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Sustainable Supply Chain Management and Operational Performance: The Roles of Lean Management and Supply Chain Agility in Pakistan's Textile Industry

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Abstract

The purpose of this study is to explore the connection between Supply Chain Agility, Lean Management, Sustainable Supply Chain, and Operational Performance. Operational Performance in Pakistan is vital for protecting the environment and reducing pollution from heavy industries. In this study, primary data sources and quantitative research were used as well. The research design of this study is correlational to evaluate the relationship between variables. This study selected a population that included top management, middle management, and textile mills in Punjab, Pakistan. Data was collected through a questionnaire that consisted of a five-point Likert scale. We distributed data to 400 employees of textile mills through Google Forms and physically, but we received only 350 accurate questionnaires. For data analysis, we used SPSS v26 and Smart PLS 3.3.7. The results of this study revealed the significant positive impact of SSCM on OP, a partially significant impact of LM on OP, and an insignificant impact of SCA on OP. The future recommendation of this study is to conduct further investigation on OP with other factors or variables, and researchers can conduct future studies in another region.

KEYWORDS: Supply Chain Agility, Lean Management, Sustainable Supply Chain Management, Operational Performance.

1. INTRODUCTION

Pakistan's textile sector is essential to its economy, mainly because of its contribution to its gross domestic product, employment, and export earnings (Ahmad, Ahmad, & Malik, 2020). A significant amount of Pakistan's export revenue comes from the textile sector. Because of the importance of the cotton and textile industries globally, efficient supply chain management describes the country's operations (Jalees, 2023). In the textile sector, "supply chain management (SCM)" is crucial for improving productivity, reducing costs, and ensuring customer satisfaction (Awan & Khan, 2021).

Over the past many years, "Supply Chain Agility, Lean Management, and Sustainable Supply Chain Management frameworks have emerged as one of the most effective approaches to improving organizational performance. "Supply Chain Agility (SCA)" means the capability of an organization to respond to customer demands and other market conditions in the shortest time possible, which is applicable more often in the apparel textile industry, as it is characterized by oscillating demand and changing trends (Syromyatnikov, Geiko, Kuashbay, & Sadikbekova, 2020). Research conducted by

Chowdhary (2022) reveals that supply chain uncertainty enhances how companies manage the supply chain to gain agility and make the necessary adjustments to enhance customers' overall performance and satisfaction. Lean Management, a paradigm developed in the automotive industry, has been implemented extensively in organizations in various industries, including textiles, given that its characteristic emphasis is on the utilization of waste (J. P. Womack & Jones, 1997). Lean practices in Pakistani textiles are known to assist in controlling waste within the manufacturing process and improving organizational efficiency, which can, in turn, improve productivity and operational performance (Tariku).

Commonly known as "sustainable supply chain management (SCM), which considers economic, environmental, and social sustainability pillars", SCM has become crucial for long-term corporate prosperity and market positioning (Seuring & Müller, 2008b). Pakistan's textile industries are pressured to adopt sustainable technologies because of rising global concerns and consumers' inclinations toward green products (Rasheed, Zaheer, Hassan, Junaid, & Majeed, 2023). Implementing sustainability into SCM positively affects



organizational environmental importance and the social and organizational bottom line (Habib, Balasubramanian, Shukla, Chitakunye, & Chanchaichujit, 2022).

Hence, due to the challenges and opportunities inherent in these SCM frameworks, there is a lack of research on their efficacy in enhancing the overall textile industry's operational performance in Pakistan. This research aims to establish the association between "Supply Chain Agility, Lean Management, and Sustainable Supply Chain Management on operational performance", help expand the understanding of supply chain literature (Hassan, 2023), and offer valuable recommendations for practitioners in the Pakistani supply chain context).

1.1. Problem Statement & Gap

Over the past three decades, the industrial environment has seen significant changes and faced more problems due to greater global competitiveness. The market has been constantly changing, and technological developments have made it possible for consumer preferences to change at a never-before-seen pace (Evans, 1987). Before the 1990s, research concentrated on improving outcomes, mainly on the technical aspects of implementing Lean Management (Marin-Garcia & Bonavia, 2011).

Lean Management assists the company in enhancing operations by addressing the significant reasons for the inefficiency of the organization, establishing a proper system of management of the organization by increasing abilities to provide new methods of working and improving daily basis work by engaging the top management and staff (Shaturaev & Bekimbetova, 2021). SCA is a very important factor in improving operations and meeting the competition in the present day (Zeraati, Rajabion, Molavi, & Navimipour, 2020). When organizations implement SCA, firms can meet their customers' needs, expectations and demands and effectively reduce risk (Akkaya & Qaisar, 2021). Most previous researchers believe Supply Chain Agility and Lean Management can encourage efficiency. However, several analysts claim that Lean Management production is no longer likely to provide a market advantage due to massive implementation among corporations. Consequently, researchers suggest that supply chain agility is an attribute considered to enhance competition. However, no investigation has yet specifically emphasized how Supply Chain Agility and Lean Management in the SCM, in which the value chain should be in order to eliminate costs from operations and develop responsiveness, or to Supply Chain Agility and Lean Management with the low quantity of waste, and the cheapest cost. There is a significant disconnect between 'Leagile' survey instruments and techniques that can be applied that are likely to enhance operations while also enhancing flexibility in the SCM.

Pakistan is one of the most economically developing nations in the world. The textile industry is the most significant manufacturing production sector in Pakistan. Additionally, the textile industry is focused on exports, with garment products contributing almost 60% of all national exports. The textile

sector is also the country's second-largest employer (M. Ali, 2018). However, the textile industry also affects nature and the environment through pollution. It is one of the significant pollution industries (F. A. Khan et al., 2017). Pakistan's textile sector consumes much gasoline, generating environmental risks like air emission, which impacts the residential area. Furthermore, the industry's use of wood as a fuel causes deforestation in nearby areas, harming the environment (M. I. Ali et al., 2014). This study examined the problem of operational performance in Pakistan's Textile sector by determining the variables of "Lean Management, Supply Chain Agility, and Sustainable Supply Chain Management".

2. Literature review

The second chapter is about the literature review and theory building. This chapter discusses in detail each of the variables of our research model: "Operational Performance, Supply Chain Agility, Lean Management, and Sustainable Supply Chain." After providing a detailed review of the literature on each variable, develop theory and hypotheses related to each variable of our study.

2.1. Operational Performance

Operational Performance is crucial for any organization because it identifies the company's efficiency, quality and constrained market responsiveness. These include cost, delivery time, flexibility and product quality, crucial for sustaining competitive advantage, most often in highly volatile industries, particularly textiles (Devaraj, Krajewski, & Wei, 2007). Operational performance is another strategic aspect, as efficient operation enables an organization to have tremendously enhanced strategic capacity to achieve competitive advantage concerning the challenges in the market (Saragih, Tarigan, Silalahi, Wardati, & Pratama, 2020). The competitive pressure escalates, and businesses focus on maintaining and enhancing operational performance to maintain profitability and expand market share (Abdallah, Alhyari, & Alfar, 2023). In the context of "supply chain management", there is a shared focus on improving operations performance because it directly affects customer satisfaction and financial returns (Gunasekaran, Patel, & Tirtiroglu, 2001). An organization's operational performance requires time to reach its maximum level. An organization's performance is determined by four factors: quality, pricing, delivery, and adaptability (Abdallah et al., 2023). Reducing overall operating costs and increasing daily operations' efficiency are the main goals of operations. The operational performance of a company gauges the amount of raw materials that can be converted into creative, high-quality final products on time and with minimal waste (Prajogo & Olhager, 2012; Saragih et al., 2020).

Supply chain performance is the term used to describe how the global supply chain operates to effectively and responsively meet end-customer needs, such as timely delivery and product availability. Supply Chain Performance crosses company frontiers because it involves the participation of multiple companies in providing services and products to target clients. Strong relationships are the main

focus of the socialization process as the world grows more interconnected, even if buyer-supplier connections have received much attention lately (Chowdhury, Paul, Sianaki, & Quaddus, 2020). The manufacturing industry, specifically textile manufacturing, has frequently been described as a rapidly changing industry, and there is a need to provide and maintain high operational standards to remain competitive internationally (Chowdhury, Quaddus, & Chowdhury, 2023). Here, operational performance is key as it determines how an organization delivers its products, manages resources, and timely satisfies customer needs (Mazzarol, Reboud, Mazzarol, & Reboud, 2020). A high level of operational performance is applicable to measure the efficiency of the internal processes and essential indicators of customer satisfaction and company competitiveness.

2.2. Role of the Textile Industry of Pakistan

Pakistan is also ranked as the fourth largest vendor or supplier in that region. The textile industry in Pakistan pays a percentage of the national economy in terms of the annual Gross Domestic Product – GDP of 8.5%. Several manufacturing units in Pakistan export fabric, including 1220 ginning units, 440 spinning units, 424 small units, and 125 big spinning units (Ahmed, 2008). Moreover, the textile industry is focused on exports, with garment products contributing approximately 60% of all national exports (Government of Pakistan, 2018). Unfortunately, nature is also impacted by the textile industry and the environment through pollution. It is one of the extensive pollution industries (Aftab, Ali, Khan, Robinson, & Irshad, 2000).

2.2.1. Underpinning Theory - RBV Theory

The Resource-based view (RBV) theory relates to the organizational competitive advantage concerning the relationship between societal needs starts to emerge for improvement of the environment as well as deployment of the resources of the firm to sustain three strategic capabilities of product management, prevention of pollution, as well as incorporation of sustainable development (Hart, 1995). Therefore, according to the Resource-based view theory, the dynamic of the formation of resource capabilities can also be explained as the economic part of the firm. Therefore, in this particular research, RBV is most suitable for all the concept formulation about performance in the supply chain.

2.2.2. Supply Chain Agility and Operational Performance

Supply chain agility, which refers to the capacity of an organization to quickly respond to changing market needs of customers, influences operational performance, as pointed out in (Jermsittiparsert, 2022). Flexibility, especially in today's highly unpredictable global markets, helps a company to make prompt changes to its manufacturing, stocking and supply patterns, thus improving its response to changes in demand and reducing lead time (Al Humdan, Shi, Behnia, & Najmaei, 2020). This responsiveness is particularly critical for product sectors characterized by reduced life cycles, like the textiles sector (Cadden et al., 2022). One of the most significant values of supply chain agility is its ability to enhance delivery velocity and consistency, two critical

parameters that measure operational effectiveness (Mukhsin, Taufik, Ridwan, & Suryanto, 2022). Flexibility also enables organizations to match the supply with demand, reducing lead time and customer satisfaction. For instance, textile manufacturers can apply agility by regularly restocking products that are likely to run out, thus improving the work rate significantly (Um, 2017). Studies also indicate that agility improves flexibility, another vital element of firm operational performance. Alfalla-Luque, García, and Marin-García (2023) point out that flexibility enables organisations to manage disruption and undergo change in a way that disrupts production minimally, thereby showing improved productivity and lower operational risks. This is particularly valuable in a highly competitive sector where flexibly prime resources and responsibilities could foster ongoing performance enhancement and operating efficiency (H. Khan & Wisner, 2019).

Furthermore, prominent agile supply chains use efficient information-sharing technologies, enabling the interaction of suppliers and manufacturers in real-time, which boosts decision-making speed and precision (Panigrahi, Jena, Meher, & Shrivastava, 2023). Getting prompt and relevant information to enable business people to tweak their operations generates the much-needed information that enables firms to operate efficiently and at considerably lower costs. Supply chain agility positively relates to the firm's operation performance since it reduces supply chain vulnerability to fluctuations affecting market demands, optimizes delivery dependability, and increases flexibility. For industries such as the textile industries, where being responsive is key, agility-driven operation enhancements present a competitive weapon in that they enhance the ability to satisfy customers and, at the same time, drive profitability (Jermsittiparsert, 2022; Panigrahi et al., 2023).

H1: Supply Chain Agility is positively associated with Operational Performance

2.3. Lean Management and Operational Performance

Adopting the lean management approach, mainly based on values focusing on minimizing waste within organizational operations, is paramount in enhancing operations performance. Since lean practices involve removing extra or unnecessary work, organizations can drive down costs and increase efficiency, an aspect of operational excellence (J. Womack & Jones, 1996). Lean management is a management ideology that deems the responsibility of eliminating defects, optimal use of resources, and streamlining processes that, in turn, increase a firm's operating efficiency and adaptability of operations (Bhadu, Kumar, Bhamu, & Singh, 2022). Another critical area of lean management that improves operations performance is systematically eliminating the seven forms of waste in manufacturing. This reduction decreases operational expenses and leads time, making it easier for companies to meet consumer needs (Hines et al., 2004). In the textile industry, for example, where every dollar counts and time to market is of the essence, lean practices help the companies in question run more efficiently and serve market needs on time

(Hernandez-Matias, Ocampo, Hidalgo, & Vizan, 2020). LM also increased the reliability of processes, which is one competencies of operating performance. In other words, lean systems promote standardization of work practices that boost quality control to eliminate the risk of production hitches or defects (Kurdi, Alquqa, Alzoubi, Alshurideh, & Al-Hawary, 2023). This reliability also brings up the quality of the delivered products and, even more critical in the markets saturated with the offered products, the reliability of the delivery process (Biondo, Kai, Pinheiro de Lima, & Benitez, 2024).

Biondo et al. (2024) Also note that lean practices create workplace flexibility through speedy production and inventory flow changes in light of real-time demands. This flexibility improves operational performance since fewer stocks are maintained, which means lower holding costs, and the tied-up capital can be redeployed in other investment opportunities within the business. Furthermore, improving performance in lean systems makes it possible for the employees to point out areas of inefficiency, whereby other workers can make any changes to ensure that the company attains operational efficiency (Buer, Semini, Strandhagen, & Sgarbossa, 2021). Moreover, LM has a positive influence on operational performance by reducing the waste of time in production through the use of techniques and strategies. Lean's basic concept is to optimize value by removing unnecessary manufacturing and distribution processes, which lowers expenses and boosts productivity (Zekhnini, Cherrafi, Bouhaddou, Chaouni Benabdellah, & Bag, 2022). In the context of textiles producing organization, lean has a different implication, which can be the optimization of material and human resources, reduced cost of production, and shortened cycle time, all of which enhance organizational performance according to Naeem, Ahmad, Hussain, Nafees, and Hamid (2021). A survey conducted by Begum, Akash, Khan, and Bhuiyan (2024) shows that lean improvements positively affect operational performance within the manufacturing sectors in terms of productivity and quality.

2.4. Sustainable Supply Chain and Operational Performance

SSCM defines “how to manage the Capital flow, Materials, and all types of information related to the SC, as well as defines cooperation and collaboration between the Partners of Supply Chain, taken from customers and stakeholders, executing all goals similar to the triple bottom line as environmental, economic, and social dimensions” (Seuring & Müller, 2008a). Moreover, for almost the last 20 years, most organizations have focused on economic goals, social goals, and environmental goals around the whole supply chain management of the firm; it is also essential for the enhancement of sustainable outcomes of the firm's supply chain management (Seuring & Müller, 2008a). Performance of Environmental Strategies refers to the efficiency in utilizing all company resources, waste recycling, and decreasing pollution and waste (Rao & Holt, 2005). Social Performance refers to the responsibility for social practices such as labor law, child labor, child abuse, and all human

rights performed by the company (Yawar & Seuring, 2017). Economic Performance refers to all those operations operated by the company in terms of accounts and marketing (Golicic & Smith, 2013). SSCM is still limited in developing and underdeveloped countries (Kim & Min, 2011). Pakistan is the sixth-largest country by population. Every year in Pakistan, almost 20 million tons of scrap are dumped in open areas. Due to this solid waste, many people die every year in Pakistan, and there is no practical solution to reduce waste (Puertas, Martí, & García, 2014). Similarly, the Operations Performance of manufacturing industries faced several issues due to solid waste in Pakistan, due to transportation and logistics (Ehsan et al., 2018).

A key factor in raising the effectiveness of organizational operations is effective SSCM. Nowadays, companies improve their operational performance by following the sustainability of the supply chain system (Sahu, Mahapatra, & Mishra, 2022). According to Sahu et al. (2022), a high level of sustainable supply chain management can help to enhance the entire organizational operational performance. Moreover, SSCM positively impacts the operational performance of the company (Sahu et al., 2022). Many small textile companies in Pakistan still use old machinery to stitch clothes. Also, most companies do not follow sustainability and environmental protection policies. Firms must follow sustainability strategies and environmental protection policies because, in Pakistan, many people die due to environmental hazards. Textile and many other chemical firms produce pollution in the air, so these firms should follow sustainability practices. Improving technology and importing modern machinery into companies is costly, so companies do not convert their traditional environment to modern technologies.

3. Research Framework

This part comprises a graphic display of the variables in the literature review section. It also includes a conceptual model highlighting “supply chain agility, lean management, and sustainable supply chain management” as IVs for this study's particular objectives, while the SSCM represents the DV.

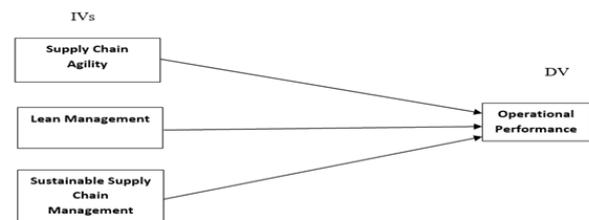


Figure 1: Research Framework

3.1 Methodology

3.1 Data Collection and Sampling Techniques

This study has a measurable focus and purpose in statistical or numerical approaches to data analysis. Consequently, a quantitative method has been adopted in this investigation. Hence, this study used explanatory purposes to examine the relationship between “Supply Chain Agility, Lean Management, Sustainable Supply Chain Management and Operational Performance”. This study used a correlational

research design. This study selected the population, including top and middle managers of textile mills in Punjab, Pakistan. The research's sample size was chosen by the thumb rule, as Sarstedt, Ringle, Smith, Reams, and Hair Jr (2014) proposed “determining the sample size by multiplying the total number of items in the questionnaire by ten”. The current study has 33 measurement items; the minimum sample size was required to be 330. Because of the low rate of response, the researcher increased the sample size to 400. This study used the five-point Likert, indicating 5 as strongly agree and 1 as strongly disagree. The study's absence of a sample selection is the primary reason for convenience sampling. The researcher cannot have an accurate picture of the research population in this situation because we aim to collect data from employees of textile mills operated in Punjab, Pakistan. Therefore, this study selected a convenience sampling approach from the non-probability sampling methods. This study used “Partial Least Square (PLS) and Statistical Package for the Social Sciences (SPSS)” for results and findings.

3.2 Measurements

The authors deployed the standardized questionnaires from other empirical studies to obtain respondent information

Variables	Source	No. of Items
Supply Chain Agility as IV	(Eckstein, Goellner, Blome, & Henke, 2015)	6
Lean Management as IV	(Moyano-Fuentes, Maqueira-Marín, Martínez-Jurado, & Sacristán-Díaz, 2020)	6
Sustainable Supply Chain Management as IV	(Kot, 2018)	16
Operational Performance as Moderator	(Hadli, 2017)	5

4. Data analysis & results

The accuracy and completeness of the data were examined. This study used SPSS, “Statistical Package for Social Sciences version 26,” and “Smart PLS version 3.3.7”. Descriptive analysis and a demographic test were conducted by using SPSS. Additionally, the hypothesized associations between variables were examined by using PLS-SEM.

4.1 Demographic Test

Respondent demographic data, including gender, age, and income. After distributing questionnaires, 350 accurate data points were received out of 590 distributed questionnaires, and the response rate was 87.5%. In total received data, 53.4% were male, and 46.6% were female. The maximum number of people fell in the age group of 30-35, with 44.9%. In this study, the researcher selected our population from the top and

middle management, so respondents who fell in middle management were 50.70%, and top management was 49.30%.

4.2 Measurement Model

The efficacy of the construct is evaluated by evaluating the measurement model. The criteria of quality assessment start with outer loading and then move to the reliability of the used and validity. Loadings, Construct Reliability, & AVE Factor or Outer Loadings as computed or defined by (Pett, Lackey, & Sullivan, 2003) as “the extent to which each of the items in the correlation matrix correlates with a given principal component” or “How each of the items in the correlation matrix is related to a given principal component.” No item in this analysis was found to be less than the 0.50 value recommended by Hult et al. (2018). Therefore, no items were removed from this study.

According to Mark (1996) “Reliability is defined as the extent to which a measuring instrument is stable and consistent. The essence of reliability is repeatability. If an instrument is administered repeatedly, it will yield the same results”. The findings of “Composite Reliability” ranged from 0.944 to 0.976, whereas “Cronbach’s Alpha” ranged from 0.929 to 0.973. “Composite Reliability” and “Cronbach's Alpha” both show a dependability level over the suggested 0.70 (Hair, Ringle, & Sarstedt, 2011).

When the “Average Variance Extracted value is equal to or more than 0.50, the underlying construct is measured through convergent items.” (Fornell & Larcker, 1981b). “Convergent validity” outcomes rely on the statistics of AVE. All of the variables are higher than recommended. Thus, “convergent validity” is demonstrated.

Construct	Items	Loadings	CA	CR	AVE
Lean Management	LM1	0.855	0.933	0.947	0.748
	LM2	0.887			
	LM3	0.86			
	LM4	0.85			
	LM5	0.868			
	LM6	0.872			
Operational Performance	OP1	0.877	0.934	0.950	0.790
	OP2	0.914			
	OP3	0.902			
	OP4	0.891			
	OP5	0.859			
Supply Chain Agility	SCA1	0.834	0.929	0.944	0.738
	SCA2	0.886			
	SCA3	0.887			
	SCA4	0.884			



	SCA5	0.803			
	SCA6	0.859			
	SSCM1	0.848			
	SSCM2	0.865			
	SSCM3	0.846			
	SSCM4	0.829			
	SSCM5	0.828			
	SSCM6	0.834			
	SSCM7	0.844			
	SSCM8	0.857			
SSCM	SSCM9	0.818	0.97 3	0.97 6	0.715
	SSCM10	0.838			
	SSCM11	0.857			
	SSCM12	0.858			
	SSCM13	0.863			
	SSCM14	0.852			
	SSCM15	0.861			
	SSCM16	0.827			

SCA	0.834	0.879	0.859	
SSCM	0.817	0.845	0.848	0.846

Structural Model

The interaction hypothesis in assessing the proposed hypotheses as the next step in SEM is to evaluate the hypothesized link.

Hypotheses Testing

H1 develops whether SCA has a significant and positive relationship with OP. The findings showed that SCA has no significant impact on OP ($\beta = 0.104, t = 1.577, p = 0.115$). H1 is, therefore, not supported. H2 determines that LM and OP have a significant and constructive association. The findings showed that LM significantly affects OP ($\beta = 0.140, t = 1.898, p = 0.058$). H2 is, therefore, accepted. H3 examines whether SSCM has a significant and positive association with OP. The results show that SSCM significantly impacts OP ($\beta = 0.704, t = 9.750, p < 0.001$). As a result, H3 is accepted.

Table No. 3 and Structure Model .

Direct Relationship Results

	Beta Coefficient	(STDEV)	T Values	P Values
LM -> OP	0.140	0.074	1.898	0.058
SCA -> OP	0.104	0.066	1.577	0.115
SSCM -> OP	0.704	0.072	9.750	0.000

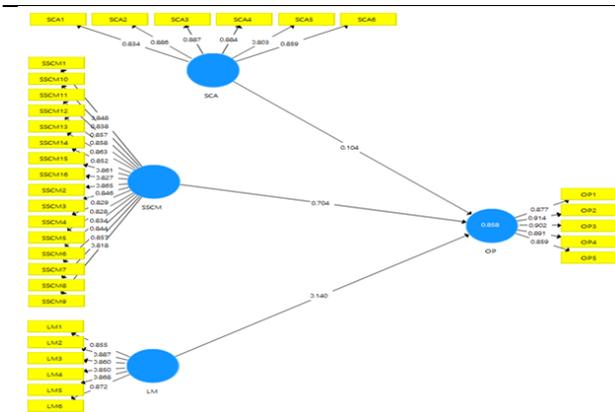


Fig. No. 2: Factor Loadings

Discriminant Validity - Fornell and Larcker Criterion: When the construct's overall AVE R-squared value is more significant than its correlation to other factors, "discriminant validity" is established (Fornell & Larcker, 1981a) criterion. The construct's AVE R2 values in the present research were higher than its covariance with another construct. Thus, there is a good level of support for discriminant validity.

"Discriminant Validity - Fornell-Larcker Criterion"

	LM	OP	SCA	SSCM
LM	0.865			
OP	0.859	0.889		

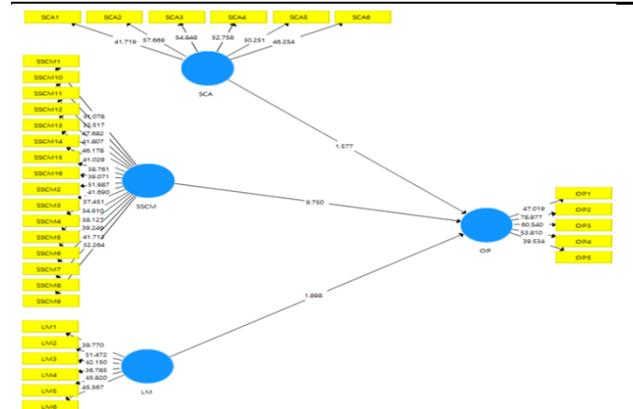


Fig No. 3: Bootstrapping

5. Discussion & Conclusion

This part presents the conclusions of the research's questions, objectives, theories, hypothesis linkage, and theoretical framework. Nowadays, consumers are increasingly paying more attention to sustainability and eco-friendly systems for environmental protection. In Pakistan, due to thousands of chemical and textile firms, the usage of fossil fuels, gas, and carbon has become excessive, and more carbon usage results in a healthy environment and higher carbon emissions. For environmental protection, many companies are



now converting their policies into sustainable systems because of government pressure and consumer pressure. Pakistan is not like developed countries in the implementation of green systems and environmental protection because the government provides policies about green systems and environmental protection schemes. However, most companies do not follow these policies to save on their expenditure. The waste management system in Pakistan is not as advanced as that in the United Kingdom. According to the literature on supply chains, many studies emphasize the value of SCA because it positively affects a firm's operational performance (Ayoub & Abdallah, 2019). This study's results are justified by the study conducted by Shan, Shou, Kang, and Park (2022), which identified that SCA helps implement strategies to improve a "company's performance of the supply chain".

The general implication of this study may be useful to other developing countries because other developing countries also face similar environments, politics, social factors, and economic issues. "Let's Example of India": This study points out that India, a developed country, has a very big issue of waste and a hazardous environment due to its population. That means millions of people die in India every year due to air pollution. Suppose India follows sustainability in supply chain management and practices agility and lean operations. In that case, firms can enhance the performance of their operations, protect the environment, and minimize waste. Overall, this study is beneficial to the textile and other manufacturing companies. By reading this study and considering the concepts analyzed, firms can identify their operations' challenges and improve efficiency. With the help of Agility and lean, firms can reduce time waste and improve performance quality. In Southern Punjab, there is very little concept of Sustainability, Agility, or Lean. In Southern Punjab, firms do not use these strategies; this study is very helpful for this area.

5.1 Result Discussion

"To determine the relationship between Supply Chain Agility and Operational Performance" (H1): This study concludes that supply chain agility is essential to operational performance. As explained in past studies Eckstein et al. (2015) An SCA can assist with quality performance in several ways. It is the enabler of businesses to address supply chain disruptions. According to Gligor, Holcomb, and Stank (2013), an agile supply chain can also influence operational performance. It is an enabler for businesses to achieve delivery time and ensure the dependability of the quality of service. However, according to this analysis, supply chain agility has a favorable but insignificant impact on operational performance with ($\beta = 0.104$, $t = 1.577$, $p < 0.115$).

An earlier investigation on SME manufacturing firms was carried out in developed countries, but the current study was conducted in Pakistan, a developing country in Asia. The Supply chain system of developed countries is advanced, and companies use agility in their operations and supply chain as well. However, in Pakistan, most companies have no own supply chain system. Most companies outsource for supply

chain, that is why the result is insignificant compared to the previous study. To ascertain how "Lean Management and Operational Performance" are related (H2):

This study's primary goal is to ascertain how LM and OP are related. H2 was created in order to examine the objective hypothesis. According to this study, H2 has been discovered to be partially accepted. It also explains that in past studies, Browning and Heath (2009) investigated the effects of instability, complexity, novelty, and buffering on the link between the implementation of Lean Management and Operational Performance.

Past studies have validated the strong correlation between "Lean Management and Operational Performance". According to Rahman, Laosirihongthong, and Sohal (2010), lean strategy has a positive and strong association with "operational performance". In this study, "Lean Management has a significant relationship with operational performance".

To ascertain how "operational performance and sustainable supply chain management" are related (H3):

It is concluded in this study that "sustainable supply chain management" plays a vital role in operational performance. It is also explained in past studies that SSSC methods may indirectly increase operational performance by lowering operational risk (Klassen & Vereecke, 2012). The findings and conclusions of this study's hypothesis H3 are validated, and there is a substantial positive correlation between SSCM and operational performance ($\beta = 0.704$, $t = 9.750$, $p < 0.000$). In the previous research, too, it has been observed that SSCM has a positive association with Operational Performance (Hasan, 2013).

5.2 Conclusion

The present research aims to determine the relationship between "Supply Chain Agility, Lean Management, Sustainable Supply Chain Management and Operational Performance". The following Hypotheses have been set. The connection between the variables and the SCA is inspired by the research questions derived from the literature review already analyzed in the prior section of the current chapter. Hypotheses are H1-H3. Therefore, out of all the hypotheses that we tested, hypothesis 3 has a major impact on Operational Performance, the second is partially significant on Operational Performance, and the last has an insignificant relationship with operational performance.

Theoretical Implications

The theoretical contribution of this work includes the optimal synthesis of supply chain agility, lean management, and sustainability and their overall effect on operational performance. Although these three approaches are conventionally examined individually, this work integrates all three to provide an understanding of their joint impact on efficiency and responsiveness, which retains a research gap in the supply chain literature.

In terms of context, it adds more depth to the theories, which initially focused more on developed economies while

examining the textile sector in Pakistan. By using these frameworks in the context of emerging markets, this research contributes to the supply chain theory's practical applicability in under-researched economies, offering an understanding of how to steward operations when limited monetary resources are available (Akbar, 2022; Nwagwu, Niaz, Chukwu, & Saddique, 2023). Further, analyzing operational performance as an overall measure of practices provides an appraisal of the realistic performance measures in supply chain research, where the connection of specific practices with concrete results, such as cost control and product quality, and the best practice guides the results (Anjum, Kibria, Ahmed, & Alam, 2023).

Managerial Implications

The previous study was conducted in the manufacturing industry of developed countries, but the current study was conducted in Pakistan, a developing country in Asia. The Supply chain system of developed countries is advanced, and companies use the concept of sustainability in their operations and supply chains. However, in Pakistan, most of the companies are not aware of the benefits of sustainability. In my area of study, the manufacturing sector is not using the concept of sustainability properly. This study has put strong literature on previous studies about each variable to provide information to the managers. After reading the current study, they can develop strategies for their supply chain management. It will also help the industries find means to achieve the supply chain's performance effectively.

5.3 Limitations

The sample chosen in this study was voluntary, thus indicating that the quality and size of the respondents in this study could only be as large as the willingness of the following sample. As such, the generality of the results of this study is to some extent compromised to the extent of compromising the outcomes. The researcher also employed online survey forms as one of the means of data collection. It will be noticed that occasionally, some respondents may have some problems in completing the online questionnaire, even when they were given clear instructions. "The research instrument of the present study was self-administered, and sometimes individuals try to project their more positive image, and so hide their true self; therefore, informant-based instruments should be used." Since the present study was conducted only on the employees of the textile mills of Lahore and Faisalabad, future research should encompass other industry sectors or other regions or other countries to generalize the findings of the present study. "The limitations of this study also rest in the generalizability of the research, as the study is on a specific population; due to such limitations, empirical generalization of this study is somewhat compromised." Besides these, the sample size is limited.

5.4 Future Recommendations

Further study should also incorporate both the private and public sectors in various provinces of Pakistan to arrive at more generalized and meaningful comparisons in terms of the influence of "Supply Chain Agility, Lean Management,

SSCM and Op. Performance". This study only focused on private textile mills in Lahore and Faisalabad. The present study focused on factors like supply chain agility, lean management, and sustainable supply chain management, which are factors affecting operational performance. Other future studies should use other factors such as work use of IT, the internet of things, process innovation, supply chain collaboration, interactional justice, social responsibility, environmental dynamics, supply chain dynamic capabilities, enterprise performance, and other external variables. This study focused on the manufacturing sector. In contrast, future studies may focus on other sectors, like service, to gain more in-depth knowledge of the unexplored variables; in a cross-cultural setting, it is also possible to contrast different countries in different provinces and other Muslim nations. The present study has been carried out in textile mills, while future research may be conducted in healthcare, agriculture, educational, transportation, and logistics industries etc.

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