the furniture industry in Pakistan, GL comes in particularly handy in light of the number of resources (wood, panels, fittings) moved across the regions and the corresponding level of storage facilities. Ahmed and Khan (2023) reported that companies that implemented low-energy warehouses, efficient inventory operations, and damaged goods recycling systems demonstrated better operational results and had less impact on the environment. As well, Rahman et al. (2024) found that the green logistics is associated with an increase in consumer loyalty and community influence since appropriate waste management and materials recovery increase the corporate image. As the available empirical data demonstrate, GL has a significant positive impact on environmental indicators and a moderate positive impact on financial and social performance within the Pakistani furniture sector.

### **2.1.6 Relationship among Environmental Collaboration, Green practices and Sustainability Performance.**

The realm of environmental cooperation (EC), characterised by the efforts of firms, their suppliers, users, and general authorities to work together with the purpose of attaining environmental goals, has been scientifically confirmed as a critical facilitator to the achievement of sustainability results. The articles by Carter et al. (2023), Yuan et al. (2024), and Hoang et al. (2025) reveal that the partnerships can increase the effectiveness of the practice of GSCM through better data sharing, environmental planning, and common investment in environmentally friendly solutions. Available studies in Pakistan on the furniture industry demonstrate that partnerships with suppliers, transport companies, and regulatory bodies have a significant positive impact on the enhancement of environmental safety and the use of resources (Shoukat and Rafiq, 2024; Malik et al., 2023). With environmental collaboration, there happens to be greener sourcing as the vendor aligns with the environmental requirements, cleaner production as a result of sharing knowledge and adopting technology, and environmentally friendly distribution with synchronized operation improvements also. Accordingly, it is established in research studies that collaboration in the environment enhances

the positive effect of GSCM practices on sustainability performance, especially when applied to the furniture industry in Pakistan, where the limited nature of businesses in terms of resources, technology, and capabilities tends to be limiting.

## **2.3 Research Theory and Contributions**

### **2.3.1 Resource-Based View (RBV)**

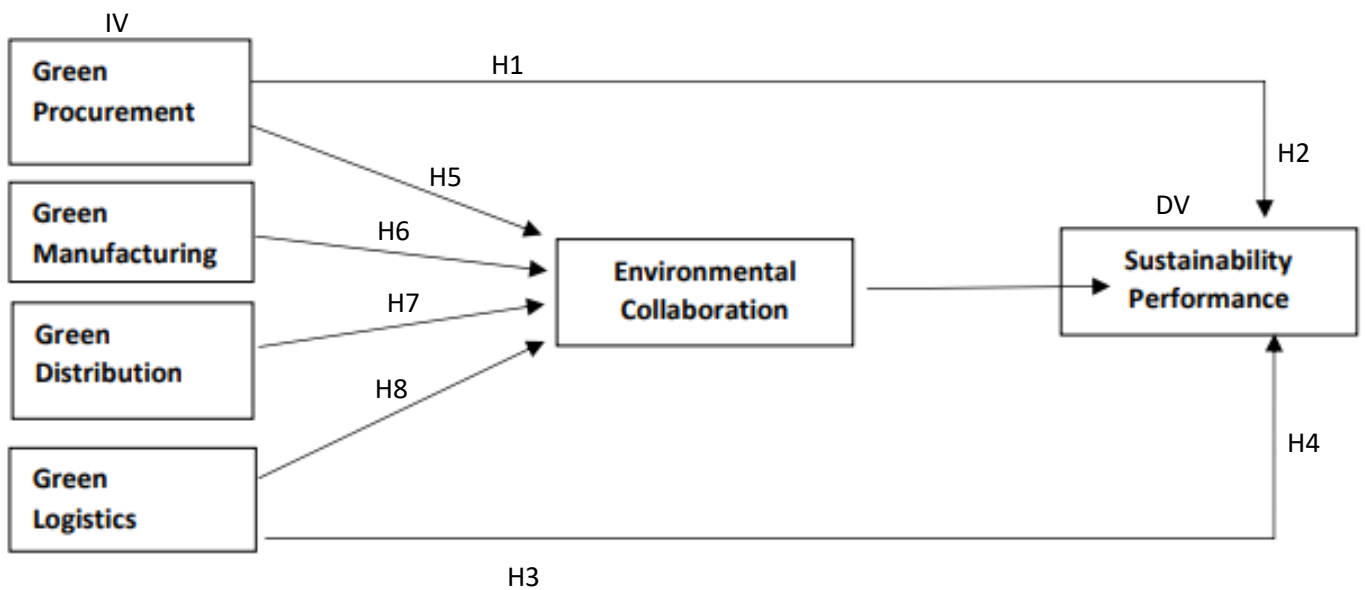
The Resource-Based View (RBV), postulated by Barney (1991), explains that firms achieve superior performance when they possess and effectively deploy resources and capabilities that are valuable, rare, difficult to imitate, and non-substitutable. RBV further emphasizes that it is not only the existence of these resources, but also the way they are developed, coordinated, and utilized through organizational routines that shapes long-term success. Within sustainability research, scholars increasingly recognize that environmental and “green” capabilities can also function as strategic resources because they require specialized knowledge, dedicated investment, and consistent managerial commitment to implement effectively. In the context of this study on Pakistan’s furniture manufacturing industry, RBV provides a clear theoretical foundation for linking Green Supply Chain Management (GSCM) practices to Sustainability Performance. Specifically, green procurement, green manufacturing, green distribution, and green logistics represent capability-based routines that firms build across their supply chain from selecting environmentally responsible suppliers and managing cleaner production processes to optimizing distribution and logistics to reduce emissions and waste. These capabilities can improve operational efficiency, support compliance with environmental requirements, and strengthen economic, environmental, and social outcomes. From an RBV perspective, furniture firms that successfully develop these green supply chain capabilities are more likely to outperform competitors because such practices are not easily replicated due to differences in supplier networks, process know-how, implementation costs, and organizational commitment. Therefore, RBV is used in this research to justify and explain the expected positive effects of GSCM practices on sustainability performance in the Pakistani furniture sector.

### **2.3.2 Natural Resource-Based View (NRBV)**

The Natural Resource-Based View (NRBV), introduced by Hart (1995), extends the Resource-Based View by arguing that a firm’s relationship with the natural environment is not merely a compliance issue, but a strategic domain where capabilities can generate superior performance. NRBV posits that environmental challenges (e.g., pollution, resource scarcity, and stakeholder pressure) shape competitive conditions, and firms that build strong environmental capabilities can achieve sustained advantages. In NRBV, environmental competencies become strategic assets because they require long-term investment, managerial commitment, process redesign, and coordinated learning that competitors cannot easily replicate. In the context of this study on Pakistan’s furniture manufacturing industry, NRBV provides a direct theoretical basis for examining how Green Supply Chain Management (GSCM) practices improve Sustainability Performance. The four GSCM dimensions green procurement, green manufacturing, green distribution, and green logistics represent environmental capabilities aligned with NRBV’s key capability pathways, particularly

pollution prevention (reducing waste, emissions, and inefficiencies through cleaner production and logistics) and product stewardship (managing environmental impact across the supply chain, including suppliers, production, packaging, and distribution). Moreover, environmental collaboration fits NRBV as a critical enabling capability that helps firms coordinate sustainability initiatives with supply-chain partners, integrate shared environmental standards, and jointly solve environmental problems, thereby strengthening the translation of green practices into measurable sustainability outcomes. Accordingly, NRBV supports this research by explaining why furniture firms that adopt and embed GSCM practices supported by environmental collaboration are more likely to enhance sustainability performance across economic, environmental, and social dimensions. In an industry where many firms still operate with conventional methods, developing such natural-environment-oriented capabilities can differentiate firms through improved efficiency, reduced environmental impact, stronger stakeholder legitimacy, and more resilient supply-chain operations.

## 2.4 Research Framework



# Chapter 3 Research Methodology

## 3.1 Introduction

In this chapter, the research methodology, as well as certain techniques used to conduct the research, are outlined. The general aim of the study is to examine how green procurement, manufacturing, distribution, and logistics practices affect sustainability performance in the Pakistani furniture industry, as well as the degree to which the environmental cooperation mediates this relationship. The respondents to the developed survey tool were furniture manufacturers in Pakistan, in a structured survey tool, which was developed using validated items of measurement that appeared in the relevant literature. The study method follows the model of the research onion offered by Saunders et al. (2019). This part provides the explanation of the ontological and epistemological orientations, research design and strategy, time factor, methodological practices, instrumentation, scaling procedures, and sampling framework.

## 3.2 Research Philosophy

Research philosophy summarizes the fundamental notions that influence the views of researchers on reality and knowledge creation. This study is positivistic in its approach, and it assumes that social phenomena can be measured and examined quantitatively. According to Creswell and Creswell (2022), the framework of positivism is typically used in supply-chain and sustainability studies as it helps the investigator to use measured instruments and statistical tools that allow them to examine the relationships among variables. Survey-based research and the statistical confirmation of theoretical constructions within organizations are supported by the positivist approach.

## 3.3 Research Approach

The research approach is used to determine the way theoretical frameworks guide the study. This paper uses a deductive method in testing hypotheses based on already laid theoretical premises, like the Resource-Based View and the Natural Resource-Based View. Deductive reasoning enables one to take a step to testing hypotheses based on theory, then corroborating the theory with empirical data, it is applicable in the detection of cause and effect between predictor and outcome variables in a quantitative study. Considering this, Hair et al. (2021) confirms that deductive methods are especially applicable when carrying out a study that requires testing hypotheses and analyzing the structure and model.

### **3.4 Research Strategy**

The action plan adopted to answer the research questions is related to the research strategy. The survey approach is used in this investigation to collect primary data on the sample statistics of a wide range of furniture manufacturing businesses. Several surveys are efficient ways to capture the perception of respondents and the possible queries to determine the relationship between green supply-chain management practices, environmental collaboration, and sustainability performance indicators. Saunders et al. (2019) stress that survey designs are a common type of business research method because they allow producing numerical results.

### **3.5 Research Choice**

The approach taken in this research is quantitative, and thus it is quite adequate when exploring the data-driven correlations using numerical data. Quantitative strategy makes it easier to apply the standard measurement tools, statistical tests such as correlation, regression, and mediation tests. Sometimes, according to Henderson (2023), quantitative procedures would be more appropriate in cases of projects when a consistent data sample and strict statistical evaluation are needed.

### **3.6 Research Time Horizon**

Research time frame refers to the time frame within which empirical data are collected and later analyzed. The current study involves a cross-sectional time horizon in that the information was gathered at a single moment in time and not over a long period. The research designs with special benefits include cross-sectional research designs; in cases where longitudinal observations are not feasible or practicable, it becomes beneficial to probe the relationships between variables through cross-sectional research designs. The cross-sectional approaches are the most suitable in research focused on an organization and use survey tools, a component of the methodology that is upheld by Creswell and Plano Clark (2021).

### **3.7 Research Methodologies and Processes.**

The analysis uses quantitative methods of analysis to discuss the data gathered. Once the responses had been collected through the survey instrument, codification and importing of the data to IBM SPSS version 25 were undertaken to conduct a thorough statistical analysis of the data. SPSS was applied to measure the measurement properties of constructs, besides the structural relationship between variables. According to Hair et al. (2021), SPSS-based processes are especially suited to the studies of latent constructions, direct effects, and mediation or moderation testing, as well as in research in the field of management and social sciences.

### **3.8 Research Instruments**

A structured questionnaire was used as the main tool of data collection. Measurement items of the key constructs, such as green procurement, green manufacturing, green distribution, green logistics, environmental collaboration, and sustainability performance, were derived based on

measurement scales that had been tested issues as literature. The questionnaire was separated into two major elements: the demographics and Likert-type questions. The instrument was examined by industry professionals so that they could make sure that it was understandable and that it was relevant to the Pakistani furniture industry.

### **3.9 Measurement of Scale**

The research used a five-point Likert scale of five points in order to technically measure the perception of respondents. The participants rated statements between one (strongly disagree) and five (strongly agree). In line with Sekaran and Bougie (2020), interval scales, more specifically the Likert scale, are widely applied in supply-chain and organizational literature to measure attitudes, as interval scales allow for measuring attitudes and conducting statistical analysis. The nominal scale and the ratio scale were used in the measurement of demographic variables of position in the organization, the type of the company, experience, and the size of the organization. All constructs to be measured in this study used already tested scales that were altered in accordance with available research studies. Everything was rated on a five-point Likert scale between one (strongly disagree) and five (strongly agree). Vachon and Klassen (2008), Chan et al. (2012), Abbasi and Nilsson (2016), and Agyemang et al. (2020) mainly used the measurement items of the key variables, such as Green Procurement, Green Manufacturing, Green Distribution, Green Logistics, Environmental Collaboration, and Sustainability Performance, derived by Zhu and Sarkis (2004). These scales of measurement have already been rigorously tested in previous studies and exhibit a high degree of reliability/validity in measurements of environmental and supply-chain practices.

### **3.10 Population and Sample**

The sample of the research included the executives and experts involved in working within the proven furniture manufacturing industry in Pakistan, which includes approximately 40 60 well-known businesses, including Interwood Mobel, Master Offisys, Dolce Vita Home, Habitt, ChenOne Home, Malik Furniture, and Style & Comfort. These institutions reflect the institutionalized section of the industry and have their supply-chain, procurement, production, and logistics departments, and are thus best suited to investigate the Green Supply Chain Management applications. Since the number of staff in these positions is not known exactly, the research was conducted according to the recommendations provided by Krejcie and Morgan who propose that 150 responses are enough in case of large or unspecified populations. As a result, there were 153 responses gathered. Listwise deletion was used following the screening of missing values or outliers, and the resulting size of the final analytical sample is N 150. Convenience sampling was adopted because a complete and accessible sampling frame of furniture manufacturers and relevant managerial staff was not available, and organizations were geographically dispersed, making probability-based sampling impractical within the study's time and access constraints. In line with this access limitation, responses were collected from reachable and relevant participants in target roles across firms. To reduce the risk of insufficient statistical power, the study maintained an adequate sample size for regression and mediation analysis, consistent with commonly used sample size guidance for large/unspecified populations; however, the sample size was accepted as sufficient to yield dependable statistical analysis with the help of IBM SPSS, including the regression and mediation analysis.

# Chapter 4: Results and Analysis

The proposed study follows a quantitative approach, which is considered the most appropriate in analyzing the hypotheses based on the numerical results of the research. The methodology also allows using standardized measurement tool and statistics, including correlation analysis, regression, and mediation analysis. According to Wilson (2021), quantitative research designs are handy in studies that require an orderly gathering of data and a rigorous level of statistical analysis. In Chapter Four, the research contains the empirical results of the study and provides a record of the data collected by the researcher on the respondents. The chapter will rigorously be used to test the hypotheses proposed as well as measure comprehensively the relationship between green supply chain practices, environmental collaboration, and sustainability performance. Statistical tests were performed on the Windows of IBM SPSS Statistics version 25 and provided powerful data analysis and hypothesis testing instruments. Model 4 was the mediation analysis done using PROCESS Macro, version 4.2, and bootstrapping, hence, providing reliable outcomes based on the resampling methods. The chapter has a well-imposed six-section structure. The demographic analysis of respondents has been exhaustively covered in section 4.1, and their characteristics and profiles are defined. Section 4.2 presents a comprehensive explanation of data screening and assumption testing, with important aspects like normality, multicollinearity, and homoscedasticity being described and ensured to ensure quality data. In section 4.3, the descriptive and correlational statistics are thoroughly presented in order to clarify the relationship between variables. Section 4.4 assesses measurement scale reliability through the different statistical tests. Section 4.5 provides a detailed hypothesis testing result, both in the direct effect between variables and the mediating effect through environmental cooperation. Lastly, Section 4.6 will bring together the key data findings of the study, highlighting the most salient statistical findings and their implications for the purpose of the research.

## 4.1 Demographic Analysis

Demographic data is a key factor of research analysis since it helps researchers to achieve a holistic view of the written composition of survey participants, and estimate the level to which particular segments of the population are represented in the study sample (Sekaran, 2003).

This understanding cannot be done without determining the generalizability and representativeness of research findings. In Table 1, the demographic information about the 153 individuals who filled out the survey is broken down in the following way: by their key variables, by their gender, age, education levels, and by their relevant work experience in the field.

### *Demographic characteristics of respondents*

<b>Characteristic</b>	<b>n</b>	<b>% (valid)</b>
Gender		
Female	45	30.2
Male	104	69.8
Missing	4	2.6
Age		
20–30	93	61.2
31–40	48	31.6
41–50	11	7.2
Missing	1	0.7
Highest education		
Bachelors	83	54.6
Masters	65	42.8
Bachelors & Masters	3	2.0
Masters & PhD	1	0.7
Missing	1	0.7
Work experience		
0–2 years	37	24.3
3–5 years	38	25.0
6–10 years	39	25.7
More than 10 years	37	24.3
0–2 & 3–5 years	1	0.7
Missing	1	0.7

*Note.* N = 153. Percentages are valid percentages within each characteristic block.

## **4.2 Data Analysis**

It was also necessary to determine that the empirical data met the basic assumptions needed to execute the regression and mediation tests before establishing the research hypotheses and testing them. The systematic data screening can be used to check the validity and reliability of the results of statistical analysis. Three critical assumptions, therefore were further tested to a high level, namely data normality, multicollinearity, and homoscedasticity. The methodological criticism is critical towards ensuring the soundness of further analysis and validity of the research results.

### **4.2.1 Data Normality**

The construct of data normality refers to how similar the values of variables appear centered around a bell-shaped distribution (Gaussian) of value distribution. Normalcy is another important assumption since most procedures in statistics, such as regression, assume that residual values are normally distributed. Inferential validity can be invalidated when this assumption is violated, and the findings provided are untrustworthy.

In the current study, normality was evaluated by using both numerical and visual values. All composite variables have been calculated using skew and kurtosis with the same amount of examination of the histograms and normal probability plotting. The skewness measures the symmetry of the distribution, and the kurtosis is the relative flatness or peakedness relative to a normal reference distribution. According to Table 4.1, the skewness and kurtosis of all the variables are within an acceptable range of  $\pm 2$ , which implies that there were no meaningful non-normal deviations. The histograms had close bell shapes with almost the same profiles, and normal probability plots displayed the result with data points spaced closely along the reference diagonal, which further supports the assumption of normality.

Since the quantitative indices agree with graphical evidence, it can be concluded that the normality assumption is adequately satisfied. Subsequently, the dataset can be used in regression and mediation analysis, and thus, it represents an adequate foundation for the intended statistics. Table 4.2

*Normality Statistics of Study Variables*

Variable	N	Mean	SD	Skewness	Kurtosis
Green Procurement (GP)	150	3.52	0.96	-0.69	0.23
Green Manufacturing (GM)	150	3.66	0.94	-0.63	0.26
Green Distribution (GD)	150	3.59	0.95	-0.64	0.13
Green Logistics (GL)	150	3.55	0.96	-0.54	0.01
Environmental Collaboration (EC)	150	3.67	0.94	-0.72	0.18
Sustainability Performance (SP)	150	3.69	0.88	-0.61	0.35

*Note.* N = 150. SD = standard deviation.

#### **4.2.2 Multicollinearity**

Multicollinearity occurs when there is a high intercorrelation between the independent variables. The severe multicollinearity interferes with the disentangling of the individual effect of each predictor on the dependent variable. The phenomenon may produce unstable and unreliable regression coefficients, inflated standard errors, and low statistical power. The Tolerance and Variance Inflation Factor (VIF) statistics were investigated to assess the multicollinearity. Tolerance measures the share of the variance of a predictor that cannot be

explained by other predictors and VIF measures the multi-fold increase in the variance of a regression coefficient that can be due to multicollinearity.

The results presented in Table 4.2 indicate that the tolerance values are all greater than the admissible minimum of 0.10 and all of the VIF values have a value below the traditional 10 cutoffs. Therefore, in this study, multicollinearity is not an important issue. The highest VIF was 5.03 and the company was Green Distribution and this is much lower than the critical value. Based on the abovementioned, independent variables can be applied into regression models without altering the results. These outcomes suggest that the individual predictors provide distinct information to the model thus, allowing a reliable interpretation of individual effects. Table 4.3

### Multicollinearity Diagnostics

#### *Multicollinearity Diagnostics*

Predictor	Tolerance	VIF
Green Procurement	0.29	3.43
Green Manufacturing	0.23	4.4
Green Distribution	0.2	5.03
Green Logistics	0.23	4.39
Environmental Collaboration	0.27	3.74

*Note.* VIF = variance inflation factor.

### 4.2.3 Homoscedasticity

Homoscedasticity is an important assumption necessary in regression analysis, which represents the assumption that the standard deviation of residuals (prediction errors) stays the same at all levels of the predictable values. This is a basic assumption because heteroscedasticity, which is characterized as the inequality of variance, may give biased standard errors and invalid statistical conclusions. A thorough review was made of this assumption to test it rigorously by use of a scatterplot of standardized residuals versus standardized predicted values.

The scatterplot analysis showed a haphazard distribution of the points that did not show any clear patterns, trends, or funnel shapes that could suggest a systematic change in the variance of the residual. The distribution of the points around zero on both axes was even, with no clear clustering of points or variation in the distribution patterns towards the expected points of increased or reduced value. Such a random scatter pattern is a strong indication that the variance of residuals is nearly constant at the various levels of the independent variables, which is a condition that the assumption of homoscedasticity is satisfied. This validation helps in a comfortable decision on the results of the regression and also makes sure that the statistical inferences made based on the analysis are reliable.

### 4.3 Descriptive Statistics

An overall analysis of descriptive statistics was done to give a clear and precise summary of the key features of the study variables. The statistics can be used in several ways: they allow determining central tendencies, analyzing the data distribution, and preliminarily investigate the perceptions of respondents. Mean values were calculated to find out the average level of agreement with both constructs, and standard deviations were calculated to measure the dispersion or variation in the ratings of respondents.

#### 4.3.1 Means and Standard Deviations

The analytical findings provided in Table 4.3 show that there are a few interesting trends in the data. The mean values of all the variables are always above the mid-level of the scales (3.0 of a 5-point scale), with a mean of 3.523.69. This tendency indicates an overall affirmative attitude of the respondents about the way their organizations participate in the green supply chain practices, environmental cooperation activities, and sustainability performance attainments. The mean value of Sustainability Performance (3.69) is close to that of Environmental Collaboration (3.67) and Green Manufacturing (3.66), which implies that there is a strong consensus with regard to these areas.

The values of the standard deviation, 0.88-0.96, are moderately high, which means the discrepancy in responses. Such comparatively uniform standard deviation values imply that the opinions of the respondents are fairly homogeneous across all constructs, with Sustainability Performance having the most aligned opinions (SD = -0.88) and Green Procurement and Green Logistics having a minimal bit more dispersion (SD = -0.96).

Table 4.4

#### *Descriptive Statistics of Study Variables*

<b>Variable</b>	<b>N</b>	<b>Mean</b>	<b>SD</b>
Green Procurement	150	3.52	0.96
Green Manufacturing	150	3.66	0.94
Green Distribution	150	3.59	0.95
Green Logistics	150	3.55	0.96
Environmental Collaboration	150	3.67	0.94
Sustainability Performance	150	3.69	0.88

*Note.* N = 150. SD = standard deviation.

#### 4.3.2 Correlational Statistics

A detailed Pearson correlation analysis was performed to systematically examine the interrelationships among the study variables. This analysis revealed robust and statistically

significant positive correlations among all variables in the study framework. The correlation coefficients range from moderate to strong (0.71 to 0.85), indicating substantial relationships between the measured constructs.

These strong correlational patterns provide strong preliminary evidence supporting the theoretical foundations of the research model. The particularly strong correlations between Environmental Collaboration and Sustainability Performance ( $r = 0.85$ ) and between Green Logistics and Environmental Collaboration ( $r = 0.84$ ), suggest these constructs are closely interlinked in practice. These findings align with and support the underlying logic of the proposed research framework.

Table 4.5

*Pearson Correlations Among Study Variables*

Variable	GP	GM	GD	GL	EC	SP
GP	1					
GM	.80**	1				
GD	.79**	.85**	1			
GL	.73**	.76**	.81**	1		
EC	.72**	.71**	.77**	.84**	1	
SP	.73**	.77**	.78**	.83**	.85**	1

*Note.* N = 150. GP = Green Procurement; GM = Green Manufacturing; GD = Green Distribution; GL = Green Logistics; EC = Environmental Collaboration; SP = Sustainability Performance. \*\*  $p < .01$  (two-tailed).

#### 4.4 Reliability of the Study Scales

The reliability of the measurement tools was fully evaluated in order to determine the internal consistency and dependability of the measurement tools used in the study. Coefficients of alpha of Cronbach were calculated in relation to each construct with the adopted alpha of 0.70, meaning that anything below that was deemed to be a reliable measure. This commonly-acknowledged standard also ensures that those items that are included in each scale are always measuring the same underlying construct.

All constructs in the investigation produced strong values of Cronbach's alpha, as shown in the table. 4.6, which significantly exceeded the recommended level of 0.70. These high-order correlation coefficients provide unquestionable information that the measurement scales are highly internally consistent and reliable, thus enhancing the quality and reliability of the collected information.

Table 4.6

*Reliability of Study Scales*

Construct	Items	Cronbach's $\alpha$
Green Procurement	5	0.894
Green Manufacturing	5	0.906
Green Distribution	5	0.911
Green Logistics	5	0.928
Environmental Collaboration	5	0.925
Sustainability Performance	9	0.948

*Note.*  $\alpha$  = Cronbach's alpha.

## 4.5 Hypothesis Testing

An elaborate hypothesis testing process was adopted to intimately test the direct and indirect relationship among the variables being tested. Assessment was done on a two-methodological basis, where direct hypotheses (H1, H4) were tested by simple linear regression analysis and mediation hypotheses (H5, H8) were tested by the advanced PROCESS Model 4 through the use of the bootstrapping method, which gave the results the strength and stability of bootstrapping.

### 4.5.1 Direct Effects (H1–H4)

The use of regression analysis provided strong results showing that all green supply chain practices have positive and statistically significant impacts on sustainability performance in an individual way. This comprehensive study shows that companies that actively pursue green procurement, manufacturing, distribution, and logistics performance are always able to have excellent performance on sustainability. These associations and their robustness and consistency highlight the reason why environmental considerations should be an imperative element in all the operations of the supply chain.

Expressed in the form of the standard deviation of the mean difference: Table 4.7 Direct Hypothesis Testing Results.

Table 4.7

#### *Direct Hypothesis Testing Results*

Hypothesis	Relationship	$\beta$	t	p	Decision
H1	GP $\rightarrow$ SP	0.703	12.03	< .001	Supported
H2	GM $\rightarrow$ SP	0.756	14.05	< .001	Supported
H3	GD $\rightarrow$ SP	0.681	11.82	< .001	Supported
H4	GL $\rightarrow$ SP	0.722	13.67	< .001	Supported

*Note.*  $\beta$  = standardized coefficient.

## 4.5.2 Mediation Effects (H5–H8)

The mediation analysis revealed strong evidence that environmental collaboration serves as a significant mediating factor in the relationship between each green supply chain practice and sustainability performance. The analysis utilized sophisticated bootstrapping techniques with 5000 resamples to ensure robust results. In all cases examined, the bootstrap confidence intervals demonstrated clear separation from zero, providing strong statistical confirmation of significant mediation effects across all hypothesized relationships. Table 4.8 Mediation Analysis Results

Table 4.8

### *Mediation Analysis Results*

Hypothesis	Indirect Path	Indirect Effect	BootLLCI	BootULCI	Total Effect ( $\beta$ )	Result
H5	GP → EC → SP	0.4205	0.2832	0.5341	0.703	Supported
H6	GM → EC → SP	0.3706	0.2447	0.4884	0.756	Supported
H7	GD → EC → SP	0.401	0.2403	0.5339	0.681	Supported
H8	GL → EC → SP	0.4122	0.2604	0.5732	0.722	Supported

*Note.* BootLLCI/BootULCI = bootstrap confidence interval bounds (5,000 resamples). Total Effect ( $\beta$ ) is the direct standardized effect of X → SP from Table 4.7.

## 4.6 Data Findings

Empirical findings that have been obtained from this comprehensive research provide good evidence that supports the proposed research framework. The results clearly verify that all the analyzed green supply chain activities, i.e., green procurement, green manufacturing, green distribution, and green logistics, have a statistically significant positive effect on the sustainability performance of organizations. Further, the analysis points out the central and multidimensional mediating contributions regarding environmental cooperation (strengthening and enhancing these core relationships).

The overall discussion in this paper provides conclusive evidence that environmental collaboration is one of the core processes by which the concept of green supply chain performance improves sustainable performance. These lessons have a strong theoretical contribution to the academic literature as well as providing a practical and implementable advice to industry practitioners and decision-makers who are determined to take their sustainability performance to the next stage by means of polished practices throughout the supply chain and environmentally focused initiatives.

# CHAPTER 5: DISCUSSION, CONCLUSION, AND RECOMMENDATIONS

## 5.1 Discussion

This paper explored how much the green Supply Chain Management (GSCM) practices relate to Sustainability Performance in the Pakistani furniture manufacturing industry. It was based on the Resource-Based View (RBV) and the Natural Resource Based view (NRBV) (Barney, 1991; Hart, 1995). in which the study sought to determine how internal environmental capabilities and collaboration mechanisms work together to enhance better sustainability performance. The furniture producing sector in Pakistan is gradually changing owing to globalization, pressure to export to the world, rising environmental consciousness, and the necessity to observe the new sustainability standards. In this transforming industrial environment, the application of GSCM practices has gained a central position as a strategic instrument that a company can adopt to ensure that it remains competitive in a long-term perspective, as well as being environmentally accountable. Implementation of these practices is a major change from the conventional manufacturing processes to the more sustainable and eco-friendly processes.

The empirical evidence gives rigorous and thorough support to the suggested research design. As opposed to the previous expected results in the developing economies, the findings indicate that the entire green supply chain practices, or green procurement, green manufacturing, green distribution, and green logistics, positively and statistically influence the sustainability performance (Bencheqroun et al., 2024). Besides, another important mediating factor is environmental collaboration, which enhances the impact of every GSCM practice on sustainability results. These results underline the increased maturity of on-the-sustainability-oriented practice in the furniture production industry in Pakistan and support the idea that companies may nowadays better turn green efforts into tangible environmental, economic, and social performance benefits. The outcomes pose a challenge to past beliefs regarding the insufficient applicability of the advanced environmental practice in the developing economies and show that the sphere is progressively moving towards sustainable functioning. Green Procurement had a good positive correlation with sustainability performance. This observation represents that furniture producers are increasingly considering environmental criteria in the purchasing process, including the purchase of sustainable timber, the minimization of material waste, and the use of more socially responsible suppliers. Although the procurement difficulties persist, the remarkable outcomes obtained indicate that companies that actively invest in more sustainable sourcing policies can be better oriented to minimize environmental risks and increase the levels of supply chain transparency and sustainability (Agyemang et al., 2020; Chen et al., 2023; Bencheqroun et al., 2024).. In terms of the RBV, green procurement is actually a useful organizational capability that facilitates firms to procure environmentally adequate resources; thus, it also helps establish sustainable competitive advantage. The establishment of such procurement functions is an essential milestone towards creating supply chains that are responsible to the environment and contribute to long-term sustainability.

Green Manufacturing also became among the refutable factors on sustainability performance, which confirms the emphasis of the NRBV on the prevention of pollution and the more efficient use of resources. The process of manufacturing furniture has significant environmental implications, as some processes involve wood cutting, finishing, chemical usage, and the use of energy. Companies that utilize cleaner production methods, use a minimum amount of power, generate minimum waste, and have a safe workplace enjoy affordable operations, better standards of compliance, and environmental performance. Well, consistent with the highly persuasive green manufacturing, it is certainly true that the subject of internal process improvements is chosen as the most direct and controllable channel towards the achievement of sustainability, especially in manufacturing-intensive sectors. The outlined results represent the paramount role that investing in eco-friendly production processes and technologies plays as lines and a section of sustainable business practices.

The results also reveal that Green Distribution has a considerable beneficial influence on environmental sustainability performance. This outcome implies that the companies are beginning to acknowledge the significance of distributing in an environmentally conscientious way, i.e., enhanced packaging effectiveness, enhanced transportation strategizing, and decreased waste of goods and returns. Although the distribution patterns in Pakistan are still mostly traditional, companies that actively aim to simplify the distribution scheme could minimize the emission of greenhouse gases, minimize the cost of logistic operations, and increase customer loyalty. These enhancements are translated into realistic sustainability performance, thus highlighting the strategic importance of the incorporation of environmental consideration in downstream supply-chain processes. The favorable interrelation between green distribution and the sustainability performance shows that the work of companies has moved beyond the internal business operations and has begun to build more comprehensive and efficient sustainability programs.

On the same note, green logistics has become an influential determinant of sustainability performance as it highlights the ever-increasing emphasis on the environmental sustainability of the logistics practices in the furniture sector. Consequently, it is possible to note that environmental programs that are woven into the strategy of logistics make significant contributions to the overall sustainability results. These efforts include a wide range of activities, including sophisticated fleet-management networks to maximize vehicle tracking and maintenance, complex algorithms for route planning and fuel consumption, application of energy-efficient warehouse methods, automated lighting and temperature-control frameworks, and strategic minimization of gasoline use by driver training and upkeep of automobiles. Although there are significant obstacles in the logistics environment in Pakistan, given the low transportation infrastructure and limited access to modern technologies, the study also shows that green logistics practices can be gradually implemented, with tangible results. Within the context of the resource-based perspective, such green logistics facilities can be regarded as good strategic resources that help the firms to be more able to manage and alleviate environmental risks in the whole chain of supply and, as a result, improve the sustainability performance and competitive position in general.

The environmental collaboration turned out to be a strong determinant; it not only reveals a direct positive influence on sustainability performance but mediates the relationship between the green supply-chain management practices and sustainability results. This observation explains why inter-organizational cooperation is critically important in solving environmental

issues, especially in circumstances where companies experience limited resources, knowledge, or technology. Strategic alliances between furniture manufacturers and various stakeholders, such as suppliers, logistics providers, customers, and governmental agencies, allow such entities to come up with innovative, sustainable solutions and common sustainability goals in the supply-chain network (Dyer & Singh, 1998; Chavez et al., 2023; Mishra & Singh, 2022).. The mediation role of environmental collaboration helps to understand that sustainability performance stems from the concerted effort, exploiting the resources and the abilities of the supply-chain partners. Through teamwork, the firms would go beyond the limits of each individual, contributing to the development of synergy, which increases the effectiveness of environmental sustainability. manufacturing initiatives In theoretical terms, the findings provide support for the Resource-Based View and the Natural Resource-Based View. From an RBV perspective, green procurement, green manufacturing, green distribution, and green logistics represent capability-based routines that can enhance sustainability performance by improving efficiency, reducing waste, and strengthening compliance outcomes (Barney, 1991). Extending this logic, the Natural Resource-Based View argues that environmentally oriented capabilities (e.g., pollution prevention and product stewardship across supply-chain activities) can become strategic sources of performance improvement (Hart, 1995). In addition, environmental collaboration can be viewed as a relational capability that strengthens the conversion of green practices into measurable sustainability outcomes by enabling coordinated planning and shared environmental initiatives across partners (Dyer & Singh, 1998; Chavez et al., 2023; Mishra & Singh, 2022). Collectively, these capabilities are costly to develop, embedded in firm routines and inter-firm relationships, and therefore difficult to imitate—supporting the potential for sustained performance benefits (Barney, 1991; Hart, 1995).

## **5.2 Conclusion**

In this detailed analysis, the authors identified complex mutual connections between five major factors, namely Green Procurement, Green Manufacturing, Green Distribution, Green Logistics, and Environmental Collaboration, and how each of them affects the Sustainability Performance of the situation in the furniture manufacturing industry in Pakistan. The procedure of the research involved data collection and processing of data collected at a managerial level, using advanced techniques of regression and mediation to examine the hypotheses put forward, and support the theoretical model. Empirical findings indicate that green practices in the management of supply chains are relevant to enhance the sustainability performance, and this fact proves that Pakistani furniture manufacturers have gained enough capacity to apply effective environmental practices across their supply chains. Some of these practices, specifically green manufacturing and environmental cooperation, have very high impacts, which points to the importance of significant collaborations in environmental activities, as well as the enhancement of internal processes, in achieving the sustainability objectives. In addition, the analysis found that the concept of environmental collaboration serves as a partial conduit between the entire range of GSCM practices and the sustainability performance, and thus it is an important factor in improving the effectiveness and influence of green activities. The study concludes that, in general, the incorporated interplay between interior environmental capabilities and exterior collaborative relations is sophisticated enough to provide sustainability performance in the Pakistani furniture manufacturing industry. Companies that

are strategic investors in cleaner production methods, best sourcing practices, effective distribution channels, sustainable logistics service, and effective environmental relationships have a significant chance of attaining superior environmental, financial, and social results. These results provide useful information and effective advice to managers, policymakers, and researchers who are trying to stimulate sustainable development of manufacturing industries in emerging economies.

### **5.3 Recommendations**

Based on the comprehensive empirical findings of this study, several strategic and actionable recommendations are proposed to enhance GSCM implementation and drive improved sustainability performance within Pakistan's furniture manufacturing sector. Furniture manufacturers should prioritize and systematically strengthen their green manufacturing initiatives through strategic investments in advanced, cleaner technologies, state-of-the-art energy-efficient machinery, comprehensive waste reduction systems, and safer chemical management protocols. These core manufacturing initiatives have consistently demonstrated robust and measurable sustainability benefits across multiple performance dimensions (Abualfaraa et al., 2020; Ahmed & Siddiqui, 2024).. They represent a practical and proven starting point for firms seeking to enhance their environmental performance while maintaining operational efficiency. Special attention should be given to implementing technologies that enable real-time monitoring of resource consumption and waste generation. Organizations are strongly encouraged to deepen and broaden their environmental collaboration with supply chain partners across the value chain (Carter et al., 2023; Chavez et al., 2023; Hoang et al., 2025).. This can be achieved through structured joint training programs, comprehensive shared environmental audits, systematic collaborative product development initiatives, and integrated information-sharing platforms that facilitate real-time communication and data exchange. Such collaborative efforts have shown significant potential to enhance sustainability outcomes through knowledge transfer and resource optimization. Industry associations and chambers of commerce can play a pivotal role by creating structured networking opportunities and establishing formal knowledge-sharing mechanisms. Green procurement, distribution, and logistics practices should be further institutionalized through the systematic integration of environmental criteria into core decision-making processes. Firms should develop comprehensive supplier evaluation systems that incorporate sustainability metrics, implement innovative eco-friendly packaging solutions, optimize transportation planning through advanced analytics, and establish strategic partnerships with environmentally responsible logistics providers. These coordinated actions will strengthen the overall sustainability impact across the entire supply chain network. Policymakers should actively support industry efforts by introducing targeted incentives for green investments, implementing and enforcing more stringent environmental regulations, and developing robust infrastructure to support sustainable transportation and logistics operations. Finally, future research initiatives should explore additional mediating and moderating factors, such as eco-innovation capabilities and green human resource management practices, while employing longitudinal research approaches to effectively capture and analyze the long-term impacts of GSCM practices on sustainability performance.

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# Appendix

## QUESTIONNAIRE

Enhancing Sustainability in Pakistan's Furniture Manufacturing Industry: The Role of Green Procurement, Green Manufacturing, Green Distribution, Green Logistics, and Environmental Collaboration.

This questionnaire is created to collect data for an academic thesis. The information gathered during this survey will be used ONLY for academic purposes, and respondents' confidentiality will be maintained.

### Demographic Information

Gender:

- Male  Female

Age:

- 20-30  31-40  41-50  51-60  Above 60

Highest Education:

- Matric/ O-Level  Intermediate/A-Level  Bachelors  Masters  PhD

Work Experience:

- 0-2 Years  3-5 Years  6-10 Years  More than 10 Years

Likert five-point scale is used to measure responses:

1 = Strongly Disagree | 2 = Disagree | 3 = Neutral | 4 = Agree | 5 = Strongly Agree

### SECTION A – GREEN PROCUREMENT

Our organization evaluates environmental impact when choosing source materials.

- 1 – Strongly Disagree  
 2 – Disagree  
 3 – Neutral  
 4 – Agree  
 5 – Strongly Agree

Environmental standards are prioritized in material sourcing decisions.

- 1 – Strongly Disagree  
 2 – Disagree  
 3 – Neutral  
 4 – Agree  
 5 – Strongly Agree

Our purchasing guidelines emphasize environmentally sustainable products.

- 1 – Strongly Disagree
- 2 – Disagree
- 3 – Neutral
- 4 – Agree
- 5 – Strongly Agree

We prioritize sustainable and recycled materials in our sourcing process.

- 1 – Strongly Disagree
- 2 – Disagree
- 3 – Neutral
- 4 – Agree
- 5 – Strongly Agree

Environmental ISO standards guide our procurement strategy.

- 1 – Strongly Disagree
- 2 – Disagree
- 3 – Neutral
- 4 – Agree
- 5 – Strongly Agree

#### SECTION B – GREEN MANUFACTURING

Minimizing waste is central to our production methodology.

- 1 – Strongly Disagree
- 2 – Disagree
- 3 – Neutral
- 4 – Agree
- 5 – Strongly Agree

Our production processes emphasize energy conservation.

- 1 – Strongly Disagree
- 2 – Disagree
- 3 – Neutral
- 4 – Agree
- 5 – Strongly Agree

We limit harmful substances in our furniture manufacturing.

- 1 – Strongly Disagree
- 2 – Disagree
- 3 – Neutral
- 4 – Agree
- 5 – Strongly Agree

Our company promotes eco-friendly production methods.

- 1 – Strongly Disagree
- 2 – Disagree
- 3 – Neutral
- 4 – Agree
- 5 – Strongly Agree

We conduct regular environmental audits of production processes.

- 1 – Strongly Disagree
- 2 – Disagree
- 3 – Neutral
- 4 – Agree
- 5 – Strongly Agree

#### SECTION C – GREEN DISTRIBUTION

Our furniture packaging is optimized to minimize material consumption.

- 1 – Strongly Disagree
- 2 – Disagree
- 3 – Neutral
- 4 – Agree
- 5 – Strongly Agree

We utilize sustainable and reusable packaging solutions.

- 1 – Strongly Disagree
- 2 – Disagree
- 3 – Neutral
- 4 – Agree
- 5 – Strongly Agree

Our distribution network adheres to strict environmental protection protocols.

- 1 – Strongly Disagree
- 2 – Disagree
- 3 – Neutral
- 4 – Agree
- 5 – Strongly Agree

We optimize delivery routes to achieve maximum fuel efficiency.

- 1 – Strongly Disagree
- 2 – Disagree
- 3 – Neutral
- 4 – Agree
- 5 – Strongly Agree

Our distribution processes include emission tracking and mitigation measures.

- 1 – Strongly Disagree
- 2 – Disagree
- 3 – Neutral
- 4 – Agree
- 5 – Strongly Agree

#### SECTION D – GREEN LOGISTICS

We implement eco-conscious practices throughout our logistics operations.

- 1 – Strongly Disagree
- 2 – Disagree
- 3 – Neutral
- 4 – Agree
- 5 – Strongly Agree

Our transport fleet prioritizes eco-friendly vehicles and methods.

- 1 – Strongly Disagree
- 2 – Disagree
- 3 – Neutral
- 4 – Agree
- 5 – Strongly Agree

Logistics-related waste undergoes systematic management procedures.

- 1 – Strongly Disagree
- 2 – Disagree
- 3 – Neutral
- 4 – Agree
- 5 – Strongly Agree

Our company actively implements reverse logistics principles.

- 1 – Strongly Disagree
- 2 – Disagree
- 3 – Neutral
- 4 – Agree
- 5 – Strongly Agree

We maintain strict adherence to environmental regulations in logistics.

- 1 – Strongly Disagree
- 2 – Disagree
- 3 – Neutral
- 4 – Agree
- 5 – Strongly Agree

#### SECTION E – ENVIRONMENTAL COLLABORATION

Cross-departmental teams work jointly on environmental challenges.

- 1 – Strongly Disagree
- 2 – Disagree
- 3 – Neutral
- 4 – Agree
- 5 – Strongly Agree

Environmental objectives are integrated across all departments.

- 1 – Strongly Disagree
- 2 – Disagree
- 3 – Neutral
- 4 – Agree
- 5 – Strongly Agree

Staff members engage actively in environmental initiatives.

- 1 – Strongly Disagree
- 2 – Disagree
- 3 – Neutral
- 4 – Agree
- 5 – Strongly Agree

Environmental teamwork positively impacts our organizational culture.

- 1 – Strongly Disagree
- 2 – Disagree
- 3 – Neutral
- 4 – Agree
- 5 – Strongly Agree

The company actively promotes creative solutions for environmental challenges.

- 1 – Strongly Disagree
- 2 – Disagree
- 3 – Neutral
- 4 – Agree
- 5 – Strongly Agree

#### SECTION F – SUSTAINABILITY PERFORMANCE

Implementation of GSCM practices has resulted in decreased operational expenses.

- 1 – Strongly Disagree
- 2 – Disagree
- 3 – Neutral
- 4 – Agree
- 5 – Strongly Agree

Environmental initiatives have enhanced our financial performance.

- 1 – Strongly Disagree
- 2 – Disagree
- 3 – Neutral
- 4 – Agree
- 5 – Strongly Agree

Sustainable practices have led to improved resource conservation.

- 1 – Strongly Disagree
- 2 – Disagree
- 3 – Neutral
- 4 – Agree
- 5 – Strongly Agree

We have achieved significant reductions in environmental impact.

- 1 – Strongly Disagree
- 2 – Disagree
- 3 – Neutral
- 4 – Agree
- 5 – Strongly Agree

Our energy consumption has decreased through sustainability measures.

- 1 – Strongly Disagree
- 2 – Disagree
- 3 – Neutral
- 4 – Agree
- 5 – Strongly Agree

Environmental regulations are consistently met and exceeded.

- 1 – Strongly Disagree
- 2 – Disagree
- 3 – Neutral
- 4 – Agree
- 5 – Strongly Agree

Staff understanding of environmental practices has strengthened.

- 1 – Strongly Disagree
- 2 – Disagree
- 3 – Neutral

- 4 – Agree
- 5 – Strongly Agree

Workplace safety and wellbeing are prioritized by our organization.

- 1 – Strongly Disagree
- 2 – Disagree
- 3 – Neutral
- 4 – Agree
- 5 – Strongly Agree

Environmental initiatives have enhanced our standing in the local community.

- 1 – Strongly Disagree
- 2 – Disagree
- 3 – Neutral
- 4 – Agree
- 5 – Strongly Agree