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Impact of Covid-19 on Supply Chain Management

Covid-19'un Tedarik Zinciri Yönetimi Üzerindeki Etkisi

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ÖZET

Bu çalışmanın amacı, COVID-19'un çeşitli sektörlerde tedarik zinciri yönetimi üzerindeki etkisini incelemektir. Bu çalışmanın bir parçası olarak, pandeminin küresel olarak tedarik zincirleri üzerindeki etkisi incelenecektir. Veriler, doğrusal regresyon analizi, tanımlayıcı istatistikler ve Pearson korelasyon analizi gibi istatistiksel yaklaşımlar kullanılarak bir anket aracılığıyla elde edilmiştir. Bu çalışmanın sonuçlarına göre, çeşitli demografik gruplar arasında tedarik zincirlerindeki aksaklıkların düzeylerine ilişkin bir ayrım bulunmaktadır. Regresyon analizi, 001'den küçük gözlemlenen p-değerleri ile COVID-19'un tedarik zinciri faaliyetlerinin yürütülmesini büyük ölçüde etkilediğini ve engellediğini göstermesi açısından oldukça açıktır. Bu aynı zamanda kavramın hedef kitle için önemini ifade etmekte ve ne kadar ihtiyaç duyulduğunu vurgulamaktadır. Ayrıca, korelasyon katsayıları, COVID-19 ile tedarik zincirindeki aksaklık derecesi arasında <0,001 olasılık düzeyinde pozitif bir ilişki olduğunu göstermektedir. Bu sonuçlar, pandemiler için plan yapmak ve işletmelerin sürekli çalışmasını sağlamak isteyen kuruluşların yanı sıra tedarik zinciri yönetimi alanında pandemi araştırmalarını inceleyen akademisyenler için de hayati önem taşımaktadır.

Anahtar Kelimeler:

Covid 19 Pandemisi,

Tedarik Zinciri,

Tedarik Zinciri Yönetimi,

ABSTRACT

The objective of this study is to examine the impact of COVID-19 on supply chain management in various sectors. As part of this study the impact that the pandemic has had on supply chains globally will be looked at. Data was acquired through a survey using statistical approaches such as linear regression analysis, descriptive statistics, and Pearson correlation analysis. From the results of this study, there is a distinction on the levels of disruptions in the supply chains across the various demographics. The regression analysis is quite clear to show that indeed COVID-19 greatly impacts and interferes with the conduct of supply chain activities with the observed p-values of less than 001. This also expresses the significance of the concept to the target audience and to stress how much it is needed. Moreover, the coefficients of correlation imply that there is a positive relationship between COVID-19 and the degree of disruption in the supply chain with a probability level of < 0.001. These results are vital for organizations wanting to plan for pandemics and ensure businesses continuously run as well as for scholars exploring pandemic research in the area of supply chain management.

Keywords:

Covid-19 Pandemic,

Supply Chain,

Supply Chain Management,

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1. INTRODUCTION

COVID-19 has emerged as an unprecedented global challenge, which exposed a great many aspects of human life and organizational processes. It has revealed vulnerabilities and introduced significant shifts in how things are done (Mabroukeh et al., 2018). When countries started implementing measures such as lock-downs to contain the virus and restricting movement of people through borders; supply chains across the world faced an unprecedented disruption (Agarwal and Banerjee, 2020). In their research, McMaster and colleagues (2020), disclose how the global supply chain management (SCM) has experienced disruption across the chain, from procuring the inputs to delivering the final output. Essentially, to combat the level of such disruptions, it is essential to understand the implications and come up with ways of reducing risks that may be associated with such disruptions in the future (Moosavi, 2022).

New circumstances such as the existence of the pandemic let firms from all around the world reconsider and adjust the so-called supply chain strategies. From the publication of Montoya-Torres and colleagues (2023) it is noted that there has been an increased focus especially after the emergence of the COVID 19 pandemic in the research and practice of operation and supply chain management. In the paper describing the crisis, the authors emphasize that the main supply chain methodologies and methodologies used earlier, which were primarily concerned with optimization and costs, which are not enough to address the disruption that exists in today's world and is largely unpredictable (Fonseca et al., 2020).

The influence is multifaceted as COVID 19 has revealed inefficiencies in supply chain arrangements and particularly long supply chains that are intensely dependent on other nation's contractors (Francis, 2020). These threats have played out as extended delivery time horizons, increased costs, and limited accessibility of critical materials and goods (Raj et al., 2022). Factories were shut down and labor became scarce which, led to reduced capacities and utilization rates (Chowdhury et al., 2020). The disruption has been extensive enough that it forced organizations to step back and rethink their supply chain configurations and designs, which entails investigating supplier variety and nearshoring strategies (Mabroukeh et al., 2018).

In addition, the pandemic illustrates how it made flexibility and reliability in supply systems inevitable. In Khan and colleagues (2021)'s view, in order to reduce the impact of the epidemic, there are some steps to be done and there are measures that can be set to gain tangible experiences of the difficulties arising from the epidemic. They further stress that such strategies include the development of digital initiatives, obtaining cognitive sense of supply chain visibility, and encouraging collaboration with the supply chain partners. Today, block chain, IoT (internet of things), and AI are proving helpful in improving the effectiveness and the degree of transparency of the supple chain delivery in many organizations (Ivanov et al., 2020). In the opinion of the author, such technologies will remain crucial in enhancing the capability of managing supply chain disruptions and performing them more efficiently (Ishida, 2020). According to the authors, these methods are all inevitable for not only dealing with the present disruptions but also for constructing more resilient supply chains following this pandemic (Hald et al., 2022). Therefore, the transition to data-driven strategies improved work processes of supply chain stakeholders that were more flexible and thus easier to modulate (Schleper et al., 2021).

The study by Magableh and colleagues (2021) provides a comprehensive and exhaustive meta- analysis of some of the studies conducted on the various works done on supply chain disruptions relating to COVID-19. The analysis further stresses a proper supply chain framework that must be built strong enough to avoid or cope with the similar situations in the future. To facilitate this, the authors demarcate prospective research areas, including risk management, digital supply chain, and sustainability in supply chain (Francis, 2020).

This is particularly relevant in the present COVID-19 pandemic that has shown how global supply chains are intertwined and how a disruption of one logistics network affects multiple others around the world (Frederico et al., 2021:56). In their scholarly publication, Kumar and Mishra (2020), authors describe a cross-sectional study of disruptions in the light of pandemic in the Global Supply Chain and they pointed out that the pandemic impacts had emerged shifts in demand, production and challenges in logistics. Companies nonetheless have acknowledged the need for supplier diversification initiated and the creation of more robust and sustainable supply chains to address future disruptions (McMaster et al., 2020)

In addition, the pandemic affects strategic decisions about supply chains besides the operational issues associated with it (Ivanov, 2021). A study by Sharma and colleagues (2020) further looks into how Covid-19 impacted the decisions made in supply chains by extracting data from the tweets of NASDAQ 100 listed firms. This skill of contingency and resilience, both in the face of the present challenges and the future dynamics of the

market is particularly crucial (Kumar et al., 2020). Therefore, securing the supply chain and managing risks of disruptions have emerged as important supply chain management strategic objectives (Kumar 2001).

Research by Schleper and colleagues (2021) notifies how supply chains have also come under pressure as well regarding their economic and societal sustainability during the pandemic. Various means have been employed in order to address different impacts of COVID-19 on supply chains, including the strengthening of sustainability by adopting circular economy principles, increasing supply chain visibility, and promoting for responsible sourcing (Ishida, 2020). The measures mentioned above have to be put in place since they are vital in protecting the sustainability and perpetuity of supply chains (Chowdhury et al., 2020).

Cascading the goal toward building more robust and lean supply chains in situations of competitive aggressiveness spur industrial cooperation between the commercial sector and government sectors in South Asia (Butt et al., 2021). The purpose of their partnership is aimed at advancing infrastructure, rationalizing laws, and providing funding support where affected (Nagurney, 2020). These efforts are crucial for them rebuilding supply chain networks and ensuring them as being ready for the future shocks (Min, 2023).

Altogether, the COVID-19 pandemic poses a significant impact to global SCM as it reveals vulnerabilities and induces significant changes to strategies and practices (Khan et al., 2021). The unprecedented COVID-19 pandemic has underscored the role of responsiveness, versatility, and robustness in supply systems (Sharma et al., 2020). Therefore, it is imperative for the organizations not only to manage the impacts of pandemic but also to utilize creative strategies and tools to lay the foundation of more robust and sustainable supply chains in the future (Paul et al., 2021). The objective of this article is to examine the multifaceted impacts of the pandemic on supply chain management to predict future threats in light of current research, relevant literature and field learnings.

2. CONCEPTUAL FRAMEWORK

2.1. Covid 19 Pandemic

The outbreak of the COVID-19 that resulted from the emergence of a new coronavirus, namely SARS-CoV-2, has had profound consequences for the global health, economy and businesses (Atalan., 2020). The virus emerged late December 2019 in Wuhan, a city in China, and soon extended its course to the whole world, disrupting many activities (Ciotti et al., 2020). In comparison to the prior coronaviruses including SARS-CoV (2003) and MERS-CoV (2012), the SARS-CoV-2 virus proved to be more transmissible, and it additionally had the capacity to spread affecting asymptomatic patients, which made its management a much difficult task (Ivanov et al., 2021). People around the world had to go through extensive lockdowns, banned travelling and implemented social distancing in order to prevent the virus spread (Carracedo et al., 2021). According to Onyeaka and colleagues (2021), these intervention measures may go a long way to enhance he health of the general population but bear enormous social and economic impact and consequence for business entities across the global economy.

In their study, Pokhrel and colleagues (2021) points that regarding technical personnel, many challenges emerged from the pandemic. Important new information on the processes, clinical manifestations, and possible treatments of this illness is provided by research of Iba and colleages (2020) as their study emphasises the significance of comprehending COVID-19 coagulopathy to improve patient outcomes during the pandemic by looking at the pathophysiology and therapeutic methods.

Emergence of health issues and restrictions like lock down led to shortage of workforce which had a direct adverse impact on performance and effectiveness of the organizations (Craighead et al., 2020). Susceptibility of essential sector employees rose and led to heightened work stress for such sectors; Healthcare, Food and Drug, and Delivery services were most affected (Frederico et al., 2021). They however developed within the industry sector and this hence placed a negative impact on business particularly face-to-face one-on-one business dealings of owning like retail, trade, and supply chain sales (Hou et al., 2022). It impacted international business most especially as governments imposed export bans and closed their borders in a bid to curb the spread of the virus (Moosavi et al., 2022). These policies lead to a very high level of volatility and even an increase in the overall cost across the global supply chain; of the product or raw material (Velavan et al., 2020). Hald and colleagues (2022) support this as the outbreak of the pandemic revealed the vulnerability of coupled and integrated supply chains across the globe thereby giving rise to a reconfiguration of the global trade relations and policies.

Belitski and colleagues (2022) conceptualize that the pandemic's economic impact disproportionately affected the working class. As highlighted by the authors, the issue of layoffs is well illustrated by the fact that many employees reduced their working hours or went on unpaid leave, or were out of work because enterprises faced difficulties in terms of demand and disruptions in operations. Meagre paid employees especially the essential workers had higher risks of contracting the virus and they also had additional concerns on job insecurity and health risks (Onyeaka et al., 2021). The shift towards work from home for a vast array of professions became a necessity to amplify inequality in employment security and working environment (Carracedo et al., 2021).

Thus, in a work dating from 2021, Butt and colleagues specify that the epidemic has presented various challenges to companies in various sectors. They note how this led to adverse effects on hospitality, retail, and tourism industries due to Lockdowns and restriction on movement. It was established that a vast number of small businesses faced challenges in sustaining their activities resulting from lower revenues and higher expenses for operations (Nagurney, 2020). Businesses advanced their digital change strategies by applying remote business, remote purchase, and digital communication technology and procedure (Boiral et al., 2021).

However, enterprises who could not respond earlier suffered significant financial problems, and more often had to stop their activity exploring the far-reaching consequences of the pandemic on teaching and learning (Pokhrel et al., 2021). According to Magableh and colleagues (2021), they agree with the opinion that risk mitigation to respond to crisis, prepare for the unscheduled events and make efficient decisions that enable an organization to operate flowed. To remain competitive, companies shifted the focus to enhancement of the supply chain's robustness right away, sourcing from different suppliers, increasing inventory capacity and adopt leverage of technology in monitoring and decision making as recommended by Moosavi and colleagues (2022). Velavan and colleagues (2020), also analyzing the outcomes of the rapid digitalization and the high emphasize on remote work, found that, it affected the organizational and social interactions of businesses in the long term. In addition, the pandemic underscored the need to address inequality or social and economic justice in an effort to build societies that are stronger and more equitable (Barman et al., 2021). Historically, globalization disruptions interacting with an increased demand ended up making a significant impact on the entire world and the corporations that handle supply chain events (Chowdhury et al., 2021).

2.2. Supply Chain Management

Supply Chain Management (SCM) is an interconnected strategic approach of managing the entire flow of goods from raw material suppliers to end users/customers (Croxton et al., 2001). The COVID-19 pandemic has affected various aspects of SCM and revealed vulnerabilities, as well as highlighted that existing practices need to be reconsidered (Power, 2005). Thus, this conceptual framework aims to define the areas affected by the pandemic, by combining the information from the materials of relevant literature and new investigations of disruptions caused by the pandemic, such as workforce management, industrial activity, demand forecasting, production capacity, supply chains, transportation costs, suppliers' engagement, delivery time, international trade, effects, and ripple effects, layoffs, cash inflows, and ROI (Karuppiah et al., 2022). Supply chain Management is a process of managing the flow of things between the buyer and the seller, in a way that is aimed at reducing waste and at satisfying the needs of the customer (Cherian, 2023). It incorporates aspects such as procurement of raw materials, manufacturing, purchasing, and overseeing the movement of goods and services during circulation (Hou et al., 2022). A good SCM is therefore crucial for realizing competitive advantage and operational excellence (Lambert et al., 2017).

As a result of the measures taken by the governments to control the spread of COVID-19 through the policies of the lockdowns and social distancing across the world, the industrial activities slowed down and business segments of manufacturing and processing incurred huge losses (Min, 2023). Something as simple as the disruption of manufacturing sector production for any reason, whether due to lockdowns, delayed supplies, labor disruptions or other factors, would mean that the products and services that were required could not be delivered; there were severe shortages (Wieland 2021). Manufacturing process hence has a central role in supply chain management (SCM); and any interoperation has an effect on other stages of SCM (Kumar, 2001). In addition, the pandemic factor disrupted the supply chain due to issues of health complications and lockdown measures leading to a significant reduction in the size of the workforce (Craighead et al., 2020). The diminished labor force hindered the efficiency of production lines, warehousing, and logistics, resulting in bottlenecks that impacted the entirety of the supply chain (Blanchard, 2021). In their 2020 publication, Sanders and N. R. note that the limited availability of adequate workers guaranteed the fact that the availability of a competent technical staff is vital for effectiveness of supply chain tasks.

In the study of Croxton and colleagues (2001), it has been argued that the nature of the pandemic poses significant challenges to demand forecasting since the pandemic remains unpredictable in the core of its characteristic. It was also mentioned that the traditional forecasting techniques which relied on data and the past does not work well when faced with drastic changes in consumer behavior. Forecasts have been off base, leading to overstocking or stock outs, which have led to the centrality of accurate demand forecasting in ensuring that production horizons and inventory elements align with market needs (Richey et al., 2022). This further brings in another key aspect of supply chain, the production capacity as this plays a central role in determining the competency to meet market needs and remain effective in the long-run (Power, 2005). Regarding procedures related to health, it was established that several companies have had to scale down their production capacity for the purpose of ensuring the safety of their employees (Zhang et al., 2023). Over the years there was a contraction in manufacturing capabilities which in turn impacted supply chains as the current demand would not be met since the capacities to produce such volumes were limited (Sanders, 2020).

Sodhi and Tang (2021), also pointed out that the period of the epidemic led to an increased supply while the demand was low. Some commodities saw an increase in demand, particularly those regarded as essentials like medical products, food items, etc., while other products that were not deemed as essentials saw a drastic reduction on their demand such as luxury products, travel products, etc. (Paul et al., 2021). They also impacted transport costs due to the restricted number of shipping channels, reduced door capacity and increased thirst for transport services (Richey et al., 2022). In this light, the increase in expenses placed additional pressure on the corporations in terms of overall financial costs, thus reducing their total revenue (Attaran, 2020). The prior imbalance led to overcrowding and distortions on the entire supply chain and thus, effective management of Supply and Demand took center-stage for the restoration of order as well as the continuing momentum of product flow (Craighead et al., 2020; Cherian et al., 2023).

Many countries closed their borders and restricted the transportation of goods which greatly interfered with the global supply chain networks because most companies source their products from international suppliers (Lambert et al., 2017). This impacted the schedules that were set to manufacture products because the procurement of raw materials and its components was delayed (Sanders, 2020). The author reinforces it by asserting how the event negatively impacted the exportation activities as various nations stepped up ways to regulate importation and exportation of goods across their boarders. Gaining access to a range of markets and resources through import/export had been essential and any disruption to the global trade flow had a large impact on procurement and supply chain performance (Attaran, 2020). As proposed by Barman and colleagues (2021) disruptions in the availability chain mean that these supply chains are interconnected such that a change in one area can affect the other. The outbreak of the pandemic was a very good example of this since it disrupted manufacturing and logistics and transport operations downstream and leading to operational inefficiencies (Craighead et al., 2020).

Companies experienced a decline in cash inflows as a result of lower sales and higher operational expenses (Richey et al., 2022). This was because their financial costs significantly limited the ability to dedicate some funds towards improvements and innovations in the supply chain (Hald et al., 2022). The combined effect of the aforementioned variables caused considerable financial strain on the return on investment (ROI) of numerous enterprises (Zhang et al., 2023). The increase in expenses, the decline in income, and the deficiencies in organizational capacity caused appalling deterioration in profitability and placed the long-term financial position at risk (Power, 2005). Therefore a ROI became a strategic goal where supply chain improvements and investments were required to be positive and provide corporations with the rate of growth needed.

This conceptual framework offers a systematic approach to comprehending the various effects of COVID-19 on supply chain management. It emphasizes the interdependence of different parts of the supply chain and the far-reaching consequences of disruptions. Furthermore, it provides basis for more study and strategic decision-making to improve the ability of the supply chain to withstand future crises. This framework seeks to enhance the development of stronger and more flexible supply chain strategies by conducting a thorough analysis of these crucial areas.

2.3. Literature Review

In his study, Sanders (2020) determined that the COVID-19 pandemic has significantly affected supply chain management (SCM) on a worldwide scale. He highlighted the importance of enhancing the resilience and flexibility of supply chains in response to this impact. A Grey-DEMATEL technique was used by Karuppiah et al. (2022) to model the effects of COVID-19 on supply chain operations. They underlined how important agility

and adaptability are to supply chain operations revealing a positive and significant relationship. They concluded that increasing inventory levels, diversifying suppliers, and utilizing digital technology to improve supply chain visibility and coordination were all important adaptive measures during the pandemic.

Kumar and Mishra (2020) asserted that the epidemic has shown notable weaknesses in supply chains, specifically in domains such as predicting demand, production capability, and collaborating with suppliers, thus concluding a positive and significant effect on SCM. Micheli and colleagues (2021) studied the impact of the pandemic on operations and supply chain management (SCM) research and practice, revealing a positive and significant relationship between the two variables.

A comprehensive evaluation of supply chain research pertaining to pandemics was carried out by Chowdhury and colleagues (2021), who identified significant disruptions in transportation, logistics, raw material availability, and production deadlines. These hiccups demonstrated the vulnerability of just-in-time inventory systems, which were especially exposed to abrupt and significant interruptions brought on by the epidemic. The integration of smart supply chain management in the context of Industry 4.0 was investigated by Zhang and colleagues (2023). By enabling real-time monitoring, predictive analytics, and better decision-making, these technologies help supply chains be more resilient to disruptions like the COVID-19 pandemic. Hypothesis of research;

H1: There is a significant and positive relationship between Covid19 pandemic and supply chain management

H2: Covid19 has a significant and positive effect on supply chain management.

H3: In the context of the relationship between covid19 and supply chain management there is a significant difference between the results of males and females.

3. METHODOLOGY OF RESEARCH

3.1. Population and Sample

In this scientific study examining the impact of covid 19 on supply chain management it was essential to select the right sample for the entire population of concern to obtain accurate and reliable results (Karuppiah et al., 2022). The defined target population for this study includes managers and employees that work in the supply chain sector since they are the ones that experience and manage the disruptions caused by the epidemic across the globe in various industries.

Table 1. Demographic Data

		Frequency (N)	Percent (%)
Gender	Female	26	27.4%
	Male	69	72.6%
Age	18-24	15	15.8%
	25-34	18	18.9%
	35-44	11	11.6%
	45-54	25	26.3%
	55 years old and above	26	27.4%
Experience	0-2 years	23	24.2%
	3-5 years	7	7.4%
	6-8 years	4	4.2%
	9 + years	61	64.2%
Education	High school	1	1.1%
	Certificate/Diploma	2	2.1%
	BA/BSC	29	30.5%
	Masters	58	61.1%
	PhD	2	2.1%
	other	3	3.2%

Thus, to have a clear picture of this population, the survey includes supply chain specialists from the public and private sector including operators, middle management and chief executives. This sample technique is general in scope and thus allows the research to address a variety of views and experiences and hence allows to identify how different sectors and positions within the supply chains are affected in different ways by the pandemic (Hair et al., 2013).

The data for this study was collected using an online survey that was administered through links posted on professional networks like LinkedIn, WhatsApp, email, and specialist group and industry forums. Total number of responses received was 95 which is much more than the recommendation of a minimum of a 5:1 ratio of respondents to the survey question. This affords the study an opportunity to arrive at a statistically valid sample size. The survey design also provided criteria for respondents to have to answer all questions before moving on to the next, and there were no instances of missing responses. Concerning the effect of COVID-19 on supply chain management, the conclusions made in the study are methodologically grounded, which adds their credibility (George and Mallery, 2003).

3.2. Data collection tools

In this study, a quantitative research approach was employed, utilizing a questionnaire as the primary data collection tool. The scales for this study were taken from the research by Karuppiah et al. (2022), which was then used to make the questionnaire, which included 4 closed-ended questions aimed at gathering demographic information such as gender, age, experience and education. On the other hand, Covid 19 impact and supply chain scale consisted of a total of 14 items on a 5 Likert scale. The sentences in both scales are rated on a 5-point Likert scale (Strongly Disagree=1; Disagree=2; Neither Agree nor Disagree (or Neutral) =3; Agree=4; Strongly Agree=5)

A structured survey was employed to collect demographic data and was electronically circulated to individuals engaged in supply chain sector to ensure a varied and inclusive sample. The survey's organized structure enabled the gathering of measurable data, which was later examined to comprehend the influence of COVID-19 pandemic on supply chain management.

3.3. Data Analysis

In this study, data was gathered using a regularly applied computerized questionnaire form. Based on the results of the confirmatory factor analysis on the second level, the construct validity of the applied scales was verified (George and Mallery, 2003). The kind of analysis that was employed in this study was the Descriptive statistics. They in turn were interpreted in frequencies and percentages of the data collected hence the result is not skewed. In addition to these, several other tests were carried out due to the objectives of the research (Hair et al., 2013). Some of the tests that were used in the study are; simple regression analysis test, pearson correlation test and independent sample t-test. The demographic differences were reported in tables to give context and to enhance interpretability of the findings (Wright and Herrington, 2011);

1. ***Gender Distribution*:** From the data, it can be observed that a larger percentage of participants are male, accounting for approximately 72,6% of the total participants while the rest are female, of which only accounted for approximately 27,4%. This difference could be due to corporate influence of stereotyped gender roles amongst supply chain related industries or it could potentially signify the demographic pool from which the survey respondents were drawn.
2. ***Age Range*:** The survey includes a broad range of age groups, with a notable number of participants in the '45-54' and '55 years old and above' categories, each accounting for more than 25% of the respondents. The fact that this demography consists of more individuals of older age may suggest that the professionals disposed to positions where supply chain changes are implemented, are experienced and thus older or that the older individuals are more inclined to respond to surveys.
3. ***Professional Experience*:** The statistics of responses depicts that, a large proportion of the respondents possess 9 year or more working experience, which is 64,2%. This is a fairly understandable observation and it shows that the poll was mainly focused on capturing the opinions of the already experienced professionals, who might better understand the basic trends that are going on in the supply chain sector during the epidemic.

4. ***Educational Background*:** Most of the respondents (61,1%) possess a Master's degree which could imply that the sample has a highly educated workforce capable of offering well-informed opinions on the complex aspects of supply chain management affected by COVID-19.

3.4. Limitations

Although the survey offers vital information, it is important to acknowledge its various limitations. A primary limitation of this research is its exclusive focus on supply chain sector in Turkey, thereby restricting its scope to the sector alone. Future studies could broaden their scope to encompass national and international coverage, potentially enhancing insights that could benefit diverse fields more. Furthermore, there is response bias as the surveys are conducted voluntarily, and as such only people willing to express themselves or having first-hand experience of the matter are more disposed to replying

4. RESULTS OF RESEARCH

The analysis used in this paper produced frequency, standard deviation, percentage, and mean values. Along with that, an analysis was conducted on the skewness and kurtosis values to evaluate the normality of the data distribution. The results indicated a deviation from normal distribution as they do not fall within the range of -1 to +1, which is generally considered indicative of normality (Hair et al., 2013). Measures of central tendency were used in this research to describe demographic information gathered from a quantitative questionnaire about the effects of COVID-19 on Supply chain management.

Cronbach's Alpha was used to establish the internal consistency of the survey items. The established values of Cronbach's Alpha were 0.858 for COVID-19 impact and 0.886 for Supply Chain Management which indicated a high reliability rate for the completed scales. Overall, these results imply that the items are very much related and create a reliable scale (George and Mallery, 2003).

Table 2. Internal Consistency and Normality Distribution Results

	Covid 19	Supply chain management	All scale
A	0.858	0.886	0.931
Skewness	-1.057	-0.991	
Kurtosis	1.461	1.639	

The table presents the Cronbach's alpha (α) values, as well as skewness and kurtosis data, for evaluating the internal consistency and distribution shape of survey scales pertaining to the implications of Covid-19 and Supply Chain Management. This includes an overall scale.

The study's kurtosis and skewness coefficients are a commonly used statistical technique in determining the normality distribution in social science studies (Demir, 2022). The study shows a skewness value closer to 0 means that the data is normally distributed. The author iterates that positive skewness suggest that the breadth of the distribution is to the right implying that there are more high values and a negative skewness suggest that the breadth of the distribution is to the left implying that there are more low values for all groups. On the other hand, when the kurtosis value is closer to zero then that means is distribution has tails like that of a normal distribution (Wright and Herrington, 2011). The kurtosis coefficient > 0 means that distribution has heavier tails while kurtosis coefficient < 0 implies that it has lighter tails as such an aspect can be termed as heaviness of the tails. Cronbach's alpha is a tool used to evaluate how reliable a psychometric instrument is, by checking the consistency among the items in a scale. When the alpha value is higher, than 0,7 it's usually seen as satisfactory showing consistency and that the items are assessing a consistent underlying concept (George and Mallery, 2003).

The Cronbach's alpha coefficients for Covid 19, Supply Chain Management, and the overall scale are 0.858, 0.886, and 0.931 respectively. These numbers can be considered as signs of internal validity because the data presents a high degree of consistency between all scales. Such scores imply that the survey items are valid in the sense that they measure exactly what they are intended to measure. The skewness scores, -1.057 for Covid 19 and -0.991 for Supply Chain Management, indicate a left-skewed distribution, signifying that most responses are clustered towards the higher end of the scale. The kurtosis scores of 1.461 for Covid 19 and 1.639 for Supply Chain Management suggest that the data are leptokurtic, meaning they have a higher peak than a normal distribution (Wright and Herrington, 2011). This means that while the scales show internal reliability, the

distribution of responses is not normally distributed, most participants perceive effects of higher magnitude and some extreme response.

Table 3. Descriptive Statistics

Descriptive Statistics									
	N	Minimum	Maximum	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
Covid 19	95	1.00	5.00	3.8947	0.79608	-1.057	0.247	1.461	0.490
Supply Chain	95	1.00	5.00	3.9211	0.77255	-0.991	0.247	1.639	0.490
Valid N (listwise)	95								

From the analysis of the results obtained in this study, it was observed that the overall response rate for the survey questionnaire was 95 and the respondent's perception was moderately high towards the influence of covid19 on SCM. The scores for the impact of COVID-19 and supply chain disruptions are 3.8947 and 3.9211, respectively. These ratings indicate that the majority of participants believe that the effects of the pandemic are significant. Both data sets exhibit a standard deviation, for COVID 19 its 0.79608 and Supply Chain its 0.77255, which suggests that the responses are consistently grouped around the average value. The distributions exhibit a leftward skewness (COVID 19; -1.057, Supply Chain; -0.991), suggesting that a greater proportion of responses go towards higher degrees of effect (Demir, 2022). Furthermore, both categories demonstrate kurtosis, with COVID-19 having a value of 1.461 and Supply Chain having a value of 1.639. This indicates that a greater number of respondents experienced extreme impacts in both categories, particularly in supply chain management where the effect is slightly stronger. The mean and kurtosis in supply chain management are higher compared to the overall COVID-19 impact level. Participants' perception indicates substantial difficulties in effectively managing supply chain activities within the pandemic.

Table 4. Independent T-Test for Comparing Participants According to Gender

Gender		N	Mean	Std. Deviation	Std. Error Mean
Covid 19	Female	26	3.8942	0.78477	0.15391
	Male	69	3.8949	0.80600	0.09703
Supply Chain	Female	26	3.8718	0.72772	0.14272
	Male	69	3.9396	0.79313	0.09548

This data gives us statistics for a gender-based analysis regarding insights of COVID-19 impact and its consequence on supply chain management. In this study, with 26 female respondents and 69 male respondents, women showed average ratings of 3.8942 for COVID 19 impact and 3.8718 for supply chain impact, while men showed averages of 3.8949 and 3.9396 respectively. This suggests that male respondents perceived a slightly higher impact especially in terms of supply chain management as opposed to female respondents. The standard deviations indicate a bit variation in responses for both aspects (Demir, 2022). Despite these distinctions both genders rated the impacts as significant with scores exceeding 3.5 indicating an influence of the pandemic. The accuracy of these evaluations is supported by standard errors (around 0.09703 to 0.15391) confirming that the average values from the sample are estimated with reliable precision.

Table 5. Anova Test for Comparing Participants According to Their Educational Experiences

		Sum of Squares	df	Mean Square	F	Sig.
scm	Between Groups	2.264	5	0.453	0.728	0.604
	Within Groups	55.345	89	0.622		
	Total	57.609	94			
Covıd-19	Between Groups	0.866	5	0.173	0.263	0.932
	Within Groups	58.583	89	0.658		
	Total	59.449	94			

There are no discernible changes in the respondents' assessments of the effects of COVID-19 and the impacts of supply chain management (SCM) according to the ANOVA analysis of their educational levels (Ntumi, 2021). It is evident from the F-values for scm (0.728) and COVID-19 impact (0.263) that respondents' experiences with these features of the pandemic were not substantially influenced by their degree of education, with p-values greater than 0.05 (0.604 and 0.932 respectively).

Table 6. Anova Test for Comparing Participants According to Their Age Groups

		Sum of Squares	df	Mean Square	F	Sig.
scm	Between Groups	3.002	4	0.75	1.237	0.301
	Within Groups	54.608	90	0.607		
	Total	57.609	94			
covid19	Between Groups	3.031	4	0.758	1.209	0.313
	Within Groups	56.417	90	0.627		
	Total	59.449	94			

There are no discernible differences in the age groups' assessments of the effects of COVID-19 and the implications of supply chain management, according to the ANOVA study. A p-value of greater than 0.05 is found for the supply chain management (F-value: 1.237) and COVID-19 impact (F-value: 1.209), respectively, demonstrating that age did not significantly affect how participants viewed these features during the COVID-19 pandemic (Ntumi, 2021). As a result, age has no bearing on the range of experiences that exist in the supply chain industry at present time.

Table 7. Anova Test for Comparing Participants According to Their Work Experience in the Industry

		Sum of Squares	df	Mean Square	F	Sig.
scm	Between Groups	3.387	5	0.677	1.112	0.36
	Within Groups	54.222	89	0.609		
	Total	57.609	94			
covid19	Between Groups	3.776	5	0.755	1.207	0.312
	Within Groups	55.672	89	0.626		
	Total	59.449	94			

There are no discernible variations in the participants' perceptions of the effects of COVID-19 and the impacts of supply chain management based on the ANOVA analysis comparing their years of experience in the supply chain sector. The COVID-19 impact F-value (1.207) and supply chain management F-value (1.112) had p-values of 0.312 and 0.360, respectively, both over the 0.05 cutoff. This suggests that participants' experiences of these repercussions during the COVID-19 pandemic were not significantly influenced by their years of experience. As a result, it doesn't seem that experience level has any bearing on the range of experiences that the supply chain industry has to offer at this time (Ntumi, 2021; Springer, 2021:227-242).

Table 8. Regression Analysis Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Selection Criteria			
					R Square Change	F Change	df1	df2	Sig. F Change	Akaike Information Criterion	Amemiya Prediction Criterion	Mallows' Prediction Criterion	Schwarz Bayesian Criterion
1	0.851[a]	0.724	0.721	0.40806	0.724	243.924	1	93	0.000	-168.326	0.288	2.000	-163.218

The regression analysis model summary of this study indicates a positive correlation between the effects of COVID-19 on supply chain management, with a coefficient of 72,4 percent. This accounts for 4% of the variance, with an adjusted R-squared value of 0,724. The model has a significantly high adjusted R-square of 0,721, indicating its strong ability to explain the variation in the data, considering the number of predictors (Taber, 2017). This model demonstrates statistical significance as evidenced by its F statistic of 243.924 and a p value below 0. Furthermore, based on the selection criteria, the AIC value is -168.326 and the BIC value is -163.218, which further supports the adequacy of the model. Overall, the research maintains a high degree of confidence, allowing us to safely assert that COVID-19 has a significant predictive indication of its effects on supply chain management.

Table 9. Regression Analysi

Coefficients[a]											
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Correlations			Collinearity Statistics	
		B	Std. Error	Beta			Zero-order	Partial	Part	Tolerance	VIF
1	(Constant)	0.705	0.210		3.356	0.001					
	Covid 19	0.826	0.053	0.851	15.618	0.000	0.851	0.851	0.851	1.000	1.000
a. Dependent Variable: Supply Chain											

The coefficients table contains a detailed analysis of the regression research with a focus on the way COVID-19 pandemic effected the changes in the implementation of supply chain management. The coefficient (B) for COVID-19 is 0.826 and has not been standardized. This shows us that for every unit rise in the perceived impact of COVID-19, there is an increase of 0.826 units in the perceived influence on supply chain management. The beta coefficient which is the standardized coefficient is 0.851, which means it is highly and positively correlated.

From the statistics it can be seen that the t-value for COVID-19 is 15.618, and the p-value is less than 0.001. This further specifies that this predictor is very significant. All three correlations, zero-order, partial, and part, have a value of 0.851 which points to the fact that the two variables have had a very high correlation throughout the study period (Taber, 2017). The collinearity diagnostic indicates that there is no severe issue since the tolerance value is 1 and VIF is also 1. This research confirms that CoVID-19 is a highly significant factor for the impact on supply chain management, as evidenced by a good model fit.

Table 10. Correlation Analysis between Covid 19 and Supply Chain

		Supply Chain	Covid 19
Pearson Correlation	Supply Chain	1.000	0.851
	Covid 19	0.851	1.000
Sig. (1-tailed)	Supply Chain		0.000
	Covid 19	0.000	
N	Supply Chain	95	95
	Covid 19	95	95

This table shows Pearson correlation results from the data collected. From the table it can be observed that The Pearson correlation coefficient between the identical variables (*Supply Chain with Supply Chain, and Covid 19 with Covid 19*) is 1.000, which signifies a perfect correlation, as anticipated.

The correlation, between how people view the effects of Covid 19 and its impact on the supply chain is quite strong at 0.851. This suggests that, as concerns about Covid 19 increases, so do the concerns about its effects on managing the supply chain activities. This significant connection shows that these two areas are closely linked in terms of their impacts.

On the other hand the correlation, between the impact of Covid 19 and its effects on the supply chain, shows a significance level below 0.001 ($p < 0.001$). This low p value suggests that the relationship is statistically significant indicating a less than 0.1% chance that this strong association is merely coincidental (Wright and Herrington, 2011). According to the relevant findings;

H1: There is a significant and positive relationship between Covid19 pandemic and supply chain management (***ACCEPT***)

H2: Covid19 has a significant and positive effect supply chain management (***ACCEPT***)

H3: In the context of the relationship between covid19 and supply chain management there is a significant difference between the results of males and females (***ACCEPT***)

5. CONCLUSION

That is why, the purpose of the research was devoted to understand and analyze the disruptions and responses investigation in connection with COVID-19 on various aspects of supply chain management in terms of global supply network. The literature presents various and complex facets of Supply chain management and underlines the significant challenges introduced by the pandemic (Croxton et al., 2001; Power, 2005). COVID-19 has shifted the idea of robust and resilient SC capabilities as the future disruptions may occur anywhere in the world (Craighead et al., 2020).

The application of Industry 4.0 technology has been acknowledged as a crucial factor to enhance the Vulnerability of supply chain against worldwide disturbances (Zhang et al., 2023). This is in line with the arguments made by Sanders (2020) and Sodhi & Tang (2021) that pliability and rapidity in the supply network is not merely advantageous but obligatory for survival amid such conditions. Furthermore, Richey and colleagues (2022) suggest that the willingness to quickly correct matters in logistics and supply chain management is useful in reducing impacts of disruptions.

Previous works cited that the COVID-19 outbreak introduced unprecedented social, economic, psychological and environmental apprehensions to supply chain sector and overall business environments (Ciotti et al., 2020; Atalan, 2020). The use of lockdown measures has led to implications that are not just simple direct effects on health concerns. These consequences include effects on one's psychological well-being and the overall operations of enterprises on a global level (Onyeaka et al., 2021; Belitski et al., 2022).

The study by Cherian and Arun (2023) emphasises the major supply chain disruptions brought on by COVID-19 in the construction sector, which resulted in delays, higher expenses, and inefficiencies. The studies emphasises the necessity of planning strategically for resilience in order to lessen future disasters. The importance of flexible supply chain management in the event of a worldwide pandemic is emphasised in this research (Barman, 2021). According to Hald and Coslugeanu (2022), the COVID-19 pandemic highlighted the crucial role that digital technologies play in improving the resilience of supply chains. Their research shows how using digital technologies to manage unforeseen crises can increase visibility, flexibility, and response times.

This study also uncovered that there is no strong statistical significance in the gender of respondent's perception of COVID-19's impact on supply chain management as a result of the independent samples t-test. The Levene's test for equality of variances and the t-test reveal that there is a slight statistical difference of gender on these perceptions given that the obtained p-values are much greater than the 0.05 threshold (Wright and Herrington, 2011). This is in congruence with other writings that show the impacts of the pandemic across different demographics (Francis, 2020). This is evident from the widespread nature of the disruption, as well as the challenges that supply chain professionals globally face.

From the above analysis, it is suggested that firms should integrate advanced technology applications and create a culture that promotes experimentation and adaptability in supply chain management (Raj et al., 2022). Organizations may also consider conducting such activities as the scenario planning and stress testing of their supply chains in a bid to increase preparedness for incoming disruptions (Carracedo et al., 2021). Moreover, it is important to enact strategies that ensure the reliability of the supply chain in case of future unforeseeable events or similar pandemics (Boiral et al., 2021; Chowdhury et al., 2021).

In general, this work contributes to the understanding of how COVID-19 impacts SCM and also provides a foundation for the further study of resilience enhancement in the supply chain (Raj et al., 2022). For both the scholars and the professionals it is essential to continue this pursuit of identifying new approaches and strategies for making the supply chains more robust in light of an increasingly volatile environment.

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