



Vaasan yliopisto  
UNIVERSITY OF VAASA

Author: Tariq Ali Malik

# Navigating Sustainable Supply Chains in Pakistan's Textile Industry: Addressing Regulatory, Infrastructural, and Social Challenges for Enhanced Sustainability

School of Technology and Innovations

Master's Thesis in

Industrial Management

Vaasa 2024

---

**UNIVERSITY OF VAASA****School of Technology and Innovations****Author:** Tariq Ali Malik**Title of the Thesis:** Navigating Sustainable Supply Chains in Pakistan's Textile Industry: Addressing Regulatory, Infrastructural, and Social Challenges for Enhanced Sustainability**Degree:** Master of Science in Technology**Program:** Industrial management**Supervisor:** Khuram Shahzad**Year: 2024** **Pages: 75**

---

**Abstract:**

This research investigates the key challenges and opportunities associated with implementing sustainable supply chain practices within the textile sector of Pakistan, focusing on two prominent companies: Interloop and Kohinoor Textile Mills (KTML). The study aims to address the regulatory, infrastructural, and social challenges that impact the effectiveness and sustainability of supply chains in this sector.

The research employs a qualitative approach, utilizing semi-structured interviews with industry professionals who have a minimum of five years of experience in supply chain management. These interviews are designed to explore the nuances of regulatory compliance, infrastructural constraints, and social dynamics within the textile industry. The study captures in-depth insights from participants in various roles, including procurement specialists, senior managers, compliance officers, and operations managers, providing a comprehensive understanding of the sector's challenges and opportunities.

The findings reveal that the regulatory landscape in Pakistan's textile industry is marked by outdated compliance systems and high tariffs, which, while intended to protect domestic industries, often result in inefficiencies and increased costs. The research identifies specific regulatory gaps and calls for updated policies that better align with international standards and support sustainable practices. In terms of infrastructure, the study highlights significant barriers, such as inadequate facilities, technological limitations, and energy crises, which impede the implementation of sustainable practices. The analysis shows that while training programs are in place to address these issues, their effectiveness is compromised by systemic challenges and a lack of skilled labour.

Recommendations include investing in infrastructure improvements, enhancing training programs, and developing more robust support systems for sustainability initiatives. Social challenges are also critical, with the study uncovering issues related to supplier engagement and workforce management. The low morale and educational gaps among workers pose difficulties for effective management and the implementation of sustainable practices. The research suggests that improving social conditions, enhancing educational programs, and fostering better relationships with suppliers are essential for overcoming these challenges.

**Keywords:** *Sustainable supply chains, textile industry, regulatory challenges, infrastructural barriers, social challenges, Pakistan, Interloop, Kohinoor Textile Mills*

---

## **Contents**

Chapter 1: Introduction	6
1.1 Purpose of the Study	8
1.2 Research Aim	9
1.3 Research Objectives	10
1.4 Research Question	10
1.5 Significance of the Research	10
1.6 Research Limitations	11
1.7 Thesis Structure	12
Chapter 2: Literature Review	13
2.1 Literature Review: Sustainable Supply Chain in the Textile Sector	13
2.2 Sustainable Supply Chain Practices	14
2.3 Challenges in Textile Industry	15
2.3.1 Sustainable Performance	16
2.3.2 Regulatory Challenges in the Textile Industry	17
2.3.3 Infrastructural Challenges in the Textile Industry	19
2.3.4 Social Challenges in the Textile Industry	22
2.4 Compliance with international sustainability standards	25
2.5 Circular economy in textile supply chains	26
2.6 Research Gaps	27
2.7 Synthesis of Literature Review	29
Chapter 3: Research Methodology	32
3.1 Introduction	32
3.2 Research Framework	32
3.3 Research Onion	33
3.4 Research Rationale	34
3.5 Data Collection	34
3.5.1 Interview Questions	35
3.5.2 Target Audience	37

3.5.3 Interview Respondents	38
3.6 Data Analysis	40
3.6.1 Sample Size and Justification	41
3.7 Research Validity and Reliability	42
Chapter 4: Results and Findings	44
4.1 Introduction to the Organizations	44
4.1.1 Kohinoor Textile Mills (KTML)	44
4.1.2 Interloop Private Limited	45
4.2 Findings	47
4.2.1 Regulatory Challenges	47
4.2.2 Infrastructural Challenges	49
4.2.3 Social Issues	52
Chapter 5: Discussion and Conclusion	56
5.1 Conclusion	56
5.2 Research Contribution	57
5.3 Recommendations	59
5.3.1 Regulatory Reforms	59
5.3.2 Infrastructural Improvements	60
5.3.3 Social Initiatives	61
6. References	62
7. Appendix	73

## Figures

**Figure 3. 1** Research Framework ..... 32

**figure 3. 2** Saunder's Research Onion..... 33

## Tables

**Table 3. 1** Details of the interview Questions ..... 36

**Table 3. 2** This table provides a structured overview of the interview participants..... 38

## Chapter 1: Introduction

Sustainable supply chain management (SSCM) is crucial for the long-term viability and ethical operation of industries worldwide, particularly in emerging economies like Pakistan. This thesis examines the regulatory, infrastructural, and social challenges impeding sustainable supply chain practices within Pakistan's textile industry focusing on Interloop and Kohinoor Textile Mills (Prasad et al., 2024).

The textile sector is a cornerstone of Pakistan's economy, Statistics show over 8% of GDP and 40% of total exports come from textiles (Abbate et al., 2024). Millions of livelihoods depend on it directly or indirectly. It represents one of the largest export industries, playing a pivotal role in the country's economic stability (Küsters et al., 2017). Despite its economic significance, the sector grapples with numerous sustainability challenges. These challenges include environmental degradation, social injustices such as poor labor conditions, and economic vulnerabilities that threaten the industry's long-term competitiveness.

In this context of the uncertain economic environment and the growing emphasis on sustainable supply chain management, the need for SSCM in the context of Pakistan's textile industry can hardly be overestimated (Islam et al., 2022). Research showed that more than half of customers around the world, particularly the millennials, are willing to compensate for sustainable products, Therefore, Pakistani textile firms should transform themselves to cope with the changes. The general public including the consumers, investors, and the regulating authorities have become more sensitive to the sustainable investing thus any company in the textile industry including Interloop and Kohinoor Textile Mills need to incorporate sustainable practices within their supply chain management systems (Khan & Khan, 2010).

It is, therefore, pertinent that the challenges regarding regulation concerning Pakistan's textile industry be addressed in order to create sustainability. The textile sector is very important to the country's economy and job market this sector has suffered from a set of policies and standards that hinder the attempt to improve its ecological and sociopolitical performance. It is for these

regulations that the industry must strive to work in a manner that reduces its impact on the environment to global standards. Textile companies that are in Pakistan will be to penetrate the global market which is expanding its demand for the products that are manufactured ethically. This in term enables business to market its products and services to the green conscious clientele leading to new revenue streams and growth prospects (Jäämaa & Kaipia, 2022).

Pakistan's textile industry also faces major structural problems that limit its capacity for functioning efficiently. For instance, old buildings or buildings constructed with now outdated technology hold substandard energy systems, substandard water and sewerage treatment plants as well as poor transport systems that working in harmony make up part of the enhanced environmental deterioration within the industry. Improve the infrastructure in the sector is thus an important determinant in the promotion of sustainable change (Fadara & Wong, 2023). Thus, by investing on modern efficient structures and technology that complies with the environment naturally for textile manufacturing industry lower energy, water and waste usage which in turn minimizes the carbon footprint of the industry and its environmental impact. Enhancing the industry infrastructure is a double-win situation because apart from helping companies in their operations it also entails supporting the improvement of the region to be conducive for the growth of sustainable industries. Freeway, utilities and modern production complexes also allow the textile firms to improve its manufacturing processes, quality of the final product, and to fulfil the demand for environmentally friendly products both locally and internationally (S. A. S. Shah et al., 2014).

The social issues affecting the textile industry in Pakistan are also extensively reported to contribute to the colossal problems affecting the sustainability and productivity of its workforce. The problems like the unfavourable working conditions, low levels of occupational safety, and violation of employees' rights remained a chronic concern for the sector, which was reflected in deteriorated well-being of workers and the firms themselves. Combating these social issues is highly crucial in the development of a sustainable textile chain. On this basis, the focus on the wellbeing of employees can help textile manufacturers increase the satisfaction and loyalty of an

organisation's staff, with the potential to diminish the switching costs for both hiring and training new employees (Oliveira et al., 2011). Better social conditions also mean better products because content and empowered workers can make fewer mistakes that can be costly to a company. Conducting this research is crucial for several reasons. It provides a comprehensive understanding of the specific challenges faced by the textile industry in Pakistan at Interloop and Kohinoor Textile Mills (Sánchez-Flores et al., 2020).

### **1.1 Purpose of the Study**

The purpose of this study is to investigate the challenges and opportunities associated with implementing sustainable supply chain practices within Pakistan's textile industry, focusing specifically on Interloop and Kohinoor Textile Mills. This research aims to explore regulatory compliance, infrastructural limitations, social responsibility, environmental impact, collaboration and partnerships, supplier engagement, and top management support as key variables affecting sustainability. Given the textile sector's significant contribution to Pakistan's GDP and employment, ensuring its sustainability is crucial for the country's economic stability and growth. The textile industry accounts for approximately 60% of Pakistan's total exports and adapting to global demands for sustainable practices is essential to maintaining and expanding this market share.

### **Research Gaps**

The regulatory landscape in Pakistan's textile industry is marked by significant gaps that hinder the adoption of sustainable practices. One of the primary issues is the outdated regulatory framework that fails to incentivize compliance and instead increases operational costs through complex and often opaque compliance requirements (Khan & Khan, 2010). This regulatory regime does not align with international standards, making it difficult for Pakistani textile firms to compete globally. The high tariffs imposed to protect domestic industries result in inefficiencies and discourage innovation (Tanveer & Zafar, 2012). There is a need for comprehensive policy reforms that streamline regulatory processes, align with global sustainability standards, and provide clear incentives for compliance.

Infrastructural limitations present a formidable barrier to sustainability in Pakistan's textile sector. Key issues include inadequate facilities, outdated technology, and inconsistent energy supplies. Frequent energy crises and scheduled load shedding severely disrupt production processes, leading to inefficiencies and increased operational costs (Shah et al., 2012). While some companies like Kohinoor Textile Mills mitigate these issues through private power plants, this solution is not scalable for the entire industry. The lack of investment in modern infrastructure and technology further exacerbates these challenges, preventing firms from adopting more sustainable practices and reducing their environmental footprint.

Its social issues in textiles industry, especially those in relation to management of labour and suppliers, are quite significant. There is also the problem of low morale, and in some cases educational disparities in workforce, factors that always make management and the resultant processes of establishing workable sustainable management techniques much more challenging (Baraldi & Nadin, 2006). The worker's socio-economic status determines the level of productivity and involvement in sustainable practices. Working with local suppliers who most of the time do not have the required social and environmental competence increases the difficulties (Kazancoglu et al., 2020). Critical is the call for topical investment in education and training processes that improves the know-how as well as the morale of the workers. It is hence pertinent to build improved supplier relations to guarantee that they are meeting social and environmental standards to the desire of the stakeholders.

## **1.2 Research Aim**

The aim of this research is to investigate the hurdles impeding the implementation and adoption of sustainable supply chain practices in the textile industry of Pakistan, focusing specifically on Interloop OR Kohinoor Textile Mills. By examining the factors contributing to supply chain disruptions and irregularities, the research seeks to identify key challenges and opportunities for enhancing sustainability performance within these organizations and the broader industry context.

### **1.3 Research Objectives**

1. To identify the key regulatory challenges impacting sustainable supply chain practices in Pakistan's textile industry.
2. To analyse the infrastructural limitations that hinder the implementation of sustainable supply chain management.
3. To examine the social issues affecting supplier relationships and workforce management within the textile sector.
4. To assess the effectiveness of training programs in enhancing sustainability practices among textile industry workers.
5. To provide recommendations for improving regulatory frameworks, infrastructural support, and social conditions to promote sustainability in the textile industry of Pakistan.

### **1.4 Research Question**

*What are the key challenges and opportunities for implementing sustainable supply chain practices in the textile sector of Pakistan, specifically within Interloop and Kohinoor Textile Mills?*

### **1.5 Significance of the Research**

This study is significant as it addresses critical sustainability challenges within Pakistan's textile industry, a vital sector contributing significantly to the nation's GDP and employment. The textile sector is facing mounting pressure from global markets to adopt sustainable practices, driven by increasing consumer, investor, and regulatory demands for ethically produced and environmentally friendly products. The timing of this research in 2024 is particularly crucial, as the industry stands at a pivotal juncture where failure to adapt could result in substantial economic repercussions, including loss of export market share and reduced competitiveness.

Conducting this study in Pakistan's textile sector, focusing on leading firms like Interloop and Kohinoor Textile Mills, is essential due to the specific regulatory, infrastructural, and social

contexts that influence sustainability practices in this region. The research aims to fill significant gaps identified in the literature, such as the need for localized assessments of sustainability barriers and the lack of strategic recommendations tailored to the Pakistani textile industry.

## **1.6 Research Limitations**

This research has several limitations that must be acknowledged. Firstly, the study focuses exclusively on two prominent textile firms, Interloop and Kohinoor Textile Mills, which may limit the generalizability of the findings to the entire textile industry in Pakistan. While these companies provide valuable insights into sustainable supply chain practices, other firms in the sector may face different challenges and opportunities that this research does not capture.

The research primarily employs qualitative methods, specifically interviews with industry experts. Although this approach provides in-depth understanding and rich data, it may not fully capture the quantitative aspects of sustainability performance as precise measurements of environmental impact or economic cost-benefit analyses. The qualitative nature of the study also means that the findings are interpretive and may be influenced by the subjective perspectives of the participants (Shafqat et al., 2023b).

The study is aimed only at the regulatory, infrastructural and social factors prevailing in the textile industry of Pakistan. It does not discuss other possible antecedents of the sustainable supply chain practices like technological developments or global trade policies because of the time limitations and resource constraints. These are pertinent factors, but the analysis of these requires a research strategy, which goes beyond the scope of this research (Sánchez-Flores et al., 2020).

This research is conducted within the specific timeframe of 2024, which may not account for longer-term trends and developments in sustainability practices. Rapid changes in regulations, market demands, and technological innovations could alter the landscape of sustainable supply chains, and the findings may become less relevant as these changes occur.

Finally, the study relies on a relatively small sample size of interviews, which may not fully represent the diverse perspectives within the industry. The selection criteria for participants, focusing on those with a minimum of five years of experience in supply chain management, could exclude details from newer entrants with fresh perspectives on sustainability (Sharma & Singla, 2021).

## **1.7 Thesis Structure**

This thesis comprises five main chapters, each dedicated to exploring different aspects of sustainable supply chain management within Pakistan's textile industry, focusing on Interloop and Kohinoor Textile Mills. Chapter 1, Introduction, provides an overview of the thesis, presenting the research objectives, significance, and background of Pakistan's textile sector. Chapter 2, Literature Review, synthesizes existing research from the past ten years, drawing from scholarly articles and publications on Google Scholar to identify key themes, gaps, and trends in sustainable supply chain practices, with a particular focus on regulatory, infrastructural, and social challenges. Chapter 3, Research Methodology, outlines the primary research approach, detailing the process of conducting interviews with industry experts and employing qualitative analysis techniques to gather and analyze data. Chapter 4, Results and Discussion, presents the findings from the thematic and content analysis of the interview responses, discussing the patterns and themes identified and how they relate to the existing literature. Chapter 5, Conclusion, summarizes the key findings, highlighting the practical implications for the textile industry in Pakistan, and provides recommendations for future research and practice. The thesis includes References, formatted in APA 7 style, listing all the sources cited throughout the study, and Appendices, containing all relevant data, tables, and graphs, such as the interview questions and detailed responses, to support the research findings.

## **Chapter 2: Literature Review**

### **2.1 Literature Review: Sustainable Supply Chain in the Textile Sector**

Sustainable supply chain management (SSCM) in the textile sector involves integrating environmental, social, and economic considerations throughout the supply chain process, including raw material sourcing, manufacturing, transportation, and distribution (Marculetiu et al., 2023). Key components such as freight management and collaboration with local and international dealerships and partnerships play pivotal roles in enhancing sustainability practices.

Freight management in the textile sector is crucial for minimizing carbon emissions, reducing transportation costs, and optimizing logistics efficiency (Sharafuddin et al., 2022). Sustainable freight practices include adopting fuel-efficient vehicles, optimizing shipping routes, and utilizing alternative transportation modes such as rail and sea freight to lower environmental impacts. Effective freight management strategies contribute to reducing the carbon footprint of textile supply chains while ensuring timely delivery of products to customers and stakeholders (Baig et al., 2020).

Challenges in freight management include fluctuating fuel prices, regulatory compliance with emissions standards, and infrastructure limitations in developing regions. Overcoming these challenges requires collaboration between industry stakeholders, government agencies, and logistics providers to implement sustainable transportation solutions and improve supply chain resilience (Dhonde & Patel, 2020).

Collaboration with local and international dealerships and partnerships enhances the sustainability of textile supply chains by promoting responsible sourcing practices, fostering innovation, and expanding market reach (Lu et al., 2024). Partnerships with suppliers, distributors, and retailers enable companies to exchange best practices, share resources, and jointly develop sustainable solutions across the supply chain. These collaborations facilitate

knowledge transfer, improve supply chain transparency, and enhance the traceability of materials and products.

However, challenges such as cultural differences, regulatory complexities across international markets, and varying sustainability standards among partners can impede collaboration efforts. Building trust, establishing clear communication channels, and aligning sustainability goals are essential for successful partnerships in the textile sector (A. Shah et al., 2023).

## **2.2 Sustainable Supply Chain Practices**

The article by (Vishwakarma et al. 2022) analysed barriers to sustainable supply chain management in the apparel and textile sector. It highlighted that this industry is highly polluting and sustainability practices play a key role in addressing environmental and social issues. The study identified various obstacles to sustainability implementation across supply chain stages through expert opinions.

Interactive Structural Modeling (ISM) and fuzzy MICMAC techniques were applied to determine critical barriers. Key challenges included communication gaps, performance barriers, lack of sustainability training, capacity constraints and weak reverse logistics (Vishwakarma et al., 2022). DEMATEL method categorized barriers into cause-based and effect-based groups. It found all cause barriers matched ISM's level 5 barriers.

Studies have explored sustainability challenges and practices across various industries such as electronics, apparel, food etc. The textile industry is considered one of the most polluting industries globally (Chaabouni et al., 2021). Regulatory frameworks and compliance trends in textile producing countries like Pakistan have been studied. Infrastructure and social compliance also impact environmental and social sustainability (Ali & Feng, 2016; Latif et al., 2017).

### **2.3 Challenges in Textile Industry**

Some of the issues faced by the Textile Industry in Pakistan include the following: The textile industry of Pakistan has the following shortcomings: The existing environmental laws and legislation are quite old, and the present environmental laws are not implemented properly and thru rigidly (Saeed et al., 2021). Lack of efficiency in energy systems for instance is also a major infrastructural inhibitor of sustainable development (Ali & Feng, 2016). Limitations such as workers' rights and health & safety add yet more layers to the conundrum within the constraints of environmental and social sustainability. Yet, there is a scarcity of research that focuses on a fabric that explores all three factors – regulatory, infrastructural, and social, cumulatively for the supply chain of the Pakistani textile industry. The article discusses sustainable supply chain practices (SSCPs) which involves incorporating sustainability principles throughout the supply chain from sourcing raw materials to distributing finished products (Seuring & Müller, 2008). SSCP includes sustainable sourcing, energy efficient operations, product design for sustainability and recycling/reuse (Carter & Jennings, 2002; Sarkis et al., 2011; Govindan et al., 2015). Supply chain resilience is also reviewed, defined as the ability to withstand, adapt and recover from disruptions while maintaining operations (Ponomarov & Holcomb, 2009).

The textile industry is a complex and multifaceted sector that faces a wide range of challenges across different regions and markets (Karim et al., 2021). While the specific challenges may vary, there are several common issues that textile manufacturers and supply chain stakeholders grapple with on a global scale.

Some risks in the textile industry include the fact that as the industry grows, it is demanded to stay cheap at the same time it works under condition that it must meet higher and higher level of environmental and social responsibility. Fabric manufacturing is by its very nature heavy metal, heavy water and heavy raw material consuming (Nazam et al., 2022). There are increasing reports by the consumer and regulatory authorities on the environmental impact of the textile industry hence exerting pressure on textile firms to undertake water recycling and renewable energy as well as the use of eco-dyes. These investments sometimes come at a premium and as a result of

this put a lot of pressure on such margins which in turn limits how much textile firms can invest in sustainability.

Another threat that is quite apparent and recalcitrant within the textile value chain is the globalization issue manifests in supply chain that are multiple and usually convoluted. Textile manufacturing often means sourcing, supply chain of various components, and logistics channels cross the borders of different countries, which makes it almost impossible to control supply chain integrity, origin, and compliance (Lorente-Leyva et al., 2024). This complication can result in cases like labour rights infringement, poor employees' remuneration and working conditions, employment of substandard subcontractors who compromise the quality of a firm's products and services thus adversely affecting the company's image with the public.

Technological disruption and the need for digital transformation also pose significant challenges for the textile industry (Schneider & Wallenburg, 2012). As consumer preferences and shopping habits evolve, driven by the rise of e-commerce and omnichannel retail, textile manufacturers must adapt their production processes, logistics, and customer engagement strategies to meet these changing demands. This often requires significant investments in new technologies, data analytics, and digital infrastructure, which can be particularly daunting for smaller and medium-sized enterprises (Singh et al., 2022).

The textile industry is also grappling with the impact of global macroeconomic trends, such as trade tensions, currency fluctuations, and supply chain disruptions. These external factors can significantly affect the cost of raw materials, transportation, and labour, forcing textile companies to constantly adjust their production and sourcing strategies to remain competitive (Demir & Paksoy, 2023).

### **2.3.1 Sustainable Performance**

Sustainable performance is multidimensional, involving economic, environmental and social assessment beyond profits (Epstein & Roy, 2001). Regulations motivate sustainability compliance (Dangelico & Pujari, 2010). Leadership endorsement and innovation also impact sustainability performance.

Employee involvement through effective leadership, culture and external factors like competition influence engagement. Engagement moderates the relationship between SSCPs and sustainable performance.

### **2.3.2 Regulatory Challenges in the Textile Industry**

Regulatory frameworks play a pivotal role in shaping sustainability practices within the textile industry, particularly concerning environmental impact and waste management. Textile industrial waste, characterized by effluents containing dyes, chemicals, and untreated wastewater, poses significant environmental challenges (DVYKALIUK et al., 2022). Stringent regulations are crucial in mitigating these impacts by mandating treatment processes and emission standards. Compliance with these regulations not only ensures environmental protection but also influences operational strategies and financial investments.

The textile industry plays a vital role in Pakistan's economy, contributing significantly to the country's GDP and employment. This sector is burdened by a complex web of regulatory challenges that hinder its ability to operate in a sustainable and responsible manner (Shah, Walayat, Ali warraich, Usman and Kabeer, 2012).

The major challenge which textile industry of Pakistan has been experiencing in terms of regulation is a lack of clear legal policy in environmental management. Though the country has implemented various regulations in dispensing with some of the problems like water pollution, air quality and waste management, the implementation has not been feeling throughout the different regions and jurisdictions (Marquesone & Carvalho, 2022). Lack of many diverse standards also puzzles the textile manufacturers on which measures to employ, and it hinders them from establishing the correct structures as well as the technologies that are required to minimize their effects on the environment.

Apart from the given regulations, the Pakistan textile industry mainly has a problem in that most of them fail to meet the new and developing international standards or criteria for sustainability (Atstja et al., 2021). Potential challenges for Pakistani textile firms, As the global buyers get conscious about the ethically sourced and environmentally friendly textile and apparels, the pressure has shift to the Pakistan textile firms towards the international certification and international standard for developed world such as UN Global Compact and Sustainable Development Goals. Then again, the accreditation and sustenance of these certifications is not an easy task since they demand appropriate resources and institutional support which such companies producing textiles at a comparatively smaller scale might not have.

The regulatory framework governing the textile industry in Pakistan is often fragmented, with various government agencies and ministries overseeing different aspects of the sector's operations (Khan & Khan, 2010). This siloed approach to regulation can lead to overlapping jurisdictions, bureaucratic delays, and a lack of coordinated efforts to address the industry's pressing challenges. Textile companies often find themselves navigating a maze of permits, licenses, and approvals, diverting valuable resources away from their core business activities and sustainable transformation initiatives.

Another critical regulatory challenge faced by the Pakistani textile industry is the limited access to financial incentives and support mechanisms for investing in sustainable technologies and practices ("The Rise and Fall of Pakistan's Textile Industry: An Analytical View," 2020). While the government has introduced some schemes and subsidies to promote eco-friendly textile manufacturing, the availability and accessibility of these programs remain limited, for smaller enterprises. This lack of financial support hinders the industry's ability to adopt cutting-edge technologies, implement renewable energy solutions, and upgrade their infrastructure to minimize environmental impacts (Khan & Khan, 2010).

Sustainable processes in textile production encompass initiatives like water recycling, energy efficiency, and the use of eco-friendly materials. Regulatory frameworks that promote these practices are essential for fostering innovation and driving industry-wide adoption. Challenges persist, including the enforcement of regulations, resource limitations, and technological barriers. These factors hinder the seamless integration of sustainable practices across the textile supply chain (Shaikh et al., 2011).

### **2.3.3 Infrastructural Challenges in the Textile Industry**

Infrastructural challenges in the textile industry are anchored on three critical pillars, facilities, technology, and training programs.

#### **Facilities**

Facilities in the textile industry encompass physical infrastructure such as manufacturing plants, wastewater treatment facilities, and recycling units (Imran et al., 2018). These facilities are crucial for managing environmental impacts associated with textile production, in handling industrial waste. Wastewater from textile manufacturing contains harmful chemicals and dyes, making effective treatment essential for environmental stewardship. Facilities that incorporate advanced treatment technologies can significantly reduce water pollution and resource depletion, aligning with sustainable practices like water recycling and energy efficiency. Challenges arise in maintaining and upgrading these facilities due to high costs, regulatory compliance requirements, and technological limitations (Shah, Walayat, Ali warraich, Usman and Kabeer, 2012).

In terms of production facilities, the textile industry requires specialized infrastructure, such as weaving sheds, dyeing and finishing units, and warehousing spaces. The quality and availability of these facilities are often suboptimal. Aging machinery, inefficient layout, and limited automation can lead to lower productivity, higher energy consumption, and increased waste generation. The absence of centralized effluent treatment plants and waste management systems

can result in environmental issues, compliance challenges, and reputational risks for textile manufacturers (F. Shah et al., 2022).

Another critical aspect of textile industry infrastructure is the availability of reliable utilities, such as a steady supply of electricity, clean water, and efficient waste management systems (Hashmi et al., 2021). Many textile-producing regions struggle with power outages, water scarcity, and inadequate waste treatment facilities, forcing manufacturers to rely on costly and often unsustainable backup solutions. This can impact the operational costs and carbon footprint of textile production, making it challenging for the industry to meet the increasing demand for sustainable and socially responsible products (Giavina & Rodighiero, 2006).

### **Technology:**

Technological advancements play a pivotal role in enhancing sustainability within the textile industry. Modern textile machinery and equipment are designed to improve production efficiency, reduce energy consumption, and optimize resource utilization (Iyer, 2000). Innovations in dyeing and finishing processes can minimize water and chemical usage, thereby lowering environmental impact (O'Dwyer et al., 2011). The adoption of sustainable technologies faces barriers such as initial investment costs, compatibility with existing infrastructure, and the pace of technological innovation.

One of the key technological challenges in the textile industry is the limited availability of high-speed internet connectivity and reliable data infrastructure. Many textile-producing regions, particularly in rural areas, suffer from poor internet coverage and unreliable connectivity, making it difficult for manufacturers to implement advanced digital solutions, such as automated process control, real-time supply chain monitoring, and predictive maintenance (Moretti et al., 2021).

The lack of centralized data management platforms and cloud computing infrastructure can impede the textile industry's ability to harness the power of data analytics, machine learning, and artificial intelligence. These technologies are crucial for driving operational efficiency, improving

product quality, and enhancing supply chain visibility, but their implementation requires robust digital infrastructure and data-driven decision-making capabilities (Saleeshya et al., 2019a).

Another technological challenge facing the textile industry is the need for specialized machinery and equipment. Upgrading to modern, energy-efficient, and automated production systems can be a significant investment, for small and medium-sized enterprises. The absence of localized machinery suppliers and maintenance services can further compound this challenge, limiting the industry's ability to adopt the latest technological advancements (Saleeshya et al., 2019b).

### **Training Programs**

Training programs are essential for fostering a culture of sustainability and ensuring compliance with environmental regulations in the textile sector (Scheuch et al., 2021). These programs educate employees on best practices for waste management, chemical handling, workplace safety, and sustainable production techniques (Chohan & Hu, 2022). Well-trained personnel are better equipped to implement sustainable initiatives, identify process improvements, and adhere to regulatory requirements, enhancing overall operational efficiency and environmental performance. Challenges such as resource constraints, varying skill levels among employees, and the need for continuous training updates pose ongoing hurdles to the effectiveness of these programs (Siramaneerat & Chaowilai, 2022).

One of the key challenges in the textile industry is the lack of comprehensive training programs that cater to the evolving needs of the sector. Traditional vocational training and technical education programs often fail to keep pace with the rapid technological changes and sustainability requirements in the industry, leaving workers ill-equipped to handle the increasingly complex production processes and operational challenges (Scheuch et al., 2021).

The absence of industry-academia collaborations and knowledge-sharing platforms can hinder the development of tailored training programs that address the specific infrastructure-related challenges faced by textile manufacturers. This can cause a persistent skills gap, making it difficult

for the industry to attract and retain the talent needed to operate, maintain, and innovate its critical infrastructure (Chohan & Hu, 2022).

To address these infrastructural challenges, a holistic approach is required, involving coordinated efforts among textile industry stakeholders, government authorities, and educational institutions. This may include strategic investments in modernizing production facilities, upgrading digital infrastructure, and developing specialized training programs that equip the workforce with the necessary skills to operate and maintain the industry's critical infrastructure (Scheuch et al., 2021).

#### **2.3.4 Social Challenges in the Textile Industry**

Social challenges in the textile industry encompass issues related to supplier relations, community impacts, and internal workforce dynamics, all of which influence sustainability practices in clothing production (Hastings & Weate, 2018). Suppliers play a crucial role in the textile supply chain, affecting social and environmental performance through their practices. Challenges such as ethical sourcing, labor standards compliance, and supply chain transparency are critical considerations for sustainable textile production. Effective management of supplier relationships is essential for fostering sustainable practices and ensuring social responsibility across the supply chain (Kaul, 2015).

Local communities surrounding textile manufacturing facilities often experience social and environmental impacts, including pollution, resource depletion, and socioeconomic disparities (Smith, 2014). Engaging with local stakeholders and implementing community outreach programs are essential for mitigating negative impacts and fostering sustainable development. Challenges such as conflicting interests, regulatory pressures, and communication barriers hinder effective community engagement and sustainable development initiatives (Shukla, 2014).

The textile industry, particularly in developing countries, has a long history of labor-related challenges, including poor working conditions, low wages, child labor, and worker exploitation.

These issues have drawn widespread attention from human rights organizations, consumer groups, and regulatory bodies, putting immense pressure on textile manufacturers to address these social concerns (Bathrinath et al., 2021).

One of the primary labour-related issues is the lack of adequate health and safety measures in textile production facilities. Many factories, in smaller and informal settings, lack proper ventilation, fire safety equipment, and worker protection mechanisms, exposing employees to hazardous working conditions and the risk of accidents or occupational diseases (Rese et al., 2022).

The continued low wages and many hours worked in the textile industry in developed countries and rather low ones in the developing ones. There is a problem: the low-qualified textile employees cannot provide for themselves and their families, which leads them to work excessive hours. It can cause worker unrest which results in low morale, high turnover, and labour strikes and all these affect production, development and general image of the industry (Farhate et al., 2021).

The problem of child labour is an ongoing problem in the textile industry and some developing countries that due to poverty and inability to get quality education push children into the textile factories. Child labour is not only a violation of international labour standards but also continuously discourages the break from poverty and takes away children's rights ("The Rise and Fall of Pakistan's Textile Industry: An Analytical View," 2020).

Textile industries still experience other working conditions' challenges including the depressed skills level which compromises the sectors dexterity to embrace change and show efficiency through technology, productivity and market competitiveness (Ahmed Ullah & M Faisal, 2019).

One of the primary skill gaps in the textile industry is the shortage of trained technicians and machine operators capable of operating and maintaining the industry's specialized machinery

and equipment. As textile production becomes increasingly automated and digitalized, the demand for workers with technical expertise and digital skills has grown exponentially. Many textile-producing regions lack the necessary vocational training and technical education programs to develop this skilled workforce (Stats SA, 2022).

Another skill gap is the dearth of industry-specific management and entrepreneurial skills. Textile manufacturers often struggle to find professionals with the necessary expertise in areas as supply chain management, quality control, sustainability practices and strategic decision-making. This lack of managerial and leadership capabilities can limit the industry's ability to optimize its operations, adapt to changing market dynamics, and capitalize on emerging opportunities (Banik et al., 2021).

The textile industry's shift towards sustainability and environmental responsibility has created a demand for specialized skills in areas like sustainable textile production, waste management, and eco-friendly product development. The availability of professionals with these specialized skills is often limited, hampering the industry's efforts to transition towards more sustainable practices (Oseghale et al., 2015).

Internal social dynamics within textile firms, particularly between workers and management, also influence sustainability outcomes. Issues such as worker rights, fair wages, workplace safety, and employee empowerment are critical for maintaining a sustainable and ethical work environment. Effective communication, stakeholder engagement, and participatory decision-making processes contribute to fostering a positive organizational culture and sustainable practices (Kesici, 2022). Challenges such as labor disputes, turnover rates, and cultural differences pose ongoing challenges to achieving social sustainability within textile firms.

## **2.4 Compliance with international sustainability standards**

The global textile industry has faced increasing pressure to adopt more sustainable practices and align with international sustainability standards. These standards aim to reduce the environmental impact, improve social conditions, and enhance the overall sustainability of textile supply chains (IFRS, 2022). Compliance with such standards is critical for textile manufacturers and exporters to remain competitive in the global market and meet the growing demand for eco-friendly and ethically produced textiles (GOTS, 2020).

In this case, the textile business faces several national and international legal requirements and recommendations based on sustainability. Launch some of the key standards are the Oeko-Tex Standard which is a certification system that sets limits concerning substances which are harmful in textile products; the Global Organic Textile Standard (GOTS), it is a high standard of organic textile product that extends to environment and social considerations; Higg Index is a set of tools adopted by the Sustainable Apparel Coalition to assess the firms' sustainability performance; ISO 14001 is an International Standard that helps organizations (GOTS, 2017).

However, these standards are unaccompanied by certain measures and the textile industry in many developed countries, Pakistan included, is subject to a number of difficulties in this process. Some of the key issues that still persist include the fact that many of the current regulations are old and even those, which are in place, rarely motivate the textile manufacturers and producers to adhere to the set standards but end up compromising the business by raising the operational costs greatly (Brügel, 2016). So, domestic regulations are incongruent with the international sustainability standards and obstruct the international competitiveness. The use of factors such as high tariffs and trade barriers is helpful in protecting domestic industries while at the same time it hampers competition and efficiency as well. Lack of stronger punitive measures on the violators of the set standards and little supervision that is often implemented make sustainability standards less powerful (Roche et al., 2023).

To overcome these challenges and improve compliance with international sustainability standards, a multifaceted approach is required. Policy reforms are essential to streamline

regulatory processes, align with global standards, and provide clear incentives for compliance. Capacity building through training and development programs can enhance the technical and managerial capabilities of textile manufacturers to implement sustainable practices. Stakeholder collaboration, involving textile companies, governments, NGOs, and international organizations, is crucial in developing and implementing effective sustainability strategies. Adopting advanced technologies and automation can improve resource efficiency, reduce waste, and enhance environmental and social performance. Implementing robust tracking and reporting systems can ensure transparency and accountability throughout the textile supply chain (van Wyk & Els, 2023).

## **2.5 Circular economy in textile supply chains**

This normal cycle of production, usage and disposal in the textile industry have caused series of environmental and resource troubles. As a result, there is a growing interest in developing a more sustainable paradigm for the textile supply chains through the concept of circular economy. Circular economy envisages the questioning of the linear ‘take-make-dispose’ model and focuses on the idea of making the best use of resources through using them for as long as possible (Grafström & Aasma, 2021).

In the context of textile supply chains, the circular economy principles can be applied through various strategies and initiatives. One of the key strategies is the use of recycled and renewable materials in textile production. This includes utilizing post-consumer textile waste, industrial waste, and natural fibers like organic cotton and bamboo. By incorporating these materials, textile manufacturers can reduce their reliance on virgin resources and minimize the environmental impact associated with the extraction and processing of raw materials (Corvellec et al., 2022).

There is also the concept of design within the circular economy of textile, that is known as design for circularity. This entails development of apparel products with disassembly, reparable as well as recyclable components and structures when they reach their life cycle disposal phase. This can comprise exclusion of mono-material as well as removal of dangerous substance, and,

encapsulation of circularity principles, such as modularity and biodegradable parts (Morseletto, 2020).

Receiving and sorting mechanisms as they pertain to textile waste management are important inputs when it comes to the reprocessing of textile waste. To gain improvement in the efficiency of textile waste separation, sorting technologies like near-infrared (NIR) spectroscopy as well as colour sorters and fibre sorters help. Reverse logistics network and consumer recovery programmes help in the collection and returning of post-consumer textile waste to the supply networks (Awan & Sroufe, 2022).

The recycling, as well as the reuse, of second hand and end of roll fabrics are also crucial to the concept of sustainability or the circular economy. A textual division of textile waste can occur on the mechanical level to return the waste to its original fibres or on the chemical level to return it to the molecular level so that it can be recycled properly. This also serve a reducer of waste, hence conserving the natural resources used in textile production and decreasing the emission of greenhouse gases (Kirchherr et al., 2017).

The circular economy in textiles requires the collaboration and engagement of various stakeholders, including textile manufacturers, retailers, consumers, recyclers, and policymakers. Effective policy frameworks, such as extended producer responsibility (EPR) schemes, can incentivize textile companies to design for circularity and invest in end-of-life management solutions. Consumer education and awareness campaigns can also play a crucial role in promoting the adoption of circular practices, such as clothing rental, repair, and responsible disposal (Velenturf & Purnell, 2021).

## **2.6 Research Gaps**

The regulatory framework governing Pakistan's textile industry is marked by gaps that hinder the adoption of sustainable practices. Among them there is the problem of the current regulations being often outdated: The existing regulations do not encourage companies to engage with the

compliance programs; on the contrary, the complicated and sometimes rather opaque nature of the compliance procedures drive up the operational costs. Unlike other developed countries this regulatory environment hinders most Pakistani textile related firms from seizing the foreign market. The measures that include high tariffs that are set to protect domestic industries mean that inefficiencies and lack of innovation are promoted by such measures hence negatively affecting competitiveness of the industry (Awan, U., Kraslawski, A., & Huiskonen, J. 2018).

Current policies must be made less complex to respond to the international standards in sustainability while encouraging firms within the textile industry to abide by the recommended policies (Barros et al., 2021). This would not only help the efficient functioning of the firms but would also assist them in the goal of competing and excelling on the global level. With the help of the governmental authorities, the conditions that are favorable for the further development of the textile industry and implementation of S-SMS need to be created.

Inadequate facilities, outdated technology, and inconsistent energy supplies present formidable barriers to sustainability in Pakistan's textile sector (Atstja et al., 2021). Frequent energy crises and scheduled load shedding severely disrupt production processes, leading to inefficiencies and increased operational costs. While some companies have mitigated these issues through private power plants, this solution is not scalable for the entire industry. The lack of investment in modern infrastructure and technology further exacerbates these challenges, preventing firms from adopting more sustainable practices and reducing their environmental footprint (IFRS, 2022).

To overcome these infrastructural limitations, one must make a right investment in infrastructure. This includes efficient exploitation of the textile mills and other related facilities; improvement of textile production processes; and availability of adequate energy. If these important areas are developed the industry will be able to improve on its operations productivity, decrease on energy related hitches and foster for sustainable practices (Suchek et al., 2021). This will help in improving the sustainability of the textile sector in the country making it export competitive.

Key challenges in the social aspect of textile industry mainly in labour relation and suppliers also remain a major hurdle to sustainability. A significant problem is the weak motivation and poor level of education of the staff that causes challenges for managers and the implementation of sustainable policies. The status of the workers in the socio-economic indicant could impact the productivity or dedication towards these activities. Also, bargaining with the local suppliers many of whom fail to meet the required social and environmental performance add on the task (Shrivastava, R. L. 2013).

Such is the case with the social issues, and to combat them, one must use several strategies. It is recommended that programs such as educational and training programs be conducted to improve the overall ability and job satisfaction of the textile workers to improve their input towards sustainability programs. The often-overlooked element is how better relationship with suppliers can be managed and how they can be made to embrace social and environmental policies for sustainability (Velenturf & Purnell, 2021). Thus, understanding the requirements of the employees as well as increasing the involvement of suppliers will help the textile industries to become more socially oriented and sustainable and, thus, improve the performance and competitiveness of the businesses.

## **2.7 Synthesis of Literature Review**

Chapter 2 of the literature review provides an extensive overview of sustainable supply chain practices within the textile sector, highlighting the multifaceted challenges and opportunities faced by the industry. It begins by discussing sustainable supply chain practices, emphasizing the integration of environmental, social, and economic considerations to enhance overall sustainability Mahalik, M. K. (2018). The chapter then delves into specific challenges encountered in the textile industry, segmented into various dimensions. It addresses sustainable performance issues, such as the need for effective resource management and minimizing environmental impact. Regulatory challenges are explored, revealing complexities in compliance with evolving sustainability rules and the impact of outdated regulatory frameworks on industry practices.

Infrastructural challenges are also examined, focusing on limitations such as technological deficiencies and facility constraints that hinder the implementation of sustainable practices.

The table 2.1 presented below present several research gaps, focusing on regulatory, infrastructural, and social challenges within the textile industry, and presents a conceptual framework to address these issues. The regulatory landscape is hampered by an outdated framework that increases operational costs and fails to incentivize compliance, which misaligns with international sustainability standards and results in high tariffs that protect domestic industries but discourage innovation. The proposed framework suggests comprehensive policy reforms to streamline regulatory processes, align with global standards, and provide clear incentives for compliance.

Infrastructural limitations are marked by inadequate facilities, outdated technology, and inconsistent energy supply, all of which disrupt production processes and increase operational costs. There is a lack of investment in modern infrastructure and technology, preventing sustainable practices and reducing environmental impact. The framework recommends significant investment in infrastructure development, including modernization of facilities and ensuring reliable energy supplies, to foster a sustainable and competitive textile industry. Social challenges involve low morale and educational gaps among the workforce, socio-economic status affecting productivity and commitment to sustainability, and local suppliers lacking social and environmental performance standards. The framework calls for comprehensive educational and training programs to enhance workforce skills and morale, and better relationships with suppliers to ensure adherence to social and environmental standards.

**Table 2. 1** Synthesis of Literature Review

Research Gaps	Conceptual Framework	References
Regulatory Landscape	<p>Outdated regulatory framework that fails to incentivize compliance and increase operational costs</p> <p>Misalignment with international sustainability standards, hindering global competitiveness.</p> <p>High tariffs that protect domestic industries, leading to inefficiencies and discouraging innovation</p> <p>Need for comprehensive policy reforms to streamline regulatory processes, align with global standards, and provide clear incentives for compliance</p>	<p>Awan, U., Kraslawski, A., &amp; Huiskonen, J. (2018).</p>
Infrastructural Limitations	<p>Inadequate facilities, outdated technology, and inconsistent energy supply disrupting production processes and increasing operational costs</p> <p>Lack of investment in modern infrastructure and technology, preventing the adoption of sustainable practices and reducing environmental impact</p> <p>Requirement for significant investment in infrastructure development, including modernizing facilities and ensuring reliable energy supplies, to foster a sustainable and competitive textile industry</p>	<p>Hussain, J., Ismail, K., &amp; Akhtar, C. S. (2015).</p> <p>Khan, M. I., &amp; Malik, M. N. (2017).</p>
Social Challenges	<p>Low morale and educational gaps among the workforce, complicating management efforts and the implementation of sustainable practices</p> <p>Socio-economic status of workers affecting their productivity and commitment to sustainability initiatives</p> <p>Challenges in dealing with local suppliers who lack the necessary social and environmental performance standards</p> <p>Need for comprehensive educational and training programs to enhance the skills and morale of the workforce, and fostering better relationships with suppliers to ensure adherence to social and environmental standards</p>	<p>Rehman, A. U., &amp; Shrivastava, R. L. (2013).</p>

## Chapter 3: Research Methodology

### 3.1 Introduction

This research employs a primary approach, utilizing qualitative analysis to investigate the complexities of sustainable supply chain management within Pakistan's textile sector (Avison & Stewart, 1986). The primary research method involves conducting semi-structured interviews with industry experts to capture detailed insights and firsthand experiences.

### 3.2 Research Framework

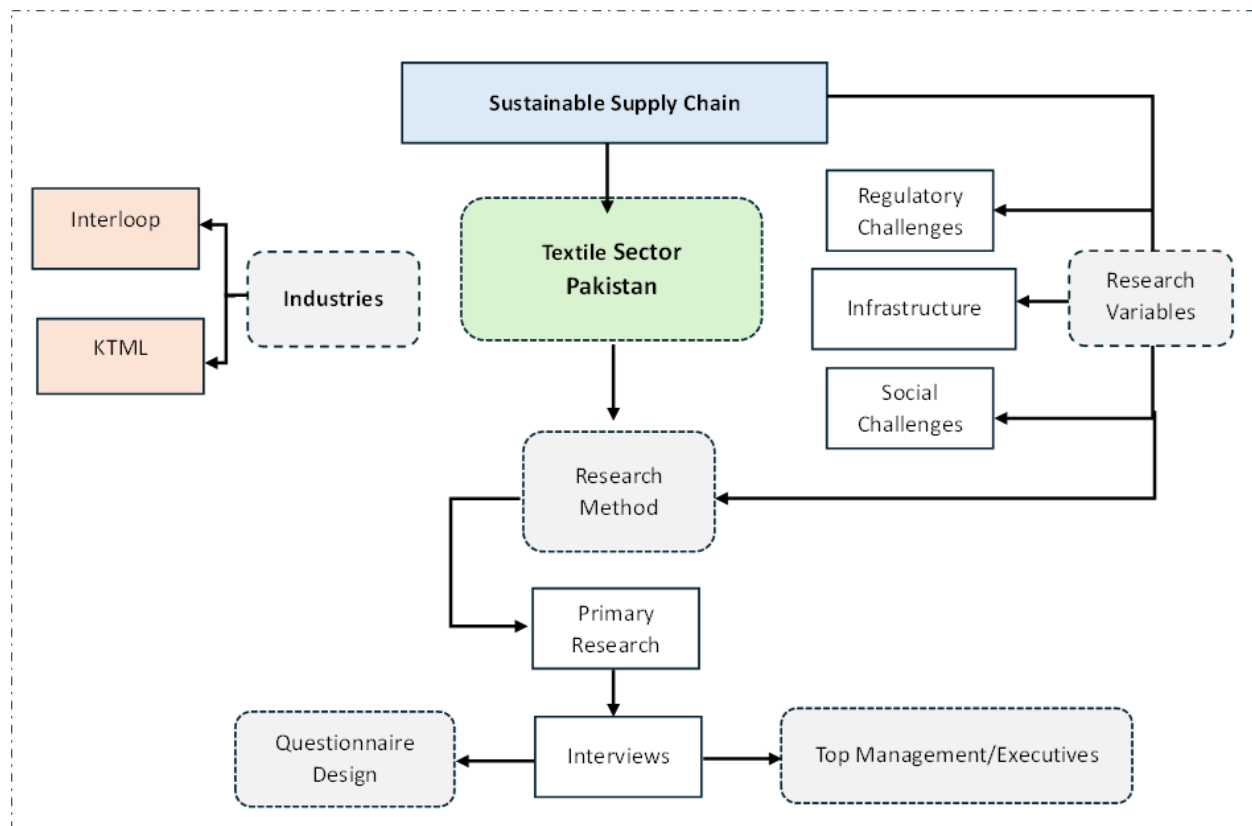


Figure 3. 1 Research Framework

### 3.3 Research Onion

The research onion for this study is structured to align closely with the specific variables and context of the research. The outer layer, **philosophy**, is interpretivism, focusing on understanding the subjective experiences and perspectives of industry experts (Crossley, 2021). The next layer, **approach**, is inductive, building theories from the collected qualitative data. The **strategy** is interview-based approach, concentrating on two prominent textile firms, Interloop and Kohinoor Textile Mills. For **choices**, the study employs a mono-method, using only qualitative data collection techniques. The **time horizon** is cross-sectional, capturing data at a single point in time during 2024. The **techniques and procedures** involve thematic analysis of data collected through the interviews, focusing on identifying and analysing key themes and patterns related to regulatory compliance, infrastructural limitations, social responsibility, environmental impact, collaboration and partnerships, supplier engagement, and top management support (UK Essays, 2018).

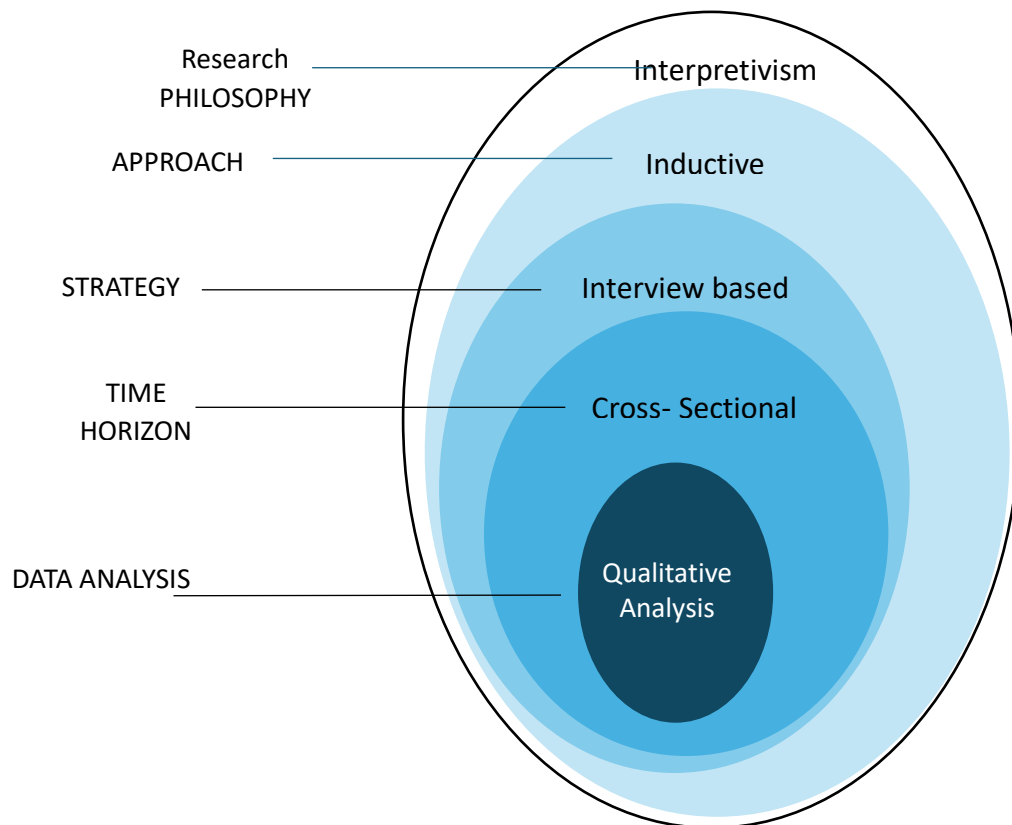


figure 3. 2 Saunderson's Research Onion

### **3.4 Research Rationale**

The primary interview-based research method is chosen for this study to obtain a deep, nuanced understanding of the challenges and opportunities associated with sustainable supply chain management within Pakistan's textile sector. This approach is preferred over secondary research for several reasons (Khan & Khan, 2010).

Primary research allows for direct engagement with industry experts, providing firsthand insights that are specific, current, and highly relevant to the context of Interloop and Kohinoor Textile Mills (S. A. S. Shah et al., 2014). This level of detail and specificity is essential for understanding the intricate dynamics of regulatory compliance, infrastructural limitations, social responsibility, environmental impact, collaboration and partnerships, supplier engagement, and top management support variables that are best explored through direct interaction with those who experience and manage these issues daily.

Secondary research, while valuable for background information and broad overviews, often lacks the specificity and contextual relevance needed for this study (Shaikh et al., 2011). Existing literature may not fully capture the unique challenges and real-time conditions faced by the Pakistani textile industry. Given the rapidly changing landscape of global sustainability standards and local industry practices, relying solely on secondary sources could result in outdated or generalized data that does not accurately reflect the current state of the industry.

### **3.5 Data Collection**

The data collection process for this research is meticulously designed to capture comprehensive insights into sustainable supply chain management within the textile sector of Pakistan (Zhang et al., 2017). This process involves conducting semi-structured interviews with industry professionals who have considerable expertise in the field. Here is a detailed and in-depth method of data collection:

The first data collection process includes identifying the respondents to be professionals with a minimum of 5 years of experience in the textile industry in the supply chain management department. By employing this criterion, insights proposed originate from informative sources that understand the industry's functional characteristics and the external environment. Individuals are contacted through the industries and communities, through networking and through referrals from multiple organizations and guaranteeing the participants across the sectors, with varied experience and expertise (Takona, 2024).

The interview questionnaire is carefully designed to address three key themes crucial to understanding sustainable supply chains in Pakistan's textile industry, regulatory challenges, infrastructural challenges, and social challenges. The questionnaire includes:

- i. **Regulatory Challenges:** Two questions focused on understanding the impact of government regulations on sustainability practices and organizational performance.
- ii. **Infrastructural Challenges:** Three questions that probe into the effectiveness of training programs, infrastructure limitations, and the impact of facilities and technology on sustainability efforts.
- iii. **Social Challenges:** Two questions exploring supplier engagement and the dynamics between workers and management.

### 3.5.1 Interview Questions

This interview questionnaire explores three key themes crucial to understanding sustainable supply chains in Pakistan's textile industry: regulatory challenges, infrastructural challenges, and social challenges. Each theme is tailored with specific questions: two questions for regulatory challenges, three questions for infrastructural challenges, and two questions for social challenges, totalling seven questions (Liu, 2022). These themes directly align with the research title, "Navigating Sustainable Supply Chains in Pakistan's Textile Industry: Addressing Regulatory, Infrastructural, and Social Challenges for Enhanced Sustainability." The questions are designed to

delve into how government regulations, infrastructural limitations including facilities and technology, and social dynamics impact sustainable practices within the industry. By focusing on these themes, the research aims to uncover barriers and opportunities, providing a comprehensive understanding essential for developing strategies to promote sustainability in Pakistan's textile sector (Robinson, 2014).

**Table 3. 1** Details of the interview Questions

Sr No.	Theme	Question Statement	Research Gap	Keywords	Reference
1	<b>Regulatory Challenges</b>	What sustainability rules and regulations does the government of Pakistan impose on operations?	Specific regulatory landscape in Pakistani textiles industry	Sustainability rules, government regulations, Pakistan	(Mukwarami et al., 2023)
2		How do these government regulations impact your organization's performance?	Investigate the direct impacts of regulatory compliance on organizational effectiveness.	regulatory impact, organizational performance, compliance	(Caccialanza et al., 2023)
3	<b>Infrastructural Challenges</b>	What training programs does your organization use to educate labour?	Examine existing training initiatives in the context of sustainable supply chain management.	Training programs, labour education, sustainability	(Yu et al., 2014)
4		How effective are these training programs for your organization?	Assess the efficacy of training programs in enhancing sustainability practices.	Training programs, Online Courses, Efficacy	(Kumar & Chopra, 2022)
5		What are the main infrastructural limitations, such as facilities and technology, that your organization faces in implementing sustainable practices?	specific infrastructural barriers hindering sustainability efforts.	infrastructural limitations, facilities, technology	(Bosona, 2020)
6		What major issues arise when working with suppliers on	Supplier engagement related to social	supplier issues, social performance,	(Bratt et al., 2021)

	<b>Social Challenges</b>	social and environmental performance?	and environmental criteria.	environmental criteria	
7		How different is it to manage relationships between workers and the management team?	Organizational dynamics impacting social sustainability initiatives.	Relationship management, organizational dynamics	(Kamble et al., 2020)

**3.5.2 Target Audience**

The target audience for the interviews in this research study consists of executive-level and senior management experts from the textile industry in Pakistan. This specific group of participants was selected due to their in-depth knowledge, decision-making authority, and extensive experience in the field of sustainable supply chain management (Management, 2022).

The target participants comprise Managers, Deputy General Managers (DGMs), as well as Officers of a higher rank. At the functional management level there are managers who will handle different functional areas in the textile organization such as purchasing, supply chain, green issues, or operations. Such people are fully aware of the dynamics of managing and supporting work with sustainable projects, strategies, and initiatives at different stages of the supply chain. The process of sustainability implementation is within the remit of managers within organisational for which they are useful sources of information in this investigation.

Deputy General Managers (DGMs) are middle aged officials who are strategic decision makers in the textile firms. It is their role to design and maintain the execution of the business strategies and initiatives on the sustainable supply chain management. Since DGMs operate at a higher level in the organization, they can offer a view on the macro issues that affect, or may be opportunities for, the implementation of sustainable supply chain management practices.

The higher-ranking category of the Officers is more experienced with the job and is senior level personnel in the textile organizations including General Managers, Directors or even Vice

Presidents. These people have a panoramic view of the sustainable environment of the industry and can provide information as to where the organization’s sustainable chain is headed, what its values and where its goals lie in the long-term.

### 3.5.3 Interview Respondents

**Table 3. 2** This table provides a structured overview of the interview participants

<b>Sr No.</b>	<b>Role/Designation</b>	<b>Years of Experience</b>	<b>Industry</b>	<b>Interview Duration</b>
1	Executive QA and Compliance	1	Kohinoor	30 minutes
2	Senior Officer	3.5	Interloop	25 minutes
3	Senior Manager	10	Kohinoor	35 minutes
4	Quality Control Supervisor	4	Interloop	28 minutes
5	Production Manager	7	Kohinoor	32 minutes
6	HR Manager	5	Interloop	20 minutes
7	Compliance Officer	6	Kohinoor	38 minutes
8	Operations Manager	8	Interloop	30 minutes
9	Lean Manufacturing Specialist	3	Kohinoor	22 minutes
10	Sustainability Coordinator	2	Interloop	40 minutes
11	Supply Chain Analyst	5	Kohinoor	35 minutes
12	Environmental Engineer	7	Interloop	27 minutes
13	Training and Development Officer	4	Kohinoor	33 minutes
14	Logistics Coordinator	6	Interloop	29 minutes
15	Procurement Specialist	9	Kohinoor	37 minutes

#### **3.5.4 Interview Process**

The data collection for this research study is conducted through a series of in-depth, semi-structured interviews with executive-level and senior management experts from the textile sector in Pakistan. The interviews are carried out via video conferencing platforms, such as Zoom or Microsoft Teams, to ensure the safety and convenience of the participants during the ongoing COVID-19 pandemic (Jacobs, 2024).

The researcher establish contact with the potential participants and provide them with a detailed information sheet outlining the purpose of the study, the interview process, and the measures taken to ensure the confidentiality and anonymity of their responses. Participants are asked to sign a consent form, which will be sent electronically, to confirm their willingness to participate in the study (Peloquin et al., 2020).

The interviews are conducted in a structured manner, with the researcher following a pre-determined interview guide. This guide includes a set of open-ended questions designed to elicit detailed responses from the participants, allowing them to share their experiences and perspectives on the challenges and opportunities related to sustainable supply chain management in the textile industry.

During the interviews, the researcher actively listens to the participants, probing and asking follow-up questions to gain a deeper understanding of the issues discussed. The interviews were recorded, with the explicit permission of the participants, to ensure accurate transcription and analysis of the data.

Upon completion of the interviews, the researcher transcribes the audio recordings and conduct a thorough qualitative analysis, using thematic coding and pattern identification techniques to uncover the key themes relevant to the research objectives (“Secondary Research Methods in the Built Environment,” 2021).

Throughout the interview process, the researcher maintains the highest standards of ethical conduct, ensuring the protection of the participants' privacy and the confidentiality of the information shared. Participants were informed that they have the right to withdraw from the study at any time and that their identities are anonymized in the research findings.

### **3.6 Data Analysis**

The data analysis method used in this research interview analysis involves simple descriptive analysis, a qualitative research technique that effectively summarizes and interprets the responses obtained from interviewees (Taherdoost, 2020). The process begins with data collection through semi-structured interviews with various stakeholders from Interloop and Kohinoor Textile Mills. Each interview is recorded and transcribed verbatim to ensure accuracy and completeness of the data. This transcription process is crucial for capturing the exact words of the respondents, which is essential for an accurate descriptive analysis.

Following transcription, the familiarization process begins. This involves an in-depth reading of the interview transcripts multiple times. The goal of this phase is to gain a comprehensive understanding of the content, allowing the researcher to identify initial patterns and ideas within the data. By immersing in the transcripts repeatedly, key points related to the research questions start to emerge. These key points include significant statements, phrases, or words that are directly relevant to the regulatory, infrastructural, and social challenges discussed by the interviewees (Abelairas-Etxebarria & Astorkiza, 2020).

The next stage involves organizing these identified key points into broad themes based on the research questions. The main themes that emerge are regulatory challenges, infrastructural challenges, and social challenges. Each theme encapsulates the key points pertinent to it, allowing for a structured approach to summarizing and interpreting the data. This organization into themes is fundamental for the subsequent steps, as it provides a clear framework for summarizing and interpreting the data (Köster et al., 2021).

Summarizing the themes is step in the analysis process. This involves condensing the key points into concise descriptions that capture the essence of the responses related to each theme. The aim is to create summaries that are both comprehensive and succinct, ensuring that the core insights from the interviews are clearly presented. These summaries serve as the basis for the final interpretation of the data.

The interpretation phase links the summarized themes back to the main research question, which focuses on the key challenges and opportunities for implementing sustainable supply chain practices in the textile sector of Pakistan. This interpretation provides valuable insights into the specific regulatory, infrastructural, and social challenges faced by Interloop and Kohinoor Textile Mills. Techniques such as descriptive coding are employed during the initial coding process to tag sections of the text with codes that describe the content. This helps in categorizing the data into meaningful themes. Thematic summarization is used to condense the data into clear and concise descriptions, making it easier to interpret and draw conclusions.

### **3.6.1 Sample Size and Justification**

The research study aims to conduct a total of 15 in-depth interviews to explore the challenges and opportunities in sustainable supply chain management within the textile sector. This sample size was determined based on the principle of data saturation, ensuring that the research provides a comprehensive and well-rounded understanding of the topic (Sarfo et al., 2021).

The selection of 15 interviews as the sample size is justified for several reasons. The research question requires a deep and nuanced understanding of the complex issues surrounding sustainable supply chain management in the textile industry. A sample size of 15 interviews allows for a substantial amount of data to be collected, enabling a thorough exploration of the main themes and sub-themes Click or tap here to enter text..

The textile industry involves a wide range of stakeholders, including executives, managers, and experts from various functional areas. By conducting 15 interviews, the researcher can capture a

diverse set of perspectives, ensuring that the findings reflect the multifaceted nature of sustainable supply chain management (Sarfo et al., 2021).

Based on the existing literature and the researcher's experience in the field, a sample size of 15 interviews is expected to reach thematic saturation, where interviews are unlikely to uncover details. This sample size provides a balance between the depth of exploration and the practical constraints of conducting qualitative research.

### **3.7 Research Validity and Reliability**

The validity and reliability of this research are underpinned by several key factors, primarily focusing on the expertise and experience of the interview participants, the methodological rigor of the interview process, and the ethical considerations, including consent and agreement. The respondents were carefully selected based on their extensive experience and critical roles within their respective organizations, ensuring that the data collected is both credible and reflective of the actual industry practices and challenges (Alexander et al., 2014; Gruner & Power, 2017).

The interview participants have adequate knowledge in the textile industry especially in Interloop and Kohinoor textile mills. The Senior Manager from Kohinoor has a total experience of 10 years which creates a good understanding of the regulatory issues and problems faced in the operation. Likewise, the Operations Manager of Interloop with 8 years of experience would provide a strong background of infrastructural and logistic problems. Of course, the experience of the Procurement Specialist from Kohinoor with 9 years of experience is still useful in terms of the supply chain shifting perspective. This diversity and depth of experience among participants increase the reliability of the conclusion since having professional experience in managing the supply chain operations in Pakistani textile industry, respondents' responses were based on practical knowledge.

The very process of interview increases the reliability of the research to great extent. The interviews were semi-structured so while there was a guide for each interview that included the same sets of questions there is room to ask follow-ups and probe for more details on a certain topic. The range of interview time was from 20 to 40 minutes which ensured enough time was accorded to the facet concerning sustainable supply chain management. For instance, the Sustainability Coordinator from Interloop was interviewed for 40 minutes and his/her understanding of environmental and social issues were specific. Thus, detailed discussions provide the highest level of data depth and help to reveal the multifaceted nature of the studied phenomena (Bui et al., 2020).

The research adheres to ethical standards, ensuring the reliability of the responses through proper consent and agreement from all participants. Before the interviews, each participant was informed about the purpose of the research, the use of the data, and their right to confidentiality. Written consent was obtained to ensure that participants were willingly sharing their insights, which adds to the credibility of the data collected. This ethical approach not only respects the participants' rights but encourages them to provide honest and detailed responses, knowing that their information will be handled responsibly (Bratt et al., 2021).

In terms of methodological rigor, the research employs triangulation by integrating perspectives from different roles within the organizations. This approach helps in cross verifying the information, thereby enhancing the reliability of the findings. Both the Compliance Officer with 6 years of experience from Kohinoor and the Environmental Engineer with 7 years of experience from Interloop provided consistent observations regarding regulatory and environmental challenges. Such consistency across different interviews indicates that the data is reliable and not biased by the perspectives of a single individual or role (Alexander et al., 2014).

## **Chapter 4: Results and Findings**

### **4.1 Introduction to the Organizations**

#### **4.1.1 Kohinoor Textile Mills (KTML)**

Kohinoor Textile Mills Limited (KTML) stands as a prominent figure in the Pakistani textile industry, functioning as a subsidiary of the larger Kohinoor Mills Limited Group (KMLG). Recognized as one of the textile companies in the country, KTML is committed to innovation, sustainability, and delivering high-quality products to both domestic and international markets (Khwaja, 2014).

KTML operate through two main manufacturing divisions. The Rawalpindi Division, located on Peshawar Road, Rawalpindi, comprises five manufacturing units with a total installed capacity of 85,680 spindles. The Gujar Khan Division situated on Gulyana Road in Gujar Khan; District Rawalpindi consists of four manufacturing units with a combined capacity of 71,808 spindles. KTML operates nine manufacturing units across its two divisions, boasting a combined spinning capacity of 151,000 spindles. These facilities are equipped with state-of-the-art machinery imported from Europe and Japan, ensuring the production of high-quality yarn and textiles (Khwaja, 2014).

KTML's product range primarily focuses on two key areas. The spinning division produces a wide range of cotton yarn, catering to various count requirements from coarse to fine, and is renowned for its quality-focused solutions and diverse product range. The home textiles division specializes in made ups and processing, including dyeing and printing, with the company's finest quality materials sold in top stores across the globe.

KTML places a strong emphasis on sustainability and innovation. The company has implemented various sustainability measures, such as energy efficiency, water conservation, and waste management, to minimize its environmental impact. KTML has a proven track record of successfully commercializing innovative products and solutions, demonstrating its commitment to technological advancements and the adoption of new practices (Khwaja, 2014).

KTML has cultivated a unique corporate culture that is both creative and collaborative. The company values its employees, recognizing their contributions through initiatives such as long service award ceremonies and training programs, including recent sessions on emotional intelligence for senior management [Click or tap here to enter text..](#) KTML is always on the lookout for young, talented individuals to join their team and contribute to the company's continued growth and success, fostering a dynamic and forward-thinking workforce.

#### **4.1.2 Interloop Private Limited**

Interloop is a premier manufacturer of socks, hosiery, denim, knitted apparel, and seamless activewear in Pakistan, known for its commitment to sustainability and innovation. With over 30 years of manufacturing expertise, Interloop has established itself as a leader in the textile industry, leveraging its extensive experience to produce high-quality products. The company places a strong emphasis on minimizing environmental impact, prioritizing worker well-being, and adhering to global standards, ensuring that its operations are both sustainable and ethical (Tara et al., 2019).

Interloop boasts impressive production capacities across its diverse product range. The hosiery division can produce up to 830 million pairs of socks annually, meeting the demands of both domestic and international markets. The denim division has an annual production capacity of 7.5 million garments, while the apparel division can produce 45 million garments each year. Interloop's activewear division has a capacity of 4 million garments annually. These robust

production capabilities enable Interloop to supply a wide array of high-quality textile products, catering to various market needs and preferences (Zubair et al., 2017).

Interloop is also very interested in the sustainable development strategies, which were reflected in the facilities that received the LEED certification and traded products. Being a part of the United Nations Global Compact and responsible for its country's sustainable development, this company can be considered sustainable and responsible. Interloop's commitment in sustainability expresses positive outcomes where the company has been able to minimize emissions of GHG at 29,029 tonnes as well as using 164 million liters less water than before. Apart from this, the company has also contributed to over 30500 direct employment and over 5000 children have been given education, \$ 485 million worth have been solved to economy and Rs 792 million has been invested in community development programs. These achievements state that Interloop is socially responsible and an environmentally friendly organization.

Interloop aims to become the "Full Family Clothing, Partner of Choice" by offering responsibly manufactured multi-category products with exceptional customer service. The company's Vision 2025 strategy focuses on leveraging the potential of its people, embracing digital transformation, and adopting an agile mindset. This forward-thinking approach will enable Interloop to meet the evolving needs of its customers and maintain its competitive edge in the global textile industry.

Interloop provides a range of specialized services, including expertise in research and innovation, digital design, and supply chain traceability. These services enable the company to stay at the forefront of industry trends and deliver cutting-edge solutions to its clients. By offering these value-added services, Interloop ensures that its products not only meet but exceed the expectations of its customers, solidifying its reputation as a leader in the textile manufacturing sector.

## **4.2 Findings**

### **4.2.1 Regulatory Challenges**

#### **Sustainability Rules and Regulations by the Government of Pakistan**

During the interviews, several key regulatory challenges were highlighted by various respondents, including the Procurement Specialist, Senior Manager, and Compliance Officer of Kohinoor Textile Mills (KTML), as well as the Operations Manager, Logistics Coordinator, and Senior Officer of Interloop Ltd. These challenges pertain to the sustainability rules and regulations imposed by the Government of Pakistan.

The current regulatory system for social and environmental compliance in Pakistan's textile industry is perceived as outdated by industry experts. The Procurement Specialist from Kohinoor Textile Mills remarked, "The regulatory framework is quite outdated and doesn't encourage real compliance. It leads to higher operational costs due to necessary settlements outside standard audits." This inefficiency in the regulatory regime is seen as a hurdle, making it difficult for companies to adhere to international compliance standards without incurring additional costs.

The tariff structure has been another hot issue that has been brought for debate and discussion. Higher end Kohinoor Textile Mills Senior Manager said, "Although upstream value chain is stimulated by the governments high tariff policies, generally the sales done inside the country become a cause of setting up inefficient market competitions." Hence true goal of tariff is to boost investment is defeated with large impact on setting up inefficiency and competition. Government processes aimed at liberalisation of tariffs for all links of the MMF chain as well as yarns and fabrics based on cotton fibre; accessories, dyes and chemicals are good but here the matter is in better practice.

Reflecting on the Agreement on Textiles and Clothing (ATC), the Compliance Officer at Kohinoor Textile Mills mentioned, "Despite the abolition of the quota regime under the Multi-Fiber Agreement (MFA), Pakistan's textile exports did not see the anticipated growth. This is due to both macro and micro-level distortions within the industry." The ATC's completion on December 31, 2004, was expected to bolster Pakistan's textile exports. The anticipated growth did not materialize significantly, attributed to various structural and regulatory challenges. These issues have hindered Pakistan's ability to leverage its comparative advantage in cotton production to become a leading exporter in the global textiles market.

### **Impact of These Policies on Organizational Performance**

The regulatory policies and their impact on organizational performance were discussed in detail by the respondents from both KTML and Interloop Ltd. The analysis of these impacts reveals both positive and negative aspects.

#### **1. Positive Impacts**

Compliance with government regulations, despite the associated costs, has led to an enhanced reputation for both KTML and Interloop Ltd. in the international market. Adhering to stringent environmental and social governance (ESG) standards has positioned these companies as responsible and sustainable organizations, attracting more global clients who prioritize sustainability. The Operations Manager of Interloop Ltd. noted, "Our compliance with ESG standards has significantly boosted our international reputation, making us more attractive to clients who value sustainability."

The need to comply with sustainability regulations has driven innovation within the organizations. Investments in energy-efficient technologies and waste management systems have not only helped in meeting regulatory requirements but also improved operational efficiency and reduced long-term costs. The Senior Manager at KTML stated, "Compliance with sustainability regulations has pushed us towards innovation, causing investments in energy-efficient technologies that have, in turn, improved our operational efficiency and reduced costs over time."

## **2. Negative Impacts**

KTML and Interloop Ltd. has indicated that they have had to incur more cost in operations because of the compliance needs. Such costs include the purchase of new techniques, conducting of audits, and the facilitating of training to the employees to meet the set regulatory requirements. Interloop Ltd.'s Senior Officer stated, "The compliance cost is high now, there are new technologies that have to be bought, audits done frequently, and the employees must be trained for a longer duration to adhere to the standards."

Recommending the update of this regulatory regime the Compliance Officer at KTML stated: "Besides the rising operational costs due to compliance with the out-of-date regulation, it also creates additional bureaucratic procedures in the process." While compliance with government regulations has improved the reputation and innovation portfolios of these companies, it has also posed certain costs and bureaucratic inconveniences. Mitigating these effects is however important as the ensure the stable growth of the textile industry in Pakistan.

### **4.2.2 Infrastructural Challenges**

The theme of infrastructural challenges was explored in detail with key respondents, including the Production Manager, Senior Manager, and Executive QA and Compliance Officer of Kohinoor Textile Mills (KTML), as well as the Operations Manager, Environmental Engineer, and Sustainability Coordinator of Interloop Ltd. Their insights provide a comprehensive understanding of the effectiveness of training programs and the infrastructural limitations and challenges faced by their respective organizations.

### **Training Programs for Skilled Labor**

Both KTML and Interloop Ltd. have implemented comprehensive training programs to enhance the skills of their labour force, ensuring compliance with sustainability standards and improving overall operational efficiency.

### **Technical Skills Development Program**

This program focuses on enhancing technical skills in various areas of textile manufacturing, including spinning, weaving, knitting, dyeing, printing, and garment production. Specialized training modules are designed for different departments to ensure that employees are well-versed in the specific technical requirements of their roles. The Production Manager at KTML highlighted, "Our technical skills development program has significantly improved the capabilities of our workforce, leading to higher efficiency in production processes."

### **Quality Assurance and Control Training**

The Quality Assurance and Control Training program aims to instil a strong understanding of quality control measures, quality assurance techniques, and product inspection procedures. Topics covered include quality standards, testing methodologies, defect identification, and corrective actions. This training ensures that employees can maintain high product standards, reducing the likelihood of defects and improving customer satisfaction. The Executive QA and Compliance Officer at KTML stated, "Our quality assurance training has fostered a culture of excellence, ensuring that our products meet stringent quality standards."

### **Lean Manufacturing and Process Improvement Training**

Employees are introduced to 5S, Value Stream Mapping, Kanban System, Kaizen, and reduction of waste methods. Reduced waste and optimal process is what is sought when speaking of operation efficiency and productivity enhancement. However, there is a Senior Manager in KTML who expressed that with the lean manufacturing in implementation the company saw an efficiency of operations, reducing waste tremendously.

### **Occupational Health and Safety Training**

Protecting the welfare of employees in relation to health and safety in their workplace is part of the Occupational Health and Safety Training program. They are areas of hazard identification, risk evaluation, work practice, and emergency response and protective measures, personal protective equipment. It is central for minimizing the incidents and promoting the employees' health, as well as surrounding everyone with safety and compliance. Interloop Ltd.'s Environmental Engineer was of the view saying, "We have laid major emphasis on the OH&S that minimized the incidence of workplace accidents and enhanced morale."

### **Effectiveness of Training Programs**

According to the responses provided by the participants from KTML, it was emphasised that the primary area of success in training the employees has been in enhancing the technical skills and compliance to quality requirements. In this aspect, it could be said that Technical Skills Development Program has in certain way improved these employments in different sectors of textile industry like spinning, weaving, knitting, dyeing, printing and garments. It has been effective in this organization to help minimize on defects and to enhance on production. Looking at the program Quality Assurance and Control Training program, the organization has been able to change the Employees' attitude towards Quality and this has enhanced customer satisfaction and minimized returns.

The Lean Manufacturing and Process Improvement Training program has also been effective, with employees adopting lean principles and tools such as 5S, value stream mapping, Kanban, and Kaizen. These techniques have contributed to waste reduction and optimized processes, resulting in improved operational efficiency. The Occupational Health and Safety Training program has ensured a safe working environment, reduced the risk of accidents, and enhanced employee well-being.

On the other hand, employees from Interloop Ltd. rated the intervention programs for increasing training and technical skills along with quality assurance, lean manufacturing, and occupational health and safety. They outlined certain difficulties of putting into practice these kinds of programs, especially in reference to the Pakistani governmental measures and the problem of qualified personnel. The Operations Manager at Interloop Ltd. added on the issue that despite the training programs at Interloop, limited government support in vocationally oriented trainings and the dearth of skilled workforce in the market are the issues that persist.

In case of Pakistan, one of the important issues includes scarcity of government patronage to vocational education as well as shortage of skilled workforce in the market. These disruption gaps are in turn addressed by Interlope's training programs but the rate of change of regulations is also slow, and workers need to be continuously trained for improvement. These notwithstanding, Interloop has since recorded significant accomplishments in its training and development that has seen a corresponding enhancement in quality of its products together with efficiency in operations. For instance, a Sustainability Coordinator of Interloop Ltd. stated, 'A lot has been done in terms of training and developing the required skills; however, the expectations and training requirements are constantly rising to meet the industry standards and expectations.

#### **4.2.3 Social Issues**

The procurement and supply chain departments of both Kohinoor Textile Mills (KTML) and Interloop Ltd. have highlighted significant social issues when dealing with local vendors and suppliers in Pakistan. A prominent challenge identified is the low moral status of these suppliers. This issue stems from several socio-economic factors intrinsic to Pakistan's developing status. "The economic disparity in Pakistan heavily influences social attitudes and behaviours. Vendors, often operating on thin margins, prioritize immediate financial gains over long-term relationships or ethical practices. This environment encourages substandard practices and non-compliance with regulations." This quote from a procurement specialist at KTML underlines the financial instability faced by local vendors, which pushes them to prioritize short-term gains over long-

term commitments. This practice can lead to quality issues, delivery delays, and a reluctance to adhere to environmental or labour regulations.

"The lack of comprehensive regulatory frameworks and inconsistent enforcement exacerbates the situation. Regulatory bodies often lack the resources or authority to enforce compliance uniformly, creating an environment where unethical practices can thrive." This insight from a supply chain manager at Interloop Ltd. highlights the regulatory gaps that allow unethical practices to flourish. Vendors may resort to cutting corners because the cost of compliance is perceived to be higher than the risk of penalty, given the inconsistent enforcement of regulations.

#### **Cultural Factors:**

In many developing countries, including Pakistan, business relationships are influenced by personal wealth and social standing. Vendors and suppliers from lower economic backgrounds may experience low morale and self-esteem, impacting their business interactions. They might feel disenfranchised and less inclined to uphold high standards, believing that their socio-economic status limits their business prospects. "Addressing these social issues requires a multi-faceted approach. Companies can foster fair trade practices, ensure timely payments, and invest in capacity-building initiatives for local suppliers. Improving regulatory frameworks and their enforcement can help elevate the overall moral and ethical standards within the supply chain." This statement from a senior procurement officer at Interloop Ltd. suggests that collaborative efforts between companies and regulatory bodies are crucial in addressing these social issues. By fostering fair trade practices and investing in capacity-building, companies can support local suppliers in adopting better practices.

Managing the workforce presents a distinct set of challenges for the HR manager at Interloop Ltd. and the Production Manager at Kohinoor Textile Mills. The primary issues stem from the low morale and educational levels of the labour force, which complicate workforce management.

"A significant portion of the industrial labour force comes from rural areas with limited access to quality education. This lack of educational background means many workers enter the workforce with minimal skills and little understanding of industrial best practices." This quote from the HR manager at Interloop Ltd. emphasizes the educational gap that hinders workers' ability to adapt to modern manufacturing techniques, safety protocols, and quality standards. This gap can lead to inefficiencies and lower productivity.

"Economic instability, low wages, and precarious working conditions contribute to a workforce that often feels undervalued and demotivated. When workers perceive that their efforts are not adequately recognized or rewarded, it leads to disengagement and reduced productivity." This statement from the production manager at KTML highlights the economic and motivational challenges faced by the workforce. Low wages and unstable working conditions contribute to low morale, which in turn affects productivity and engagement.

### **Strategies for Workforce Management**

Managing such a workforce requires significant effort and innovative strategies. One approach is to invest in comprehensive training programs that not only impart technical skills but also emphasize the importance of workplace ethics, safety, and quality. Regular training sessions can help bridge the knowledge gap and instil a sense of competence and confidence among workers.

"Fostering an inclusive and supportive work environment can significantly boost morale. Management should focus on clear communication, recognizing and rewarding good

performance, and providing opportunities for career advancement." This quote from the operations manager at Interloop Ltd. suggests that management can improve morale by creating a supportive work environment. Recognizing and rewarding good performance, along with providing career advancement opportunities, can motivate employees and improve productivity.

"In the context of Pakistan's socio-economic environment, it is essential for management to address the external factors affecting workers. Providing support in areas such as financial literacy, access to healthcare, and educational opportunities for workers' families can create a more stable and supportive environment." The following view from another senior manager at KTML suggests that outside issues influencing employees, including monetary concerns and diseases, can enhance the employees' motivation and productivity if dealt with. Through attending to the two aspects of the employees' lives, their families and other socio-economic needs of the workers, firms can then build a strong staff resource base.

## Chapter 5: Discussion and Conclusion

### 5.1 Conclusion

The analysis of regulatory, infrastructural, and social challenges faced by the textile industry in Pakistan, specifically through the lens of Kohinoor Textile Mills (KTML) and Interloop Ltd., reveals a complex interplay of factors that significantly impact organizational performance and sustainability efforts.

#### **Main Research Question was**

*What are the key challenges and opportunities for implementing sustainable supply chain practices in the textile sector of Pakistan, specifically within Interloop and Kohinoor Textile Mills?*

The government imposes sustainability regulations aimed at improving working conditions, sustainable product design, and adherence to environmental protection standards. The current regulatory regime is often outdated and adds costs without necessarily encouraging compliance. High tariffs intended to promote upstream investment have created inefficiencies, and the lack of robust enforcement of international compliance standards has hindered the sector's global competitiveness. Both Interloop and Kohinoor Textile Mills are impacted by these policies, which require substantial investments in sustainable technologies and processes, driving innovation and enhancing corporate reputations.

There are many courses introduced in both Interloop and Kohinoor Textile Mills to develop the capacity of employees in relation to training. Such programs are useful in enhancing production efficiency, quality, and safety standards of products in the respective organizations. Mizoram's infrastructural deficiencies are restricting factors, whereby energy crises, inadequate gas supply, and technology constraints have major issues. The other areas of concern that affects Interloop are the issues to do with government regulations and the shortage of skill workers. Thus, Kohinoor Textile Mills, which operates its own plant for diesel consumption to fulfil energy requirement, also faces issues of streetlights and other problems which are prevalent to the industry.

The social environment in the supply chain also has some issues that make its functioning more complicated. Suppliers lack moral values which is influenced by the socio-economic characteristics in the operating theatre of Pakistan. This impacts their read option to sustainable practices and the management of their supply chains. Maintaining social relationships compared to the workers and the management is complex because of the low morale and education standards of their human resource.

## **5.2 Research Contribution**

This research makes important contributions by addressing key gaps in sustainable supply chain practices in Pakistan's textile industry. Through interviews with experts from Interloop and Kohinoor Textile Mills (KTML), it identifies and provides insights into various challenges affecting the sector. By aligning these findings with existing research gaps, this study bridges the gap between theory and real-world experiences.

Previous studies highlight the complexity of Pakistan's regulatory landscape, especially concerning sustainability rules (Khan & Khan, 2010). However, there is a lack of detailed research on how these regulations impact organizational performance (Tanveer & Zafar, 2012). This research addresses this gap by showing how outdated regulatory systems increase costs instead of encouraging compliance. Interloop and KTML's consultants also observe that high tariffs that are implemented for the purpose of improving the upstream investment also creates inefficiencies and tends to focus on the domestic instead of export markets. This work contributes to the existing literature that demonstrated the functioning of regulatory policies in practice and which forms the ground for enhancement of these frameworks for promoting sustainability.

There is little knowledge of concrete structures of sustainability preventing implementation in the textile industry (Shah et al., 2012). This research addresses this gap by explaining how energy crises such as erratic gas supply and constant power blackouts, affect production. Forcing carries inefficiencies and use of old machinery also restricts productivity and competitiveness on the international market. The specialists of KTML report that in this case, they rely on a diesel-based

power plant, which is expensive and disadvantageous. This work brings to the awareness of the required investment in modern technologies and reliable energy sources for future development.

The social issues within the textual content of the textile provide chain, significantly with suppliers and employees, want additional depth analysing (Kazancoglu et al., 2020; Baraldi & Nadin, 2006). This research also establishes how socio-economic factors determine the morale of local suppliers and how this hurts the supply chain. It also discusses challenges related to arranging for a workforce that is often unmotivated and with often little formal education which limits other improvements for sustainable management. Regarding the training and development, HR and production managers pointed out the importance of developing specific programmes and social sustainability measures.

There is a gap in examining how effective training programs are in enhancing sustainability practices (Shah, Walayat, Ali Warraich, Usman & Kabeer, 2012; Franco, 2017). This research assesses various training initiatives aimed at technical skills, quality assurance, lean manufacturing and occupational health and safety. While experts acknowledge the positive impacts of these programs, they also point out challenges in implementation due to regulatory constraints and a lack of skilled labour.

This research provides a thorough analysis of the regulatory, infrastructural, and social challenges faced by Pakistan's textile industry. By integrating industry experts' perspectives with existing research gaps, it offers valuable contributions to both academic literature and practical applications, helping to inform better policies and strategies for achieving sustainability in the textile sector.

## 5.3 Recommendations

### 5.3.1 Regulatory Reforms

1. **Update Regulatory Framework:** The Pakistani government should focus on the further improvement of the existing legal framework that regulates the textile sector. The current system is characterized by a set of restrictions that can be hardly categorized as compliance-driven but rather result in additional organizational overhead due to emerging lawyers' practices. It should be noted that state regulation, which needs revising, can explain this situation by providing incentives for adopting environmentally friendly practices, such as tax credits or grants for organisations. This can invariably promote a culture of compliance and innovation thus enhancing the textile sector's sustainability and competitiveness (Koberg & Longoni, 2019).
2. **Rationalize Tariffs:** High tariff protection regime, which has been mostly employed in the upstream link of the chain, creates inefficiency and high domestic prices and this is fatal for the exporting Pakistani textiles to have competitive price in the international market. The rationalized tariff structure should be worked out for different value additions, MMF as well as value additions in cotton, accessories, and dyes. The government for instance can reduce tariffs selectively to bring down costs and increase efficiency as well as boost export productivity ensuring domestic industries can successfully penetrate the global markets (Becerra et al., 2022).
3. **Strengthen Enforcement:** To improve Pakistan's standing in the global textile market, it is essential to strengthen the enforcement of international compliance standards. This includes adopting and rigorously enforcing global best practices related to labour rights, environmental protection, and quality standards. Strengthening enforcement mechanisms can involve regular audits, stringent penalties for non-compliance, and collaboration with international bodies to ensure adherence to global standards. Such measures will not only enhance the reputation of Pakistani textiles but also open up new markets and opportunities for growth (Bratt et al., 2021).

### 5.3.2 Infrastructural Improvements

1. **Enhance Training Programs:** It is vital to strengthen and refresh the training processes so that the staff would be qualified to perform their tasks effectively. Some of the programs include technical skills, quality assurance, lean manufacturing, and occupational health and safety; should be updated from time to time depending on the current trends within the industry and the endorsed technological advancement. For instance, targeted training methods may be incorporated for various divisions in the textile production stream to enhance the enterprise's performance. Besides, the use of technology-based learning solutions can help create conditions for constant learning and personal growth of the personnel (Scheuch et al., 2021).
2. **Invest in Technology:** To become efficient Interloop and Kohinoor Textile Mills should focus on the effective machinery and technologies to improve production line. New technologies, better equipment are good investments because; energy consumption, wastage and product quality will be enhanced. Subsidization or low interest on loans is a way through which the government can encourage investment on technology upgrades. In addition, the implementation of sophisticated technologies including automation, data analysis, and IoT enhance manufacturing procedures, cut costs, and enhance organizational decision-making power.
3. **Address Energy Issues:** Some of the problems that have been noted to affect the textile industry in Pakistan centre mainly on energy supply which consists of gas crisis and load shedding. To tackle such problems, it is advisable for the firms to look for other forms of energy like solar, wind and biomass. Emphasis on development of renewable power plants will ensure adequate supply of power while in the process minimizing the reliance on conventional sources of energy thus improving the operations and costs in the long run. Other methods to support energy reductions are to ensure the use of modern energy efficient equipment in production as well as establishment of efficient working schedules.

### 5.3.3 Social Initiatives

1. **Supplier Development Programs:** Another critical factor that needs to be addressed is that of suppliers, where it is necessary to establish efficient and all-encompassing supplier development programs that will enhance the suppliers' adherence to higher social and ethical measures. These programs should train the suppliers in matters related to sustainable management, ethical behaviour, and accordant standards. Another approach to ensuring that the suppliers conform to the firm's standards is by giving the suppliers incentives for conforming to the established standards like amicable contracts or sponsorships. It is imperative to maintain an accountability check with the help of audits and monitoring to minimize the deviation from such standards and gradually and constantly make the supply chain more responsible and sustainable.
2. **Enhance Worker Engagement:** Having programmes aimed at boosting the morale and knowledge of the workforce is important in the provision of a competent workforce. It can entail coverage details such as the enforcement of more training sessions on technical matters including quality/quantity standards and safety precautions, as well as appreciation trainings, more so appreciation programs to outstanding performers. Improving on the ways through which workers and management interact can also improve on the levels of transparency, trust, and constructive cooperation. Education, which includes literacy and vocation, can help a worker enhance his or her existence by delivering educational services to the workers.
3. **Foster Inclusivity:** Encouraging multiculturalism at the workplace remains crucial given that it enhances the appreciation of Diversity, Acceptance, and Engagement by workers on the firm's payroll. Team activities, participative decision-making, and diversity programs contribute to the improvement of organizational culture for employees' support. The involvement of the employees in decision-making could help in boosting satisfaction, creativity and production. There are other policies associated with working conditions, work-life balance, and flexibility in working hours and practises that might enhance the organisation's employees' morale and retention even more.

## 6. References

1. Abbate, S., Centobelli, P., Cerchione, R., Nadeem, S. P., & Riccio, E. (2024). Sustainability trends and gaps in the textile, apparel and fashion industries. In *Environment, Development and Sustainability* (Vol. 26, Issue 2). <https://doi.org/10.1007/s10668-022-02887-2>
2. Abelairas-Etxebarria, P., & Astorkiza, I. (2020). From exploratory data analysis to exploratory spatial data analysis. *Mathematics and Statistics*, 8(2). <https://doi.org/10.13189/ms.2020.080202>
3. Ahmed, M. I. (1996). Challenges and role of Pakistan textile industry. *Pakistan Textile Journal*, 45(4).
4. Ahmed Ullah, A., & M Foisal, A. B. (2019). A review on Sustainable Textile Products from Jute and Cotton Blends. *SEU Journal of Science and Engineering*, 13(1).
5. Alexander, A., Walker, H., & Naim, M. (2014). Decision theory in sustainable supply chain management: A literature review. *Supply Chain Management*, 19. <https://doi.org/10.1108/SCM-01-2014-0007>
6. Atstja, D., Cudečka-Puriņa, N., Vesere, R., Abele, L., & Spivakovskyy, S. (2021). Challenges of textile industry in the framework of Circular Economy: Case from Latvia. *E3S Web of Conferences*, 255. <https://doi.org/10.1051/e3sconf/202125501014>
7. Avison, W. R., & Stewart, D. W. (1986). Secondary Research: Information Sources and Methods. *Canadian Journal of Sociology / Cahiers Canadiens de Sociologie*, 11(2). <https://doi.org/10.2307/3340803>
8. Awan, U., & Sroufe, R. (2022). Sustainability in the Circular Economy: Insights and Dynamics of Designing Circular Business Models. *Applied Sciences (Switzerland)*, 12(3). <https://doi.org/10.3390/app12031521>
9. Baig, S. A., Abrar, M., Batool, A., Hashim, M., & Shabbir, R. (2020). Barriers to the adoption of sustainable supply chain management practices: Moderating role of firm size. *Cogent Business and Management*, 7(1). <https://doi.org/10.1080/23311975.2020.1841525>
10. Banik, N., Ghosh, B., & Choudhury, R. R. (2021). Impact of MGNREGA on labour wage rate dynamics in India. *Regional Statistics*, 11(1). <https://doi.org/10.15196/RS110106>

11. Barros, M. V., Salvador, R., do Prado, G. F., de Francisco, A. C., & Piekarski, C. M. (2021). Circular economy as a driver to sustainable businesses. In *Cleaner Environmental Systems* (Vol. 2). <https://doi.org/10.1016/j.cesys.2020.100006>
12. Bathrinath, S., Bhalaji, R. K. A., & Saravanasankar, S. (2021). Risk analysis in textile industries using AHP-TOPSIS. *Materials Today: Proceedings*, 45. <https://doi.org/10.1016/j.matpr.2020.04.722>
13. Becerra, P., Mula, J., & Sanchis, R. (2022). Sustainable Inventory Management in Supply Chains: Trends and Further Research. *Sustainability (Switzerland)*, 14(5). <https://doi.org/10.3390/su14052613>
14. Bosona, T. (2020). Urban freight last mile logistics—challenges and opportunities to improve sustainability: A literature review. *Sustainability (Switzerland)*, 12(21). <https://doi.org/10.3390/su12218769>
15. Bratt, C., Sroufe, R., & Broman, G. (2021). Implementing strategic sustainable supply chain management. *Sustainability (Switzerland)*, 13(15). <https://doi.org/10.3390/su13158132>
16. Brügel, M. (2016). Global Organic Textile Standard. In *Zertifizierung als Erfolgsfaktor*. [https://doi.org/10.1007/978-3-658-09701-1\\_12](https://doi.org/10.1007/978-3-658-09701-1_12)
17. Bui, T. D., Ali, M. H., Tsai, F. M., Iranmanesh, M., Tseng, M. L., & Lim, M. K. (2020). Challenges and Trends in Sustainable Corporate Finance: A Bibliometric Systematic Review. *Journal of Risk and Financial Management*, 13(11). <https://doi.org/10.3390/jrfm13110264>
18. Caccialanza, A., Cerrato, D., & Galli, D. (2023). Sustainability practices and challenges in the meat supply chain: a systematic literature review. In *British Food Journal* (Vol. 125, Issue 12). <https://doi.org/10.1108/BFJ-10-2022-0866>
19. Chohan, S. R., & Hu, G. (2022). Strengthening digital inclusion through e-government: cohesive ICT training programs to intensify digital competency. *Information Technology for Development*, 28(1). <https://doi.org/10.1080/02681102.2020.1841713>
20. Corvellec, H., Stowell, A. F., & Johansson, N. (2022). Critiques of the circular economy. *Journal of Industrial Ecology*, 26(2). <https://doi.org/10.1111/jiec.13187>
21. Crossley, J. (2021). Saunders' Research Onion: Explained Simply (+ Examples) - Grad Coach. In *Grad Coach webpage* (Issue 2007).

22. Demir, S., & Paksoy, T. (2023). Just-in-Time and Lean Management. In *Smart and Sustainable Operations and Supply Chain Management in Industry 4.0*.  
<https://doi.org/10.1201/9781003180302-11>
23. Dhonde, B., & Patel, C. R. (2020). Implementing circular economy concepts for sustainable urban freight transport: Case of textile manufacturing supply chain. *Acta Logistica*, 7(2).  
<https://doi.org/10.22306/al.v7i2.172>
24. DVYKALIUK, R., ADAMCHUK, L., ANTONIV, A., & SEVIN, S. (2022). REVIEW OF NATIONAL REGULATORY REQUIREMENTS FOR PROPOLIS QUALITY FOR COMPLIANCE WITH INTERNATIONAL STANDARDS. *Animal Science and Food Technology*, 13(2).  
[https://doi.org/10.31548/animal.13\(2\).2022.16-25](https://doi.org/10.31548/animal.13(2).2022.16-25)
25. Fadara, T. G., & Wong, K. Y. (2023). A decision support system for sustainable textile product assessment. *Textile Research Journal*, 93(9–10).  
<https://doi.org/10.1177/00405175221135167>
26. Farhate, A., Elboq, R., Tetouani, S., & Soulhi, A. (2021). Location selection for a textile manufacturing facility using neural network. *Journal of Theoretical and Applied Information Technology*, 99(21).
27. Giavina, L., & Rodighiero, I. (2006). Textile wastewater treatment & recycling aimed to zero discharge. *Pakistan Textile Journal*, 55(3).
28. GOTS. (2017). Global Organic Textile Standard Version 5.0. *Global Organic Textile Standard International Working Group (IWG), Version 5.0*.
29. GOTS, G. O. T. S. (2020). Global Organic Textile Standard (GOTS). Version 6.0. *Zertifizierung Als Erfolgsfaktor, March 2020*.
30. Grafström, J., & Aasma, S. (2021). Breaking circular economy barriers. In *Journal of Cleaner Production* (Vol. 292). <https://doi.org/10.1016/j.jclepro.2021.126002>
31. Gruner, R. L., & Power, D. (2017). Mimicking natural ecosystems to develop sustainable supply chains: A theory of socio-ecological intergradation. In *Journal of Cleaner Production* (Vol. 149). <https://doi.org/10.1016/j.jclepro.2017.02.109>
32. Habib, M. A., Bao, Y., Nabi, N., Dulal, M., Asha, A. A., & Islam, M. (2021). Impact of strategic orientations on the implementation of green supply chain management practices and

- sustainable firm performance. *Sustainability (Switzerland)*, 13(1). <https://doi.org/10.3390/su13010340>
33. Hashmi, A., Azeem Ahmad, M., Ali, S., & Hashmi Assistant Professor, A. (2021). The Impact of Green and Social Network Marketing and Marketing Strategies on the Textile Business Performance in Pakistan: Moderating Role of Consumer Behavior. *Systematic Reviews in Pharmacy*, 12(02).
  34. Hastings, C., & Weate, J. (2018). Local governments and social enterprise: Meeting community challenges together? In *Social Capital and Enterprise in the Modern State*. [https://doi.org/10.1007/978-3-319-68115-3\\_6](https://doi.org/10.1007/978-3-319-68115-3_6)
  35. IFRS. (2022). *International Sustainability Standards Board*. IFRS.
  36. Imran, M., ul Hameed, W., & ul Haque, A. (2018). Influence of Industry 4.0 on the production and service sectors in Pakistan: Evidence from textile and logistics industries. *Social Sciences*, 7(12). <https://doi.org/10.3390/socsci7120246>
  37. Islam, Md. T., Jahan, R., Jahan, M., Howlader, Md. S., Islam, R., Islam, Md. M., Hossen, Md. S., Kumar, A., & Robin, A. H. (2022). Sustainable Textile Industry: An Overview. *Non-Metallic Material Science*, 4(2). <https://doi.org/10.30564/nmms.v4i2.4707>
  38. Iyer, G. (2000). ADVANCED SUPPLY CHAIN MANAGEMENT (Book). *Journal of Business-to-Business Marketing*, 7(1).
  39. Jäämaa, L., & Kaipia, R. (2022). The first mile problem in the circular economy supply chains – Collecting recyclable textiles from consumers. *Waste Management*, 141. <https://doi.org/10.1016/j.wasman.2022.01.012>
  40. Jacobs, D. C. W. (2024). Secondary Data in Mixed Methods Research. In *Secondary Data in Mixed Methods Research*. <https://doi.org/10.4135/9781071938997>
  41. Kamble, S. S., Gunasekaran, A., & Gawankar, S. A. (2020). Achieving sustainable performance in a data-driven agriculture supply chain: A review for research and applications. In *International Journal of Production Economics* (Vol. 219). <https://doi.org/10.1016/j.ijpe.2019.05.022>
  42. Karim, R., Ahammed, T., Hossen, S., Nazmus Sakib, N. x, & Mohaimin, S. M. (2021). Challenges To Sustainable Supply Chain Management And Their Interrelation In The Apparel

- Sector Of Bangladesh: A Dematel Approach. *European Scientific Journal ESJ*, 17(15).  
<https://doi.org/10.19044/esj.2021.v17n15p409>
43. Kaul, R. (2015). Gender Inequality: Challenges of Educating the Girl Child. *Social Change*, 45(2). <https://doi.org/10.1177/0049085715574183>
  44. Kesici, M. R. (2022). Labour Market Segmentation within Ethnic Economies: The Ethnic Penalty for Invisible Kurdish Migrants in the United Kingdom. *Work, Employment and Society*, 36(2). <https://doi.org/10.1177/09500170211034761>
  45. Khan, A. A., & Khan, M. (2010). Pakistan Textile Industry Facing New Challenges. *Research Journal of International Studies-Issue*, 14(14).
  46. Khwaja, M. G. (2014). The Impacts of Quality Management on Performance: A Case Study of Kohinoor Textile. *INTERDISCIPLINARY JOURNAL OF CONTEMPORARY RESEARCH IN BUSINESS*, 5(9).
  47. Kirchherr, J., Reike, D., & Hekkert, M. (2017). Conceptualizing the circular economy: An analysis of 114 definitions. In *Resources, Conservation and Recycling* (Vol. 127). <https://doi.org/10.1016/j.resconrec.2017.09.005>
  48. Koberg, E., & Longoni, A. (2019). A systematic review of sustainable supply chain management in global supply chains. In *Journal of Cleaner Production* (Vol. 207). <https://doi.org/10.1016/j.jclepro.2018.10.033>
  49. Köster, J., Mölder, F., Jablonski, K. P., Letcher, B., Hall, M. B., Tomkins-Tinch, C. H., Sochat, V., Forster, J., Lee, S., Twardziok, S. O., Kanitz, A., Wilm, A., Holtgrewe, M., Rahmann, S., & Nahnsen, S. (2021). Sustainable data analysis with Snakemake. *F1000Research*, 10. <https://doi.org/10.12688/f1000research.29032.2>
  50. Kumar, N. M., & Chopra, S. S. (2022). Leveraging Blockchain and Smart Contract Technologies to Overcome Circular Economy Implementation Challenges. *Sustainability (Switzerland)*, 14(15). <https://doi.org/10.3390/su14159492>
  51. Küsters, D., Praß, N., & Gloy, Y. S. (2017). Textile Learning Factory 4.0 – Preparing Germany's Textile Industry for the Digital Future. *Procedia Manufacturing*, 9. <https://doi.org/10.1016/j.promfg.2017.04.035>

52. Liu, Y. (2022). Paradigmatic Compatibility Matters: A Critical Review of Qualitative-Quantitative Debate in Mixed Methods Research. *SAGE Open*, 12(1). <https://doi.org/10.1177/21582440221079922>
53. Lorente-Leyva, L. L., Alemany, M. M. E., & Peluffo-Ordóñez, D. H. (2024). A conceptual framework for the operations planning of the textile supply chains: Insights for sustainable and smart planning in uncertain and dynamic contexts. *Computers and Industrial Engineering*, 187. <https://doi.org/10.1016/j.cie.2023.109824>
54. Lu, H., Zhao, G., & Liu, S. (2024). Integrating circular economy and Industry 4.0 for sustainable supply chain management: a dynamic capability view. *Production Planning and Control*, 35(2). <https://doi.org/10.1080/09537287.2022.2063198>
55. Management. (2022). Secondary Research: Definition, methods, & examples. *Qualtrics*.
56. Marculetiu, A., Ataseven, C., & Mackelprang, A. W. (2023). A review of how pressures and their sources drive sustainable supply chain management practices. *Journal of Business Logistics*, 44(2). <https://doi.org/10.1111/jbl.12332>
57. Marquesone, R. de F. P., & Carvalho, T. C. M. de B. (2022). Examining the Nexus between the Vs of Big Data and the Sustainable Challenges in the Textile Industry. *Sustainability (Switzerland)*, 14(8). <https://doi.org/10.3390/su14084638>
58. Moretti, L., Milani, M., Lozza, G. G., & Manzolini, G. (2021). A detailed MILP formulation for the optimal design of advanced biofuel supply chains. *Renewable Energy*, 171. <https://doi.org/10.1016/j.renene.2021.02.043>
59. Morseletto, P. (2020). Targets for a circular economy. *Resources, Conservation and Recycling*, 153. <https://doi.org/10.1016/j.resconrec.2019.104553>
60. Mukwarami, S., Nkwaira, C., & van der Poll, H. M. (2023). Environmental Management Accounting Implementation Challenges and Supply Chain Management in Emerging Economies' Manufacturing Sector. *Sustainability (Switzerland)*, 15(2). <https://doi.org/10.3390/su15021061>
61. Nazam, M., Hashim, M., Nută, F. M., Yao, L., Zia, M. A., Malik, M. Y., Usman, M., & Dimen, L. (2022). Devising a Mechanism for Analyzing the Barriers of Blockchain Adoption in the

- Textile Supply Chain: A Sustainable Business Perspective. *Sustainability (Switzerland)*, 14(23). <https://doi.org/10.3390/su142316159>
62. Nguyen Viet, B., & Nguyen Anh, T. (2021). The role of selected marketing mix elements in consumer based brand equity creation: milk industry in Vietnam. *Journal of Food Products Marketing*, 27(2). <https://doi.org/10.1080/10454446.2021.1892007>
  63. O'Dwyer, Jerry, Renner, & Ryan. (2011). The Promise of Advanced Supply Chain analytics. *Business and Economics- Management*, 15(1).
  64. Oliveira, S., Oliveira, J. A., Dias, L. S., & Pereira, G. (2011). Modeling and simulating a textile production system. *ESM 2011 - 2011 European Simulation and Modelling Conference: Modelling and Simulation 2011*.
  65. Oseghale, B. O. ;, Dr Abiola-Falemu, J. O. ;, & Oseghale, G. E. (2015). An Evaluation of Skilled Labour shortage in selected construction firms in Edo state, Nigeria. *American Journal of Engineering Research* , 4(1).
  66. Peloquin, D., DiMaio, M., Bierer, B., & Barnes, M. (2020). Disruptive and avoidable: GDPR challenges to secondary research uses of data. In *European Journal of Human Genetics* (Vol. 28, Issue 6). <https://doi.org/10.1038/s41431-020-0596-x>
  67. Prasad, S. R., Kumbhar, V. B., & Prasad, N. R. (2024). Applications of Nanotechnology in Textile: A Review. In *ES Food and Agroforestry* (Vol. 15). <https://doi.org/10.30919/esfaf1019>
  68. Rese, A., Baier, D., & Rausch, T. M. (2022). Success factors in sustainable textile product innovation: An empirical investigation. *Journal of Cleaner Production*, 331. <https://doi.org/10.1016/j.jclepro.2021.129829>
  69. Robinson, O. C. (2014). Sampling in Interview-Based Qualitative Research: A Theoretical and Practical Guide. *Qualitative Research in Psychology*, 11(1). <https://doi.org/10.1080/14780887.2013.801543>
  70. Roche, J., Yudha, E., & Roche, J. S. (2023). Seeds of change: how will the creation of the International Sustainability Standards Board affect sustainability reporting by agribusiness? *Qeios*.

71. Saleeshya, P. G., Rajan, V., & Premkumar, N. (2019a). Optimising the financial performance of supply chain - a case study. *International Journal of Advanced Operations Management*, 11(3). <https://doi.org/10.1504/IJAOM.2019.100711>
72. Saleeshya, P. G., Rajan, V., & Premkumar, N. (2019b). Optimising the financial performance of supply chain - a case study. *International Journal of Advanced Operations Management*, 11(3). <https://doi.org/10.1504/ijaom.2019.10021913>
73. Sánchez-Flores, R. B., Cruz-Sotelo, S. E., Ojeda-Benitez, S., & Ramírez-Barreto, M. E. (2020). Sustainable supply chain management-A literature review on emerging economies. In *Sustainability (Switzerland)* (Vol. 12, Issue 17). <https://doi.org/10.3390/SU12176972>
74. Sarfo, J. O., Debrah, T. P., Gbordzoe, N. I., Afful, W. T., & Obeng, P. (2021). Qualitative Research Designs, Sample Size and Saturation: Is Enough Always Enough? *Journal of Advocacy, Research and Education*, 8(3). <https://doi.org/10.13187/jare.2021.3.60>
75. Scheuch, I., Peters, N., Lohner, M. S., Muss, C., Aprea, C., & Fürstenau, B. (2021). Resilience Training Programs in Organizational Contexts: A Scoping Review. In *Frontiers in Psychology* (Vol. 12). <https://doi.org/10.3389/fpsyg.2021.733036>
76. Schneider, L., & Wallenburg, C. M. (2012). Implementing sustainable sourcing-Does purchasing need to change? *Journal of Purchasing and Supply Management*, 18(4). <https://doi.org/10.1016/j.pursup.2012.03.002>
77. Secondary Research Methods in the Built Environment. (2021). In *Secondary Research Methods in the Built Environment*. <https://doi.org/10.1201/9781003000532>
78. Shafqat, S. Z., Mahmood, K., & Imran, M. (2023a). Analyzing the Moderating Role of Employee Involvement in the Relationship between Sustainable Supply Chain Practices and Sustainable Performance. *Pakistan Journal of Humanities and Social Sciences*, 11(3). <https://doi.org/10.52131/pjhss.2023.1103.0652>
79. Shafqat, S. Z., Mahmood, K., & Imran, M. (2023b). Analyzing the Moderating Role of Employee Involvement in the Relationship between Sustainable Supply Chain Practices and Sustainable Performance. *Pakistan Journal of Humanities and Social Sciences*, 11(3). <https://doi.org/10.52131/pjhss.2023.1103.0652>

80. Shah, A., Soomro, M. A., Zahid Piprani, A., Yu, Z., & Tanveer, M. (2023). Sustainable supply chain practices and blockchain technology in garment industry: an empirical study on sustainability aspect. *Journal of Strategy and Management*. <https://doi.org/10.1108/JSMA-04-2023-0080>
81. Shah, F., Liu, Y., Shah, Y., & Shah, F. (2022). Trade credit promotes industrial growth during the COVID-19 pandemic: Evidence from the textile sector of Pakistan. *R-Economy*, 8(1). <https://doi.org/10.15826/recon.2022.8.1.006>
82. Shah, S. A. S., G. Syed, A. S., & M. Shaikh, F. (2014). Impact of Textile Industry on Pakistan Economy. *Romanian Statistical Review - Supplement*, 3(3).
83. Shah, Walayat, Ali warraich, Usman and Kabeer, K. (2012). Challenges Faced by Textile Industry of Pakistan: Suggested Solutions Walayat Shah 1 , Usman Ali Warraich 2 and Kazi Kabeer 3. *Journal, Kasbit Business*, 39.
84. Shaikh, Faiz. M., Gopang, N. A., & Shafiq, K. (2011). Global Financial Crisis And Its Impact On Textile Industry In Pakistan. *Journal of Business Case Studies (JBSCS)*, 7(3). <https://doi.org/10.19030/jbcs.v7i3.4260>
85. Sharafuddin, M. A., Madhavan, M., & Chaichana, T. (2022). The Effects of Innovation Adoption and Social Factors between Sustainable Supply Chain Management Practices and Sustainable Firm Performance: A Moderated Mediation Model. *Sustainability (Switzerland)*, 14(15). <https://doi.org/10.3390/su14159099>
86. Sharma, E., & Singla, J. (2021). Sustainable supply chain practices (sscps) and organizational performance: A mediating role of functional constructs. *Operations and Supply Chain Management*, 14(4). <https://doi.org/10.31387/oscm0470316>
87. Shukla, S. (2014). Emerging Issues and Challenges for HRM in Public Sectors Banks of India. *Procedia - Social and Behavioral Sciences*, 133. <https://doi.org/10.1016/j.sbspro.2014.04.201>
88. Singh, P., Elmi, Z., Krishna Meriga, V., Pasha, J., & Dulebenets, M. A. (2022). Internet of Things for sustainable railway transportation: Past, present, and future. *Cleaner Logistics and Supply Chain*, 4. <https://doi.org/10.1016/j.clscn.2022.100065>

89. Siramaneerat, I., & Chaowilai, C. (2022). Impact of specialized physical training programs on physical fitness in athletes. *Journal of Human Sport and Exercise*, 17. <https://doi.org/10.14198/jhse.2022.172.18>
90. Smith, P. (2014). Project Cost Management – Global Issues and Challenges. *Procedia - Social and Behavioral Sciences*, 119. <https://doi.org/10.1016/j.sbspro.2014.03.054>
91. Stats SA. (2022). Quarterly Labour Force Survey. *Quarterly Labour Force Survey, March*.
92. Suchek, N., Fernandes, C. I., Kraus, S., Filser, M., & Sjögrén, H. (2021). Innovation and the circular economy: A systematic literature review. *Business Strategy and the Environment*, 30(8). <https://doi.org/10.1002/bse.2834>
93. Taherdoost, H. (2020). Different Types of Data Analysis; Data Analysis Methods and Techniques in Research Projects. *International Journal of Academic Research in Management (IJARM)*, 9(1).
94. Takona, J. P. (2024). Research design: qualitative, quantitative, and mixed methods approaches / sixth edition. In *Quality and Quantity* (Vol. 58, Issue 1). <https://doi.org/10.1007/s11135-023-01798-2>
95. Tara, N., Arslan, M., Hussain, Z., Iqbal, M., Khan, Q. M., & Afzal, M. (2019). On-site performance of floating treatment wetland macrocosms augmented with dye-degrading bacteria for the remediation of textile industry wastewater. *Journal of Cleaner Production*, 217. <https://doi.org/10.1016/j.jclepro.2019.01.258>
96. The Rise and Fall of Pakistan's Textile Industry: An Analytical View. (2020). *European Journal of Business and Management*. <https://doi.org/10.7176/ejbm/12-12-12>
97. UK Essays. (2018). *Research Onion - Explanation of the Concept*. Essays,.
98. van Wyk, M., & Els, G. (2023). The relevance of integrated reporting in future standard setting of the International Sustainability Standards Board. *Frontiers in Sustainability*, 4. <https://doi.org/10.3389/frsus.2023.1218985>
99. Velenturf, A. P. M., & Purnell, P. (2021). Principles for a sustainable circular economy. In *Sustainable Production and Consumption* (Vol. 27). <https://doi.org/10.1016/j.spc.2021.02.018>

100. Warasthe, R., Brandenburg, M., & Seuring, S. (2022). Sustainability, risk and performance in textile and apparel supply chains. In *Cleaner Logistics and Supply Chain* (Vol. 5). <https://doi.org/10.1016/j.clscn.2022.100069>
101. Yu, H., Solvang, W. D., & Chen, C. (2014). A green supply chain network design model for enhancing competitiveness and sustainability of companies in high north arctic regions. *International Journal of Engery and Environment*, 5(4).
102. Zhang, X. C., Kuchinke, L., Woud, M. L., Velten, J., & Margraf, J. (2017). Survey method matters: Online/offline questionnaires and face-to-face or telephone interviews differ. *Computers in Human Behavior*, 71. <https://doi.org/10.1016/j.chb.2017.02.006>
103. Zubair, M., Farid, M., Danish, M., & Zafar, M. N. (2017). Evaluation of air pollution sources in selected zone of textile industries in Pakistan. *Environmental Engineering and Management Journal*, 16(2). <https://doi.org/10.30638/eemj.2017.037>

## 7. Appendix

### Interview Questions

Hello, my name is **Tariq Ali Malik**, and I am a student pursuing a Master in Business and Industrial Management at the University of Vasa. I am currently conducting a research project titled "*Navigating Sustainable Supply Chains in Pakistan's Textile Industry: Addressing Regulatory, Infrastructural, and Social Challenges for Enhanced Sustainability.*"

Your insights and experiences will be invaluable in understanding the key challenges and opportunities for enhancing sustainability in this industry.

Your participation is voluntary, and you may withdraw from the study at any time without any consequences. By proceeding with this interview, you consent to the use of your responses for the purposes of this research. Thank you for your time and contribution.

*By signing below, you acknowledge that you have read and understood the consent statement and agree to participate in this study.*

Signature: \_\_\_\_\_

Date: \_\_\_\_\_

### Basic Information

1. **Would you like to state the name of your organization? (Optional)**

Name of Organization: \_\_\_\_\_

2. **What is your current role within the organization?**

Current Role: \_\_\_\_\_

3. **Can you briefly describe your primary responsibilities in your current role?**

Primary Responsibilities: \_\_\_\_\_

4. **How many years of experience do you have in the textile industry?**

Years of Experience: \_\_\_\_\_

### Interview Questions

#### 1. Regulatory Challenges

**What sustainability rules and regulations does the government of Pakistan impose on operations?**

Answer: \_\_\_\_\_

**How do these government regulations impact your organization's performance?**

Answer: \_\_\_\_\_

#### 2. Infrastructural Challenges

**What training programs does your organization use to educate labour?**

Answer: \_\_\_\_\_

**How effective are these training programs for your organization?**

Answer: \_\_\_\_\_

**What are the main infrastructural limitations, such as facilities and technology, that your organization faces in implementing sustainable practices?**

Answer: \_\_\_\_\_

<b>3. Social Challenges</b>
-----------------------------

**What major issues arise when working with suppliers on social and environmental performance?**

Answer: \_\_\_\_\_

**How different is it to manage relationships between workers and the management team?**

Answer: \_\_\_\_\_