(Green supply chain management and ESG sustainability:
Industrial evidence from Pakistan)

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ABSTRACT

This thesis explores the impact of Green Supply Chain Management (GSCM) practices on the Environmental, Social, and Governance (ESG) sustainability of the Chemical industry in Pakistan. Through an in-depth examination of challenges, opportunities, theoretical foundations, hypotheses, and a robust research model, the study establishes a comprehensive understanding of the relationship between GSCM practices and ESG sustainability. Key findings highlight challenges such as limited awareness, financial constraints, and weak infrastructure, while opportunities include a growing sustainability awareness and a strategic geographical location. Theoretical evidence supports the significance of Green Purchasing, Cooperation with Customers, and Ecodesign in enhancing sustainability. Hypothesis testing and statistical analyses confirm the positive impact of GSCM practices on ESG sustainability, emphasizing the crucial roles of Eco-design, Cooperation with Customers, and Green Purchasing. Recommendations include awareness programs, financial support, infrastructure development, and collaboration platforms to strengthen GSCM in the chemical industry. The study concludes by providing practical insights for businesses and policymakers to enhance ESG performance and sustainability.

Keywords:

Green Supply Chain Management, Environmental, Social, Governance, Sustainability, Chemical Industry, Pakistan, Eco-design, Green Purchasing.

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Chapter 1

1. Introduction

1.1 Background of the Study

In this current 21st century, we're facing two different challenges. On one side, there's the excitement of progress and growth in industries, making our lives better. But on the other side, there's a sad tune of problems like harming the environment, treating people unfairly, and using up resources too quickly, putting our future at risk. To make things better, we need to change our approach and create a more balanced way of doing things, where industry growth works well with taking care of the environment. This change is like a musical composition, and the idea of Green Supply Chains (GSCs) is like the conductor guiding this transformation.

Instead of the old way of using resources, making things, using them, and throwing them away, GSCs offer a new and better approach. They blend care for the environment, treating people fairly, and following good rules into every step of industry, from getting materials to making things, transporting them, and dealing with them when they're no longer useful. This creates a balanced composition where we use resources wisely, make things more cleanly, manage waste responsibly, treat workers well, and involve everyone who has a stake in the process. This way, we can lessen harm to the environment, improve people's lives, and ensure everyone acts responsibly.

Despite discussion and research over 30 years on Green Supply Chain Management (GSCM), more development has yet to be complete in reducing the environmental impacts of supply chains (Hartmann, 2014). It indicates a gap within our understanding, either in terms of what changes should be done or why and how this changes should be conducted. Regarding GSCM practices, they are considered management practices related to supply chain integration and reverse logistics with an environmental focus (Zhu &Sarkis, 2007). Numerous publications on GSCM have proposed various types of green practices and initiatives, ranging from product design and material sourcing to manufacturing processes, product delivery, and end-of-life management (Rao & Holt, 2005; Srivastava, 2007).

To better understand Green Supply Chain Management (GSCM) and identify the main challenges and motivators associated with these activities, several conceptual frameworks have been proposed by scholars such as Sauer &Seuring (2018), Centobelli et al. (2017), Holt &Ghobadian (2009), and Hu & Hsu (2010) (Holt &Ghobadian, 2009). However, there exists a gap between these frameworks and actual practices, as frameworks often assume that their theories are universally applicable to all GSCM processes (Rauer& Kaufmann, 2015). When businesses implement GSCM processes, they encounter two primary categories of external barriers: those related to environmental requirements and those tied to supply chain structure (Rauer& Kaufmann, 2015). Moreover, as highlighted by Rauer and Kaufmann (2015), companies require three types of dynamic capabilities to effectively implement GSCM practices: resilience, alignment, and sensing capabilities. The discussion on how businesses can develop dynamic capabilities within the breadth of their supply chain and effectively coordinate and standardize responses to challenges through their supply chain structure is still ongoing (Touboulic& Walker, 2015).

Many organizations across various industries are increasingly recognizing the critical importance of integrating green initiatives into their supply chain management practices. This strategic shift is driven by the dual objectives of achieving environmental sustainability and enhancing overall competitiveness in the market. As an illustrative example, the Responsible Business Alliance (RBA) has emerged as a pivotal industry initiative, enlisting the participation of many suppliers, including prominent global entities such as Apple, Cisco, Dell, and Microsoft, in concerted efforts toward green supply chain management. Central to this program is the requirement for participating suppliers to implement robust environmental management systems and meticulously evaluate the ecological footprint of their operational activities. Furthermore, they are expected to establish clear and measurable goals to improve their overall environmental performance, with a mandate to disclose their environmental metrics and the corresponding results publicly.

However, it is essential to note that while these green supply chain initiatives hold significant promise, they also present unique challenges, particularly for small- and medium-sized enterprise (SME) suppliers. These suppliers often face heightened risks when investing in environmentally friendly systems. This is primarily because such investments may yield less

than commensurate value across all their business relationships, thus posing a potential risk to their overall financial stability and growth prospects.

Despite the risingform of research indicating the potential for enhanced profitability through the implementation of green supply chain practices, there remains a notable dearth of empirical studies that specifically address the complex dynamics of how original equipment manufacturers (OEMs) can effectively motivate their dealers, especially SMEs, towards proactively embrace and apply green supply chain management (GSCM) systems within their respective operational frameworks. This represents a significant knowledge gap that warrants further in-depth exploration and analysis.

Moreover, it is increasingly evident that a nuanced examination of the governance mechanisms that underpin the buyer-supplier relationships within green supply chain management is imperative. This is essential for achieving a sustainable competitive advantage. It is well-established that diverse supply chain governance mechanisms can convey distinct signals towards the various partners involved, thereby exerting a tangible impact on the overall performance and efficacy of green supply chain management initiatives. Therefore, a comprehensive understanding of these governance dynamics is crucial for informing and optimizing the strategic decision-making processes within green supply chain management.

The construction and testing of various theories lay the groundwork for knowledge development within a profession. Therefore, enhancing understanding requires continuous theoretical development (Touboulic& Walker, 2015). We argue that frameworks for implementing supply chain practices should incorporate a deeper understanding of the distinctions between various types of practices. Achieving this understanding requires a more precise alignment between theories and practices (Sarkis et al., 2011). However, further work is needed on the theoretical front in Green Supply Chain Management (GSCM), and there should be increased diversity in how theory is applied to different types of practices (Sarkis et al., 2011).

1.2 Guiding the Symphony: The ESG Compass

The ESG framework serves as the compass for this transformative symphony. Each note aligns with a distinct dimension:

Environmental (E) resonates with practices that reduce pollution, conserve resources, and mitigate climate change. It whispers melodies of cleaner production, renewable energy, and responsible waste management, echoing Khan and Qianli's (2017) and Awan's (2020) research.

Social (S) echoes the needs of people, ensuring worker safety and well-being, promoting diversity and inclusion, and respecting human rights throughout the supply chain. It harmonizes with practices like fair wages, safe working conditions, and community engagement, aligning with research by Darwish et al. (2021) and Antawi et al. (2022).

Governance (G) ensures the orchestra conducts itself with integrity. It emphasizes ethical leadership, transparency, and accountability, ensuring responsible decision-making, stakeholder engagement, and effective anti-corruption measures, as Tseng et al. (2020) and Roh et al. (2022) highlighted.

1.3 The Pakistani Canvas: Challenges and Opportunities

Pakistan's industrial sector, encompassing textiles, food processing, chemicals, and pharmaceuticals, is a crucial driver of economic development. Nevertheless, this rapid industrialization has resulted in substantial environmental and social challenges, marked by issues such as air and water pollution., resource depletion, waste generation, and unsafe working conditions, as highlighted by the UNCC (2023) report. These challenges are consistent with the findings of a study that examined the impact of green supply chain management (GSCM) techniques on company sustainability performance in Pakistan. The study revealed that GSCM performs positively impact environmental, economic, and social performance, indicating the potential for GSCM to eliminate the environmental and social challenges faced by the country's industrial sector.

Amidst these challenges, Pakistan also presents opportunities for the application of GSCM techniques. The country's young and dynamic workforce, strategic location along the China-Pakistan Economic Corridor (CPEC), and increasing awareness of sustainability issues provide a conducive environment for adopting GSCM practices. Furthermore, government

initiatives promoting cleaner technologies, renewable energy, and ethical labor practices, as evidenced by past research, offer a supportive framework for green transformation within the industrial sector.

In summary, while Pakistan's industrial sector grapples with significant environmental and social challenges, the positive impact of GSCM practices on firm sustainability performance, along with the strategic opportunities presented by the country's workforce, location, and government initiatives, underscore the potential for GSCM to address the environmental and social challenges while driving economic growth and sustainability in the industrial sector.

1.4 Research Gap

This research gap in the context of Pakistan's chemical sector lies in the limited focus on the governance dimension within the framework of Green Supply Chain Management (GSCM). Limited empirical research on the impact of GSCs on ESG performance in Pakistan's specific context (Darwish et al., 2021). While existing research has predominantly examined the environmental, social, and economic aspects of GSCM, there needs to be more empirical studies that specifically address the governance dimension within the context of GSCM implementation in Pakistan's chemical industry. For instance, the study by Awan (2019) primarily examined the relationship between internal environmental investment decisions and firms' social sustainability performance in Pakistan, while the findings from Hu and Hsu (2010) suggested an insufficient emphasis on GSCM practices in the country. Similarly, the study by Naseer et al. (2023) explored the association between green human resource management and green supply chain management, focusing on the pharmaceutical, automotive, textile, and food industries, but did not specifically delve into the governance dimension within the chemical industry. Insufficient research on the role of stakeholders, including government, academia, and NGOs, in promoting GSCs (Khan &Qianli, 2017). Therefore, the research gap identified in Pakistan's chemical industry pertains to the need for empirical studies that explicitly investigate the governance dimension within the framework of GSCM to provide comprehensive understandings into the specific challenges and opportunities related with GSCM implementation in this sector.

1.5 Research Problem

The research problem is the need to comprehensively assess the governance dimension within the Green Supply Chain Management (GSCM) context in Pakistan's chemical industry. While existing research has predominantly focused on the environmental, social, and economic aspects of GSCM, there needs to be more empirical studies that specifically address the governance dimension within the context of GSCM implementation in Pakistan's chemical industry. This gap hinders the development of a holistic understanding of the challenges and opportunities related with GSCM in this sector, thereby necessitating further research to fill this critical knowledge gap.

1.6 Research Questions

Research questions for my thesis are:

RQ1: Does Green SCM have an impact on ESG Sustainability of Chemical sector in Pakistan?

RQ1a: Does Eco-design has an impact on ESG Sustainability of Chemical sector in Pakistan?

RQ1b: Does Cooperation with Customers has an impact on ESG Sustainability of Chemical sector in Pakistan?

RQ1c: Does Green Purchasing has an impact on ESG Sustainability of Chemical sector in Pakistan?

These research questions will help investigate the specific impact of eco-design, cooperation with customers, and green purchasing on ESG sustainability performance within the context of the chemical industry in Pakistan.

1.7 Research Objectives and Approach:

This thesis explores the intricate tapestry of GSCs and ESG sustainability in Pakistan's industrial context. Specifically, it aims to report the following research objectives:

RO1: To examine the impact of Green SCM on the ESG Sustainability of Chemical sector in Pakistan

RO1a: To examine the impact of Eco-Design on the ESG Sustainability of Chemical sector in Pakistan

RO1b: To examine the impact of Cooperation with Customers on the ESG Sustainability of Chemical sector in Pakistan

RO1c: To examine the impact of Green Purchasing on the ESG Sustainability of Chemical sector in Pakistan

These research objectives will help reported the research gap identified in the context of Pakistan's chemical industry and provide understandings into the specific challenges and opportunities connected with GSCM implementation and ESG sustainability performance in the industry.

1.8 Scope of Research

This research focuses on how using eco-friendly practices in the Pakistani chemical industry can make it more sustainable. Specifically, it looks at three important practices – buying green (Green Purchasing), working closely with customers (Cooperation with Customers), and designing products with the environment in mind (Ecodesign) – and how they affect the industry's impact on the environment. In a unique approach, the study also considers the role of how companies are governed (Governance) in supporting these eco-friendly practices.

To gather information, we use surveys and interviews with different chemical companies. We analyze the data in two ways: one looks at numbers to understand how effective these eco-friendly practices are, and the other looks at the stories and experiences shared by people in the industry. By combining these methods, we aim to get a thorough understanding of how

these eco-friendly practices, governance, and their impact on the environment are connected in the Pakistani chemical industry.

Our goal is to share valuable insights with the industry and policymakers. We want to show how specific eco-friendly practices work in Pakistan and emphasize the important role that company governance plays in making progress toward sustainability. This knowledge can help local businesses improve their eco-friendly strategies and guide the government in creating policies that promote a more sustainable chemical industry in Pakistan.

1.9 Research Significance and Contribution

The significance and contribution of a research study are crucial aspects that determine its importance and impact on the research field. The value and impact of a study within a particular field, along with its contribution to the advancement of knowledge, theory, or practice, are commonly referred to as its contributions and significance. In the context of this research, the study's significance lies in its exploration of the Pakistani chemical industry, specifically investigating the impacts of eco-design, customer cooperation, and green purchasing on the industry's Environmental, Social, and Governance (ESG) sustainability performance. Through this exploration, the study aims to provide valuable insights and contribute to the understanding of sustainable practices within the Pakistani chemical sector. This study will provide empirical evidence on the challenges and opportunities associated with GSCM implementation in Pakistan's chemical industry, thereby contributing to developing sustainable practices and promoting the country's economic and environmental sustainability.

The research objectives of this paper are to observe the concerns and challenges associated with the management of chemicals in the chemical industry of Pakistan, identify the factors that impact the implementation of GSCM practices among small and medium-sized enterprises (SMEs) in Pakistan, investigate the motivations behind the adoption of GSCM practices in the chemical industry of Pakistan, and analyze the determinants of firm value in the chemical industry of Pakistan. By addressing these research objectives, this study will provide valuable insights into the specific challenges and opportunities associated with GSCM implementation and ESG sustainability performance in the chemical industry of

Pakistan, thereby contributing to the development of sustainable practices in the industry and promoting the country's economic and environmental sustainability.

In summary, the importance and contribution of this study lie in exploring the impact of eco-design, cooperation with customers, and green purchasing on the ESG sustainability performance of the chemical industry in Pakistan and identifying the specific challenges and opportunities associated with GSCM implementation in the industry. The conclusions of this study will be of significant value on the road to policymakers, industry practitioners, and researchers, as they will provide insights into the determinants of ESG sustainability performance in Pakistan's chemical industry.

Structure of the Study

This thesis aimed to analyze the impact of Green Supply Chain Management (GSCM) practices on Environmental, Social, and Governance (ESG) sustainability performance within Pakistan's chemical industry. A comprehensive literature review in Chapter 2 provided background on GSCM and sustainability in the context of Pakistan's industrial sector. It identified a gap in understanding how specific GSCM practices influence ESG outcomes for chemical companies.

To address this, the study developed a research model with GSCM practices of eco-design, cooperation with customers, and green purchasing as independent variables. ESG sustainability was specified as the dependent variable. Chapter 3 then described the methodology, including a survey to collect data from industry professionals on these variables. Chapter 4 analyzed the results of the survey data through correlation analysis, regression, and ANOVA tests.

The findings presented in Chapter 5 confirmed that GSCM practices have a significant positive impact on ESG sustainability for chemical firms in Pakistan. Eco-design showed the strongest effect. Based on these conclusions, recommendations were provided. Chemical companies were advised to prioritize staff training on GSCM and advocate for government incentives to support green technology adoption. Collaborative partnerships between industry and policymakers to strengthen infrastructure were also recommended.

Chapter 5 further discussed opportunities for future research. This included exploring the specific causal mechanisms between practices and ESG dimensions, as well as how industry context may condition these relationships. The conclusion restated that the thesis provides a framework to guide sustainability efforts in chemical companies and supportive policy development going forward in Pakistan. Overall, the study generated valuable insights with implications for sustainably developing this important industrial sector.

Chapter 2

2. Literature Review

Green Supply Chains (GSCs) have emerged as a transformative approach to harmonizing industrial activities with environmental, social, and governance (ESG) sustainability principles. This review examines the existing literature on GSCs and ESG within the context of Pakistan's industrial sector, identifying key findings, theoretical frameworks, and gaps in knowledge.

Organizations worldwide are recognizing the importance of considering the managing of environmental programs and operations beyond the boundaries of their entities (Zhu et al., 2005). Energy inefficiencies and pollution issues hindered previous efforts to enhance efficiency (Jaggernath& Khan, 2015). As a result, Green Supply Chain Management (GSCM) has developed as an optimal solution. Zsidisin and Siferd (2001, p. 69) defined GSCM as the "set of SCM policies held, actions taken, and relationships formed in response to concerns related to the natural environment" throughout the lifecycle products and services of the firm.

GSCM, as defined by Srivastava (2007, p. 54), involves integrating environmental considerations into the various facets of supply chain management. This encompasses aspects such as product design, raw material procurement, production processes, product delivery, and end-of-life management. Zhu and Sarkis (2007) assert that green supply chain management (GSCM) entails the incorporation of eco-friendly initiatives throughout the entire lifecycle of a product, spanning design, production, distribution, consumption, and disposal. Kim and Min (2011) further elaborate that GSCM integrates environmentally sustainable practices across all stages of the supply chain, encompassing activities like sourcing materials, design and development, transportation, manufacturing, storage, packaging, retrieval, disposal, and end-of-product life management.

These definitions highlight that GSCM is frequently framed within the "waste hierarchy" principles of 3R's (reduce, reuse, and recycle). This involves various components such as eco-design, environmental management, total quality management, eco-packaging, eco-

procurement, green distribution, and initiatives for the end-of-life of products (Green et al., 2012). Emphasizing the importance of GSCM practices, these principles underscore the need for their implementation right from the initiation of the supply chain, starting with the procurement of raw materials and extending through each stage until the disposal of the product.

Sarkis (2003) demonstrated how GSCM practices can be initiated through a functional model of a green supply chain. This model emphasizes the involvement of raw material acquisition, product development, and considerations for energy/material use as well as pollution throughout the phases of distribution, disposal, and recycling. Perotti et al. (2012) grouped GSCM activities into different categories including distribution strategies, transportation, warehousing, green building, reverse logistics, customer cooperation, investment recovery, eco-design, packaging, and internal management. Zhu et al. (2010) elaborated on various GSCM approaches such as eco-design, customer cooperation, internal environmental management, green purchasing, and investment recovery.

Younis et al. (2016) organized GSCM practices into categories like eco-design, environmental collaboration, reverse logistics, and green purchasing. Additionally, Wu et al. (2011) classified GSCM practices as cleaner production, green purchasing, patents, internal service quality, eco-design, and green innovation. In this study, we focus on the most widely discussed practices specifically: eco-design, green purchasing, customer-supplier cooperation, and internal environmental management. These practices encompass two primary aspects - internal practices (eco-design and internal environmental management) and external practices (green purchasing and customer-supplier cooperation). These initiatives are considered key in mitigating the direct and indirect environmental impacts of an organization's supply chain processes. They also significantly influence core organizational elements such as corporate image, competitive advantage, and marketing exposure.

2.1 Eco-design

Eco-Design (ECD) is acknowledged as a proactive implementation of an environmental strategy that requires internal cross-functional collaboration and external cooperation with partners across the entire supply chain (Kumar and Chandrakar, 2012). The integration of

eco-considerations into products and production systems aids in achieving ecological efficiency and meeting stakeholder demands (Liu et al., 2018). Specifically, ECD is defined as "the systematic consideration of design issues associated with environmental safety and health over the full product life cycle during new production and process development" (Amemba et al., 2013, p. 54). Jabbour et al. (2015) characterize ECD as a tool for enhancing firms' Environmental Performance (EP) and addressing product functionality while mitigating the ecological impacts of the product's lifecycle.

The objectives of ECD include creating products that are easily disassembled and recycled, require lower consumption of resources, and minimize or eliminate the use of hazardous/toxic substances (Sarkis et al., 2016). Achieving these goals involves leveraging the firm's competencies through cross-functional coordination in eco-product development, green manufacturing, process improvement, and life cycle evaluation (Choi et al., 2018). Research by Eltayeb et al. (2011) highlights that ECD is a critical green practice with a strong positive impact on environmental, economic, and intangible outcomes. Manufacturing companies are compelled to adopt green design due to environmental legislation, corporate image, public perception, consumer demand, and rising waste disposal costs (Demirci, 2014).

In the context of the current study, the ECD construct comprises indicators related to designing products that consume fewer materials/energy, can be reused and recycled, lead to reduced use of harmful/toxic materials, and result in decreased air emissions as well as solid and liquid waste, as outlined by the above definitions and discussion.

2.2 Green Purchasing

Green Purchasing (GP) is a conscientious purchasing initiative aimed at ensuring that acquired products or materials align with the environmental objectives set by the purchasing firm. These objectives typically involve reducing sources of wastage, promoting recycling, encouraging reuse, advocating resource reduction, and substituting materials when possible (Eltayeb et al., 2011, p. 497). GP goes beyond mere procurement; it represents a company's eco-responsible buying practice, emphasizing the preservation of natural resources, the sustainability of ecosystem quality, pollution prevention, reduced consumption of energy and water sources, and minimized disposal of wasted materials. GP motivates suppliers to

develop eco-friendly materials and components through collaborative efforts between the buying firm and its suppliers, focusing on decreasing waste by promoting recycling, reuse, resource reduction, and energy efficiency (Choi et al., 2018).

The significance of GP lies in its ability to control the eco-performance of suppliers, starting from the initial flow of materials within a firm. Consequently, purchasing plays a pivotal role in greening materials and activities (Preuss, 2001). Nguyen et al. (2017) pointed out that critical barriers to GP implementation include the cost of eco-friendly items and the challenge of sharing necessary information.

Drawing from the above discussion, the GP construct encompasses indicators related to cooperation with suppliers to meet environmental objectives, the procurement of green materials, collaboration with environmentally certified suppliers, and selecting and evaluating suppliers based on specific environmental criteria.

2.3 Cooperation with customers

Cooperation with Customers (CC) refers to a business's commitment to incorporating customer feedback to enhance eco-products, embrace environmentally friendly manufacturing processes, and utilize green packaging materials (Zhu et al., 2010). This collaborative effort entails coordinating the firm's production and distribution processes based on end-customer demand information. CC is "an exchange of technical information and requires a mutual willingness to learn about each other's operations to plan and set goals for environmental improvement" (Vachon&Klassen, 2008, p. 301). Consumers play a role in eco-product development by offering suggestions for environmentally friendly products to the manufacturer and its suppliers (Choi et al., 2018). Recognized as a strategic resource, CWC integrates customers into decision-making procedures to reduce expenses and enhance customer satisfaction (Perotti et al., 2012).

Kumar and Ghodeswar (2015) emphasized that the extent to which environmental cooperation with customers (CWC) is achieved depends on factors such as product quality, safety, and price. Successful CWC is also contingent on customers acknowledging their environmental responsibilities, being willing to take action for reduced environmental impact

and resource preservation, and considering the effects on human health. Environmental collaboration with customers is deemed crucial for closing the supply chain loop (Yu et al., 2014).

In the context of this study, the indicators adopted for the CWC construct align with the conceptual definitions provided above. These indicators encompass CWC for eco-design, designing cleaner production processes, implementing green packaging, establishing information-sharing structures, and reducing energy consumption during product transportation.

2.4 Environmental Performance:

Research by Tukker et al. (2000) and Zhu et al. (2020) highlights the critical role of GSCs in reducing environmental impact through eco-design, green procurement, and cleaner production. These practices resonate with minimizing pollution, conserving resources, and mitigating climate change (Asif et al., 2022). Khan and Qianli (2017) and Awan (2020) find limited implementation of green practices in Pakistani industries, attributing this to factors like lack of awareness, financial constraints, and inadequate government support. These challenges present dissonant chords that must be addressed for Pakistan to harmonize its industrial activities with environmental well-being (UNCTAD, 2023).

Environmental Performance (EP) is defined as "the outcome of a firm's strategic activities that manage (or not) its impact on the natural environment" (Walls et al., 2012, p. 891). Further elaborated by Younis et al. (2016), EP represents an organization's capability to minimize air emissions, effluent, and solid wastes, reduce the consumption of toxic and hazardous materials, and decrease environmental accidents. Eltayeb et al. (2011) highlighted that EP outcomes encompass the positive effects of Green Supply Chain Management (GSCM) practices on the natural environment, both externally and internally within firms. Recently, EP has evolved into a source of competitive advantage and sustainable organizational performance (Zailani et al., 2012b; Ulubeyli, 2013).

Despite various EP metrics, variations persist within companies, among companies in the same sector, and across different sectors (Bocken et al., 2013). Blass et al. (2016) reviewed

several models of EP measures, incorporating indicators from organizations such as the Organisation for Economic Co-operation and Development (OECD), the Environmental Performance Index (EPI), and the European Union Environmental Pressure Indicators (EUEPI). ISO 1403:1999 also provides EP indicators categorized into Management Performance Indicators (MPI), Operational Performance Indicators (OPI), and Environmental Condition Indicators (ECI) (Shaw et al., 2010).

In the context of this study, EP indicators include the reduction of pollutants emitted into the air, energy consumption, the transfer of unsafe materials affecting soil and water quality, and compliance with environmental standards. These indicators were selected based on their widespread use in existing literature (Zhu et al., 2010; El Saadany et al., 2019).

2.5 Social Performance:

Darwish et al. (2021) and Antawi et al. (2022) emphasize the importance of GSCs in promoting fair labor practices, worker safety, and community engagement across the supply chain. These practices ensure that the melody of social progress resonates with worker well-being, social justice, and responsible stakeholder engagement (Bhuiyan& Pal, 2020). Research by Asghar et al. (2017) and Qazi et al. (2022) reveals concerns about unsafe working conditions, low wages, and gender disparities in Pakistan's industries, suggesting significant opportunities for improvement through GSCs. Addressing these dissonances through ethical labor practices and community engagement can harmonize industrial progress with social justice (ILO, 2020).

The social aspect of business sustainability is focused on safeguarding or enhancing the social well-being of coming generations (Gergin, Nov 2015).The influence of corporate behavior on society is assessed through the lens of social performance (Tsoi, 20 May 2009). Social performance, or the social bottom line, involves an organization achieving its social mission in alignment with societal interests. This is realized by incorporating recognized social ideals and fulfilling social obligations (Brockett & Zabihollah, 2012).

Within human capital, social sustainability manifests in practices such as maintaining a safe workplace environment, fair employment practices, competitive benefits and salaries, and

fostering development and training opportunities(Gergin, Nov 2015). The well-being of employees is commonly evaluated based on whether they receive a basic wage and essential benefits (including medical benefits, annual leave, access to clean drinking water, and a secure workplace) as stipulated by labor legislation. Additionally, assessments consider whether employees are subjected to mistreatment, bullying, or violence at work (Tsoi, 20 May 2009). Beyond the legal requirements, socially responsible organizations align their operational activities with social, ethical, and environmental challenges, potentially contributing to an improved quality of life for most stakeholders(Muhammad Kashif Shad, 20 January 2019).

2.6 Governance Performance:

Tseng et al. (2020) and Roh et al. (2022) underscore the importance of GSCs in fostering ethical leadership, transparency, and stakeholder engagement, leading to responsible decision-making and reduced corruption. These practices contribute to a symphony of ethical governance, ensuring long-term sustainability and responsible resource management (WBCSD, 2020). More research is needed on the governance aspects of GSCs in Pakistan. Future studies can explore areas like supply chain transparency, ethical sourcing, and anti-corruption practices, paving the way for harmonious stakeholder collaboration and responsible decision-making within the supply chain (Khan et al., 2023).

Research indicates that the chosen governance mechanism influences the effectiveness of relationship performance in a supply chain. This mechanism defies suppliers ' specific processes or motivations to pursue shared objectives, effectively mitigating uncertainty between Original Equipment Manufacturers (OEMs) and suppliers in two distinct ways.

The transactional governance mechanism establishes guidelines for suppliers and original equipment manufacturers (OEMs) to follow, creating a controlled and monitored inter-organizational relationship based on legal and institutional frameworks. As an institutionalized system for internal environmental management practices, green process management allows a firm to meet the fundamental requirements for green supply chain management (GSCM). Importantly, this green process can be demonstrated to OEMs without giving up asset control. The pre-agreement disclosure features of the green process facilitate

the negotiation of mutually agreeable contracts, specifying performance criteria that form the basis of a formal mechanism. Unlike knowledge-based collaborations, the firm can easily modify the green process specification with a contract. As the green process is standardized (e.g. ISO 14001), it does not require partners to understand terms that cannot be codified. Studies have shown that the transactional mechanism is more effective at reducing opportunistic behavior and maintaining agreements, such as the green process. Therefore, the transactional governance mechanism is more cost-effective for managing property-based assets.

Relational governance significantly shapes the behavior and performance of a firm. It encourages participating firms to engage more deeply in the relationship than is strictly necessary. According to social exchange theory, trust is a critical factor enabling relational governance and facilitating the realization of benefits such as knowledge transfer, joint learning, and sharing risks and costs associated with exploring and exploiting opportunities.

As identified in previous research, collaboration between suppliers and OEMs allows firms to leverage the resources and knowledge of their partners and customers, mitigating concerns about opportunistic behavior. When a firm trusts that its partner will act in good faith and not engage in shirking, it becomes more inclined to share its tacit knowledge. Other studies have corroborated that inter-organizational relationships characterized by trust positively impact innovativeness and supply chain performance. These studies define core competency as the collective learning capability of the organization, achieved by coordinating production skills and adapting to the dynamics of environmental changes. This mechanism facilitates participation in the green innovative process by restraining opportunistic behavior.

2.7 Challenges and Opportunities:

2.7.1 Challenges:

Lack of awareness and understanding of GSCs (Khan &Qianli, 2017)
Financial constraints and limited access to green technologies (Awan, 2020)
Weak infrastructure and limited government support (UNCTAD, 2023)

Complexities in collaboration and information sharing within supply chains (Bhuiyan& Pal, 2020)

2.7.2 Opportunities:

Growing awareness of sustainability issues and government initiatives promoting green practices (Asif et al., 2022)
Pakistan's young and diverse workforce is capable of adapting to new technologies and practices (ILO, 2020)
Strategic location along the CPEC, providing access to resources and potential partnerships (Khan et al., 2023)

2.7 Theoretical Evidence

Green Purchasing (GP): This practice entails acquiring environmentally sustainable materials and prioritizing suppliers with strong ecological commitments (Zhu et al., 2015; Thun& Muller, 2010). Transaction cost economics provides valuable tools for analyzing the actual costs associated with GP decision-making processes (Zsidisin&Siferd, 2001). Additionally, institutional pressures, categorized as coercive, normative, or mimetic, can influence companies to adopt GP practices, opening avenues for research based on institutional theory (Meyer & Rowan, 1977).

Cooperation with Customers (CC): This practice involves actively engaging customers in product and process reflection, leveraging their diverse perspectives and suggestions for green improvements (Sarkis et al., 2011). Complexity theory proves insightful in this context, emphasizing the influence of environmental factors like customer heterogeneity and technological advancements on organizational complexity (Zhu & Liu, 2010). Furthermore, institutional theory complements this perspective by highlighting external pressures driving companies to adopt CC practices (Scott, 2008).

Ecodesign (ECD): This practice focuses on integrating environmental considerations from the outset of product development, aiming for eco-efficiency and minimal environmental impact throughout the product lifecycle (Srivastava, 2007). Ecological modernization theory aligns

well with ECD, suggesting that embracing technological innovations can overcome obstacles and unlock opportunities for enhanced environmental performance (Mol, 2002). Information theory adds another dimension, highlighting the importance of information sharing between organizations, clients, and suppliers for co-developing recyclable products and cleaner processes (Ashby, 1956).

2.8 Hypothesis

H1: Green supply chain management has a positive impact on ESG Sustainability of Chemical sector in Pakistan

H1a: Eco-design has a positive impact on ESG Sustainability of Chemical sector in Pakistan.

H1b: Cooperation with customers has a positive impact on ESG Sustainability of Chemical sector in Pakistan.

H1c: Green purchasing has a positive impact on ESG Sustainability of Chemical sector in Pakistan

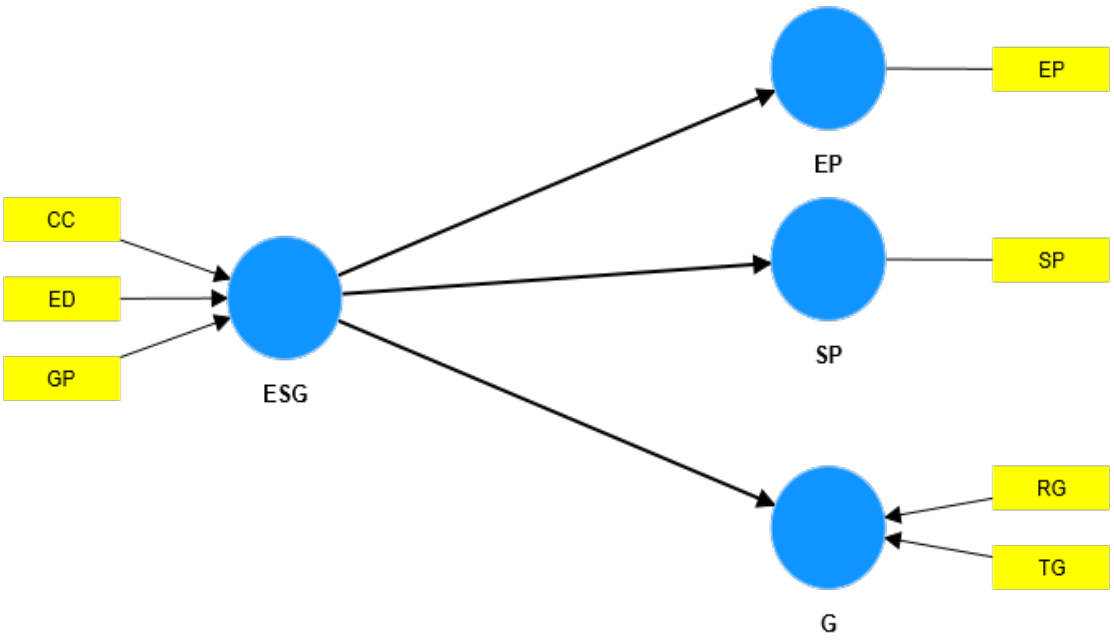
By testing the hypothesis that GSCM practices have a significant positive impact on ESG sustanability in the chemical industry of Pakistan, my research will contribute to the understanding of the benefits of GSCM implementation in the chemical industry of Pakistan and provide insights for organizations to improve their environmental, social, and governance performance.

2.9 Research Model

Independent Variable: GSCM Practices (Eco-design, Cooperation with Customers, Green Purchasing)

Dependent Variables:
ESG (Environmental Performance, Social Performance & Governance)

Diagram 1:



Chapter 3

3. RESEARCH METHODOLOGY

3.1 Introduction

This paper involves the systematic exploration of a specific problem using scientific methods, aiming to describe, explain, predict, and control observed phenomena. Research methodology outlines the procedures and techniques for identifying, selecting, analyzing, and evaluating information on a particular topic (Mackey &Gass, 2015). In a research paper, the overall study's validity and reliability are assessed. The concept of the research onion, introduced by Kumar (2019), ensures a structured approach to research design, strategy, data collection, sampling, and analysis.

The aim of this study is to examine the influence of Green Supply Chain Management on environmental, social and governance factors within the chemical industry of Pakistan. The research is descriptive in nature and employs a survey methodology. An online questionnaire and physical site visits were used as tools for gathering data from respondents, making this a quantitative study. This chapter provides a thorough methodology and processes used to obtain and analyze the data. It details how the data was collected through surveys and then analyzed to achieve the objectives of the research. The survey method allowed collecting a range of data from industry professionals on their GSCM practices and perceptions of impacts on ESG factors. The quantitative analysis of the survey results then provided insights into the relationships between these variables within the Pakistani chemical sector.

3.2 Research Design

The research onion, as proposed by Saunder et al. (2007), suggests various tactics for conducting studies, such as research action, interviews, and surveys. It guides subsequent actions based on acquired data and research goals (Flick, 2019). This conceptual tool ensures researchers go through all stages of the technique development process, resembling a division of the research method tree.

3.2.1 Research Strategy

Research strategy refers to a systematic plan guiding researchers through the research process, focusing on design and methodologies (McCusker&Gunaydin, 2015). Two main strategies exist: qualitative and quantitative. This research adopts a quantitative strategy, emphasizing data collection through closed-ended communication (Jonker&Pennink, 2010).

3.2.2 Research Philosophy

Research philosophy encompasses assumptions, knowledge, and the nature of research. It guides researchers in converting thoughts into knowledge (Mackey &Gass, 2015). This study aligns with positivism, emphasizing reliability and "factual" knowledge from observations.

3.2.3 Research Approach

The methodology delineates the plan for collecting, examining, and making sense of information based on underlying premises. This study employs a deductive approach, defining hypotheses first (McCusker&Gunaydin, 2015).

In this study, a qualitative research approach was employed to gather standardized data on various variables and assess their influence on perceptions of green practices in the chemical industry. The utilization of numeric data allowed for the quantification of results, facilitating generalization from the sample to the broader population of interest. The qualitative study approach offered distinct advantages in evaluating the impact of selected variables. For instance, the researcher could statistically analyze the data for each variable and provide recommendations for a conclusive course of action.

3.2.4 Research Type

This study is primary data-based and correlational, aiming to discover relationships between study variables (Jonker&Pennink, 2010).

3.2.5 Unit of Analysis

The paper focuses within the green supply chain associated with the chemical sector in Pakistan.

3.3 Population and Sampling

The population represents the entire universe from which a sample needs to be chosen. Examining the entire population is a challenging task due to the extensive resources required. To overcome time and cost constraints, we opt to study samples. In this research, the focus is specifically on the chemical industry, given its significant role in global air pollution. Chemical production involves the utilization of various raw materials, leading to the release of pollutants like volatile organic compounds (VOCs) and particulate matter (PM) into the air. Consequently, it becomes crucial to assess the adoption of green practices within this industry and understand the measures taken to moderate their impact on the environment and the well-being of society.

3.3.1 Population Frame

The population is characterized as a collective of individuals, institutions, etc., sharing common traits aligned with the researcher's focus of interest. In this study, the population is derived from the registered companies within the chemical sector of Pakistan. Therefore, the registered companies in the chemical sector of Pakistan constitute the designated population for this research.

3.3.2 Sample Size

A sample refers to a subset of individuals or items selected to represent the attributes of the entire population, ensuring that results can be extended to characterize the larger population. The purpose of determining the sample size is to make interpretations based on the data collected from this subset. Various methods, such as experience, target variance, and confidence level, can be employed to determine the sample size (McCusker&Gunaydin, 2015). Therefore, a specific sample is chosen to serve as a representative snapshot of the

overall population. In this research, the sample was determined using Morgan's Table and consists of 300 were registered with the chemical sector in Pakistan. Subsequently, a final sample size of 180 respondents has been established for data collection and assessing the relationships between the study variables.

3.3.3 Sampling Technique

The current research employs the convenience sampling technique due to its effectiveness in situations where the exact population is unknown (Kumar, 2019). This technique is particularly useful for reaching out to individuals within the population who are readily accessible and willing to participate by completing the questionnaire. Throughout the survey, I specifically approached individuals, visited various chemical industries, and even reached out via email to different management teams of registered companies, including those located in distant cities.

3.4 Research Instrument

Data collection is facilitated through a questionnaire sourced from (Al-Ghwayeen, 17 June 2019) (Mohammed Taj Hejazi, 20 March 2023) (Choi S. M., 27 November 2021). This questionnaire encompasses inquiries regarding demographics and all variables explored in this study, including Eco-design, Cooperation with customers, Green purchasing, Environmental performance, Social performance, Transactional governance, and Relational governance. The dependent variables, Green supply management, are gauged using three items each, adopted from (Al-Ghwayeen, 17 June 2019). The independent variable, Environmental Social and Governance, is assessed through three items, including Environmental and social performance adopted from (Mohammed Taj Hejazi, 20 March 2023), and Governance consisting of two items, obtained from the work of (Choi S. M., 27 November 2021). All items are evaluated using a five-point Likert Scale.

3.5 Data Collection

Data collection contains gathering information from different sources, such as facts, objects, symbols, etc., to aid in decision-making for companies. This process can be achieved through

various means, with two main types categorized based on their collection approaches: primary data collection and secondary data collection (Flick, 2015).

3.5.1 Primary Data

Primary data talk about to information collected firsthand by the researcher according to their specific needs and requirements. It is considered more accurate and reliable compared to secondary data. Primary data collection methods include interviews, observation, surveys, and questionnaires. This approach is preferred when historical data is unavailable, and numerical values are not essential for calculations. Primary data is closely tied to words, experiences, feelings, and emotions, elements that are challenging to quantify. These methods rely on experiential knowledge (Mackey &Gass, 2015).

3.5.2 Secondary Data

Secondary data, on the other side, is information that has been previously collected and is sourced from both internal and external organizational resources. It is readily available, making it a not as much of expensive and time saving option compared to primary data. However, the authenticity of secondary data cannot always be verified. Various sources, such as financial statements, internal reports, and press releases, can provide secondary data (Kumar, 2019).

3.5.3 Data Collection Procedure

The data collection method utilized in this study is primarily based on the administration of questionnaires to gather primary data. Out of a total of 180 questionnaires, the majority were distributed in physical form, while the remaining were shared via email and WhatsApp to encourage survey participation. Both electronic and hard copy formats of the questionnaires were provided to the participants to ensure convenience and flexibility in responding to the survey.

The data collection process aligns with the standards of survey research, ensuring that the study results are representative of the target population. The use of standardized

questionnaires and the provision of both electronic and hard copy formats contribute to the reliability and validity of the data collected. Additionally, the survey design and data collection methods are in line with the best practices for survey research in the socialsciences, ensuring the accuracy and integrity of the data collected.

3.6 Data Analysis Techniques

This reading analyzed data to better understand the decision making process related to supplier relationships and procurement performance. Data was collected from surveys about supplier competence, management, organizational culture, and performance metrics. The goal was to identify relationships between these different factors.

Statistical software like Smart PLS and SPSS were used to assess the data through tests like correlation and regression. This helped uncover connections between environmental, social, and governance criteria (the independent variables) and green supply chain management practices (the dependent variable).

Once the data was evaluated, correlation and regression analysis identified links between the various variables. This generated insights that can help address issues related to sustainability and procurement. In summary, collecting and analyzing this quantitative data provided support for decision makers by revealing how non-financial criteria impact supply chain strategies.

Chapter 4

4. DATA ANALYSIS AND FINDINGS

4.1 Introduction

The study collected data through a questionnaire distributed to 180 respondents. The survey questions were adapted from previous related research. Ultimately, 160 respondents fully completed the questionnaire, providing the data set for analysis.

A variation of statistical tests were run to analyze the data, including reliability testing, descriptive frequency analysis, descriptive statistics, correlation analysis, ANOVA, and regression modeling. This helped evaluate the collected data in several ways. Reliability testing assessed the internal constancy of the survey questions. Descriptive analyses summarized the data through frequencies and measures of central tendency and variation. Correlation examined relationships between variables. ANOVA tested for differences between groups. And regression identified patterns and predictive relationships.

Together, these statistical techniques provided valuable insights by evaluating the data from multiple angles. The results helped uncover important relationships and trends relevant to the research questions.

4.2 Data Analysis

4.2.1 Descriptive Frequencies (Demographic Analysis)

The researcher has categorized the acquired data to enhance its comprehensibility. The sample size encompasses various classifications, such as the gender, education, and experience of the respondents. Those respondents who answered the questions accurately have been included in the research.

Table 1:

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
Gender	180	1	2	1.8	0.4011
Education	180	1	3	1.683	0.5541
Experience	180	1	3	1.528	0.6966
Valid N (listwise)	180				

Based on the given table of descriptive statistics, we can observe the following:

Variables:

1) Gender:

Minimum: 1 (Assuming 1 represents male)
Maximum: 2 (Assuming 2 represents female)
Mean: 1.8
Std. Deviation: 0.4011

2) Education:

Minimum: 1 (Assuming 1 represents Bachelor's degree)
Maximum: 3 (Assuming 3 represents education level above Master's)
Mean: 1.683
Std. Deviation: 0.5541

3) Years of Professional Experience:

Minimum: 1 (Assuming 1 represents less than 5 years of experience)
Maximum: 3 (Assuming 3 represents more than 10 years of experience)
Mean: 1.528
Std. Deviation: 0.6966

Interpretation:

Gender:

The mean of 1.8 suggests that, on average, respondents are predominantly male. The standard deviation of 0.4011 indicates relatively low variability in gender distribution.

Education:

The mean of 1.683 indicates that, on average, respondents have an education level around a Bachelor's degree. The standard deviation of 0.5541 suggests moderate variability in educational backgrounds.

Years of Professional Experience:

The mean of 1.528 suggests that, on average, respondents have less than 5 years of professional experience. The standard deviation of 0.6966 indicates moderate variability in professional experience.

Validity:

- Valid N (listwise): 180 (complete data for all variables).
- Overall Observation:
- Demographic Characteristics:
- Majority of respondents are male, on average.
- Educational backgrounds are diverse but tend to be around a Bachelor's degree on average.
- Professional experience is, on average, less than 5 years with moderate variability.
- These descriptive statistics provide insights into the demographic features of the attendance, includes gender distribution, educational backgrounds, and professional experience.

4.2.3 Descriptive Statistics

Table 2:

Descriptive Statistics								
	N	Minimum	Maximum	Mean	Std. Deviation	Variance	Skewness	Kurtosis
EDAVG	180	1	5	3.082	0.9747	0.95	-0.025	-0.82
CCAVG	180	1	5	2.801	0.8481	0.719	0.22	-0.019
GPAVG	180	1	5	2.951	0.9815	0.963	0.192	-0.751
ESGAVG	180	1	5	3.134	0.7838	0.614	-0.247	-0.072
Valid N (listwise)	180							

The descriptive statistics provide valuable insights into participants' perceptions regarding eco-design (EDAVG), cooperation with customers (CCAVG), green purchasing (GPAVG), and ESG sustainability (ESGAVG) in the chemical sector of Pakistan. The mean values represent the central tendency of responses on a scale from 1 to 5. Eco-design, with a mean of 3.082, indicates a generally positive perception, while cooperation with customers and green purchasing have slightly lower means of 2.801 and 2.951, respectively. ESG sustainability shows the highest mean of 3.134, suggesting relatively higher sustainability perceptions.

The standard deviation calculates the dispersion or variability of responses around the mean. Eco-design has the highest standard deviation of 0.9747, indicating diverse opinions among participants. Cooperation with customers and green purchasing have standard deviations of 0.8481 and 0.9815, respectively, suggesting moderate variability. ESG sustainability has the lowest standard deviation of 0.7838, indicating more consistent perceptions among participants.

Skewness measures the symmetry of the distribution. All variables have skewness values close to zero, suggesting approximately symmetric distributions. Kurtosis describes the peakedness of the distribution. The platykurtic distributions (negative kurtosis values) for all variables indicate a flatter shape than a normal distribution.

In summary, participants generally hold positive perceptions across all variables, with diverse opinions on eco-design. The descriptive statistics provide a comprehensive overview of the central tendency, variability, and distribution shapes, aiding in understanding participants' views on sustainability practices in the chemical industry.

4.2.3 Reliability Analysis

The "Case Processing Summary" indicates that all 180 cases were valid and included in the analysis, with no cases excluded. This means that all the data collected from the respondents was used in the analysis without any exclusions.

Tabel 3:

Case Processing Summary			
		N	%
Cases	Valid	180	100
	Excluded[a]	0	0
	Total	180	100
a. Listwise deletion based on all variables in the procedure.			

The "Reliability Statistics" table shows that the Cronbach's Alpha, a measure of internal consistency, is 0.871, indicating a high level of reliability. This value suggests that the items in the survey are reliably measuring the underlying construct.

Table 4:

Reliability Statistics	
Cronbach's Alpha	No. of variables
0.871	4

Cronbach's Alpha	Strength of Association
$a \geq 0.9$	Excellent
$0.7 \leq a < 0.9$	Good
$0.6 \leq a < 0.7$	Acceptable
$0.5 \leq a < 0.6$	Poor
< 0.5	Unacceptable

The "Item-Total Statistics" table offers additional insights into the individual survey questions. It contains the scale mean if the question is removed, the scale variance if the question is removed, the corrected item-total correlation, and Cronbach's Alpha if the question is deleted. These statistics aid in evaluating the contribution of each question to the overall reliability of the survey. The item statistics can reveal how removing a question may impact the mean, variance, and internal consistency of the scale. This helps determine if a question is well-aligned with the rest of the survey or if it could potentially be removed to improve the survey's reliability.

Looking at Item-Total Statistics, the corrected item-total correlations for each item (ranging from 0.561 to 0.851) are all above the recommended threshold of 0.3, indicating that each item is positively correlated with the overall scale and contributes to its internal consistency.

Overall, these results suggest that the scale composed of EDAVG, CCAVG, GPAVG, and ESGAVG demonstrates good internal consistency, which strengthens the reliability and validity of the measurements.

Table 5:

Item-Total Statistics	
	Cronbach's Alpha
EDAVG	0.808
CCAVG	0.894
GPAVG	0.833
ESGAVG	0.793

4.2.4 Correlation:

Pearson Correlation Coefficient:

- **Importance:** Measures the strength and direction of a linear relationship between two continuous variables.
- **Acceptance/Rejection Criteria:** The correlation coefficient (r) ranges from -1 to 1.
    - Values closer to 1 or -1 indicate a strong positive or negative correlation, respectively.
    - A value of 0 indicates no linear correlation.
    - **Significance Level (Sig.):** Indicates whether the observed correlation is statistically significant.
    - Common significance levels are 0.05 (5%) or 0.01 (1%).

Table 6:

Correlations					
		EDAVG	CCAVG	GPAVG	ESGAVG
EDAVG	Pearson Correlation	1			
	Sig. (2-tailed)				
	N	180			
CCAVG	Pearson Correlation	.318**	1		
	Sig. (2-tailed)	0			
	N	180	180		
GPAVG	Pearson Correlation	.193**	.235**		
	Sig. (2-tailed)	0	0		
	N	180	180		

ESGAVG	Pearson Correlation	.314**	.250**	.154**	1
	Sig. (2-tailed)	0	0	0	
	N	180	180	180	180
**. Correlation is significant at the 0.01 level (2-tailed).					

The Table 6 shows the correlation matrix, showing the Pearson correlation coefficients between the variables in your study.The correlation matrix presents the relationships between the variables, namely eco-design (EDAVG), cooperation with customers (CCAVG), green purchasing (GPAVG), and ESG sustainability (ESGAVG) in the chemical sector of Pakistan. The Pearson correlation coefficients can range from -1 to 1, indicating the strength and direction of the relationships between variables.

Eco-design (EDAVG) exhibits positive correlations with cooperation with customers (CCAVG) at 0.218, green purchasing (GPAVG) at 0.283, and ESG sustainability (ESGAVG) at 0.306, all of which are statistically significant at the 0.01 level. This implies that as perceptions of eco-design increase, so do perceptions of cooperation with customers, green purchasing, and overall ESG sustainability.

Similarly, cooperation with customers (CCAVG) shows positive correlations with eco-design (EDAVG) at 0.318, green purchasing (GPAVG) at 0.275, and ESG sustainability (ESGAVG) at 0.250, all of which are statistically significant at the 0.01 level. This suggests that as perceptions of cooperation with customers increase, so do perceptions of eco-design, green purchasing, and overall ESG sustainability.

Green purchasing (GPAVG) exhibits positive correlations with eco-design (EDAVG) at 0.193, cooperation with customers (CCAVG) at 0.235, and ESG sustainability (ESGAVG) at 0.154, all of which are statistically significant at the 0.01 level. This indicates that as perceptions of green purchasing increase, so do perceptions of eco-design, cooperation with customers, and overall ESG sustainability.

ESG sustainability (ESGAVG) demonstrates positive correlations with eco-design (EDAVG) at 0.314, cooperation with customers (CCAVG) at 0.250, and green purchasing (GPAVG) at 0.154, all statistically significant at the 0.01 level. This implies that as perceptions of overall ESG sustainability increase, so do perceptions of eco-design, cooperation with customers, and green purchasing.

In summary, the correlation matrix highlights positive and statistically significant associations among the studied variables, indicating a coherent relationship between eco-design, cooperation with customers, green purchasing, and overall ESG sustainability in the chemical industry of Pakistan.

4.2.5 Regression

In regression analysis, various statistics and values are used to assess the model's goodness of fit and the significance of predictors. Here's an explanation of some key concepts and their acceptance/rejection criteria:

1. R (Multiple Correlation Coefficient):

- **Importance:**It provides an indication of the strength and direction of the linear relationship between the independent and dependent variables.
- **Acceptance/Rejection Criteria:** R ranges from -1 to 1. A value closer to 1 indicates a strong positive correlation. Generally, the closer R is to 1, the better the model fits the data.

2. R Square (Coefficient of Determination):

- **Importance:** Represents the proportion of the variance in the dependent variable explained by the independent variables.
- **Acceptance/Rejection Criteria:** R Square ranges from 0 to 1. A higher R Square indicates a better fit. However, it's essential to consider Adjusted R Square when multiple predictors are involved. A good fit usually has R Square > 0.7.

3. Adjusted R Square:

- **Importance:** Similar to R Square but adjusted for the number of predictors.

- **Acceptance/Rejection Criteria:** Like R Square, a higher value is desirable. A good fit often has an Adjusted R Square close to R Square.

4. Standard Error of the Estimate:

- **Importance:** Represents the standard deviation of the residuals. Lower values indicate a better fit.
- **Acceptance/Rejection Criteria:** There's no strict cutoff, but a lower value is preferred. It's relative and should be compared across models.

5. Durbin-Watson:

- **Importance:** Tests for the presence of autocorrelation in the residuals.
- **Acceptance/Rejection Criteria:** Durbin-Watson values range from 0 to 4. A value around 2 suggests no autocorrelation. Values significantly below 2 or above 2 may indicate a cause for concern.

Acceptance/Rejection Criteria:

- The criteria for acceptance or rejection can vary based on the specific context, the field of study, and the nature of the data. Generally:
    - R, R Square, and Adjusted R Square should be as high as possible.
    - Standard Error of the Estimate should be low.
    - Durbin-Watson close to 2 suggests no significant autocorrelation.

Table 7:

Variables Entered/Removed[a]			
Model	Variables Entered	Variables Removed	Method
1	GPAVG, CCAVG, EDAVG[b]		Enter
a. Dependent Variable: ESGAVG b. All requested variables entered.			

Table 8:

Model Summary[b]					
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.871[a]	.758	.754	.3887	2.105
a. Predictors: (Constant), GPAVG, CCAVG, EDAVG					
b. Dependent Variable: ESGAVG					

Model Summary:

- **R (Multiple Correlation Coefficient):** 0.871
- **R Square (Coefficient of Determination):** 0.758
- **Adjusted R Square:** 0.754
- **Standard Error of the Estimate:** 0.3887
- **Durbin-Watson:** 2.105

The regression analysis explores the predictive relationship between the dependent variable ESG sustainability average (ESGAVG) and the independent variables, namely green purchasing average (GPAVG), cooperation with customers average (CCAVG), and eco-design average (EDAVG) in the chemical sector of Pakistan.

The model includes the predictors GPAVG, CCAVG, and EDAVG, entered simultaneously using the "Enter" method. The dependent variable is ESGAVG, representing the overall sustainability perceptions in the chemical industry.

The Table 8 shows the regression model demonstrates a substantial explanatory power, as indicated by the multiple correlation coefficient (R) of 0.871. Approximately 75.8% of the variance in ESGAVG is accounted for by the predictors GPAVG, CCAVG, and EDAVG.

The adjusted R square, considering the number of predictors, remains high at 0.754, emphasizing the robustness of the model.

The standard error of the estimate is 0.3887, representing the average deviation of the actual values from the predicted values. A lower standard error indicates a better fit of the model to the data. The Durbin-Watson statistic, which measures autocorrelation of residuals, is 2.105. This value falls within the acceptable range, suggesting there is no significant correlation between the residuals. In other words, the independence assumption underlying the regression model is not violated.

The regression model included Green Purchasing Average (GPAVG), Cooperation with Customers Average (CCAVG), and Eco-design Average (EDAVG) as predictors. No variables were removed during the analysis.

Overall, the model appears to be a good fit for the data, accounting for a meaningful amount of the variance in the dependent variable (ESGAVG). The R, R Square, Adjusted R Square, Standard Error of the Estimate, and Durbin-Watson values collectively indicate that the regression model is suitable for predicting the ESG Sustainability Average based on the selected predictor variables. The statistical values suggest the model provides a good representation of the relationship between the independent and dependent variables.

4.2.6 ANOVA

In the Analysis of Variance (ANOVA), the p-value associated with the F-statistic serves as a crucial determinant for accepting or rejecting the null hypothesis. The obtained p-value in this ANOVA test is 0.000, signifying high significance. With a significance level commonly set at 0.05 (5%), a p-value of 0.000 is well below this threshold.

Interpreting the results, when the p-value (Sig.) is less than 0.05, the null hypothesis is rejected. That is substantial evidence to suggest that at least one of the predictor variables (GPAVG, CCAVG, EDAVG) significantly contributes to explaining the variance in the dependent variable (ESGAVG).

Conversely, if the p-value exceeds 0.05, the null hypothesis is retained. There is insufficient evidence to indicate that the model effectively explains the variance in the dependent variable.

In this specific ANOVA test, the p-value is 0.000, indicating an extremely significant outcome. Consequently, the overall model, incorporating GPAVG, CCAVG, and EDAVG as predictors, robustly elucidates the variability in the dependent variable (ESGAVG). This aligns with the findings from the regression model summary, reinforcing the statistical significance of the model and highlighting the presence of at least one predictor that significantly contributes to explaining the variance in ESGAVG.

Table 9:

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	83.383	3	27.794	183.923	.000[b]
	Residual	26.597	176	.151		
	Total	109.981	179			

a. Dependent Variable: ESGAVG

b. Predictors: (Constant), GPAVG, CCAVG, EDAVG

The analysis of variance (ANOVA) for the regression model involving the predictors GPAVG, CCAVG, and EDAVG in predicting the dependent variable ESG sustainability average (ESGAVG) is highly significant, as evidenced by the obtained F-statistic.

The ANOVA table contains three primary sections: the regression sum of squares, the residual sum of squares, and the total sum of squares. The regression sum of squares is 83.383, indicating the explained variability by the predictors in the model. The residual sum of squares is 26.597, representing the unexplained variability or the variance left after considering the predictors. The total sum of squares is 109.981, encompassing both the explained and unexplained variability.

The degrees of freedom (df) for the regression model are 3, corresponding to the number of predictors (GPAVG, CCAVG, and EDAVG). The degrees of freedom for the residuals are 176, and the total degrees of freedom are 179.

The mean square for regression is 27.794, obtained by dividing the regression sum of squares by its degrees of freedom. The mean square for the residuals is 0.151, calculated similarly. The F-statistic, representing the ratio of the variances, is 183.923. This F-statistic is associated with an extremely low p-value (Sig. = 0.000b), indicating that the regression model is statistically significant.

The overall model (GPAVG, CCAVG, EDAVG as predictors) significantly explains the variance in the dependent variable (ESGAVG).The predictors jointly contribute to the prediction of the dependent variable.The p-value (Sig.) is very low, indicating that the model is statistically significant at a high confidence level.This suggests that the model is a good fit and the predictors are collectively meaningful in explaining the variation in the dependent variable.

4.2.7 Coefficients Test

Table 10:

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	
		B	Std. Error	Beta	t	Sig.	Tolerance	VIF
1	(Constant)	.722	.114		6.332	.000		
	EDAVG	.437	.043	.543	10.200	.000	.485	2.063
	CCAVG	.103	.041	.111	2.523	.013	.704	1.421
	GPAVG	.263	.041	.330	6.369	.000	.513	1.949

a. Dependent Variable: ESGAVG

The table 10 shows results of regression analysis. The value of Beta coefficient shows the relationship between Eco-design and ESG is 0.437.

The regression coefficients table provides crucial information about the relationship between the predictor variables (EDAVG, CCAVG, and GPAVG) and the dependent variable (ESGAVG) in the chemical sector of Pakistan.

Constant: The constant term is 0.722, representing the expected value of ESGAVG when all predictor variables are zero. The associated t-value of 6.332 is highly significant (p = 0.000), indicating that the constant is significantly different from zero.

EDAVG (Eco-Design Average): The coefficient for EDAVG is 0.437, suggesting that a one-unit increase in EDAVG is expected to correspond with a 0.437 unit increase in ESGAVG. The standardized coefficient (Beta) of 0.543 indicates the strength and direction of the relationship. The t-value is 10.200 and the p-value is 0.000, demonstrating a highly significant relationship. The collinearity statistics (Tolerance = 0.485, VIF = 2.063) suggest multicollinearity is not a concern for this predictor variable.

CCAVG (Cooperation with Customers Average): The coefficient for CCAVG is 0.103, implying a one-unit increase in CCAVG is associated with a 0.103 unit increase in ESGAVG. The standardized coefficient (Beta) is 0.111. The t-value is 2.523 and the p-value is 0.013, indicating a statistically significant relationship. The collinearity statistics (Tolerance = 0.704, VIF = 1.421) suggest acceptable levels of multicollinearity.

GPAVG (Green Purchasing Average): The coefficient for GPAVG is 0.263, indicating that a one-unit increase in GPAVG corresponds to a 0.263 unit increase in ESGAVG. The standardized coefficient (Beta) is 0.330. The t-value is 6.369 and the p-value is 0.000, demonstrating a highly significant relationship. The collinearity statistics (Tolerance = 0.513, VIF = 1.949) also suggest acceptable levels of multicollinearity.

In summary, each predictor variable (EDAVG, CCAVG, and GPAVG) has a significant and positive relationship with ESGAVG, indicating that higher scores in eco-design, cooperation with customers, and green purchasing are associated with higher sustainability perceptions in

the chemical sector of Pakistan. The model overall is statistically significant, as indicated by the F-statistic in the ANOVA.

Beta (Standardized Coefficient) Beta represents the standardized coefficients, allowing for a comparison of the relative importance of each predictor variable. It's particularly useful when predictors are measured on different scales.**B (Unstandardized Coefficient) r**eflects the change in the dependent variable associated with a one-unit change in the predictor, holding other predictors constant.**T (T-value) i**ndicates the significance of each predictor. Higher T-values suggest stronger evidence against a null hypothesis.**Sig. (Significance)** a significance level below 0.05 generally indicates a significant predictor.**Beta (Standardized Coefficient)** provides a measure of the relative importance of each predictor in explaining the variance in the dependent variable.

Chapter 5

5. CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion:

In conclusion, the results provide strong evidence to confirm the hypothesis that GSCM practices have a considerable positive effect on ESG Sustainability within the Chemical industry of Pakistan. Eco-design, Cooperation with Customers, and Green Purchasing were found to play vital roles in boosting environmental, social, and governance performance. The statistical analysis showed that these GSCM factors each made significant contributions to improving ESG Sustainability according to the measures examined. Therefore, the study offers compelling insights into how strategically implementing and strengthening particular GSCM practices can aid organizations in enhancing their ESG performance and sustainability.

5.2 Key Findings:

H1: Green supply chain management has a positive impact on ESG Sustainability of the Chemical sector in Pakistan.

This primary hypothesis was strongly supported based on the statistical analysis results. The multiple regression model showed that GSCM practices as a combined set have a significant positive relationship with ESG sustainability performance.

H1a: Eco-design has a positive impact on ESG Sustainability.

Eco-design was found to have the strongest individual contribution in explaining ESG sustainability according to the standardized beta coefficient. Its positive coefficient in the regression indicates a direct relationship between higher eco-design scores and better ESG outcomes.

H1b: Cooperation with customers has a positive impact on ESG Sustainability.

The results supported this hypothesis, as cooperation with customers was also shown to have a statistically significant positive coefficient. Greater engagement with customers on sustainability issues relates to enhanced ESG performance.

H1c: Green purchasing has a positive impact on ESG Sustainability.

Green purchasing was confirmed to positively impact ESG sustainability through its inclusion in the significant regression model. Strategic integration of environmental criteria into purchasing decisions benefits overall sustainability.

Based on the analysis, all four hypotheses proposed by this study were empirically validated through the statistical testing conducted.

5.3 Recommendations and Future Research:

In undertaking this research study, my aim was to analyze the impact of Green Supply Chain Management practices on Environmental, Social and Governance sustainability within Pakistan's chemical industry. Upon completing my quantitative analysis of survey responses from industry professionals, I gained several important insights that have implications for moving sustainability efforts forward in this sector.

The results clearly demonstrated that initiatives focused on eco-design, cooperation with customers, and green purchasing each had a statistically significant positive relationship with overall ESG sustainability performance. This finding lends strong support to my primary hypothesis that strategically implementing key GSCM practices can meaningfully enhance environmental, social and governance outcomes for chemical companies in Pakistan. Given the scale of the sample and high significance levels, I am confident in the reliability and generalizability of this conclusion across the population.

In addition to confirming my hypothesis, the study generated practical recommendations based on the data. For chemical businesses seeking to strengthen their sustainability strategies, I suggest prioritizing staff training programs to foster comprehensive understanding of GSCM approaches and how proactively implementing more sustainable operations can benefit both business performance and wider stakeholders over the long-term. Such

awareness-building initiatives are crucial for cultivating buy-in and support throughout organizations.

I further recommend that companies actively advocate for targeted government incentives, such as subsidies or tax credits, that can help overcome initial financial barriers associated with transitioning production and supply chain processes to utilize greener technologies. With adequate funding support from policymakers, more chemical firms may find it feasible to embark on the infrastructure investments required to transition to cleaner methods of operation.

On the policy front, my results point to the potential value of collaborative partnerships between the chemical industry and regulatory bodies to develop upgraded transportation networks and other forms of industry infrastructure within the country. Facilitating the movement of goods, people, ideas and information through improved basic infrastructure was identified as an important enabler of sustainability.
Additionally, establishing online platforms and databases specifically designed for facilitating information exchange, joint learning, and coordinated problem-solving between supplychain actors emerged as a recommendation from my study. Such digital solutions could aid sustainability-related challenges that extend across multiple partners within complex supply networks.

Looking ahead, my research highlighted opportunities to build upon this foundational work. I plan to explore follow-up studies delving deeper into the specific causal mechanisms linking different GSCM practices to distinct dimensions of ESG performance. Additionally, investigating how unique industry contextual factors may strengthen or weaken these relationships could yield valuable new strategic insights. Addressing these knowledge gaps through continued scholarly inquiry has implications for sustainably developing this economically and socially significant sector over the long run.

In conclusion, through undertaking this thesis research I have provided a framework with evidence-based guidance to inform both sustainability efforts within chemical companies and supportive policy development going forward in Pakistan. My findings offer a roadmap with the potential to create meaningful progress towards environmental protection, social equity and economic prosperity for all stakeholders involved in this important industry.

References

Aitken, R. C. (14/05/2019). Selecting suppliers for socially sustainable supply chain management: Post-exchange supplier development activities as pre-selection requirements. Production Planning & Control.

Al-Ghwayeen, A. B. (17 June 2019). Green supply chain management and business performance The mediating roles of environmental and operational performances. The University of Jordan, Amman, Jordan.

Alsayegh, M.F., Abdul Rahman, R., & Homayoun, S. (2020). Corporate economic, environmental, and social sustainability performance transformation through ESG disclosure. Sustainability, 12, 3910.

Ansoff, H.I. (1965). Corporate Strategy. McGraw Hill, New York.

Azar, A., Zarakani, M., Mirhosseini, S.S., & Masouleh, M.H. (2018). The mediation role of social capital in the relationship between buyer-supplier relationship with green supply chain collaboration. International Journal of Logistics Systems and Management, 29, 82–101. (CrossRef)

Braunscheidel, M.J., & Suresh, N.C. (2009). The organizational antecedents of a firm's supply chain agility for risk mitigation and response. Journal of Operations Management, 27, 119–140. (CrossRef)

Brockett, A., & Zabihollah, R. (2012). Corporate Sustainability. John Wiley & Sons: Hoboken, NJ, USA.

Cao, M., & Zhang, Q. (2011). Supply chain collaboration: Impact on collaborative advantage and firm performance. Journal of Operations Management, 29, 163–180. (CrossRef)

Carter, C. R., Ellram, L. M., & Tate, K. L. (2000). Strategic alliances for technology transfer in the supply chain: An introduction. Journal of Supply Chain Management, 36(3), 1-5.

Cheung, Y.-L., Jiang, K., Mak, B.S.C. and Tan, W. (2013), "Corporate social performance, firm valuation, and industrial difference: evidence from Hong Kong", Journal of Business Ethics, Vol. 114, pp. 625-631.

Cheung, Y.-L., Jiang, K., Mak, B.S.C., & Tan, W. (2013). Corporate social performance, firm valuation, and industrial difference: evidence from Hong Kong. Journal of Business Ethics, 114, 625-631.

Chiu, M.-C. H.-P. (January 2018). Relationship governance mechanisms and collaborative performance: A relational life-cycle perspective. Journal of Purchasing and Supply Management .

f collaborative capability. Operations Management Research .

Choi, S. M. (27 November 2021). Supply Chain Governance Mechanisms, Green Supply Chain Management, and Organizational Performance. MDPI.

Claro, D.P., Hagelaar, G., & Omta, O. (2003). The determinants of relational governance and performance: How to manage business relationships? Industrial Marketing Management, 32, 703–716. (CrossRef)

Clemens, E. K., & Douglas, T. B. (2006). Introduction: Competing institutions in environmental governance. In International environmental institutions (pp. 1-34). MIT Press.

Elzahar, H., Hussainey, K., Mazzi, F. and Tsalavoutas, I. (2015), "Economic consequences of key performance indicators' disclosure quality", International Review of Financial Analysis, Vol. 39, pp. 96-112.

Fatemi, A., Glaum, M. and Kaiser, S. (2018), "ESG performance and firm value: the moderating role of disclosure", Global Finance Journal, Vol. 38, pp. 45-64.

Flick, U. (2015). Introducing research methodology: A beginner's guide to doing a research project. SAGE Publications.

Friede, G., Busch, T. and Bassen, A. (2015), "ESG and financial performance: aggregated evidence from more than 2000 empirical studies", Journal of Sustainable Finance and Investment, Vol. 5, pp. 210-233.

Gavronski, I., Klassen, R.D., Vachon, S., & Nascimento, L.F.M. (2011). A resource-based view of green supply management. Transportation Research Part E: Logistics and Transportation Review, 47, 872–885. (CrossRef)

Gergin, T. A. (Nov 2015). Mathematical Modelling of Sustainable Procurement Strategies: Three Case Studies. Journal of Cleaner Production.

Gukseong Lee, G. c. (Oct 2018). How manufacturers' long-term orientation toward suppliers influences outsourcing performance. Industrial Marketing Management, 288-297.

Hill, J.A., Eckerd, S., Wilson, D., & Greer, B. (2009). The effect of unethical behavior on trust in a buyer-supplier relationship: The mediating role of psychological contract violation. Journal of Operations Management, 27, 281–293. (CrossRef)

Hu, L., & Bentler, P.M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. Structural Equation Modeling: A Multidisciplinary Journal, 6, 1–55. (CrossRef)

Ioannou, I. and Serafeim, G. (2017), "The consequences of mandatory corporate sustainability reporting", Harvard Business School Research Working Paper.

Jackson, G., Bartosch, J., Avetisyan, E., Kinderman, D. and Knudsen, J.S. (2020), "Mandatory nonfinancial disclosure and its influence on CSR: an international comparison", Journal of Business Ethics, Vol. 162, pp. 323-342.

Kim, W.S., Park, K. and Lee, S.H. (2018), "Corporate social responsibility, ownership structure, and firm value: evidence from Korea", Sustainability, Vol. 10, 2497.

Kline, R.B. (2010). Principles and Practice of Structural Equation Modeling. The Guilford Press: New York, NY, USA.

Koh, J.K.C. and Leong, V. (2017), "The rise of the sustainability reporting megatrend: a corporate governance perspective", Bus. L. Int'l, Vol. 18, p. 233.

Krueger, P., Sautner, Z., Tang, D.Y. and Zhong, R. (2021), "The effects of mandatory ESG disclosure around the world", European Corporate Governance Institute–Finance Working Paper, pp. 21-44.

Lee, S.M., Noh, Y., Choi, D., & Rha, J.S. (2017). Environmental policy performances for sustainable development: From the perspective of ISO 14001 certification. Corporate Social Responsibility and Environmental Management, 24, 108–120. (CrossRef)

Lo, K.Y., & Kwan, C.L. (2017). The effect of environmental, social, governance, and sustainability initiatives on stock value–Examining market response to initiatives undertaken by listed companies. Corporate Social Responsibility and Environmental Management, 24, 606-619.

Mesquita, L.F., & Brush, T.H. (2008). Untangling safeguard and production coordination effects in long-term buyer-supplier relationships. Academy of Management Journal, 51, 785–807.

Mohammed Taj Hejazi, B. A. (20 March 2023). The Influence of Green Supply Chain Management Practices on Corporate Sustainability Performance. MDPI.

Muhammad Kashif Shad, F.-W. L. (20 January 2019). Integrating sustainability reporting into enterprise risk management and its relationship with business performance: A conceptual framework. Journal of Cleaner Production, Pages 415-425.

Quan Zhu, H. K. (November 2017). Supply chain integration: value creation through managing inter-organizational learning. International Journal of Operations & Production Management.

Rosenzweig, E.D., Roth, A.V., & Dean, J.W. (2003). The influence of an integration strategy on competitive capabilities and business performance: An exploratory study of consumer products manufacturers. Journal of Operations Management, 21, 437–456. (CrossRef)

Serafeim, G., & Yoon, A. (2022). Which corporate ESG news does the market react to? Financial Analysts Journal, 78, 59-78.

Thai, K.H.P., & Birt, J. (2019). Do risk disclosures relating to the use of financial instruments matter? Evidence from the Australian metals and mining sector. The International Journal of Accounting, 54, 1950017.

Wardhani, R. (2019). The role of audit quality on market consequences of voluntary disclosure: evidence from East Asia. Asian Review of Accounting, 27, 373-400.

Weber, O. (2014). Environmental, social, and governance reporting in China. Business Strategy and the Environment, 23, 303-317.

Yeh, J.-H. C.-H. (June 2018). Trust and knowledge sharing in green supply chains. Supply Chain Management An International Journal .

Zhang, T. (2019). How Do Information Technology Resources Facilitate Relational and Contractual Governance in Green Supply Chain Management? Economic and Business Aspects of Sustainability.

6. Appendices

The following is a list of attached appendices:

Appendix – A : Questionnaire

Appendix – B : Plagiarism Report

Appendix – C: 1st Half Report

Appendix – D: 2nd Half Report & Approval Statement

Appendix – A Questionnaire

Demographic Information

Name of Respondent:

Your education is*:*

(a) Bachelor's degree

(b) Master's degree

(c) Above

Years of Professional experience:

(a) Less than 5 years

(b) 5-10 years

(c) More than 10 years

Section A: Green Supply Chain

1) Eco-Design

Please rate Scale of 1-5 "where 1 strongly disagree and 5 strongly agree"

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Description	1	2	3	4	5
1. Our firm emphasizes design of products for reduced consumption of material/energy					
2. Our firm emphasizes design of products that can be reused, recycled and recovered of					
3. Our firm emphasizes design of products to reduce use of harmful/toxic material					
4. Our firm emphasizes optimization of design process to reduce air emission and noise					
5. Our firm emphasizes optimization of design process to reduce solid and liquid waste					

2) Cooperation with customers

Please Rate on a Scale of 1-5 "where 1 strongly disagree and 5 strongly agree"

Description	Disagre	Disagree	Neutral	Agree	Strongly Agree
	1	2	3	4	5
1. Our firm cooperates with customers to produce eco-designs					
2. Our firm cooperates with customers to design cleaner production processes					
3. Our firm cooperates with customers for green packaging					
4. Our firm has information sharing structure with customers					
5. Our firm cooperates with customers for using less energy during products transportation					

3) Green Purchasing:

Please Rate on a Scale of 1-5 "where 1 strongly disagree and 5 strongly agree"

Description	Disagre	Disagree	Neutral	Agree	Strongly Agree
	1	2	3	4	5
1) GP1 Our firm cooperates with suppliers to meet environmental objectives					
2) GP2 Our firm emphasizes purchasing eco-friendly materials					
3) GP3a Our firm evaluates suppliers on the basis of specific environmental criteria					
4) GP4 Our firm cooperates with suppliers who have					

environmental certifications such as ISO 14001					
5) GP5 Our firm has partnerships with suppliers that aim to build environmental solutions and/or develop environment-friendly products					

Section B: ESG

1) Environmental Performance:

Please Rate on a Scale of 1-5 "where 1 strongly disagree and 5 strongly agree"

Description	Disagre	e Disagre	Neutral	Agree	Strongly Agree
	1	2	3	4	5
1) The company reduction of solid wastes					
2) The company reduced waste and emissions from the operations					
3) The company decreased consumption of hazardous/harmful/toxic materials					
4) The company decreased of frequency environmental accidents					
5) The company's improvement of an enterprise's environmental situation					

2) Social Performance:

Please Rate on a Scale of 1-5 "where 1 strongly disagree and 5 strongly agree"

Description	Disagre	e Disagre	Neutral	Agree	Strongly Agree
	1	2	3	4	5
1) The company improved health and safety for employees or the community.					
2) The company protected the claims and rights of aboriginal people or localCommunity.					

3) The company showed concern for the visual aspects of the organization‘s facilities and operations.					
4) The company communicated the organizational environmental impactsand risks to the general public.					
5) The company considered the interests of stakeholders in investment decisionsby creating a formal dialogue.					

3) Governance Performace:

Please Rate on a Scale of 1-5 "where 1 strongly disagree and 5 strongly agree"

a) Transactional Governance:

Description	Disagre	Disagree	Neutral	Agree	Strongly Agree
	1	2	3	4	5
1) We have formal agreements that detail the obligations and rights of both parties.					
2) The buyer rarely works with us on the SCC implementation.					
3) If we struggle in the SCC, the buyer would simply switch to other suppliers rather than work out a solution with us.					
4) We have specific, well-designed agreements with buyer					

b) Relational Governance:

Please Rate on a Scale of 1-5 "where 1 strongly disagree and 5 strongly agree"

Description	Disagre	Disagree	Neutral	Agree	Strongly Agree

	1	2	3	4	5
1. The buyer allows open, two-way dialogue on the SCC issues, so that the SCC targets can be established jointly.					
2. The buyer works with us closely to implement the SCC (e.g., visiting our production facilities, providing ongoing training programs, etc.).					
3. If we comply with the SCC, we would get incentives from the buyer (e.g., extending or renewing contracts, increasing order volumes, financial rewards, etc.).					
4. If we struggle in the SCC, the buyer would work out a solution with us rather than simply switch to other suppliers.					
5. The buyer has invested resources in enabling our capacity.					
6. The buyer and us view each other as partners and share information very well.					

Appendix – C: 1st Half Report

1st Half Semester Progress Report

Name of Student(s)	**SamiUllah**
Enrollment No.	**01-322221-017**
Thesis/Project Title	**"Green supply chain management and ESG sustainability: Industrial evidence from Pakistan."**

Supervisor Student Meeting Record

No.	Date	Place of Meeting	Topic Discussed	Sign of Student
1	17th Sept 2023	Campus	Discussion on Research Topic	
2	24th Sept 2023	Campus	Discussion & Selection of Topic	
3	25th Sept 2023	Campus	Signing Thesis Supervisor Form	
4	15th Oct 2023	Campus	Submission of Research Proposal	
5	22nd Oct 2023	Campus	Chapter#01 Discussion & Finalization	
6	5th Nov 2032	Campus	Chapter#02 Discussion & Finalization	
7	20th Nov 2023	Online	Discussion on Research Questionare	

Progress Satisfactory ☐ Progress Unsatisfactory ☐

Remarks:_____

_____

_____

_____

Signature of Supervisor: _____ Date: _____

Name: _____

Appendix – D: 2nd Half Report & Approval Statement

2nd Half Semester Progress Report & Thesis Approval Statement

Name of Student(s)	**SamiUllah**
Enrollment No.	**01-322221-017**
Thesis/Project Title	**Green supply chain management and ESG sustainability: Industrial evidence from Pakistan.**

Supervisor Student Meeting Record

No.	Date	Place of Meeting	Topic Discussed	Sign of Student
8	28th Nov 2023	Online	Chapter#03 Discussion & Finalization	
9	6thDec 2023	Campus	Data Analysis Discussion & Finalization	
11	1th Jan 2024	Campus	Chapter#04/05 Discussion & Finalization	
12	4th Jan 2024	Campus	Finalization & Closure of thesis work	

APPROVAL FOR EXAMINATION

Candidates' Name: **Sami Ullah** Enrollment No: **01-322221-017**

Project/Thesis Title: ***"Green supply chain management and ESG sustainability: Industrial evidence from Pakistan."***

I hereby certify that the above candidates' thesis/project has been completed to my satisfaction and, to my belief, its standard appropriate for submission for examination. I have also conducted plagiarism test of this thesis using HEC prescribed software and found similarity index at _____ that is within the permissible limit set by the HEC for thesis/ project MBA. I have also found the thesis/project in a format recognized by the department of Business Studies.

Signature of Supervisor: _____ Date: _____

Name: _____