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IMPACT OF SUPPLY CHAIN QUALITY INTEGRATION ON ENVIRONMENTAL PERFORMANCE WITH A MEDIATING ROLE OF GREEN SUPPLY CHAIN MANAGEMENT IN PAKISTAN'S TEXTILE SECTOR

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ABSTRACT

In this study, a model is developed to examine the connections between environmental performance, green supply chain management, and supply chain quality integration (SCQI). The concept is tested using information gathered from (n=188) textile industry professionals from cities such as Faisalabad, Lahore, Karachi, and Multan. Software tool SPSS 29 was used to analyze the results. Process macro method developed by Andrew Hayes was used to test the mediation analysis in this study. The results show that the integration of supply chain quality had a positive impact on both environmental performance and green supply chain management. Green supply chain management also played a significant mediating role in the interaction between supply chain quality integration and environmental performance. The findings contribute to the literature on quality management and green management practices by illuminating the mechanisms by which SCQI affects environmental performance and delineating the intricate connections between SCQI and GSCM.

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CHAPTER 1

INTRODUCTION

1.1 Background of the Study

One of the critical industries that contribute to Pakistan's economy is the textile sector, granting employment opportunities and increasing export revenues. However, because of this industry's quick development and growth, there are concerns about its potential effects on the environment. In recent years, the textile industry has been increasingly aware of the need for sustainable practices to reduce the negative environmental effects of its operation. Green practices in the supply chain are a specific approach that has received a lot of attention recently. Green supply chain management involves implementing environment -sustainable activities in the supply chain processes, including the use of sustainable materials, energy-efficient manufacturing techniques, and eco-friendly distribution and transportation strategies. Organizations can minimize their environmental issues and support the industry's sustainable growth by integrating green practices into their supply chain practices. The efficacy of integrating quality within supply chain processes is essential for ensuring that the many supply chain stakeholders collaborate effectively to achieve shared sustainability goals. It refers to the degree to which businesses cooperate and plan their actions with vendors, producers, distributors, and customers in order to perform at their best.

In order to accomplish sustainable goals, prior studies pointed out the significance of integrating quality integration and GSCM practices within the systems. According to Zhu and Sarkis (2004), In order to conserve the environment and raise environmental consciousness throughout society, the government should establish several strategies, including tightening environmental rules, encouraging cleaner manufacturing, and encouraging ISO 14001 certification. Numerous environmental issues are linked to the manufacturers upstream and downstream supply chains rather than their internal operations. Environmental management is of core importance to an organization because the entire organization both impacts and is impacted by the supply chain (Seuring and Gold, 2013). Equally imperative is the environmental protection of supply

chain partners and environmental initiatives that demand cooperation with and familiarity with the supply chain. Green practices within supply chain must be actively implemented by manufacturing firms in partnership with their stakeholders to prevent environmental degradation and develop an environmentally conscious brand. By incorporating quality into the supply chain processes, the efficacy of greening the supply chain and sustainability will be increased.

According to Zhu and Sarkis (2007), a manufacturer's upstream and downstream supply chains play a role in several environmental issues that are not directly tied to internal manufacturing processes. Collaboration across the supply chain is necessary for proactive environmental efforts and programs, and the environmental knowledge and environmental protection skills of supply chain partners are particularly crucial (Ates, Bloemhof, van Raaij, &Wynstra, 2012).

In order to create collaborative and synchronized quality-related operations that satisfy the customers' quality criteria, suppliers and customers who take the initiative to pioneer the incorporation of sustainable procedures throughout their supply chain create a hard-to-copy competitive advantage by enhancing their performance and pleasing their clients. The cooperation of internal and external supply chain partners of an organization to successfully oversee quality related associations within or outside the organization, processes and communication with the aim of achieving quality-related performance standards at lower costs. This is meant by integrating quality within supply chain (Huo et al., 2014).

According to some scholarly works (Ates, 2012; Wilhelm, 2016), it is crucial for businesses engaged in environmental improvement activities and programs to work with their supply chain partners to raise awareness of the environment and improve their environmental protection capabilities. One important tool for preventing pollution is quality control. As a result, it may be favorably correlated with environmental conditions (Kuei, 2005). It can make it easier for manufacturers to apply GSCM. SCQI relates to GSCM and environmental performance, and it is unclear how quality integration impacts environmental performance as per the study conducted by previous researchers.

Given the importance of the textile sector in Pakistan and increasing concerns about its environmental impact, it is critical to find the linkage between quality integration in supply chain, green practices in supply chain management, and environmental

performance. With an emphasis on the influencing role of green practices in supply chain, the study's objective is to ascertain the effects of quality integration on environmental performance in Pakistan's textile industry. The results of this study can help policymakers, business professionals, and other stakeholders learn about the tactics and procedures that will be useful to enhance environmental performance while keeping Pakistan's textile industry competitive.

As a result, this study intends to make clear how crucial integrating quality and green practices in the supply chain are influencing the environmental performance of the textile industry in Pakistan. By comprehending these connections, organizations may adopt effective strategies and make educated decisions to enhance sustainability in their supply chain operations.

1.2 Problem Statement

The textile sector in Pakistan is the largest manufacturing sector, and it has earned a strong position all over the world due to its exceptional contributions to delivering sustainable products. According to the Economic Survey of 2015, Pakistan's largest industrial sector is the textile industry, which contributes 8.5% of GDP, 40% of employment, and 52% of exports. It has been mentioned that Pakistan's textile sector has done a remarkable job of boosting the economy of the nation and raising the gross domestic product by 25%. The textile industry or sector has established significant connections with other sectors, including insurance, trade, transportation, and other businesses that have been influencing the nation's economy or GDP both directly and indirectly.

Additionally, one of the biggest industries that have been promoting significant employment possibilities and robust investment in the sector is textiles. Despite the industry's significant contributions to Pakistan, it has been confronted with formidable obstacles on both the domestic and international fronts. The difficulties are now significant hindrances to business performance and are reducing competitive advantages. Additionally, rules and regulations have restricted the use of hazardous materials, and it is now required for businesses to implement healthy environmental measures in order to attract suppliers and clients. To combat environmental issues, green practices in supply chain management must be encouraged, which is steadily gaining popularity among businesses. The environmental and financial objectives of a

firm can be achieved by successfully acknowledging and incorporating the quality integration practices in the supply chain. The green supply chain is currently receiving a lot of attention since the government has made it crucial for businesses to adopt less dangerous practices. Over the most recent time spans, the interaction between environmental activities and organizational performance has gained cumulative consideration. Previously, there wasn't much research conducted to determine the influence of supply chain quality integration practices in combination with green practices on improvement in environment conditions.

Pakistan's textile industry is crucial to the nation's economy, but it also has a lot of environmental sustainability difficulties to overcome. Despite the growing emphasis on environmentally friendly practices around the world, little is known about how incorporating quality practices in the supply chain can impact the Pakistan's textile sector's environmental performance. Furthermore, no information about the mediating role of the green supply chain can be found. Therefore, this study explores the possible linkages between quality integration in supply chain, green practices, and environmental behavior. Moreover, this study will enable the textile industries to explore how they can improve their environmental performance by incorporating quality integration practices and green supply chain practices within the supply chain.

1.3 Significance of the Study

This research will add on to the academic literature by filling a gap in existing research on the linkage that exists between quality integration in supply chain, green practices in supply chain, and environmental performance in the context of Pakistan's textile sector. It will improve theoretical comprehension of the mechanisms and procedures through which green management practices and quality integration affect environmental behavior in the textile industry. Because the textile industry has a substantial environmental impact, including energy consumption, water use, and waste generation, the study's focus on the sector's environmental performance is important. This study will enhance the promotion of sustainable practices in the textile sector and lessen its ecological impact by examining the linkage between quality integration in supply chain, green supply chain management practices, and environmental performance. The textile industry significantly contributes to the economy of Pakistan and a big source of employment. By improving its ecological footprint through effective

supply chain practices and green management efforts, the industry may boost its long-term sustainability and contribute to a greener and more socially responsible economy.

1.4 Research Objectives

1. To determine the impact of supply chain quality integration on green supply chain management.
2. To determine the impact of green supply chain management on environmental performance.
3. To determine the impact of supply chain quality integration on environmental performance.
4. To determine the mediating effect of green supply chain management on the relationship between supply chain quality integration and environmental performance.

1.5 Research Questions

1. What is the impact of supply chain quality integration on green supply chain management?
2. What is the impact of supply chain quality integration on environmental performance?
3. What is the impact of GSCM on environmental performance?
4. How does green supply chain management affect the relationship between environmental performance and supply chain quality integration?

1.6 Variables of the Study

1.6.1 Independent Variables

- **Supply Chain Quality Integration**

  Supply chain quality integration (SCQI) is the extent to which internal business units integrate with external supply chain partners, such as suppliers and customers, so that value chain can be managed jointly and coordination in business activities like communication and quality links in order to maximize performance and reduce the costs associated with the operations (Huo et al., 2014).

1.6.2 Dependent Variable

- **Environmental Performance**

  Environmental performance is a quantifiable indicator of an organization's ability to achieve its environmental goals and implement its business plan by being ecologically conscious of both the society and the environment (Carneioro et al., 2012).

1.6.3 Mediating Variables

- **Green Supply Chain Management**

  GSCM can be described as the incorporation of environmental consideration into SCM, starting with product design and continuing through the creation of the finished product (Srivastava, 2007).

1.7 Organization of the Thesis

- **Chapter One:** The research's general framework is described in this chapter. This chapter includes the background of the research, problem statement and the significance of the study. Along with the research purpose and objectives, the first chapter also explains the research framework.

- **Chapter Two:** This chapter constitutes a review of literature based on previous studies and a detailed study of all the variables based on existing research.

- **Chapter Three:** The research methods and research philosophy are covered in this chapter. This chapter further outlines the methods adopted for data collection, sample size, survey instrument and as well as the research design used in the research.

- **Chapter Four:** This chapter contains the results and analysis of the data collected through the questionnaires. On the basis of the results obtained, the hypotheses of the research are accepted or rejected.

- **Chapter Five:** Discussions and analyses can be found in this chapter. In achieving the goals and objectives of the research, this chapter is essential. Findings from the literature review and findings drawn from primary data have been compared in this chapter. Additionally, thorough explanations of each individual research objective have been provided.

CHAPTER 2

LITERATURE REVIEW

2.1 Supply Chain Quality Integration

According to Huo et al. (2014), supply chain quality integration is defined as "the extent to which an organization's internal functions and external supply chain partners strategically and operationally collaborate with each other to jointly manage intra- and inter-organizational quality-related relationships, communications, processes, etc., with the objective of achieving high levels of quality-related performance at low costs." Internal (IQI) and external quality integration (EQI) are two of its types, according to Huo et al. (2016). IQI concentrates on the internal operations of an organization's integrative quality-related activities. According to Huo et al. (2014), it is "the extent to which an organization structures its own strategies, practices, and procedures into collaborative, synchronized processes to fulfill its customers' quality requirements." EQI is "the extent to which an organization integrates with its external partners to structure inter-organizational strategies, practices, and procedures into collaborative, synchronized quality-related processes to meet its customers' quality requirements."Quality integration with suppliers and quality integration with customers, which are seen as core quality capabilities for coordinating important suppliers and customers, can be thought of as an extension of IQI to upstream suppliers and downstream customers (Huo et al., 2014).

Integrating quality in supply chain encourages suppliers to offer high-quality, environmentally friendly products that satisfy customer expectations for quality and aid in the accomplishment of sustainability (Carter & Carter, 1998). Defects and waste are decreased when a company configures its quality integration practices in coordination with suppliers and customers (Zhu, 2013).

Supply chain processes, supplier and customer business practices, and quality are all affected.To raise the standards for products and procedures, many academics contend that supply chain integration is the best method for implementing quality management (Huo et al., 2014). This demonstrates that integrating quality in supply chain is a

reliable method for resolving quality issues. Supply chain quality integration has been studied from diverse angles in several dissertations.

According to Lin (2003), the study of quality integration in supply chain can be done from the standpoint of quality management. According to Lin (2013), operational efficiency and quality are the hardest goals in supply chain management to reach. According to Yu et al. (2017), a company's internal operations and other stakeholders have a significant impact on quality issues. In order to overcome this issue, suppliers and customers must be involved in how firms manage their quality procedures.

2.2 Supply Chain Quality Integration and Green Supply Chain Management

According to Madu (2001), supply chain management also includes maintaining quality in internal supply chain operations. Supply chain quality integration isemerged as a result of this. The coordination and configuration of internal and external functions with customers and suppliers to work together to control quality, interactions, and processes with the goal of achieving excellent quality performance at lower costs is defined as "supply chain quality integration" by Huo et al. (2014). According to Kuei et al. (2008) and Huo et al. (2014), supplier quality integration considers core quality capabilities generated from supportive association with suppliers, involves suppliers involved in the internal operations such as product development and quality improvement programs, and encourages supplier growth.

According to Flynn and Flynn (2005), quality integration in supply chain practices involves the growth of cooperative collaborations, the sharing of quality-related information, certification, and the combined production of eco-friendlygoods. The information sharing and communications enable manufacturers to give suppliers detailed environmental requirements for products and processes and motivates suppliers to improve their environmental reputation by pursuing ISO 14001 certification (Wiengarten&Pagell, 2012). By working together to solve problems, suppliers and manufacturers can get to know one another better, which makes it easier for manufacturers to coordinate their purchasing procedures (Zhang et al., 2017).

Some researchers claim that supplier quality integration motivates companies to create environmentally friendly strategies and policies that assure package recycling and lower harmful emissions to improve green collaboration with customers (Vachon & Klassen, 2006). The degree to which businesses collaborate with supply chain partners to promote cleaner production, green packaging, and product recycling is positively influenced by customer quality integration (Vachon & Klassen, 2006; Zhu & Sarkis, 2007). Companies perform better when they incorporate suppliers into their quality management systems, according to Kuei and Madu (2001).

According to Lin et al.'s (2005) results, supplier quality integration fosters teamwork, which boosts environmental as well as organizational performance. The delivery of high-quality, environmentally friendly products is possible only via integration of quality. This can significantly increase customer satisfaction and enable them to work to achieve environmental goals (Huo et al., 2014). In order to improve green cooperation with customers, the manufacturer should enhance investments in pollution control activities in downstream supply chains (Vachon & Klassen, 2007). In order to facilitate customer-green cooperation, quality integration encourages manufacturers to develop detailed and written environmental policies and plans in supply chain management (Vachon & Klassen, 2006). In order to achieve cooperative solutions to lessen the environmental impact of material flows with customers, supplier quality integration thus serves as a foundation (Yang, Lin, Chan, &Sheu, 2010).

Companies need to make sure that their suppliers are providing environmentally friendly materials to minimize any adverse effects on the environment throughout the production operations. Implementing GSCM practices ensures that enterprises and their suppliers comply with environmental standards in addition to increasing environmental performance (Chien and Shieh, 2007).

Customer collaboration during product design and quality improvementprocess enhances quality capabilities (Kuei et al., 2008; Huo et al., 2014). Green purchasing can be implemented more easily when customer quality integration is used by a manufacturer to minimize the use of toxic materials and efficiently optimize manufacturing processes (Klassen & Vachon, 2003). In upstream supply chains, customer involvement is advantageous for the cooperative implementation of cleaner production, product recycling (Zhu & Sarkis, 2007). Keeping in touch with customers, for instance, enables a manufacturer to better comprehend and meet customer demands

for green management, which in turn enables the manufacturer to create better green purchasing procedures. Green procurement is accomplished through coordinated planning with consumers in the manufacturing and delivery processes since it must fully take customers' requirements into account. A manufacturer will require the support of suppliers in order to better meet consumer needs, encouraging collaboration between the producer and suppliers to set uniform environmental goals (Yang et al., 2010). The company will utilize eco-labeling and give suppliers design specifications for acquired items that contain environmental standards (Zhu & Sarkis, 2007).

The manufacturer will become more actively involved in conducting environmental audits of suppliers' internal operations and evaluating second-tier suppliers' environmental management practices. Suppliers will be chosen based on environmental criteria, such as ISO 14001 certification (Blome et al., 2014). Consequently, customer quality integration will enhance green buying. The capacity for green innovation on both sides will increase when producers and customers achieve seamless quality integration (Chiou, Chan, Lettice, & Chung, 2011; Wu, 2013). (Zhu & Sarkis, 2004; Flynn et al., 2010). Manufacturers are more willing to collaborate with customers to co-develop green management methods. Participating consumers in quality improvement initiatives also encourages collaborative problem-solving, which facilitates customer-green collaboration by encouraging product recycling and the decrease of energy consumption during transportation and distribution processes (Zhu et al., 2005; Vachon & Klassen, 2006).

Additionally, the integration of customer quality into manufacturing encourages firms to spend more on pollution control technologies and implement an "ex-post control" environmental management program, fostering better green customer cooperation (Vachon & Klassen, 2007; Wu, 2013). Companies should leverage customer information, establish relationships with customers, and hear what their consumers have to say. Customers should be involved in the creation and development of products, and companies should also seek their input during manufacturing to improve quality and better understand customer needs.

Environmental concerns may be included in a broader set of supply chain concerns (such as quality assessment, product creation, and delivery monitoring) through the inter-organizational activities that take place between a facility and its suppliers and consumers. Consequently, a variety of supply chain activities may have an impact on

environmental management at a plant. As a result, the purchasing literature has given rise to several perspectives addressing the connections between supply chain and environmental management (Min and Galle 1997; Zsidisin and Siferd 2001). In order to achieve persistent gains in environmental performance, an organization should collaborate jointly with its customers and/or suppliers (Handfield et al., 1997; Geffen and Rothenberg, 2000).

According to Wong, Boon-Itt, and Wong (2011), supplier integration, internal integration, and customer integration positively affect quality performance. Environmental partnership initiatives focus on manufacturing processes as well as products (Bowen et al., 2001). Environmental collaboration does not include unidirectional and control-oriented activities like site audits, questionnaires, and other buyer requirements that are frequently incorporated in the conceptualization of green supply chains (Zhu and Sarkis, 2004); rather, the emphasis is on environmental collaboration rather than environmental monitoring (Vachon and Klassen, 2006). As a result, environmental collaboration places less emphasis on the immediate results of supplier or customer environmental initiatives (such as compliance with rules already in place) and more emphasis on ways to create more ecologically friendly processes or goods. Such coordination can happen simultaneously upstream with the suppliers and downstream with the customers because each focal plant serves as both a buying organization for its suppliers and a supplier to its customers.

As stated by Carter and Carter (1998), it also denotes collaboration to lessen the environmental impact brought on by material flows in the supply chain. Finally, effective environmental collaboration requires mutual understanding of one another's roles and skills in environmental management. Customer quality integration increases the information processing capability for comprehending downstream markets by employing similar integration processes. Environmental aims, practices, and strategies, cleaner manufacturing technologies, and the impact of products on the product lifecycle are all covered by green customers (Zhu et al. 2008). Customers support the efforts of such proactive providers by becoming more aware of the issues at hand (Dyer and Singh, 1998). This results in better and more lasting customer relationships. GCI organizes customer interaction and cooperation. According to Vachon and Klassen (2008), and Zhu et al. (2008), working with customers helps generate shared environmental obligations and advance environmental objectives. Market-based

integration mechanisms are used through customer integration to provide clients with more environmentally friendly products (Ettlie and Reza 1992). Collaboration encourages the exchange of environmental impact data and issues as well as the formulation of collective environmental impact reduction decisions. Closed-loop processes and logistics planning activities can be coordinated through collaboration and information sharing. A greater understanding of client needs may be identified and influenced, and this new updatecan direct innovation efforts in packaging, logistics, andeco-friendly design.

Quality integration in internal systems refers to operations involving quality that take place inside a manufacturer's walls. Quality standards of customers can be metif the manufacturer organizes its plans, activities, and procedures across internal processes and functions into well fitted and collaborative processes (Flynn et al., 2010; Stank et al., 2001). Internal quality integration generally involves cooperating and engaging in quality-related cooperation (such as a cross-functional team and a problem-solving group). The division of internal functions and consistency of goals between various functions are necessary for the successful implementation of QM. Lack of internal integration may result in confusion between several departments, producing subpar goods, fruitless attempts, and resource waste (Pagell, 2004). IQI acknowledges that structural characteristics differ in various departments and functional areas within an organization (Drazin et al., 1985). A firm's divisions should function as one integrated process. Internal integration is associated to performance because it encourages collaboration and gets rid of any functional barriers to satisfy needs of customers instead of functioning in an isolated state.

IQI is regarded as a crucial factor responsible in bringing improvement in the environment. in terms of quality because it is an internal integrative capability (Huo et al., 2014). The foundation for achieving high efficiency, high quality, low cost, and on-time delivery is close coordination between various functions inside the firm. In order to better meet customer quality demands, functional restrictions can be detached by IQI and enable various departments to work together to resolve quality issues through consultation and cooperation (Huo et al., 2014). According to Choi et al. (2012), six-sigma management activities have a favorable impact on innovation and quality enhancement, which raise the caliber of products and increase a company's competitiveness. According to Huo et al. (2014), IQI affects the cost, quality,

transportation and flexibility both directly and indirectly. According to Zhang et al. (2017), IQI can improve the competitive environment. Second, according to the stage theory, IQI cannot be incorporated without incorporating outward integration (Huo et al., 2014). According to Westbrook (2002), removing internal obstacles must come before removing supplier and consumer hurdles in order to accomplish SCI. According to Koufteros et al. (2005), internal integration (concurrent engineering) can help with integration of customer, product and the process. Internal integration plays an important role in supplier and customer integration (Zhao et al., 2011).

2.3 Green Supply Chain Management

Owing to growing apprehension about environmental degradation due to the industrialization in various countries and the negative use of natural resources, academics are increasingly interested in the environmental difficulties associated with the supply chain operations (Shukla et al. 2011). According to several sources, the idea of green supply chain management was developed in 1990. To create aneco-friendly supply chain, GSCM is also termed as "the process of using environmentally friendly inputs and transforming these inputs into outputs that can be reclaimed and reused at the end of their life cycle" (Dube & Gawande, 2011). According to Hsu and Hu (2008), GSCM has been working to develop a proactive strategy to modify processes and goods that improve the environment while adhering to environmental rules. It has recently become well-known as an important organizational tenet and proactive tactic for controlling potential environmental risks (Diabat et al., 2013). One of the key concerns of scholars nowadays is the growing social and environmental problems in the supply chain (Brandenburg et al. 2014).

According to Zhu et al. (2016), Sharma et al. (2017), and other researchers, green supply chain management (GSCM) refers to the practices that may lessen the possibility that environmental issues would develop during the manufacturing stages of a final good. The environmental effects of supply chain associated operations are strongly impacted by GSCM. The majority of GSCM studies concentrate on a variety of subjects, from organizational research to GSCM practices. The primary objective of GSCM, according to Hervani et al. (2005), Kuei et al. (2015), Laari et al. (2016), and Sharma et al. (2017), is to minimize pollution, the use environment unfriendly

resources, and improper product dumping. GSCM practices have been associated with several performance advantages in the past. Such procedures aim to lessen the damaging effects of corporate activities on the environment (Zhu, Sarkis, & Lai, 2008). Additionally, according to Shi, Leny Koh, Baldwin, and Cucchiella (2012) and Vachon & Klassen (2008), they may encourage tacit knowledge, improve business brand, and result in competitive edge. With the help of external GSCM practices in collaboration with customers could help the business discover and address customer needs (Azevedo et al., 2011. Financial gains could also result from increased customer satisfaction and an improved corporate image (Zhu et al., 2013). Srivastava (2007) claims that since the supply chain revolution in the 1990s and the quality revolution in the 1980s, the idea of GSCM has been a topic of discussion. According to Zhu and Sarkis (2004), GSCM essentially combines reverse logistics, green purchasing, and the process cycle into the supply chain.

The relationship between GSCM practises and environmental performance has been the subject of numerous studies. On the other hand, studies disputing the connection between these two problems make up the body of literature (see Levy, 1995; Arimura et al., 2011; Eltayeb et al., 2011). Consequently, the argument over whether GSCM procedures have a favorable or unfavorable effect on environmental performance has endured. GSCM practices enhance environmental performance by minimizing water usage, energy consumption, polluted and toxic materials during production, as well as less waste production, effluent generation, air emissions, environmental accidents, and worker and the well-being of community (Eltayeb et al., 2011). The improvement in the product functionality, reduction in energy consumption and costs associated with the treatment of waste and consequently reduced harmful environmental impacts of the product life cycle can be done via eco design practices (Zhu & Sarkis, 2004). The need to successfully integrate multiple resources and GSCM capabilities has increased as a result of mounting environmental challenges (Zhu and Sarkis, 2004; Wagner, 2011). The collective GSCM competency may have an impact on environmental performance, according to past studies. As consumer demand for sustainable products rises, environmental responsibility will become more, giving GSCM practices the potential to boost both competitiveness and the organization's environmental sustainability. GSCM is a strategy that enables the flow of materials along the value chain at various stages, including acquisition of material, manufacturing, and distribution, with the goal of

preserving the environment by securing natural resources and reducing carbon emissions and global warming (Ageron, Gunasekaran, &Spalanzani, 2012). While implementing a single environmental practice may be expensive or result in only slight performance benefits, combining several environmental practices often shows a greater dedication to the cause and may have a greater performance impact. According to our theory, the complementary of several proactive GSCM practices has a bigger overall environmental impact than the individual environmental advantages of each practice taken independently.

The use of GSCM practices such as utilizing green marketing, green R&D, and green production to generate eco-friendly products can lessen the overall environmental impact by (Peng & Lin, 2007). The driver that motivates the organizations to adopt GSCM practices is performance enhancement (Zhu et al., 2010). Implementing environmental management practices will improve business performance; claim Dechant and Altman (1994).

Academic theory and corporate practices have observed the relationship between GSCM practices and performance. Businesses are urged to retain and grow their relationships with suppliers and customers by implementing GSCM practices in order to achieve enhanced environmental performance (Zhu et al., 2007b). An increased acknowledgement of the GSCM practices as systematic and all-encompassing processes has been observed that can be used to improve environmental performance together with operational effectiveness (Green et al., 2012). Businesses that use environmental management, or GSCM, are regarded as being socially responsible enterprises, according to Boger and Kruglianskas (2006).

McGuire et al. (1988) found a link between CSR and a company's business performance, including returns on stocks and indicators based on accounting. This outcome might be the result of the fact that socially conscious businesses often have stronger financial standing than socially irresponsible ones. Additionally, Zailani et al. (2012) discovered that environmental performance can be improved with use of sustainable packaging. Communication between functions, suppliers, and consumers is a crucial part of GSCM in order to point out and address environmental concerns present across the supply chain (Wong, Wong, &Boonitt, 2015). Environmental cooperation and environmental monitoring are two groups of environmental activities

that Vachon and Klassen (2006) recognized as having green practices for the supply chain.

2.4 Green Supply Chain Management Practices and Environmental Performance

The firm's sustainable goals, purchasing activities, and environmental actions must all be integrated for it to be successful (Carter et al., 2000). Because of this, the GSCM is considered an important player in improving environmental performance. Green practices in supply chain involves purchasing practices involve the company changing its requirements for greener products (such as designing products that can be disassembled and recycled), choosing suppliers who are known forproviding environment friendly products in a greener way (for example: waste reduction and ISO certification), and maintaining good relations with suppliers to improve green performance (Blome, Hollos, & Paulraj, 2014).

Environmental initiatives and programs are a crucial component of social responsibility, according to Carter et al. (2000). Green buying is one of the most crucial elements of GSCM practices. According to Sarkar (2008), "green purchasing" refers to the use ofeverlastingand recyclable products that are essential in minimizing the negative impacts on the environment throughout the production and transportation processes.Through cooperative green purchasing, the bond between the supplier and the buyer can be strengthened. The onus of educating suppliers and displaying a complete dedication to achieving highly effective environmental performance rests with the purchasers. The achievement of the environmental objectives by the company also somehow relies on the selection ofenvironmentally friendly supplier.However, only finding the right supplier does not serve the purpose of enhanced environmental performance. Assessing if the supplier satisfies the company's environmental objectives is equally crucial to supplier selection and management (Paulraj, 2011).

According to Carter et al.'s (2000) research, green purchasing protects the environment from harmful and dangerous materials, which in turn improves the functioning of the environment. The environmental and financial performance of an organization is greatly influenced by green purchasing because it is a reliable tool for reducing pollution (Chen, 2005). Similar findings were made by Hamner (2006), who discovered that purchasers

could improve their environmental performance by spreading awareness in their suppliers about the various environmental threats and helping them in putting environmental management systems in place. Businesses must focus on supply-side strategies if they want to attain organizational sustainability.

According to Roa (2007), GSCM demands that suppliers work with them to develop eco-friendly products, attend education seminars, and develop their own environmental initiatives. In order to become environmentally friendly and to ensure that products are produced and supplied in a way that does not harm the environment or otherwise violate any environmental regulations, businesses have focused on their suppliers and the raw materials they purchase (Jensen et al., 2012). According to Huang (2015), all supply chain participants must assume responsibility for their actions and take part in the pursuit of environmentally friendly goods and services in order to reap long-term rewards and profits.

There is another concept in GSCM that has resulted in considerable environmental improvement. According to Chan et al. (2012), "green customer cooperation" involves the cooperative efforts between companies and their downstream customers in the development ofenvironment friendly design, green packaging, cleaner manufacturing, and energy-efficient transportation to minimize the negative environmental impact of their supply chain operations. A previous study focused on information visibility and cooperation between customers and suppliers for environmental performance when discussing green customer cooperation (Wong, 2013).

Green customer cooperation is considered as a subcategoryof GSCM, which involves collaboration with suppliers, green procurement, investment recovery (Zhu et al., 2005)

In order to prevent pollution in the supply chains further downstream, manufacturers can execute environmental development projects with the help of environmentally conscious customers (Vachon & Klassen, 2006). The incorporation of green philosophy into the design of distribution and transportation processes, helps in the reduction of carbon emissions, contaminated water, and the consumption of lethal materials in downstream supply chains. Aligning customers with sustainable goals can help firms achieve this (Green et al., 2012). Cooperation with customers will improve process innovations (Kim et al., 2015) and can be a source of wastage minimizationand resource efficiency improvement (Wallenburg et al., 2017). When customers give importance to environmental concerns, an improvement can be seen in ecological performance with

the help of green practices and green process innovations (Johansson et al., 2014). The adoption of green innovation practices is a source of achieving environmental sustainability which means that the businesses move towards better ecological management. Companies can choose how closely they work with or watch over their suppliers and customers to solve lethal environmental issues that occur in the supply chain (Vachon & Klassen, 2006). Environmental collaboration with suppliers and customers means working together for a long time to set and achieve environmental goals(Vachon & Klassen, 2006). While environmental monitoring by customers is defined as adhering to customers' environmental requirements, environmental monitoring by suppliers entails choosing suppliers that have implemented environmental management systems, informing them of environmental requirements, and monitoring their compliance with those requirements (Vachon and Klassen, 2006; Green et al., 2012a).

According to Gimenez and Sierra (2013), the better the environmental performance, the more effective the monitoring and cooperation procedures are, and the more governance there is. Lack of external practice coordination will make it harder for industrial enterprises to improve their environmental performance (Zhu et al., 2012). Environmental customer collaboration has been shown to improve environmental performance (e.g., Green et al., 2012b; Zhu et al., 2013). Cousins (1999) noted that environmental knowledge is transferred from buyer to supplier. Green customer cooperation denotes a completely green system, demonstrating a firm's ability to cooperate and be involved with client firms in collaboratively planning for sustainability. According to existing GSCM literature, this makes green customer cooperation the most crucial component of GSCM. GSCM programs and environmental management techniques include ecodesign, environmentally friendly manufacturing, eco-friendly packaging, and end-to-end energy-efficient transportation. These procedures increase the sustainability of the supply chain. Zhu et al.'s (2005) explanation of the significance of customer cooperation makes the case that manufacturing enterprises perform better in terms of the environment, the economy, and operational efficiency when green customer cooperation is successfully implemented. Zhu et al. (2013) conducted empirical research that demonstrated how environmental performance can be improved with green customer cooperation. External GSCM involves practices targeted at enhancing collaboration with consumers and suppliers,

internal GSCM focuses on internal environmental practices. Working together with customers to implement EM practices is the definition of environmental cooperation with customers (Vachon and Klassen, 2008). By committing to shared sustainability responsibilities, such as cooperatively planning and resolving environmental problems, it focuses on fostering environmental collaboration with customers on the downstream portion of the supply chain (Klassen, 2003). Additionally, it entails creating strong, long-lasting strategic partnerships with clients further downstream (Christmann and Taylor, 2001).

Consumer value is created, and environmental criteria are met through recognizing and knowing the needs of the consumer (Chavez et al., 2016). It is crucial for businesses to work with customers to develop joint environmental planning, achieve environmental goals collectively, reduce overall environmental impact, and achieve environmental goals (Chavez et al., 2016; Green et al., 2012; Vachon and Klassen, 2008; Zhu and Sarkis, 2004). This is because there are increasing environmental pressures from stakeholders in the contemporary global marketplace and supply chains. According to Vachon and Klassen (2008), environmental collaboration with consumers is the joint application of environmental practices with a firm's customers to achieve a shared environmental goal while committing fewer resources. Manufacturing organizations perform better in terms of marketing and finances when they place a high priority on their customers (Green et al., 2005). Manufacturers must gather information on shifting consumer demands as consumers start to expect eco-friendly products and services from the businesses they patronize.

A manufactured good that sits unsold in inventory because it cannot meet consumer demand is clearly harmful to the environment. A customer has not directly benefited from the resources used to produce and sell the product. Therefore, products need to be both useful and environmentally friendly. Working together with their consumers will help manufacturers better understand their needs in this area. Such customer collaboration is probably motivated by and influenced by customers' familiarity with the company's environmental philosophies (Vachon and Klassen, 2008). Establishing strategic partnerships with downstream consumers through a commitment to cooperative planning and the implementation of green practices to increase performance is part of environmental cooperation with customers (Yu et al., 2019; Wu, 2013). Customers are viewed in the GSCM literature as stakeholders who put pressure on

organizations to change their processes and products to conform to changing consumption standards in order to increase their environmental performance (Gualandris&Kalchschmidt, 2014; Hall, 2001; Handfield, Walton, Seegers, & Melnyk, 1997; Lai et al., 2012). Additionally, little research has been done to determine how and under what conditions customers might work with businesses to improve their environmental performance.

Due to its substantial benefits as a tool of sustainable development in enhancing the performance of a corporation, eco-efficiency has recently attracted the attention of both scholars and practitioners (Govindan et al., 2014). The seven elements of eco-efficiency as outlined by the World Business Council for Sustainable Development (WBCSD, 2000), which include enhancing recyclability, maximizing the use of renewable resources, extending the life of the product, and increasing service intensity, have more recently been applied to the discipline of supply chain management (SCM). It is described as a sign of eco-efficiency in supply chain operations that can address the age-old issue of environmental performance in SCM. Therefore, combining eco-efficiency with green supply chain (GSC) activities will result in sustainable business performance, including environmental, social, economic, and operational measurements. This will allow companies to produce more green goods and services while utilizing renewable energy sources, cutting-edge technology, and other eco-friendly practices, thereby maintaining ecological balance and generating less waste and pollution.

According to Zhu et al. (2008), eco-design mandates that manufacturers create products that use the least amount of energy possible while also promoting green practices like the reuse, recycling, and recovery of component materials and parts. This reduces or eliminates the need for hazardous materials in the manufacturing process. Greenhouse gas emissions from a product can be decreased up until the end of its useful life by implementing eco-design principles (Lee et al., 2016).

Park and Tahara (2008) presented eco-efficiency-based eco-design, which considers a product's quality and customer happiness in addition to its environmental considerations. Eco-design, as defined by Zhu et al. (2013) as practices that may be applied and managed independently by various manufacturers, is one of the internal drivers of GSCM processes. The difficulties in controlling the supply chain have been written about in literature. Due to the involvement of numerous autonomous entities

with different technical cultures, managerial backgrounds, and supply chain exposure, the supply chain can be seen as a cradle of knowledge (Patil and Kant, 2014). No matter where in the product's life cycle it occurs, the design stage is when materials are selected and actions are made, which means that most the product's environmental effects are built in (Lewis and Gretsakis, 2001). Eco-design and design for the environment are helpful, emerging tools that can assist a company in bettering its EP while addressing a product's functionality and minimizing the environmental impacts over the course of the product's lifecycle (Lee et al., 2016). As a result, eco-design might lead to improvements in EP (Seuring and Muller, 2008). The technical improvement of products and processes intended to reduce environmental costs is the main emphasis of early eco-design work (Zhu et al., 2008). Sroufe (2003) concluded that ecodesign techniques and operational performance (i.e., cost savings and increased opportunities) have a significant and favorable correlation. selling the goods in international markets). Success in eco-design depends on the cooperation of internal organizational units inside a company as well as external stakeholders along the supply chain (Zhu et al., 2008).

Eltayeb et al. (2011) carried out research to find the association between eco-design and operational performance in Malaysia, and their findings revealedoperational performance is improved with the incorporation of eco design. Eltayeb and Zailani's prior study from 2009 similarly supported the finding that eco-design was the GSC effort that Malaysian manufacturing companies with ISO 14001 certification used the most frequently. This is especially true for items created to consume less material and energy. The fundamental cause of this is the shortage of materials, which drives up the cost of both resources and energy. Products that innovate to utilize minimum energy and resources are likely to be more profitable and aid a business in gaining market share (Lee et al., 2016). Therefore, an environmentally friendly product is one that uses less energy and/or material for purposes of reuse, recycling, and material recovery, as well as one that minimizes the use of potentially lethal materials in the manufacturing process or other production-related activities.

A relatively recent idea, green manufacturing can be seen as a 1990s invention. According to Handfield et al. (1997), "The reduction and elimination of all waste streams connected to the production, design, and disposal of goods and materials that are economically motivated, system-wide, and integrated. An environmental approach

known as "green manufacturing" has developed, and it has had a substantial positive impact on businesses' environmental performance. In order to restrict and avoid the contamination of water, air, and land, green manufacturing processes enable continuous improvement in industrial design and production. By using an eco-manufacturing system, businesses may manufacture and produce environmentally friendly goods with the least number of resources and waste. Green manufacturing reduces the negative consequences that a company's production methods and goods have on the larger ecosystem. The green manufacturing system decreases negative environmental incidents and advances community health, which positively impacts environmental behavior (Eltayeb et al., 2011). According to the realities of the operations system, implementing a green manufacturing process, production technology, and a process that uses as few resources, as little energy, and as little environmental pollution as is feasible. The improvement of employee and community health, as well as the reduction of all forms of wastes, carbonemissions, consumption of natural resources, and the use of lethal and toxic materials are all examples of environmental protection (Geyer and Jackson, 2004). The use of green manufacturing techniques can result in less waste, less energy and resource use, and less environmental contamination.

According to Ghazilla et al. (2015), green manufacturing is the use of appropriate and highly efficient materials in production to minimize a negative influence on the environment. It covers important manufacturing issues such as fulfilling environmental responsibilities, preserving natural resources, minimizing harmful substances, and waste management (Zhu and Sarkis, 2004). By revamping operational systems to adhere to strict environmental standards, implementing green manufacturing practices helps businesses become acutely aware of their obligation to safeguard nature.

According to Rehman et al. (2016), green manufacturing practices encompass the "Rs": redesign, recycle, reuse, remanufacturing, reduce, and recover. This inevitably means that green manufacturing practices assist businesses in fostering harmony and striking a balance between trade and the environment. Further research has shown that green production, a component of the GSCM, significantly affects environmental performance. The survey also made clear that the adoption of green practices by businesses is not only in response to the demandsof supply chain partners but also because doing so might boost their environmental performance. Moreover,

Cankaya(2013) supports the adoption and application of green practices to enhance environmental performance.

According to Baah et al. (2020), the use of green industry practices influencespositive environmental attitudes, which in turn results in improvement in the environmental performance and reputation. Alayon et al. (2017) and Fernando and Wah (2017) continued by outlining that the incorporation of green production practices is essential for environmental preservation and improvement in eco-innovations by utilizing less energy, preserving natural resources, eliminating waste during manufacturing processes, preventing noise pollution, and minimizing greenhouse gas emissions.

2.5 Environmental Performance

As per Walls et al. (2012) research, environmental performance encompasses the results of a firm's strategic initiatives that minimized the harmful consequences of pollution on the environment preservance. This research defines it as a decline in environmental contaminants, such as a drop in air, water, and solid waste; a drop in the use of dangerous, harmful, or poisonous substances; and a drop in environmental accidents (Zhu et al., 2010; Zhu & Sarkis, 2004). By incorporating new industry norms, improved environmental conditions give businesses the right to exist and even increase profit margins (Hart, 1995). Earlier studies (such as Green et al., 2012) contend that bringing resource efficiency in operations and the promotion of environmental advantages results in advancement in a company's overall financial performance. We believe that improvement in the environmental performance can bring increased operational efficiency of the firms and will therefore likely explain the discrepancy between GSCM practices and their role in the improvement of the financial performance, even though a positive association was examined the relationship between GSCM and environmental performance by the previous studies (Chuang and Huang, 2018; Saeed et al., 2018). Cost and resource optimization can also lead to improved financial success.

According to the argument, pollution prevention technologies can be implemented to achieve zero waste, which results in no costs for minimizing pollution and increased costs for waste disposal, which results in decreased costs for dealing with environmental calamity and responsibility (Klassen & McLaughlin, 1996). Fewer costs are also

incurred for energy use, raw materials, or waste treatment due to the use of hazardous materials. By achieving greater environmental performance, there is the potential to increase profit margins and market share at a reduced overall cost.

Environmental performance might be able to enhance present core business activities, claim Zhu et al. (2013). The primary obvious benefits, according to Evangelista (2014) include cheaper taxes, access to subsidies, and cost savings from improved energy efficiency. On the other hand, ignoring sustainability issues can seriously backfire (Hofmann et al., 2014). Therefore, disposal costs and liabilities resulting from industrial mishaps, customer boycotts, and legal actions can be reduced by adhering to environmental regulations (Yadav et al., 2017). The other advantages include a boost to the company's reputation, an improvement in customer satisfaction, and a greater incentive for stakeholders to pay attention to environmental concerns (Marchet et al., 2014). Over time, this might result in better profitability and sales. The company can make changes after analyzing the environment for possible dangers and opportunities and make the investments accordingly (Perez-Valls et al., 2016). According to the study, significant Japanese manufacturing companies have the resources and technology to enhance their operational and environmental effectiveness, which results in improvement in their financial performance.

While investigating the effects of the GSCM on the environment, Green et al. (2012) discovered that environmental performance favorably influences the financial performance. Additionally, it has been discovered that a firm's financial performance and environmental performance are closely related. Therefore, we declare that, rather than just generating market share and profits, the GSCM practices are implemented to ensure resource and cost efficiencies as well as minimize environmental damages. To put it another way, increased operational and environmental performance is what results in profitability, cost savings, and added revenue.

Through improving operational and environmental performance, GSCM practices have an indirect impact on an organization's financial performance. According to Shi et al. (2012), operational and financial successes are favorably correlated with intra- and interorganizational environmental practices. Klassen (1996) find that environmentally friendly purchasing and green business practices have a positive impact on a company's performance. According to Rao and Holt (2005), as consumer environmental consciousness rises, environmental concerns have turned into a source of economic

gain. Operational performance can be significantly improved by the adoption of GSCM practices through improved efficiency in supply chain processes, recycling of waste, and getting rid of fines, disposal expenses, and increasing costs. The financial performance of environmentally friendly enterprises would also be enhanced by brand awareness, increased growth, and new business avenues (Klassen and McLaughlin, 1996). Environmental practices association with social performance in the previousresearch has yielded conflicting results, albeit typically showing a favorable trend, according to Klassen and McLaughlin (1996).

Furthermore, King and Lenox (2001) call for more research because they do not discover any conclusive connections between the two. Pollution can be controlled by using environmentally friendly purchasing practices, but it is unknown whether this will result in better financial performance. Although it is anticipated that environmentally friendly manufacturing and logistics techniques will increase a company's competitiveness (Rao 2002; Rao and Holt 2005), it is not apparent whether they will also improve the company's financial performance. The competitive advantage and operational success of a company can benefit from investments in environmental practices, according to Schoenherr (2012). According to Shi et al. (2012), operational and financial successes are favorably correlated with intra- and inter organizational environmental practices. Klassen and McLaughlin (1996), discover that green business practices and environmentally conscious purchasing have a favorable impact on performance. A corporation might attempt to employ GSCM practices for several reasons, one of which is to make the financial performance better (Zhu et al., 2013). Green supply chain practices have boosted companies' profitability and competitiveness in Southeast Asian markets (Ao et al., 2005). According to Rao (2005), " the adoption of GSCM practices (such as the greening of suppliers' programs) by the leading-edge corporations in Southeast Asia have adopted GSCM have enjoyed success". Zhu et al. (2013)'s empirical study, which confirms the link between GSCM practices and company success for Chinese firms, produces significant findings.

According to Rao and Holt (2005), "green purchasing" can assist the business in minimizing the waste of hazardous products and reducing the waste produced by the supplier. GP can enhance the company's financial success by doing this. By using pallets, containers, and packaging that is recyclable or reusable, as well as minimizing packaging, the suppliers can be encouraged by the organization to support the objective

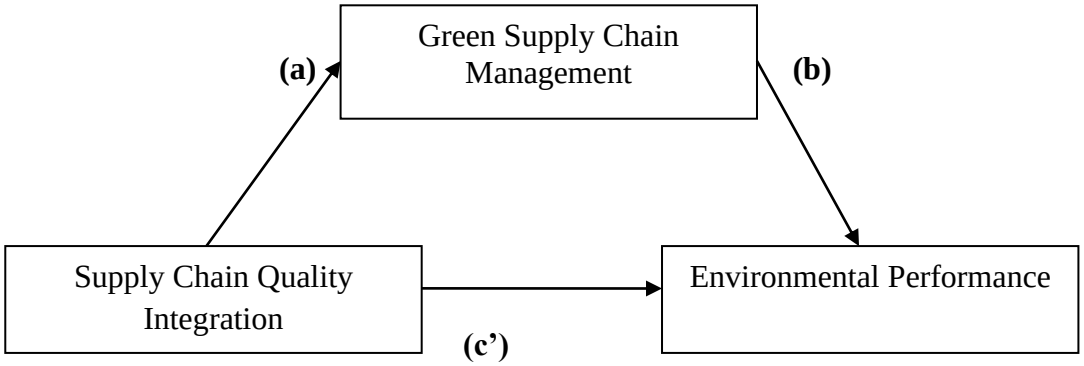
of waste reduction. Therefore, the financial costs can be reduced by implementing GP that prevents suppliers from breaking environmental regulations, like by discharging pollutants above emission standards. According to the research conducted by Green et al. (2012) and Zhu et al. (2008), "working with customers to design cleaner production processes that produce environmentally sustainable products with green packaging" is what is meant by "green customer cooperation."

According to research by Laari et al., (2016) using a sample of Finnish businesses, collaborating with customers on environmental issues is essential for enhancing financial performance. According to the results, social control may not be beneficial to improve financial performance in a stable environment when it comes to encouraging green consumer collaboration. It could be costly to employ social control to collaborate with business partners in a stable society. The findings of Zhu et al. (2008) are somewhat partially validated by the equivocal moderating influence of customer cooperation on the association between GSCM and economic prosperity.

Rahman, Ho, and Rusli (2014) claim that adopting green business practices directly affects a company's success in the market and financially, as well as how well it serves its clients. However, they found that environmentally sustainable practices within the organization and green purchasing are the only variables that may reliably predict the environmental performance of enterprises. Environmental performance and cost reduction are the major results of GSCP (Mollenkopf& Closs, 2005). Sarkis (2003) found a strong association between GSCMP, environmental and financial performance. According to Hashimoto (2010), environmental performance is often the primary motivation for implementing GSCP. Through GSCM, no sizable financial advantages have been realized in China. Environmental practices can nevertheless result in long-term financial performance, even though they rarely result in quick financial rewards, claim Farukt (2001). Within South Asian countries, the association between GSCP and environmental performance has been the subject of numerous research. But in this study, we'll use green supply chain management to evaluate the indirect influence of quality integration in the supply chain on environmental performance.

2.6 Conceptual Framework

Figure No 2.1



CHAPTER 3

RESEARCH METHODOLOGY

3.1 Overview

The research determines the influence of quality integration in supply chain on green supply management practices and the environmental performance of the textile industry in Pakistan. For this reason, we used explanatory research method by using a quantitative approach to determine the impact of quality integration in the supply chain which involves vendors, customer, and quality integration in the internal processes, on green practices within supply chain such as green packaging, green customer cooperation, green manufacturing, eco-design, and green information systems, which in turn impact environmental performance. In order to analyze the impact of quality integration in the supply chain, we have used environmental performance as a dependent variable. Green practices in supply chain management are taken as a mediating variable, and supply chain quality integration is taken as an independent variable. We will use SPSS software to determine the impact of these variables on one another using linear regression and the Process V4.2 method. A statistical method called the Process V4.2 is utilized to ascertain the mediating role of GSCM practices in the association between quality integration in supply chain and environmental performance.

3.2 Research Hypothesis

- H1: Supply chain quality integration positively impacts environmental performance.
- H2: Supply chain quality integration positively impacts green supply chain management.
- H3: Green supply chain management has a positive impact on environmental performance.
- H4: Green supply chain management mediates the relationship between supply chain quality integration and environmental performance.

3.3 Research Design

3.3.1 Explanatory Research

Explanatory research is conducted for a topic that has not previously been completely investigated, necessitates priorities, generates operational definitions, and provides a model that has been more thoroughly investigated. In essence, it is a type of research design that emphasizes carefully defining every aspect of your investigation. Our study mostly consists of causal research, sometimes referred to as explanatory research, which is carried out to determine cause-and-effect correlations. To determine the effects of specific changes to the norms, values, and procedures in place, causal research is carried out. In order to ascertain the link between variables, this form of research concentrates on the analysis of a particular issue or circumstance.

3.4 Research Approach

3.4.1 Quantitative Research

Quantitative research involves collecting and examining the numerical data. This data can be utilized to spot trends in the data, formulate hypotheses, examine causality, and extrapolate findings to larger populations. The numerical data is converted into useful statistics while doing quantitative research in order to quantify the issue.

3.5 Sampling and Data Collection

This study uses textile firms in Pakistan as a unit of analysis. The concept is tested using information gathered from (n=188) textile industry professionals from cities such as Faisalabad, Lahore, Karachi, and Multan. All the data was collected through email. Managers belonging to the top and middle level having sound knowledge were set as our target respondents. It was first verified by the respondents that they were willing to take part in the survey. For those who were willing, a questionnaire was sent along with details explaining the purpose of the survey. A total of 250 questionnaires were sent and we received 188 valid ones. Consequently, 75.2% of respondents actually responded.

3.6 Questionnaire Design

We used the relevant literature from the previous studies to develop a survey instrument in order to evaluate quality integration in supply chain, green supply chain management practices and environmental performance. A five-point Likert scale (1 = strongly disagree; 5 = strongly agree) with different items was used to evaluate each component. The constructions and the corresponding measuring items can be seen in the appendix at the end of this report. Quality integration with respect to supplier, customer, and internal processes was operationalized as part of supply chain quality integration. These items were taken from the researches of Yu et al. (2017), Huo et al. (2014, 2019), Flynn et al. (2010), Jacobs &Mafini (2019), Fish, L.A. (2011), and Flynn & Flynn (2005). Five aspects were used to measure green supply chain management which includes green buying, green manufacturing, customer green cooperation, eco-design, and a green information system. These five aspects were measured using thirty items. These items were taken from research by Kalyar et al. (2019). Environmental performance was measured using eight items. These were taken from the study of Zhu et al. (2008).

3.7 Management of Data

Managing data is an administrative task that encompasses gathering, verifying, keeping, safeguarding, and processing the essential data in order to guarantee its users' dependability, accuracy and accessibility.

3.8 Statistical Techniques

This research aims to investigate how quality integration within supply chain influences environmental performance and green supply chain management. Therefore, statistical tests would be used in the research to analyze these needs. This statistical analysis will assist in identifying how one variable affects the other. Baron and Kenny (1986) presented a 4-step regression technique within SPSS to find out the association between the independent, dependent and the mediating variable.. The results were also further validated using the process v4.2 technique.

3.8.1Data Normality

Data normality tests are used to determine whether the sample data used in research has been collected from a well-modeled normal distribution or not. It also establishes if a random variable that underlies the data set is likely to be regularly distributed. SPSS is the most practical tool for analyzing the study data for the normality test.

3.8.2 Descriptive Statistical Analysis

Descriptive statistics are short descriptive coefficients that examine a given collection of data, which might be a representation of the full population or a sample of it. In descriptive statistics, the mean and mode represent the central tendency, but the standard deviation is the measure of dispersion.

3.8.3 Analysis of Correlation

In essence, several variables association with each other can be measured with the help of correlation. It gauges how closely the variables are related to one another; we will be conducting correlation analysis in our research. A high correlation indicates good outcomes. The range of correlation lies between -1.0 and 1.0. -1.0 implies an entire negative association, and 1.0 indicates an entire positive association. The correlation between the two variables weakens as these correlation values go closer to zero.

3.8.4 Mediation Analysis

The final statistical procedure and the main goal is mediation analysis, which determines the relationship between the dependent variable (represented by Y) and the independent variable (represented by X) as well as the mediating role of the third variable (represented by M) in establishing that relationship.

CHAPTER 4

RESULTS AND ANALYSIS

4.1 Respondents Profile

The following table shows the frequency of the gender of the respondents who participated in this research.

Table 4.1

Gender

	Valid			Missing	
	Male	Female	Total	System	Total
Frequency	138	50	188	572	760
Percent	18.2	6.6	24.7	75.3	100.0
Valid Percent	73.4	26.6	100.0		
Cumulative Percent	73.4	100.0			

The data was collected from textile companies in Punjab. Data has been collected from 188 respondents, out of whom 73.4% were male and 26.6% were female.

Table 4.2

Designation

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Senior Manager	29	3.8	15.4	15.4
	Manager	28	3.7	14.9	30.3
	Assistant Manager	89	11.7	47.3	77.7
	Executive	42	5.5	22.3	100.0
	Total	188	24.7	100.0	
Missing	System	572	75.3		
Total		760	100.0		

In this study, the respondents with the designation of senior manager were 15.4%, manager 14.9%, assistant manager 47.3%, and others with executive positions 22.3%.

Table 4.3

WorkExperience

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0 to 5 years	131	17.2	69.7	69.7
	6 to 10 years	18	2.4	9.6	79.3
	10 years or more	39	5.1	20.7	100.0
	Total	188	24.7	100.0	
Missing	System	572	75.3		
Total		760	100.0		

In this study, the proportion of respondents with experience between 0 and 5 years was 69.7%, that between 6 and 10 years was 9.6%, and that between 10 years or more was 20.7%.

Table 4.4

Firmsize

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Large-scale company	163	21.4	86.7	86.7
	Medium-scale company	25	3.3	13.3	100.0
	Total	188	24.7	100.0	
Missing	System	572	75.3		
Total		760	100.0		

In this study, the large-scale firms were 86.7% and the medium-sized firms were 13.3%.

4.2 Descriptive Profile of Variables

The mean and standard deviation values of the three variables are shown in the table. Environmental performance has a mean of 3.76 and a standard deviation of 0.44. Green supply chain management has an average of 4.08 and a standard deviation of 0.25. The last variable is supply chain quality integration. Its mean is 4.06 and its standard deviation is 0.32.

Table 4.5

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
EP	188	2.50	4.67	3.7642	.44675
GSCM	188	3.36	4.48	4.0897	.25742
SCQI	188	3.44	4.67	4.0603	.32284
Valid N (listwise)	188				

4.3 Analysis of Reliability

A scale's consistency in reflecting the construct it is intended to measure can be accessed through reliability analysis. Because of this, model alpha (Cronbach's alpha) has been used to assess whether reliability is high enough to proceed with the procedure. For this, a questionnaire was employed, which contained questions reflecting the independent, mediating, and dependent variables. The statistical test of reliability included in the SPSS software was used to evaluate the reliability associated with the data, and the results were demonstrated.

Table 4.6

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.851	.834	57

In determining the dependability of Cronbach's alpha coefficients, the values that exceed 0.7 imply an excellent condition, according to Henseler et al. (2009, 2015). All 57 items have a Cronbach's alpha of 0.851, which is satisfactory because it is more than 0.7. The scales, therefore, satisfied the requirements for reliability.

4.4 Pearson Correlation

The robustness of the linear link between two variables is measured by correlation. Coefficients of correlation range from -1 to +1**.** As the correlation value approaches zero, the correlation that exists between the two variables becomes weaker. While -1 denotes an entirely negative correlation, +1 denotes an entire positive correlation. We learned some crucial things about our variables by doing the correlation test.

Table 4.6

Correlations[b]

		EP	GSCM	SCQI
EP	Pearson Correlation	1	.468**	.190**
	Sig. (2-tailed)		<.001	.009
GSCM	Pearson Correlation	.468**	1	.246**
	Sig. (2-tailed)	<.001		<.001
SCQI	Pearson Correlation	.190**	.246**	1
	Sig. (2-tailed)	.009	<.001	

**. Correlation is significant at the 0.01 level (2-tailed).

b. Listwise N=188

The relationship between all the variables under consideration is explained in the table, along with its direction and magnitude. The table shows that quality integration in supply chain is positively related to environmental performance, with strength of 19%; a positive association exists between green practices in the supply chain and environmental performance, with strength of 46.8%; and a positive association between quality integration within supply chain and environmental performance, with strength of 24.6%.

4.5 Testing Mediation with Regression Analysis

Mediation analysis is done to determine the impact of the mediating variable on the relationship between the independent and dependent variable. So, in this study, we will try to find the role of green supply chain management in mediating the relationship between supply chain quality integration and environmental performance.

Baron and Kenny (1986) proposed a four-step approach in which regression analyses are conducted and the significance of the coefficients is examined at each step.

Step 1: A simple regression analysis with supply chain quality integration predicting the environmental performance to test for part c alone. Hence, we will test the first hypothesis, which is:

H1: Supply chain quality integration has a positive impact on environmental performance.

Table 4.7

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.190[a]	.036	.031	.43982

a. Predictors: (Constant), SCQI

The above table shows the regression model summary, which indicates that the adjusted R square of the model is 0.031 and the R square is 0.036. This means that the regression explains 3% of the variance in environmental performance, and it can be seen that there might be other factors that cause a variation of 96.4% in the outcome variable. The adjusted R square corrects the R square for the number of independent variables in the analysis by 3.6%.

Table 4.8

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	2.698	.406		6.649	<.001
	SCQI	.263	.100	.190	2.635	.009

a. Dependent Variable: EP

According to the coefficient of beta, which is 0.190, a 1% improvement in supply chain quality integration will lead to a 19% improvement in environmental performance. Because the p value is less than 0.05, it can be concluded that supply chain quality integration significantly improves environmental performance. T is equal to 2.635. Therefore, a substantial positive link between supply chain quality integration and environmental performance was found by the regression analysis (beta =.190, p> 0.05). Thus, our hypothesis is confirmed.

Step 2: A simple regression analysis with supply chain quality integration predicting the green supply chain management to test for part a alone. Hence, we will test the second hypothesis, which is:

H2: Supply chain quality integration has a positive impact on green supply chain management.

Table 4.9

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.246[a]	.060	.055	.25019

a. Predictors: (Constant), SCQI

The above table shows the regression model summary, which indicates that the adjusted R square of the model is 0.055 and the R square is 0.060. This means that the regression explains 6% of the variance in green supply chain performance, and it can be seen that there might be other factors that cause a variation of 94% in the outcome variable. The adjusted R square corrects the R square for the number of independent variables in the analysis by 5.5%.

Table 4.10

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	3.294	.231		14.269	<.001
	SCQI	.196	.057	.246	3.460	<.001

a. Dependent Variable: GSCM

According to the coefficient of beta, which is 0.246, a 1% improvement in supply chain quality integration will lead to a 24.6% improvement in green supply chain management. Because the p value is less than 0.05, it can be concluded that supply chain quality integration significantly improves green supply chain management. T is equal to 3.460. Therefore, a substantial positive link between supply chain quality integration and green supply chain management was found by the regression analysis (beta =.246, p> 0.05). Thus, our hypothesis is confirmed.

Step 3: A simple regression analysis with green supply chain management predicting the environmental performance to test for part b alone. Hence, we will test the third hypothesis, which is:

H3: Green supply chain management has a positive impact on environmental performance.

Table 4.11

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.468[a]	.219	.215	.39584

a. Predictors: (Constant), GSCM

The above table shows the regression model summary, which indicates that the adjusted R square of the model is 0.215 and the R square is 0.219. This means that the regression explains 21.9% of the variance in environmental performance, and it can be seen that there might be other factors that cause a variation of 78.1% in the outcome variable. The adjusted R square corrects the R square for the number of independent variables in the analysis by 21.5%.

Table 4.12

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	.442	.461		.958	.339
	GSCM	.812	.112	.468	7.225	<.001

a. Dependent Variable: EP

According to the coefficient of beta, which is 0.468, a 1% improvement in green supply chain management will lead to a 46.8% improvement in environmental performance. Because the p value is less than 0.05, it can be concluded that green supply chain management significantly improves environmental performance. T is equal to 7.225. Therefore, a substantial positive link between green supply chain management and environmental performance was found by the regression analysis (beta =.468, p> 0.05). Thus, our hypothesis is confirmed.

Step 4: A multiple regression analysis with supply chain quality integration and green supply chain management predicting the environmental performance. Hence, we will test the fourth hypothesis, which is:

H4: Green supply chain management positively mediates the relationship between supply chain quality integration and environmental performance.

Table 4.13

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.474[a]	.225	.217	.39540

a. Predictors: (Constant), SCQI, GSCM

The above table shows the multiple regression model summary, which indicates that the adjusted R square of the model is 0.21 and the R square is 0.225. This means that the regression explains 22.5% of the variance in environmental performance, and it can be seen that there might be other factors that cause a variation of 77.5% in the outcome variable. The adjusted R square corrects the R square for the number of independent variables in the analysis by 21.7%.

Table 4.14

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	.134	.528		.254	.800
	GSCM	.779	.116	.449	6.718	<.001
	SCQI	.110	.092	.079	1.190	.236

a. Dependent Variable: EP

In this table, the coefficient for green supply chain management (GSCM) is 0.779 (standardized coefficient: 0.449, $p < 0.001$), and the coefficient for supply chain quality integration (SCQI) is 0.110 (standardized coefficient: 0.079, $p = 0.236$). It indicates that green supply chain management (GSCM) has a significant direct relationship with environmental performance (EP), but supply chain quality integration (SCQI) does not have a significant direct relationship with environmental performance (EP) when green supply chain management (GSCM) is included in the model.

Based on these results, we can conclude that green supply chain management (GSCM) acts as a mediator in the relationship between supply chain quality integration (SCQI) and environmental performance (EP). This means that the effect of supply chain quality integration (SCQI) on environmental performance (EP) is partly explained by the mediating variable, green supply chain management (GSCM). When green supply chain management (GSCM) is included in the analysis, the direct effect of supply chain quality integration (SCQI) on environmental performance (EP) becomes non-significant; suggesting that green supply chain management (GSCM) mediates the relationship between supply chain quality integration (SCQI) and environmental performance (EP).

4.6 Testing Mediation Process Procedure

Model Used: 4

Y variable: EP

X variable: SCQI

M variable: GSCM

Sample Size: 188

Outcome Variable:

GSCM

Table 4.15

Model Summary

R	R-sq	MSE	F	df1	df2	p
.2459	.0605	.0626	11.9687	1.0000	186.0000	.0007

Table 4.16

Model

	Coeff	Se	t	p	LLCI	ULCI
Constant	3.2936	.2308	14.2691	.0000	2.8383	3.7490
SCQI	.1961	.0567	3.4596	.0007	.0843	.3079

Standardized coefficients

	Coeff
SCQI	.2459

GSCM Model Summary:

- The model appears to explain 6.05% of the variance in the GSCM, according to R-squared (R-sq) of 0.0605.
- The F-test results show that the model significantly predicts GSCM (F = 11.9687, p = 0.0007).
- The SCQI coefficient is 0.1961 (p = 0.0007), which points to a strong direct correlation between SCQI and GSCM.

Outcome Variable:

EP

Table 4.17

Model Summary

R	R-sq	MSE	F	df1	df2	p
.4744	.2251	.1563	26.8637	2.0000	185.0000	.0000

Table 4.18

Model

	Coeff	Se	t	p	LLCI	ULCI
Constant	.1340	.5280	.2538	.8000	-.9076	1.1756
SCQI	.1099	.0924	1.1895	.2358	-.0724	.2922
GSCM	.7785	.1159	6.7182	.0000	.5499	1.0071

Standardized coefficients

	Coeff
SCQI	.0794
GSCM	.4486

EP model summary:

- The model accounts for 22.51% of the variance in EP, according to R-squared (R-sq), which is 0.2251.
- The F-test indicates that the model significantly predicts EP (F = 26.8637, p 0.001).
- The coefficients for SCQI and GSCM are 0.1099 (p = 0.2358) and 0.7785 (p < 0.001), respectively. These coefficients suggest that both SCQI and GSCM have significant direct positive relationships with EP.

Total Effect Model

Outcome Variable:

EP

Table 4.19

Model Summary

R	R-sq	MSE	F	df1	df2	p
.1897	.0360	.1934	6.9452	1.0000	186.0000	.0091

Table 4.20

Model

	Coeff	Se	t	p	LLCI	ULCI
Constant	2.6982	.4058	6.6493	.0000	1.8976	3.4987
SCQI	.2626	.0996	2.6354	.0091	.0660	.4591

Standardized coefficients

	Coeff
SCQI	.1897

Total, Direct, and Indirect Effects of X on Y

Table 4.21

Total effect of X on Y

Effect	Se	t	p	LLCI	ULCI	c'_cs
.2626	.0996	2.6354	.0091	.0660	.4591	.1897

Total Effect Model for EP:

SCQI's overall impact on EP is demonstrated by the coefficient 0.2626 (p = 0.0091). It indicates a significant positive relationship between SCQI and EP.

Table 4.22

Direct effect of X on Y

Effect	Se	t	p	LLCI	ULCI	c'_cs
.1099	.0924	1.1895	.2358	-.0724	.2922	.0794

Direct Effect of SCQI on EP:

SCQI's direct impact on EP is represented by the coefficient 0.1099 (p = 0.2358). It indicates a non-significant direct relationship between SCQI and EP.

Table 4.23

Indirect effect(s) of X on Y

	Effect	BootSE	BootLLCI	BootULCI
GSCM	.1526	.0410	.0801	.2419

Indirect Effect of SCQI on EP via GSCM:

The indirect effect of SCQI on EP through GSCM is represented by the coefficient 0.1526. It is significant (BootLLCI = 0.0801, BootULCI = 0.2419), suggesting that GSCM mediates the relationship between SCQI and EP.

Completely standardized indirect effect(s) of X on Y

	Effect	BootSE	BootLLCI	BootULCI
GSCM	.1103	.0287	.0573	.1704

- 95.0000 is the confidence level for each interval's confidence in the result.
- 5000 bootstrap samples were used to calculate the percentile bootstrap confidence intervals.

Completely Standardized Indirect Effect of SCQI on EP via GSCM:

The completely standardized indirect impact of SCQI on EP through GSCM is represented by the coefficient 0.1103 (BootLLCI = 0.0573, BootULCI = 0.1704). It demonstrates the statistical significance of the indirect effect.

In conclusion, based on the provided output, it can be determined that GSCM acts as a significant mediator in the association between SCQI and EP. The direct impact of SCQI on EP becomes non-significant when accounting for the indirect effect through GSCM.

4.7 Summary of Hypothesis Testing

Table 4.24

Hypothesis	Statement	Conclusion
H1	Supply chain quality integration has a positive impact on environmental performance.	Accepted
H2	Supply chain quality integration has a positive impact on green supply chain management.	Accepted
H3	Green supply chain management has a positive impact on environmental performance.	Accepted
H4	Green supply chain management plays a mediating role in the relationship between supply chain quality integration and environmental performance.	Accepted

CHAPTER 5

DISCUSSION, CONCLUSION AND SUGGESTIONS

5.1 Conclusion and Discussion

According to the results derived from the tests, integration of quality practices within supply chains with the involvement of green supply chain practices can improve the environmental performance. The process method was used to find out the direct, indirect, and total effects of quality integration in supply chain on environmental improvement. Our research also indicates that through enhancing green practices within the supply chain, quality integration in supply chain indirectly affects environmental performance. Therefore, In order to link quality integration within supply chain to environmental performance, incorporation of green practices in supply chain is essential. Thus, putting supply chain quality integration into practice can essentially not only improve the production methods and the products quality, but also reduces various environmental contaminants and benefit the environment. For a manufacturer to completely benefit from the quality integration in supply chain advantages for environmental performance, green practices within supply chain must be implemented concurrently.

5.2 Limitations

- One limitation of this research is that it focuses on textile firms only.
- The study's sample size was small. A larger sample size would have ensured a more reliable outcome.
- The convenience sampling technique limited our research to a smaller audience.

5.3 Future Research Recommendations

Other researchers can include other sectors in their studies to determine the impact on the environment with the implementation of quality integration within supply chain with the use of green practices.This study's prime focus was the influence of quality integration in supply chain via green supply chain practices on the environmental up gradation. Future researchers are suggested to examine the controlling influence of internal as well as external factors of context such as corporate and institutional settings and strategy direction.

5.3 Practical Implications

The results derived from the study suggest that managers can combine quality, practices to improve environment and green practices to enhance environmental performance. An organization can successfully implement green practices with the integration of quality in its supply chain. With the assistance of supply chain quality integration, an organization can implement green practices. Since quality control efforts and environmental protection have synergistic effects, managers should be aware that efforts to quality management may result in the incorporation of green practices. Since suppliers, customers, and internal quality integration procedures are all involved in supply chain quality integration, it is crucial for businesses to communicate their quality expectations to their suppliers and include them in their efforts to enhance quality. Customers form the backbone of any business, so in order to improve quality, businesses should establish close contact with customers. Collaboration with customers will help businesses involve them in the quality control processes and receive feedback regarding quality improvement areas. Moreover, businesses can enhance their environmental performance from the integration of supply chain quality by incorporating green supply chain management practices in their processes. The study's suggestions and conclusions can assist Pakistani textile businesses in streamlining their supply chains, integrating quality controls, and implementing green initiatives so that environmental performance can be improved, and competitive advantage is preserved at the same time.

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Appendix

Questionnaire

The impact of supply chain quality integration on the environmental performance with the mediating role of green supply chain management in the textile sector of Pakistan.

Dear Respondent, as a part of my MBA research thesis, I am carrying out research under the title "The impact of supply chain quality integration on green supply chain management, environmental performance and financial performance". I need your kind cooperation for the fulfillment of this project. It will take around 10-15 minutes of your time. I assure you that your data will be kept confidential and only will be used for this research work.

Section 1: Demographic Information

1. Gender
    a) Male
    b) Female

2. Designation
    a) Senior Manager
    b) Manager
    c) Assistant Manager
    d) Executive
    e) Other

3. Work Experience
    a) 0 to 5 years
    b) 6 to 9 years
    c) 10 years or more

Section 2: Company Profile

4. Firm Size

a) Large scale company
b) Medium Scale Company
c) Small Scale Company

5. ISO Certified
    a) Yes
    b) No

Section 3: Research Questions

Supply Chain Quality Integration	**SD**	**D**	**N**	**A**	**SA**
We maintain cooperative relationships in quality management with our suppliers.					
We help our suppliers to improve their quality.					
We maintain close communications with suppliers about quality considerations.					
Our suppliers provide input into quality control in our product development.					
Our suppliers are actively involved in quality management during our new product development process.					
We mostly use suppliers that we have certified.					
We actively engage suppliers in our quality improvement efforts.					
We help suppliers to improve their processes to better meet quality requirements.					
We share quality requirements with our suppliers.					
We are frequently in close contact with our customers in quality management.					
Our customers give us feedback on our quality and delivery performance.					
Ourcustomersprovideinputintoqualitycontrolduringourproduct design					
Our processes are certified or qualified by our customers.					
Our customers are involved in quality management during our new product development.					
Our customers share quality requirements forecast with us.					
We engage customers in our quality improvement efforts.					
We formulate uniform quality standards in consultation with our customers.					

We jointly solve quality problems with our customers.					
The functions in our plant cooperate to solve conflicts between them when they arise.					
Our supervisors frequently hold group meetings for discussion among employees.					
Our company's functions work interactively with each other.					
During problem-solving sessions, we make an effort to get all team members' opinions and ideas before making a decision.					
Our company forms teams to solve problems.					
In the past3 years many problems have been solved through small group sessions.					
Problem solving teams have helped improve manufacturing processes at this plant.					
Green Supply Chain Management	**SD**	**D**	**N**	**A**	**SA**
We provide design specifications to suppliers that include environmental requirements for purchased items.					
We cooperate with suppliers for environmental objectives.					
Environmental audit for suppliers' internal management is performed.					
The ISO14001 certification of suppliers is performed.					
Second tier supplier environmentally friendly practice evaluation.					
Suppliers are selected using environmental criteria					
Eco labeling of products.					
Providing design specification which conform to environmental requirements.					
Cooperation with customers for environmental objectives.					
Cooperation with customers for eco design.					
Cooperation with customers for cleaner production.					
Cooperation with customers for green packaging.					
Cooperation with customers for using less energy during product transport.					
Cooperation with customers for product take back.					
Our company adheres to stringent product design guidelines in order to decrease material and energy usage.					
Our company maintains a product design that allows for the reuse, recycling and recovery of materials and parts.					

Our company maintains product design in order to eliminate or limit the usage of hazardous goods and production processes.					
This organization's product is recyclable and reusable.					
Manufacturing operations guarantee that hazardous compounds are used less frequently in the process					
The product life cycle method is utilized to improve the product's environmental performance.					
Efforts were made to limit the amount of material water and energy consumed in the production process.					
Compliance with all applicable requirements is ensured by a waste management program.					
In manufacturing operations the use of energy obtained from renewable resources is optimized.					
Harmful waste is kept to a minimum during the production process.					
Pollution sources were identified and eliminated through the development.					
Environmental Performance	**ML**	**L**	**AS**	**H**	**MH**
Reduction of carbon emission.					
Reduction of waste water.					
Reduction of solid wastes.					
Decrease in consumption of hazardous materials.					
Decrease in frequency of environmental accidents.					
Significant reduction in energy consumption.					
Improvement in its overall environmental situation.					

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