

Determine the impact of COVID-19 on the textile supply chain management

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ABSTRACT

The textile supply chain is also affected by the COVID-19 epidemic, as thousands of supply chains worldwide. The textile industry is labour-intensive in structure and interconnected globally. The COVID-19 epidemic resulted in order cancellation and delays in manufacturing orders in the textile supply chain. The shortage of raw materials is another issue due to the closing of international seas and airports. During this epidemic, the textile industry became less important for the world's people as their 1st priority was to survive by purchasing only essential items. Data was collected from employees and industries primarily related to the textile industry. Data analysis was done using factor analysis and regression models. It was also found that most organizations and businesses faced the radical consequences of COVID-19 on textile supply chain management, including working capital, customer demand, and future marketing drives to pursue new customer orders. However, most companies have adopted digitalized systems to run out of production and purchasing.

Keywords: Pandemic, Regression, Factor analysis, Digitalized system, Working capital, Customer demand, Textile industry, Supply chain management

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1. Introduction

COVID-19 has created many unpredictable situations, beginning in the Chinese city of Wuhan and spreading worldwide due to the uncontrollable scenario created. Countries taking precautions at the start of the COVID-19 epidemic include closing national and international air traffic for and from the Chinese city of Wuhan. Continuously increasing cases of infection push for the closure of institutions, such as governmental and private institutions, colleges, and schools; the closure of grocery stores, cafes, and restaurants; and many other actions to minimize contact between persons and perceive the spread of the virus. This preventive action has the unplanned impact of disturbing international supply chains and companies' activities and decreasing profits. Countries are shutting down their businesses and all activities to stop the spread of this deadly virus worldwide (Albhirat et al., 2024).

The textile industry supply chain is also affected by this epidemic, like most businesses in most businesses in the rest of the world, because the textile supply chain is the most labour-intensive and extremely globalized segment with a lengthy lead time. Governments imposed lockdowns in March 2020. Lockdown led to the closure of all types of goods and public transportation, all retail sectors, airports, and seaports other than food and medical facilities, which directly hit all aspects of the textile industry of the world (Amirah et al., 2024). All textile and apparel orders have been stopped due to COVID-19, and companies have started to close their facilities due to the closure of business activities and to save their assets. Furthermore, this quantitative research study identifies how COVID-19 affects the textile industry's supply chain.

1.1 Pakistan Textile Industry

The textile industry is one of Pakistan's major manufacturing industries. Which contributes 8.5% of GDP to the growth rate of Pakistan? Pakistan's textile industry comprises 57% of export revenues. In the textile industry, Pakistan is the 8th largest exporter globally. Pakistan is ranked as the 4th largest producer of cotton, and after China and India, Pakistan has the 3rd largest spinning capacity, contributing 5% to the world capacity. Pakistan has almost 423 textile industries, which have the capacity for nearly all man-made clothes, fabrics, and natural yarns, including rayon, cotton, etc. With plenty of raw materials available in the country, Pakistan has a significant advantage and valuable power in terms of cost and adequate lead time. Furthermore, 45% of the country's workforce is in the textile industry.

1.2 Background of the Study

The world started facing the most unpredictable problems in December 2019, beginning in Wuhan, a city in China, and spreading all over China and later worldwide. At the end of December 2019, this unknown pneumonia began to appear, with initially 27 cases in Wuhan city (Lu, 2017). This unknown pneumonia virus has started infecting various people rapidly in China and has scattered across the world. The World Health Organization has announced an international public health emergency due to this virus, named COVID-19.

As a result, the pandemic spread globally, and countries took preventive measures to control this virus. Besides, WHO works with field experts, associates, and governments to develop policies for managing situations and initiate guidelines and policies to protect humans and their health from this continuously spreading virus. The business side is focused on defending their employees' and clients' health and safety and continuing their business in the best possible way (Baloch & Rashid, 2022).

In March 2020, a total of 2,039 people tested positive for COVID-19, resulting in 26 deaths and 82 total recoveries in Pakistan from COVID-19. Still, as a proactive approach, the government of

Pakistan imposed a lockdown in the country, like the rest of the world.

1.3 Problem Statement

This quantitative research study will identify and measure the influence of the COVID-19 epidemic on overall supply chain management in Pakistan's textile industry. The COVID-19 epidemic has smashed the most extensive record for economic disruptions since World War II, affecting businesses and enterprises worldwide. During the COVID-19 crisis, Pakistan's textile sector was one of the worst-hit sectors in the world. The COVID-19 crisis disrupted the supply chain operations of the textile supply chain, and significant challenges arose during the supply chain where both sides addressed uncertain problems of the century. COVID-19 has caused considerable damage to the supply chains of textiles in various industries worldwide. The availability and transfer of raw materials, intermediate products, machines, labour, technology, and finished products of the textile industries in Pakistan have been disrupted in a wide angel of ways. However, the COVID-19 epidemic has affected the growth of the textile industry. Because of this situation, many sectors have stopped their production, started layoffs, stopped exporting their products, faced issues with a lack of customer demand, and also faced a lack of use of technology due to a decrease in the number of workers.

1.4 Research Objectives

Determine the effect of COVID-19 on the supply chain management of the textile industry.

1.5 Research Question(s)

Based on these contributions, targeted contributions are highlighted by the following question:

To what extent does COVID-19 affect the supply chain in the textile industry?

1.6 Significance of the Study

Quantitative research about COVID-19 affecting the textile industry's supply chain is essential for further study of COVID-19 on the textile industry supply chain with different variables. It is necessary to recognize the impact of these COVID-19 factors and take measures to mitigate or resolve them.

1.7 Scope/Limitations

The future scope of this research is to determine COVID-19 effects on both supply and demand sides in textile sector supply chain management. The scope of COVID-19 impacts the supply chain, including a wide range of activities from purchasing raw materials to importing, sourcing and selection, manufacturing, and delivering the final product to the customers.

The limitation of this study is the participant's point of view regarding the COVID-19 effect on textile industry supply chain management. Furthermore, this research is a quantitative study with a relatively small sample size of textile supply chain-related participants conducted using exploratory research. Additionally, limitations can be considered as the limited number of studies on COVID-19 in the supply chain in the textile sector, so this topic is underdeveloped.

1.8 Keywords/Definition of Keywords

1.8.1 Supply chain

A supply chain is an arrangement consisting of people, organizations, information, activities,

and capital involved in smoothly supplying a service or product to a consumer.

1.8.2 Textile Industry in Pakistan

The textile sector is majorly concerned with the following things: the design and distribution of yarn, cloth, clothing, etc.

Pakistan's textile industry contributes almost 8.5% to its GDP. It is the largest manufacturing sector in Pakistan. Among Asian commodities, Pakistan is the 8th largest exporter.

1.8.3 COVID19

Pneumonia Disease Coronavirus (COVID-19) is a transferrable pneumonia disease caused by newly revealed pneumonia 'coronaviruses. Most people sick with the COVID-19 virus experienced slight to average breathing sickness and improved without trying special treatment. However, older persons and persons with medical issues such as diabetes, chronic respiratory disease, cardiovascular disease, and cancer are more likely to be under severe conditions of sickness.

1.8.4 WHO

WHO's primary purpose is to direct the global health system under the United Nations and to give direction to partners in global health responses.

1.9 Conclusion

This research seeks to find the textiles industry supply chain under the ongoing COVID-19 crisis in an international context by considering the situation, sectorial relationships, consequences, and managing policies. The textile industry supply chain management has been one of the worst-hit industries due to COVID-19. This is due to its labour-intensive structure. Which technological development is required in the industry to cater to this type of epidemic in the future?

2. Literature Review

2.1 COVID19

A Respiratory Disorder Corona Virus 2 (SARS-CoV-2) affects the infectious COVID-19 virus. This infection is transferred through respiration and is highly infectious (Howard et al., 2021). It was initially discovered in China in December 2019 and has since spread around the world. This virus was new to the world, and effective and instant medicine and vaccination were unavailable until that date. The COVID-19 epidemic apparently affected the global economy in general and stopped supplies and business; it created insecurities and long-term disturbances. A disruption in supply chain management arises with spreading epidemics between populations, and simultaneously, disturbances arise between supply, demand, and logistics (Ivanov, 2020). It finds that the world's largest 1000 supply chain facilities are stopped in quarantine areas. As the virus expanded worldwide, the expansion of affected areas in different countries worldwide is further intensifying the problem for supply chains (Rizou et al., 2020). The government advises the use of personal protective equipment (PPE) and social distancing and, in many places, enforces lockdowns for social and business events to manage the COVID-19 epidemic (Battista et al., 2021). The textile sector was also hit by COVID-19, especially production facilities. Government-directed textile manufacturing plants are shutting down around the world because textile products do not fall under the classification of very 'necessary' services and goods during epidemics, which is why the industry faces one of its worst problems in the era. In many countries like China, Vietnam, and India, the textile sector faces a significant disturbance in supply chain management as the government closes production facilities, orders are also cancelled by customers, and procuring raw materials from other countries like China becomes very difficult (Mondal, 2020). As per the International Textile Manufacturers Federation (ITMF) report, normal

orders and projected business were down by almost 42% and 32%, respectively, between May 20 and June 8, 2020. Textile and apparel manufacturing are labour-dependent industries and extremely globalized sectors with extensive lead times. Lifesaving actions like quarantine result in the shutting down of markets, loss of revenue, and uncertainty of saving money during a recession, decreasing customer needs for the textile industry. In the European Union, the apparel industry is estimated to face a probable 50% drop in sales in 2020. The first hit of this epidemic is China, the world's largest textile and apparel producer. This was the first big global disturbance due to the lockdown, which began a delay in the supply chain management production sector. These delays in manufacturing especially hit the fashion and textile industries, as many fashion and textile goods are periodic items, and these items have no worth after a season. At the same time, in March 2020, a virus was found in many countries around the globe, and huge order cancellations and delays affected retailers in Bangladesh, India, China, and all over the world. The apparel and footwear sector expects profits to be 27%–30% less in 2020. Those companies that process in China and South Korea are facing various issues linked to the supply chain, like labour deficiency, shortage of raw materials, and increasing charges for logistics and shipping (Lu, 2017). Problems are not only on the supply side but also on the demand side. The lack of customer demand, the anxiety of viruses, or saving money that drops demand significantly damage consistent professional operations. Though several countries reopened their retail stores, hardly 80% of the transactions were in the fashion business. Both export and domestic textile manufacturing have decreased business and caused a fallout of import and export businesses worldwide. Most textile and apparel products are perceived as having a wave in their inventory and small capacities and business values. Even though the supply of food from China might recover over a short period, the major problem at that time occurred due to demand from countries like the USA and Europe, which were still in cynicism due to COVID-19. This has badly affected textile and apparel demand orders, mostly from one of the major exporters, India. Customers still fear the increase in viruses and try to avoid unnecessary contact with people. Textiles, apparel, or fashions become the least viable options for purchasing during the lockdown, as their first priority has been buying the necessary things to live. The government proposed various financial incentives for business sectors during the COVID-19 epidemic. Many international business and production facilities are strong enough to modify their manufacturing strategies per epidemic requirements. Now, businesses are reopening with new standard operating procedures for maintaining cleanliness, social distancing at locations, and using online platforms for professional meetings (Russell et al., 2020).

2.2 Supply Chain

The idea of the supply chain is well-known and defined as the arrangement of companies that bring services and goods into the marketplace (Rasheed et al., 2024a). The supply chain contains manufacturers, distributors, marketers, transporters, suppliers, warehouses, retailers, wholesalers, and consumers. Supply chain management involves all stakeholders directly or indirectly satisfying customers' demands. As production, a supply chain inside every organization involves all parties fulfilling customers' demands. These tasks include, but are not limited to, the invention of products, distribution, operations finance, marketing, and consumer services. Chen and Paulraj (2004) said that supply chain management is the system of raw materials, services, and information with the functions of supplies, manufacturing, and demand. Figure 1 below shows the internal supply chain process.

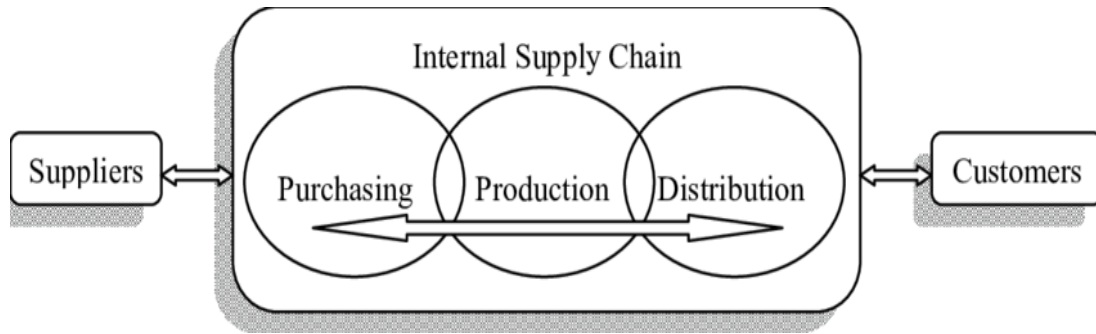


Figure 1: Supply Chain

2.3 Supply Chain Management

SCM is the management of service and product flow (Rashid & Rasheed, 2023). This contains all the operations to convert an unprocessed material into a finished product. It involves the activity starting from the purchase of material, inventory storage, and work in process, finishing goods and their storage, and reaching the end point of delivery to the customer and using all channels and interconnecting them most cost-effectively and efficiently to gain a competitive advantage. Figure 2 below highlights the supply chain management.



Figure 2: Supply Chain Management

2.4 Supply Chain Management in the Textile Industry

The textile supply chain is complex and labour-intensive, from purchasing cotton and relevant equipment to ginning, spinning, weaving, finishing, and garment manufacturing. This involves all supply chain activities starting from the purchase of raw materials, storage of raw material inventory, process, work in process, finished goods, storage of finished goods in warehousing, and logistics.

Three different stages are necessary in the textile supply chain: purchasing, manufacturing, and distribution. Every stage is composed of several segments in several places all around the world (Thomas & Griffin, 1996). Figure 3 below highlights the SCM in the textile industry.

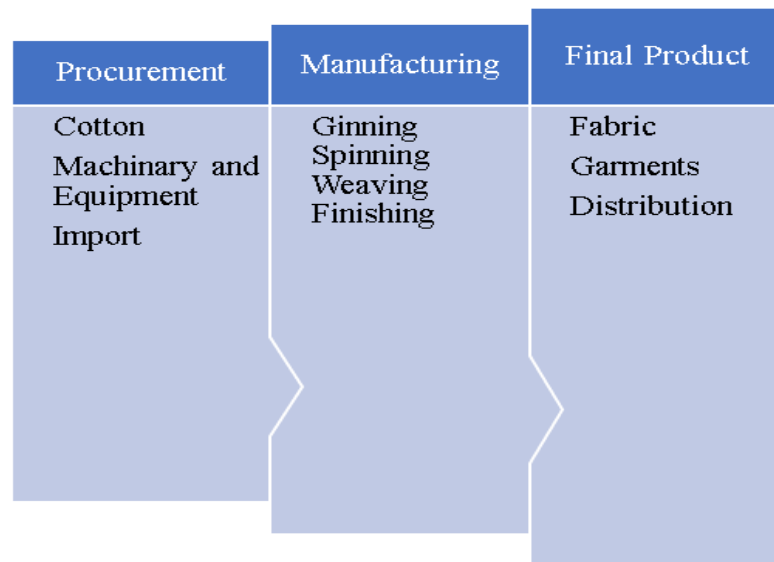


Figure 3: SCM in the Textile Industry

2.5 Impact of COVID-19 on Different Industries

This COVID-19 situation was affected globally by the systems of trade, health, education, finance, societies, and businesses. In a survey, just 2% of organizations accepted that they were prepared for this pandemic. Severe disruptions from this situation infected 57% of organizations, with 72% describing a lousy impact, of which 17% reported a significant adverse effect, and 55% mostly had a negative impact. However, some organizations have had positive effects from the pandemic; 11% of organizations were positively affected by this situation, including increased customer demand by 71% and the introduction of new products and services to the market (57%). These organizations were related to life-cycle sectors like the medical sector because there was a need for these products in those days. They also introduced COVID tests and vaccines. Meanwhile, in other sectors, they couldn't keep their products on shelves for customer demand because of a lack of demand from the customer end. These products were primarily daily-use products like flour, rice, sugar, spices, etc.

Some organizations hit by 97% were negatively affected, specifically at the industrial level, and automotive companies were affected by this situation. Additionally, 47% of all companies reported disruptions to their businesses in this situation. While many employees had started working from home by the companies, others used different settings in companies by calling 50% of staff with physical spacing, using masks and sanitizer, using temperature checking machines, and using more personal equipment. Sick staff was not allowed in this spacing. Industries and high-tech companies invest in the use of high-level technologies to reduce the number of staff in their industries in this situation. These are some examples of the effect of the COVID-19 epidemic situation on the supply chains of different industries or organizations and examples of making their supply chains sustainable." Additionally, the social and economic outcomes of COVID-19 and the authorities' reactions, concentrating on labour, well-being, gender, perception, and environmentally friendly attributes. Naudé (2020) highlighted the effect of COVID-19 on free enterprise. As new firms and businesses faced enormous harm to free enterprise, invention and development could be constant in the more extended scenario.

2.6 Impact of COVID-19 on SCM (as a dependent variable)

This research study has been developed to find the problems and consequences of the COVID-19 epidemic on supply chain actions internationally, locally, or in the Pakistan Textile Industry supply chain.

In a COVID situation, supply chain flexibility is difficult for financial retrieval in Pakistan. Efficient SCM (supply chain system management) confirms greater competence, control quality, good customer affiliation, a faster production cycle, services, minimized manufacturing expenses, and an enhancement in the business functioning of the industry. In the past, the COVID-19 pandemic disrupted the textile industry's supply chain in different ways. It had been affected by transport and raw material shortages. It also increased the production cost, which was alarming for garment manufacturers and exporters, and that's why exports and production in textiles were reduced in this pandemic situation." To lighten the impact on the textile supply chain from COVID-19, supply chain managers take innovative measures in logistics, transport, inventory management, and distribution and maintain relationships with other exporters and manufacturers. Donthu and Gustafsson (2020) highlighted the effect of COVID-19 on stores and products in the textile industry. They confronted several minor challenges associated with supply chain management, the labour force, customer demand, ash flow, trade, and selling. The main supply chain management areas are:

2.6.1 Impact of COVID-19 on production

Epidemic circumstances had increased the need for unusual production things like masks, sanitizers, and hand gloves and decreased the production of giants manufacturing textile products." "One of the concerns was that the supply chain export had decreased, which impacted the production of textiles in Pakistan. It was moving towards the supply chain risk." Teodoro and Rodriguez (2020) highlighted that the involvement of authorities in advanced countries all around the globe and executing their activities are necessary to improve the impact on their country's financial systems to cope with the pandemic and its effect on the production of textiles. But some advanced nations do not have an economic situation; that's why they faced a significant disruption in the textile industry: the limited output." The textile industry faced issues of shortage of raw materials, delay in the delivery process of downstream supply chains, shortage of staff, and shortage of technology and machinery, which also affected the production of textiles. Due to the reduction in production, brand equity is also affected, which impacts facility level, profits, and process efficiency."

Table 1: Covid-19 Impact On Production

Companies	Industry	Before COVID-19 manufacturing	During COVID-19 manufacturing
Zara (Textile)	Fashion industry	Apparel, Clothing	Surgical masks
Gul Ahmed (Textile)	Fashion industry	Fashion, Clothing	Surgical masks and gloves
Bonanza (Textile)	Fashion industry	Fashion clothes, clothing	Surgical masks, surgical body cover dress
Ford	Automobile manufacturing	Vehicles	Respirator and ventilators
Tesla	Automobile manufacturing	PV Cells and vehicles	Ventilators
Airbus	Aircraft manufacturing	Aircraft	Ventilators

2.6.2 Impact of covid-19 on customer demand

Teodoro and Rodriguez (2020) highlighted the COVID-19 impact and tried to close the production process in China first, then worldwide. Because of less production, demand from customers also decreased with time. Demand for less-used products like masks, sanitizers, gloves, and body cover dresses has increased during a pandemic. Still, demand for more-used products, like textiles, from the customer side, has dropped after the pandemic. Teodoro and Rodriguez (2020) highlighted that in European and American retailers, orders for textile production are still cancelled by the customer, which is the cause of financial loss concerns in many sourcing countries.

Impact of COVID-19 on consumer buying behavior, technology-based environment, and consumer daily change in habits, and their dependencies increase for online platforms, which impact the daily demand of customers for regular objects, including ng textiles. Amory and Martin (2020), in their article, highlighted the focus on society in socio-economic aspects. She states that every sudden

incident impacts society in three ways: social damage, environmental damage, and economic damage. This pandemic situation impacts income and household expenses, which directly affect customer demand. Additionally, household consumption is constant with the rearrangement of daily consumable items, which has led to the saving function in these days of crisis. Because of this, the lower middle class and poor people move towards the saving function and consume money for health purposes, not for the purpose of buying fashion dresses and clothes, which directly impacts customer demand for textiles.

Xu et al. (2022) stated that, due to the reduction in customer demand, economic activities were also impacted by it. Because of the sudden first wave of the pandemic, consumer buying behaviour has changed, business models and industries have been transformed, and demand for online platforms has increased. Because the economic effect was very uneven, employees started working from home. Most of the employees have lost their jobs due to health fears, lockdowns, travel restrictions, and the closure of businesses.

2.6.3 impact of covid-19 on logistics and transport

In the trading of textile goods, observable changes have been derived because of the pandemic situation. Amory and Martin (2020) stated that due to the complete shutdown of travel and transport, transferring the products from one point to another has become a difficult task. Teodoro and Rodriguez (2020) highlighted that the changes in routes and reduction in service frequency affect the logistics network of the maritime distribution network. Sea freight exports are also impacted by the number of port calls to load or unload cargo, which is reducing in this pandemic situation due to a decline in demand from the customer side and a cargo imbalance (Odunayo & Victor, 2020).

Teodoro and Rodriguez (2020) highlighted that the textile industry is in an under-pressure situation in these difficult days of the pandemic. The developed countries have different needs and approaches for their textile and resilient supply chains. The developing countries or minimum-price sourcing nations like Pakistan, which are extremely reliant on the textile trade and earn revenue from exports, faced many challenges in financial support and health system maintenance. Lockdowns affect the inter-city and intra-city logistics systems of textile products. It has been highlighted the high supply chain risk and challenges around the world.

The logistics system is essential for controlling disturbances and improving the supply chain (Choi et al., 2016). Jani (2021) stated that land transport is also not available under lockdown conditions in different countries, unlike air and sea transport, according to Agility Logistics' tracking tool. Truckload capacity has been intended under lockdown with the reduction of employees leading to higher rates of textile products and logistics of products.

Air transport exposure has also been dropped by 19% in March 2020 due to a reduction in passenger flights and a reduction in production processes in China and then all over the world, including Pakistan. Due to lockdown and decrease in customer demand and the drop in the export system of textiles in Pakistan, air transport has also been reduced, and for the important shipment, their cost has increased.

IFC also stated the issue and challenges in the logistics system of textile products. Supply chain disruptions, shortages of supplies, shortages of production, lockdowns, shortages of drivers of trucks, containers, or cargo, order cancellations, and a smaller number of transports are the issues that were highlighted in the logistics of the textile industry.

Additionally, the logistics system of textiles has been affected by a smaller number of productions, a decrease in customer demand, a change in consumer buying behavior, a high cost of transport, a smaller number of transports, a smaller number of drivers, a change in routes, lockdown, full truckload and less truckload issues, wholesaling, retailing, and warehouse management issues, and also by the late delivery of products from the supplier side, which also impacts the brand equity of

textile industries.

2.7 Conceptual Framework

The study describes the COVID-19 effect on the textile supply chain. Below figure 4 highlight the conceptual framework of this research.



Figure 4: Conceptual Framework

2.8 Hypotheses

Hypothesis for the effect of independent variables on the dependent variables has been mentioned below:

H1 => Covid19 has significant and positive impact on the SCM of Textile industry.

H0 => Covid19 has insignificant and negative impact on the SCM of Textile industry.

3. Research Method

We worked on a quantitative study because we found the effect of an independent variable on a dependent variable (Rasheed & Rashid, 2023; Rasheed et al., 2023). A qualitative research study is used to understand ideas, concepts, and experiences. So, we worked on a quantitative research study (Rashid et al., 2023; Rasheed et al., 2024b). A deductive approach is used in this quantitative research (Rashid & Rasheed, 2024). A deductive approach is used in quantitative studies to explore data, generate meanings, identify patterns and relationships, and measure the impact of independent variables on dependent variables. It moves from broader generalizations to specific observations (Rashid et al., 2024a; b). The inductive approach is opposite to the deductive approach, and it is more suitable for qualitative study (Rashid et al., 2021). In this research study, we selected a deductive approach to fit the topic from the start of the research. The explanatory research approach is about testing theory, which is related to the deductive approach. So, we used an explanatory research approach in this quantitative study (Rashid et al., 2024c). The exploratory research approach is about to create a theory that is used in qualitative research studies. The effect of one variable can be tested, calculated, measured, and compared by the researcher with another variable (Damico et al., 2021). A correlational research design investigates the relationship among variables with manipulation from the researcher and without controlling variables from the researcher's end. It has been investigating the positive and negative impact or predicting an outcome (Khan et al., 2021; 2022; Rashid et al., 2024d, e).

Descriptive research design is also part of a quantitative study, but it aims to describe a phenomenon or situation accurately and systematically (Agha et al., 2021; Haque et al., 2021; Ngah et al., 2024). As the qualitative research has trustworthiness issues (Haq et al., 2023). We selected the "Causal Research Design" for the study. We have selected this research design because it is useful to recognize the cause-and-effect connection among variables. Causal research design is related to the analysis of a problem to explain and describe the relationship between different variables.

Sampling is a way of collecting information from participants who were selected from a large target population (Alrazehi et al., 2021). Below is a description of the sampling design, sampling

technique, target population, sample size, and participant details used to describe the data collection. The sampling technique is selecting a sample for research (Das et al., 2021; Rashid & Rasheed, 2022; Rashid et al., 2024f). There are several sampling techniques, but we used the convenient sampling technique. It is defined as collecting data from available participants in real time. The target population is the large number of individual pools that we have selected to complete our research work and receive the best output from the data.

Our target population consisted of middle-class employees and workers. The age of the target population was above 18. They were mostly related to different organizations. The sample size is defined as the number of subjects obtained from the target population for research purposes (Rashid & Amirah, 2017; Rashid et al., 2019). This number is usually represented by 'n'. It influences the data precision and drawing of conclusions. Our sample size, or 'n', was 100 to 150 respondents for conducting our research. We selected the convenience sampling technique as part of the non-probability research design. We used the "Non-Probability Sampling Technique" in our research study. It is defined as the non-random sample selection criteria in which not every member can participate (Hashmi & Mohd, 2020; Rashid et al., 2024g).

There are number-based data collection tools. In which interview protocol, questionnaires, observations, checklists, case studies, and surveys are included. We used the "questionnaire" as a data collection instrument. A questionnaire is a set of written questions with choices of answers for the purpose of data collection or statistical study. Before collecting data from participants via questionnaire, we provided informed consent to the participants for their permission to disclose their information and data about their answers. Even their fictitious names are used in place of their names.

3.1 Procedure for Data Collection

- a) Describe the research objectives to the participants.
- b) Collect informed consent from them about their personal information sharing.
- c) Allow them to keep their identity anonymous.
- d) A guide to how to fill out the questionnaire
- e) Assign numbers to the data for easy analysis of the data
- f) It was better to inform primarily about collecting data.
- g) Guide the whole process of completing the questionnaire
- h) Provide a huge amount of time to give their responses to collect correct data.

3.2 Statistical Technique

A greater number of statistical techniques are used to analyze the data. However, we worked on the regression, correlation, factor analysis, t-test, and ANOVA techniques to test the impact of independent and dependent variables by using the software SPSS (Rashid, 2016).

4. Results & Findings

4.1 Descriptive Outline of the Collected Data

In the following segment, we will discuss the data profile. Which we analyzed through several methods. The first respondent profile is evaluated, which you can see in Table 2 below. Respondents are based on 69.7% male and 30.3% female categories. Respondent age groups are categorized as follows: 29.0% are respondents aged between 18 and 25 years. 53.1% of respondents are between 26 and 35 years old. 13.1% of respondents are between 36 and 45 years old. 1.4% of respondents are between 46 and 55 years old; however, 3.4% of respondents are found in the last category of "others" age. The maximum number of respondents categorizes respondents' education. 59.3% of respondents have a master's degree, whereas 30.3% have a bachelor's degree, 9.0% are intermediate, 0.7% are matriculate-qualified, and 0.7% have other qualifications. Respondent's professional experience has been categorized as follows: 74.5% of respondents have 0 to 5 years of professional experience,

17.9% have 6 to 10 years of professional experience, and 7.6% have 11 to 20 years of professional experience.

Table 2: Respondent's Profile

Demographic Items		Frequency	Percent
Gender	Male	101	69.7
	Female	44	30.3
	Total	145	100.0
Age	18-25	42	29.0
	26-35	77	53.1
	36-45	19	13.1
	46-55	2	1.4
	Others	5	3.4
	Total	145	100.0
Education	Matric	1	.7
	Intermediate	13	9.0
	Bachelors	44	30.3
	Masters	86	59.3
	Other :	1	.7
	Total	145	100.0
Experience	0-5 Years	108	74.5
	6-10 Years	26	17.9
	11-20 Years	11	7.6
	Total	145	100.0

4.2 Validation of the Model

According to Hashmi et al. (2020a), reliability tests were executed for every variable to ensure the model's reliability. The value should be greater than 0.7 of Cronbach's alpha, which shows the model's reliability (Hashmi et al., 2020b; Rashid et al., 2022a).

4.3 Reliability Analysis of Textile Supply Chain Management

Table 3: Reliability Statistics Of Textile Supply Chain Management

Cronbach's Alpha	Cronbach's Alpha Based On Standardized Items	N Of Items
.716	.727	5

Table 3 shows Cronbach's alpha value of textile supply chain management 0.716, which is greater than 0.7, and all items of the dependent variable, Textile Supply Chain Management, are reliable for every variable (Rashid et al., 2022b).

Table 4: Reliability Statistics Of Pandemic Covid-19

Cronbach's Alpha	Cronbach's alpha based on standardized items	N of Items
.859	.861	5

Table 4 shows that the Cronbach's alpha value of pandemic COVID-19 is 859, which is greater than 0.7 and for all items of the independent variable, pandemic COVID-19 is reliable for every variable (Hashmi et al., 2021a).

4.4 Hypotheses Testing

SPSS software was run, and hypotheses were tested by applying a linear test (Hashmi et al., 2021b).

4.5 R, R-square, and Adjusted R-square

Table 5 shows the strong strength relationship between dependent and independent variables by the R-value of .733 and the R square value of 53.8%, which shows the accuracy of regression of the dependent variable, which is explained by independent variables. The adjusted R square shows the unbiased accuracy of regression, and here, we have 53.5% impartial accuracy.

Table 5: Model Summary

Model	R	R Square	Adjusted R Square	Standard. Error of the Estimate	Change Statistics						Durbin-Watson
					R Change	Square Change	F Change	df1	df2	Sig. Change	
1	.733 ^a	.538	.535	.5256	.538	166.525	1	143	.000	2.148	

a. Predictors: (constant) COVID-19

b. Dependent Variable: Textile SCM

The sig value in Table 6 indicates that the independent variable, Covid-19, is significant to the dependent, which is textile supply chain management since the sig value here is 0.00, which is less than 0.05 (Rashid et al., 2020; Khan et al., 2023a),

Table 6 ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	45.996	1	45.996	166.525	.000 ^b
	Residual	39.498	143	.276		
	Total	85.494	144			

a. Dependent Variable: Textile SCM

b. Predictors: (constant) COVID-19

As per the sig values in Table 7, we can interpret that both variables have significance. Similarly, Covid-19 has an impact on textile supply chain management. Here, both sig values are smaller than 0.05. The value of VIF collinearity shows that COVID-19 has a value of less than 10, so there is no multicollinearity; the impacts reported by the model are pure. One's impact is not suffering through the effects of other independent variables (Khan et al., 2023b).

Table 7: Coefficients

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B		Correlations		Collinearity Statistics		
	B	Std. Error				Lower Bound	Upper Bound	Zero-order	Partial	Part	Tolerance	VIF
1	(Constant)	.905	.211	4.299	.000	.489	1.322					
	COVID19	.695	.054	12.904	.000	.589	.802	.733	.733	.733	1.000	1.000

a. Dependent Variable: Textile SCM

As per Table 7 above, the equation of regression has been designed as follows:

$$\text{Textile Supply Chain Management} = 0.905 + 0.695 \text{ COVID19}$$

Table 8 shows whether the hypotheses are accepted or rejected.

Table 8: Summary of Hypotheses

Hypotheses	Result
H1: "COVID-19 has a significant and positive impact on the SCM of the textile industry."	Accepted

5. Discussion, Implications, Limitations and Recommendations

5.1 Discussion

This study was conducted on the COVID-19 effect on Pakistan's textile supply chain from the perspectives of different primary areas, including production, customer demand, and transportation. Researched samples of 145 respondents were collected from the population of employees of textile companies in Karachi, Pakistan. It was found that COVID-19 affects textile manufacturing, which disturbs the overall textile supply chains. COVID-19 also affected customer demand for textile products, which resulted in disturbances in the textile supply chain. Furthermore, COVID-19 has also disturbed transportation, logistics, production, and purchasing, negatively affecting the textile sector's supply chain performance.

In the last three industrial revaluations, COVID-19 has been the most severe interruption, causing great anxiety all over the world. This epidemic, COVID-19, created a scenario for manufacturing companies to set their production systems and operations on hold for an extended period. In contrast, manufacturing companies think of long-term solutions to ensure smooth supply and operations for firms and customers. The textile supply chain needs to be more resilient in manufacturing, customer demand, purchasing, selling, and transportation so that the next pandemic, like COVID-19, may not affect the textile supply chain management. Through Pakistan, textiles were resilient enough but never faced epidemics like COVID-19. A more resilient supply chain resulted in more effective and efficient business.

5.2 Implications

This study gives an insight into the textile industry challenges faced during the COVID-19 pandemic and after the COVID-19 period. In an epidemic, how to deal with operations and production systems in supply chain management is one of the significant contributions. Effective and efficient management in this era of the COVID-19 crisis is asking for innovations and serious results in all parts of the supply chain for all the stakeholders (Government, Industry, and Citizens) of the Pakistan textile sector.

5.3 Limitations

This study, like other research and studies, holds several limitations. First of all, a study has a time limitation because it was completed quickly. Then secondly, it is individual research. No other person is involved in it. Thirdly, it was conducted only in Karachi, a city in Pakistan, so it also has some geographical limitations. Fourthly, it was only based on the textile industry in Pakistan.

5.4 Recommendations

Future research might be performed to research alternatives; those will be studied in the same study through changes in the population industry and the medical industry. Furthermore, it may be done in different geographical locations, like any other city except Karachi and outside of Pakistan. Furthermore, current production facilities for textiles should be shifted to digital manufacturing, like 3D printing, robots, etc., to produce textile goods. Real-time production and customer demand are used in the textile industry. Surgical masks and gloves should increase in the supply chain departments of textile industries to work efficiently. Most of the supply chain process should be converted into a technology-based supply chain, decreasing the chance of increasing the impact of a pandemic like COVID-19.

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