

**COVID-19 DISRUPTIONS AND RESILIENCE OF
PHARMACEUTICAL SUPPLY CHAINS IN NAIROBI COUNTY**

BY

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Degree Of Master Of Business Administration Of The Faculty Of Business And
Management Sciences, University Of Nairobi**

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DECLARATION

This research project is my original work and has not been presented for the award of degree in any other University.



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I also wish to thank my entire family their understanding and support while undertaking this study.

DEDICATION

I dedicate this research to my parents Mr. Elijah Ndiku & Mary Kioko, Family Roseanne Njeri, Blessing Kioko and Uncle Mr. Daniel Kisuke Ndiku for their patience, unwavering support and understanding during the period of this research.

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ABBREVIATIONS AND ACRONYMS

ASC	Agility Supply Chain
COMESA	Common Market for Eastern and Southern Africa
COVID-19	Corona Virus Disease
ICU	Intensive Care Unit
ISM	Information Systems Management
MEDS	Mission for Essential Drugs Supply
MICMAC	Matrice d'Impacts Croisés Multiplication Appliquée à un Classement
MOH	Ministry of Health
MSME	Micro, Small and Medium Enterprises
PPE	Personal Protective Equipment
RMC	Risk Management Culture
SCC	Supply Chain Collaboration
SCR	Supply Chain Reengineering
SCRM	Supply Chain Risk Management
WHO	World Health Organization

ABSTRACT

This study delved into the crucial realm of supply chains, recognizing their pivotal role in facilitating the processes of procurement, transportation, and delivery of essential inputs and outputs for businesses. Specifically, it aimed to investigate how disruptions from COVID-19 impacted the resilience of pharmaceutical supply chains within Nairobi County. The study pursued two specific objectives: firstly, to comprehend the extent of COVID-19's influence on supply chains, and secondly, to evaluate the resilience exhibited by pharmaceutical supply chains in countering the effects of the pandemic. In this endeavor, the study drew upon three pertinent theories, resource-based view, stakeholder theory and market-based theory, as frameworks for its exploration. The study followed a descriptive research design to carry out the analysis, employing a census approach to collect data from all 71 licensed pharmaceutical firms within the study's scope. Data was meticulously gathered from the supply chain officers of these firms, and questionnaires served as the data collection instrument which collected panel data for the study. The findings revealed significant positive correlations between supply chain risk management and resilience as well as moderate positive correlations for collaboration and communication, while pro-activeness and technology/innovation showed no significant relationships with supply chain resilience. The regression analysis yielded an R-squared value of 0.611, indicating that 61.1% of supply chain resilience variance was explained by changes in the predictor variables, emphasizing the model's significance. Supply chain collaboration and communication, along with risk management, significantly contributed to resilience, while pro-activeness and technology and innovation had no substantial influence, emphasizing the primacy of collaboration and risk management in bolstering supply chain resilience for pharmaceutical firms in Nairobi County during and after the pandemic. The study recommended that policymakers and pharmaceutical firms in Nairobi County should prioritize the development of robust collaboration, communication and risk management practices within supply chains. This includes fostering partnerships, investing in technology for real-time coordination, and comprehensive risk assessment and mitigation. To enhance resilience against disruptions like COVID-19, a multifaceted approach should be adopted, going beyond technological innovation and pro-activeness. Firms should integrate pro-activeness and technology into a comprehensive strategy that encourages innovation, proactive decision-making, and efficient communication while recognizing their indirect contributions to overall supply chain efficiency and resilience.

CHAPTER ONE: INTRODUCTION

1.1 Background of the Study

The most critical determinant of success in an organization lies in the ability to establish the best supplies and procurement methods or rather establishing an effective supply chain. Supply chain is vital for every business as it integrates all the necessary procedures of establishing, acquiring, conveying, and delivering the required inputs or outputs to the required destination. A good organizational supply chain results into improved quality of services and reduced operational cost (Lambert & Cooper, 2000). Supplies refer to equipment, furniture, appliances, stationery, food, raw materials, and other essential things that people need to operate efficiently. Procurement is the process of acquiring goods and services from external sources after an agreement of the terms and conditions of supply through a competitive bidding process. Logistics in procuring supplies on the other hand, involves controlling, management and coordination of the procedures involved in moving the goods from the supplier to the consumer which include packaging, warehousing, and transportation services (Lambert & Stock, 1993).

Resource – based view is used by the management of any organization as a framework that theoretically explains how a firm can gain sustainable competitive advantage by establishing and strategically allocating its resources. Barney (1991), who introduced this theory, explains that firm's resources are the engine of gaining a firm sustainable competitive edge. Stakeholder theory was pioneered by Edward Freeman (1984) explaining the organizational management and business. Stakeholder theory holds capitalism view as it encourages the interconnected relationships between potential investors, supply chains, customers,' employees and even the

society as a whole to work in harmony to ensure performance of the business. The theory focuses on value creation for all stakeholders and influences many business decisions such as strategies in supply and outstanding strategies. Market- based view theory originated from Mason and Bain in 1950s who emphasized on the basis of firm strategies arising from the prevailing market conditions (Vibert, 2017). The theory linked the industrial structures to the success of the firm in structure conduct performance paradigm. The theory argues that for an organization to succeed it must consider some key factors which include entry barriers into the market, number of players and the elasticity of demand.

Stringent measures were put in place to mitigate coronavirus pervasiveness in Kenya. These measures included lockdowns regulations curfew, banning of social gatherings and social distancing put in place in response to clarion call of ‘flattening the curve’ as well as preventing the overwhelming of the pandemic on health care services. As the pandemic crisis deepened, Kenya instituted lockdowns, supply chains were forced to take a new turn as the systemic demand was shocked since the pandemic forced suppliers to stock up on consumer staples which complied with the movement restriction. Most cases consumers were forced to shop for stock that could last them a whole month to avoid movements (Banga, 2020). Pharmaceutical sector unlike other sectors whose demand deteriorated, demand for pharmaceutical supplies shoot cross the pandemic period due to its importance in controlling the pandemic. Closure of the main countries such as China and India that supplies most of products to Kenya magnified the reliance on imported products and amplified the urgency to establish a robust, resilient and competitive value chain of pharmaceutical sector as well as focus on developing local manufacturing (Mutangili, 2021).

1.1.1 Supply Chain Disruption

The unprecedented chaos brought by COVID-19 pandemic threatened the supply chain of many businesses leaving them at the verge of fighting for their survival. The COVID-19 pandemic caused disruptions to the supply chain which included but were not limited to, stoppage of manufacturing in China, hoarding of products, suppliers getting quarantined at customs coupled with strict inspection and shortage of capable drivers to pick up containers at the port, all of which had dire consequences and delayed the delivery of goods and services. Some business lost their relationship with the suppliers and buyers due to the failure of critical links in the supply chains. As most countries and regions went into lockdowns it became even more difficult for those hauling freight by various means be it sea, land or air difficult and thereby slowing down the movement of even the most vital of products (Ogada et al., 2021). Supply chain disruption refers to the sudden change or crisis that can either be local or global which results to a negative impact on the process. Before the coronavirus pandemic, product enhancement and cost reduction were driving improvements, digitization and investment of the supply chain processes in businesses (Barasa et al., 2021).

The abrupt lockdown in Kenya forced organization to come to a grinding halt which completely disrupted supply chains of the commodities produced by those organizations. Supply chain being a staged procedure, COVID-19 pandemic affected almost all parts of pharmaceutical chain leading to inadequate essential products such as generic drugs, PPE and medical (Haleem et al., 2020). Demand and shortages of supply of materials required to manufacture generic drugs accelerated their cost leaving producers experiencing challenges in producing and supplying

their products (Iyengar et al., 2020). Duffy (2020) explained that India closed the exportation of 26 active pharmaceutical ingredients due to some fear that it might require more for itself. The COVID-19 outbreak significantly affected transportation of goods. It was estimated that by 2020 pandemic effect on growth of cargo markets would be four to five folds in comparison to growth of passenger traffic (Senguttuvan, 2006). Companies which focused on supplying multiple services and logistic capabilities to their customers had to deal with significant impacts on all these aspects over the course of the pandemic (Sun, Wandelt & Zhang, 2020).

Supply chain disruption will be measure on how COVID-19 affected supply chain leading to changes in customer demand, lead time and price fluctuation. The pandemic displayed the effects of supply chain disruption in full swing as items specific to the dire situation of the pandemic gained demand that was unprecedented. This ranged from hospitals competing with each other for personal protective equipment and medical components to average shoppers who bought items such as canned goods and toilet paper in bulk in preparation for the impending lockdown measures (Frederico, 2021). Lead times for air, sea and land cargo transports and production processes gradually deteriorated as coronavirus disease grew harder and harder due to tightening of the health restrictions. Prices of commodities begun to increase as lead time and production processes changed. Businesspeople began converting their commercial jets to cargo planes in order to cover the demand shortages and increase the lead times as costs of supply chain begun rising (Nižetić, 2020).

1.1.2 Supply Chain Resilience

Supply chain integrates manufacturing resources, inventory management for care services, vendors handling supply chain pipelines and delivery of required commodities by patients and service providers in pharmaceutical sector. Pharmaceutical supply chain is complex due to its fragmented processes that involves a consistent flow of product order, necessary information and transfer of ownership through payment between different stages. The series of steps encompassed in manufacturing and delivering a product starting from raw materials and concluding with the delivery to the final consumer is commonly known as the supply chain. Since supply chain facilitates the transportation of raw materials, capital goods and finished products to where they are required it is therefore required to be robust enough to withstand different forces and circumstances. The SCR can be termed as its capability to persist, transform or adapt when faced with circumstances that forces it to change (Haleem et al., 2020).

A firm`s procurement, production and logistical competencies and contingencies as influenced by effective and resilient supply chain practices such as innovative marketing strategies, adapting to modern technologies among other aspects are important in ensuring a competitive edge (Wisner et al., 2010). As such, many firms have realized the application of supply chain in attracting a sufficient demand for their products that outdoes other firms in the same market. Since resistance and recovery defines the SCR. Resilient pharmaceutical firms had the capacity to withstand while others recovered from pandemic disruptions. To improve the agility of pharmaceutical supply chains from the stress subjected at national and global level (Hippold, 2020).

The strategies that were put in place by the pharmaceutical companies will be used to gauge the resilience of a supply chain to ensure that it is resistant and once affected can recover quickly from drawbacks. SCR, SCC, STI and SMP are some of the practices adopted to ensure resilience which the study will assess. The study will be assessing policy options formulated to strengthen the agility of the supply chains among pharmaceutical firm. To manage such risks anticipating and understanding the nature of certain stress is very important to establish an accurately diagnosis of the problem. Procurement management, regulatory flexibility, enhancing digital trade as well as improving the infrastructure and inventory and capacity buffers are some of ways that can assist in building a resilient supply chain and improve competitiveness and productivity of a firm (Hippold, 2020).

1.1.3 Pharmaceutical Supply Chains in Nairobi Country

Distributors, manufacturers, and retailers are three key components of the pharmaceutical value chains in Kenya, which includes the creation of inputs, the production of drugs, and the distribution of those drugs to customers. Value is distributed equally among these stages. The industry has experienced an annual growth rate of 12%, with the top five manufacturing firms exporting between 40% and 85% of total output, mostly to nations in East Africa (MOH, 2020).

Pharmacists and distributors who work over the counter portray the marketing strategy used for medicinal products. According to Kenya Pharm Expo (2016), when compared to other nations in the COMESA region, Kenya produces the most pharmaceutical products. Kenya is the top supplier in the area, controlling more than 50% of the export market (Kenya Pharm Expo, 2016).

According to KNBS, there more than 9000 registered pharmaceutical companies in Kenya (2012).

The Kenyan pharmaceutical sector is made up of drug producers who sell their goods directly to consumers through chemists or through Kenya Medical Supply Agency to public hospitals (Simonetti, 2016). Pharmaceutical items are sold by businesses like the mission for essential drugs supply (MEDS) to religiously affiliated healthcare facilities. Nairobi is home to 39 licenced pharmaceutical manufacturing firms out of which 35 produce medications for human consumption and 5 produce both drugs for human and animal consumption (PATH, 2015).

1.2 Problem Statement

The resilience of pharmaceutical supply chains was crucial during the COVID-19 pandemic to ensure uninterrupted availability of essential medicines, enabling healthcare systems to adequately treat patients and manage the disease (WHO, 2021). It would allow for timely delivery of medications to healthcare facilities, preventing shortages that could compromise patient care. To assist the chain to adapt quickly and identify alternative suppliers in regions less affected by the pandemic to mitigate the risk of dependency on a single source and minimize disruptions caused by measures taken to mitigate the pandemic (Cullinane et al., 2021). Resilience was also necessary to address the increased demand for critical medications and medical supplies during the pandemic and facilitate a rapid scaling up of production, efficient distribution and allocation of these essential items to the areas' most needed (WHO, 2021). However, the pharmaceutical supply chains were disrupted by, lockdown measures and travel restrictions causing delays in transporting pharmaceutical products, leading to shortages and

supply chain bottlenecks. Factory closures, reduced workforce and increased demand for critical medications further strained supply chains, resulting in diminished supply capacities. The disruption also affected international trade and logistics, hindering the movement of pharmaceutical products across borders and disrupting timely delivery, exacerbating supply imbalances (KPMG, 2021).

Corona virus disease inflicted a drastic shortage of acute pharmaceutical materials, equipment and resources such as drugs, ICU beds, PPE, Fumigations and hand sanitizers as well as mechanical ventilations. The estimates from WHO showed that, 89 million masks, 76million gloves and 1.6 million goggles were globally consumed in every month for prevention of the pandemic (Sohrabi et al., 2020). As the pandemic prolonged it heightened the demand pressure on health systems which were already in a tremendous strain. Countries like Kenya that are in developing process were placed in a strenuous position due to the insufficient facilities and medical resources as well as necessary to mitigate the spread of coronavirus. The unpreparedness and ill-equipped state of the country in facing such a viral mammoth was exposed (Coustasse, Kimble & Maxik, 2020).

Scholars are advancing on different studies to identify the post-pandemic effect of COVID-19 on different sectors. Grinberga-Zalite et al. (2021) investigated how meat supply chain remained resilient during and after COVID-19 crisis. Khan et al. (2021) explored the impact of the COVID-19 disruptions on medical SC, whereas Yu, Razon, and Tan (2020) investigated the sustainability of global pharmaceutical SC during the pandemic period. COVID-19's effects on global supply chains were investigated by Xu et al. (2020). Locally, Letikash (2022) investigated Covid-19 disruptions on SC and resilience within Kenyan pharmaceutical firms, while Mwangi

and Ragui (2021) investigated the connection between supplier collaboration, SCR and supermarket performance in Nairobi City County. These studies reveal a contextual research vacuum because none of them particularly explore the resilience of pharmaceutical supply chains in Nairobi County in the context of COVID-19 interruptions. Our study aims to close this gap by investigating how COVID-19 disruptions affected the resilience of pharmaceutical SC in Nairobi County, thereby answering the following question: How the resilience of pharmaceutical supply chain in Nairobi County was impacted by COVID-19 disruptions.

1.3 Objectives of the Study

The main objective of the study sought to establish the effect of disruptions of COVID-19 disruptions on resilience of pharmaceutical supply chains in Nairobi County while the specific objectives include:

- i. To establish the effect of COVID-19 on supply chains.
- ii. To establish the resilience of pharmaceutical supply chains in mitigating effects of Covid-19.
- iii. To establish supply chain resilience practices implemented during and after COVID- 19 era.

1.4 Value of the Study

The stakeholders in the pharmaceutical sector such as the firm shareholders, directors, managers, employees, customers, suppliers and investors will benefit from this study as it will help them understand that one of the success drivers is having good supply chain management. The study will help them learn the necessary logistics required in supply chain management and understand

how they were affected by COVID-19. In this case the stakeholders involved will be in a position to develop working strategies that will provide a remedy to the negative effects, as well as upgrade the positive effects. This knowledge will help in creating awareness and in decision making toward good management of the supply chains to ensure effective performance that will lead to the success of the business.

The study's conclusions will derive from will be of help to the government and regulatory authorities such that policy makers will be aptly guided on policy formulation processes thus assisting in making relevant and attainable policy objectives in supply chain management. Owners of pharmaceutical business may refer to the findings of this study when making policies that ease the supply chain processes post- COVID-19 for success, as well as in making sustainable policies that ensure smooth flow of supplies even when faced with any pandemic.

In the field of academia, scholars and researchers will use this study for references. They will be keen to note the impact of COVID-19 on pharmaceutical supply chain disruptions in Nairobi County as will be presented by the study. The scholars will be able to borrow materials such as research methods which will be adopted by this study, as well as compare their findings.

The study will also be of use to the theoretical postulations that have been found to bear relevance to the study such that will contribute to the refinement or additions to the theories by determining the outcome of hypotheses that have not been tested before which in turn will provide new found clarity in terms of the theories. The completion of this research undertaking will also contribute to confirming or refuting the theories that have been used to underpin them serving in the long run to reveal new applications that can expound on their utility in terms of research.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

The chapter's contents entail a review of various theories found relevant and that have been underpinned to the study together with a summarized review of the various empirical studies that have been found to bear similarities to the topic of this study. The outline of the pictorial diagram of the relationship between the variables and a summary of the chapter concluded the chapter.

2.2 Theoretical review

The study made use of three theories that were found to bear relevance to the topic of this study which were resource-based view, stakeholder theory and market-based theory. The theories were expounded below.

2.2.1 Resource-Based View

RBV is used by the management of any organization as a framework that theoretically explains how a firm can gain sustainable competitive advantage by establishing and strategically allocating its resources. Barney (1991), who introduced this theory, explains that firm's resources are the engine of gaining a firm sustainable competitive edge. This theory stipulates that in designing of supply management a company should consider the resources that are available to the company. The theory indicates that parties in the supply chain seek to have an impact on over the elements of production within a competitive market structure, in order to acquire aggressive facet over their competitors (Ahuja, 2000). The definition of what constitutes competitive advantage to a firm anchored on the capability of said firm to allocate and invest resources efficiently. Competitive advantage can be achieved through exploitation of capabilities

and firm resources as well as competences in a firm. Resources that are slowly built up and held should thus be of value, enticing, of rare form and unique as they hard to imitate with no substitutes and will thus afford a competitive advantage as divulged by Freeman et al. (2010).

The RBV is pertinent to this study since it highlights the relevance of businesses' strategic resources and capabilities in attaining and maintaining a competitive edge. The pharmaceutical business faced unprecedented challenges as a result of the pandemic, necessitating the deployment of resources and capabilities to adapt and minimize disruptions. To assure continuous access to important medications, resilient pharmaceutical supply chains required a combination of key resources such as diversified sourcing, strong supplier relationships, innovative technologies, and nimble manufacturing processes. Furthermore, risk management capabilities, supply chain coordination, and communication with healthcare stakeholders were critical in responding to disruptions caused by lockdowns, transit delays, and increased demand. The theory guides the research into the specific resources and competencies that improve the resilience of pharmaceutical supply chains during times of crisis, thereby contributing to effective plans for future pandemic preparedness and response.

The drawbacks of this theory are that most firms do not have the strategic assets required to qualify for capability and uniqueness (Al-Ansari, 2014). As such companies that are more capable in terms of resources and their strategic input have an edge when it comes to competing economically (McWilliams & Siegel, 2011). This is especially apparent when the individuals that have power within the hierarchy are misallocated such resources stemming from the assumptions that are made in the implementation of the theory in practice (Conner, 1991). When

a firm has hard to replicate resources in its possession it can be seen as both a Corporate Social Responsibility model and as a means of mitigating the pushback that may arise from setting prices that are higher than the prevailing and normal market prices. Companies that have a considerable advantage competitively over their counterparts may resort to raising the prices of goods and services so as to make exorbitant amounts of profits which is serves as unscrupulous means to gain profit from customers (Conner, 1991).

2.2.2 Stakeholder Theory

Stakeholder theory was pioneered by Edward Freeman (1984) explaining the organizational management and business. Stakeholder theory holds capitalism view as it encourages the interconnected relationships between the shareholders, employees, customers, investors, suppliers and the community to work in harmony to ensure performance of the business. The theory focuses on value creation for all stakeholders and influences many business decisions such as strategies in supply and outstanding strategies. A firm stakeholder's which are made up of the shareholders, investors, employees, clients, suppliers and the community has the ability to influence a change on the firm laid policies as well as morals and values (Touboulic and Walker, 2015). The primary aim of every business is to turn over profit. Strategic decisions on supply must be made to achieve this objective.

The stakeholder theory is significant to the study because it emphasizes the need of examining the varied range of supply chain actors, including as producers, distributors, healthcare providers, and regulatory agencies. Researchers may comprehend the various requirements, interests, and power dynamics among these stakeholders, as well as how they influence supply chain

resilience, by utilizing the stakeholder theory. The theory provides a framework for identifying and analysing stakeholders' roles, responsibilities, and interactions, allowing for the development of methods to improve coordination, collaboration, and decision-making amid disruptions like the pandemic (Freeman, 2010). Understanding and embracing stakeholders' viewpoints and interests is critical for designing effective resilience strategies and ensuring the supply and accessibility of critical medicines during times of crisis.

The objective of making profits within a business without infringing on the various stakeholders attached to it is at conflict with the main postulations of this theory. The theory is seen to infringe on the property rights of stakeholders as it does not consider the various capitalisms and since it eliminates the role of government in the firm goes about acting negatively on the free-market mechanisms that are in place (Sternberg 1997). The interaction among shareholders is reliably heterogeneous adopting a nuanced view as such. Ranging from variable dependence changes in salience, multiple linkages and relationships of that order offer the major criticisms when it comes to this particular postulation (Fassin, 2008).

2.2.3 Market- Based View

Market-based view theory originated from Mason and Bain in 1950s that went about explaining the market conditions and the role they had in the development of strategic firm plans (Vibert, 2017). This postulation thus linked the firms and the structure within which they were located as a whole industry to the success of the various organizations in structure conduct paradigm. The theory argues that for an organization to succeed it must consider some key factors which include entry barriers into the market, number of players and the elasticity of demand. Porter

(1980) advanced the main postulations of this theory when he came up with five forces that constitute and that are used to gauge rivalry among firms and the three strategies that can be deployed to enhance performance of a firm if successfully implemented, thus, forming a framework that identified product substitutes, new entries as a threat in the market and the bargaining power of both buyers and suppliers as drivers of rivalry within an industry. In the industrial structure these forces determine the attractiveness and the competitiveness among rivals. The supplier's bargaining power affects the cost of inputs and therefore determines the production cost which also determines the cost of goods and services. Through strategic choices a firm competitively positions itself within the study which determines its profitability.

The market-based perspective adds vital insights to the study by emphasizing the role of market dynamics, competition, and strategic decision-making in determining business and industry performance. In the context of the pandemic, the market-based perspective aids in analysing how pharmaceutical businesses responded to disruptions, such as changing sourcing strategy, locating alternative suppliers, and engaging with stakeholders to assure the availability of important medicines. It also illuminates the competitive landscape and the importance of market forces in influencing the resilience and recovery of the pharmaceutical supply chain, such as pricing, demand-supply dynamics, and strategic partnerships. The market-based perspective provides a thorough understanding of the interplay between market dynamics, corporate strategy, and the resilience of the pharmaceutical supply chain throughout the COVID-19 pandemic.

The major criticisms of this theory arise from the fact that various scholars and shareholders argue it is beyond logic to base all strategy on the market-based view while leaving all the

internal factors to a firm and argue that the resource-based view is much more prudent in terms of choosing a basis of making strategies. Considering only the structure of the industry makes the theory to be one-sided view failing to give account of the operations within the firm. Moreover, not all resources are homogenous, and the access of these resources can vary within one industry (Makhija, 2003).

2.3 Empirical Studies

Investigating the extent of the SCR of Dutch food before, during and after COVID-19, Demirci (2021) purposed to establish how Dutch food maintained a resilient supply chain despite the pandemic crisis. The research undertaking took to completing a case study in the form of a qualitative study interview method for one of the supply chains of Dutch food. Determining strategies adopted before during and after the COVID-19 crisis was the aim of the study. Primary and secondary data was obtained where interview was used to collect primary data from 8 managers who came from the supplier, head quarter, distribution centres and supermarket. Secondary data was obtained from the internal document of the supermarket and online publication which supported the findings. The results revealed that Dutch food was proactive in making contingency plans of how to be prepared in case of unexpected disruptions. Plans such as adapting and absorbing the negative impacts of the pandemic enabled them to respond quickly to recover their performance. Strong collaboration of both internal and external supply chain partners played a significant role in maintaining the resilience. However, the study does not address the effect of the recent pandemic on SC disruption which was addressed by the current study.

Al-jadir and Alnemesh (2020) used quantitative method to determine the association between corona virus pandemic and supply chain as it pertains of health care industry. Secondary and primary data sources were used for the study. Primary data was obtained through interviewing method on some several personnel in the healthcare industry while secondary data was extracted from their internal document and online publication. The study findings concluded that the unavailability of medical equipment and the barriers experienced within the supply chain results into shortage of tools putting Stockholm in a critical condition. However, the study did not illustrate clearly how COVID-19 disrupted supply chain in the healthcare industry which became the study gap for this study.

Meyer, Walter and Seuring (2021) targeted the effects of the pandemic as affected by text mining and how these two factors were imperative the supply chain and its sustainability. The aim of the research was to analyse ways in which text mining could provide insight on the implications of the lockdown measures on supply chains in relation to sustainability, resilience, risk. Data was obtained from secondary data from the general newspaper on text mining and supply chain and logistic newspaper articles. In the analysis the study employs the open- source software R. The timeline of the data collection was divided in to three phases which included pre- during and post pandemic period. However effects of coronavirus pandemic on supply chain were not clearly depicted in the study.

Design method of interpretive structure modelling was applied in research done to determine barriers hindering sustainability of the SC in pharmaceuticals during the post-pandemic era (Liza, 2022). The study also applied the matrix of cross- impact multiplications to the classification. Basing on the driving and dependency power ISM uses MICMAC to develop a

hierarchical decision tool that can be used by the decision makers as well as in cluster analysis. The study found four barriers that were in a four-level of hierarchy in their interactions. The poor strategic implementation of risk management measures coupled with the poor dissemination of information were the major barriers during the pandemic. The insufficiency of SC strategic plan to sustain flexibility during the pandemic period served as the major barrier. However, the study failed to employ statistical analysis methods which became the study gap for the current study.

In Kenya, a study was done to gauge whether the integration of various supply chains can result in the improvement of firm output and profits during the 2020 pandemic as reliance and innovation are implemented to ensure business success (Tarigan & Siagian, 2020). Primary data was obtained by administering questionnaires where 470 respondents were collected for data analysis. Used of partial least square technique using smartPLS software was done to analyse the data. The study arrived at the conclusion that indeed the integration of supply chain systems is a factor affecting innovation, system flexibility and resilience during the COVI-19 pandemic. However, the study failed to consider the impact of COVID-19 on the supply chain which was addressed by the current study.

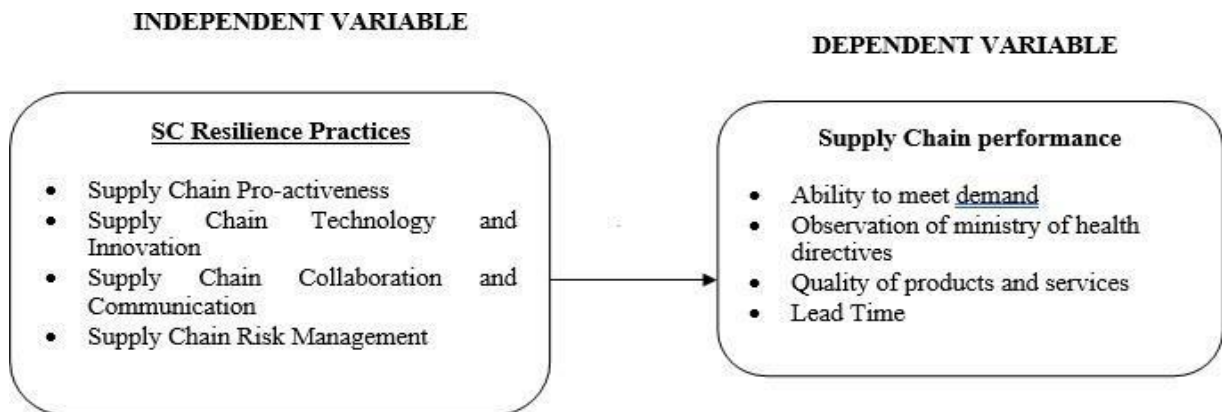
Nordhagen et al. (2021) did a study on small businesses within the food SC and how they were affected by the advent of the pandemic to establish the early effects and long-term implications on food supply chain resilience in third world countries. The study analysed 367 agri-food MSMEs in 17 developing countries. From the data collected, 94.3% of the respondents reported that the operations of their firms had been affected by the pandemic where there was a decrease in sales, low access to inputs, difficulties with staffing and financing. 13% of the respondent

reported to have closed the production. 82% reported a decrease in production. 54% altered their prices due to the pandemic effects. 80% of the enterprises had implemented mitigation measures of the pandemic effects while 44% were considering new business ventures. However, the study did not reveal clearly how supply chains were impacted upon by the pandemic which became the study area of the current study.

2.4 Conceptual Framework

The correlation between the study variables is shown in a pictorial diagram below. The framework provides a structured and theoretical foundation for understanding and analysing the relationships of the study variables. The independent variables are practices which were employed by firms during the covid-19 disruptions measuring against the dependent variable showing the ability in which the firms operated in effectiveness to meet there operations. They assist in showing the more important areas, outcomes and where more emphasis is needed. The framework outlines key variables and their theoretical interconnections.

Figure 2. 1: Conceptual Framework



Source: Researcher, (2023)

2.5 Summary of the Literature Review

This chapter divulged the theoretical review that bore relevance to the contents and the completion of this study. RBV is a theory that explains how a firm makes decision based on the resources available. In pharmaceutical industry, these resources were used to increase the supply of the products that were highly demanded especially when the demand of a certain product spiked due to unpredicted pandemic. These slake resources were therefore set aside for such unprecedented occurrences to help a firm become more competitive. Stakeholder's theory advocates for a strong relationship between the suppliers and the firm. A good communication system is emphasized to have an effective negotiation and coordination of the supply chain. The last theory was the market-based view theory which identifies market gaps as the focus of the firm. It therefore implies that a firm should first identify a market gap then look for ways to fit in the market to fill the gap. This can assist a firm to strategically plan for its resources as well as its supply chain logistics with a purpose filling the gap which makes it competitive.

The chapter then analysed the various empirical research undertakings that have been done in relation to this study's main topic. From the studies the effect of COVID-19 pandemic on resilience pharmaceutical supply chain had not been fully studied. Most of the studies that had been done on impacts of COVID-19 related to other sectors such as food supply among others. These sectors were differently affected depending on essentiality of the product dealt with. The demand for non-essential goods decreased putting businesses that dealt with those non-essential goods in a risky position of collapsing forcing them to fight for their survival. Some business thrived during the pandemic period especially online businesses and pharmaceuticals which dealt with essential goods whose demand increased with the situation and the main challenge was to

meet demand amid supply disruptions. The chapter concluded by outlining the conceptual framework of the study.

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Introduction

This chapter carefully outlined the research design employed, specifying the approach utilized to investigate the research questions. The population of interest was clearly defined, delineating the specific group or individuals the study aimed to target for data collection. Detailed descriptions of the data collection methods, including surveys, interviews, or observations, were provided. Additionally, the analytical methods and techniques applied to process and interpret the collected data were thoroughly discussed. This chapter served as a critical foundation, guiding the entire research process and ensuring a systematic and well-structured approach to addressing the study's objectives.

3.2 Research Design

A research design serves as a conceptual framework delineating the research approach. A descriptive research design was selected due to its appropriateness in systematically gathering and analysing data to generate a comprehensive and precise depiction of the subject of study. It aided in the identification of patterns, trends and connection within data (Lavrakas, 2008). It enabled the researcher to investigate differences in disruption of resilience of the supply chain among individual pharmaceutical enterprises in Nairobi County. This approach was used to elucidate the association between study variables, which in this case was supply chain resilience. Because the descriptive design may incorporate both quantitative and qualitative research

approaches, it was deemed appropriate for thoroughly clarifying the characteristics of the variables of interest as well as the interplay between numerous variables within the study (Serkan 2003).

3.3 Population

The study population is a group of objects, items, events or individuals with a specific characteristic to be studied. There were 71 licensed pharmaceutical firms in Kenya (refer to Appendix 1). The study therefore targeted all the 71 licensed firms, where data was collected from the supply chain officer of each firm or from their assistants. The study undertook a census which included the whole population.

3.4 Data Collection

The research utilized original data collected by distributing questionnaires. The study participants were sent online survey questionnaires as part of the data collection process. Google Forms was an important tool where the researcher sent the questionnaires on emails or on mobile networks to the respondents. The study was to use also drop and pick later method of administering questionnaires, to the study respondents whose online contacts would be difficult to access.

3.5 Data Analysis

The study conducted a rigorous data analysis process, which commenced with thorough data cleaning and editing to rectify errors and ensure data completeness. Subsequently, the collected data was subjected to statistical analysis using SPSS. Descriptive statistics, including mean,

mode, median, and std. deviation, were computed to discern both the central tendencies and disparities within the dataset. To explore the relationships between the study variables, the study adopted a comprehensive approach, employing both correlation and regression analyses. These analyses not only elucidated the direction and magnitude of associations but also determined the significance of these associations, thereby providing valuable insights into the interplay among the variables under investigation. This meticulous analytical process contributed significantly to the study's ability to draw meaningful conclusions and address the research objectives effectively.

CHAPTER FOUR: DATA ANALYSIS AND INTERPRETATION OF FINDINGS

4.1 Introduction

This chapter encompassed several essential components of data analysis, including assessing response rates, conducting reliability tests, performing descriptive analyses, exploring correlations, engaging in regression analyses, and ultimately providing a comprehensive interpretation of the results. This comprehensive approach ensured that the study's objectives was not only met but also offered a well-rounded perspective on the research question.

Descriptive statistics were employed to give an overview of the collected data. For the general profile data, cumulative frequencies and percentage were used to analyse and present the distribution of various demographic variables. This assisted in the understanding of the characteristics of the study respondents. For the study variables which were assessed using a Likert scale, a coding scheme was applied, where values ranging from 1 to 5 were assigned to each response option. Subsequently, descriptive statistics, such as mean, mode, median and std. deviation, were calculated to summarize and characterize the respondents' attitudes and perceptions regarding the study variables. These statistical measures provided a clear and concise representation of the central tendencies, modes, and variations within the Likert-scale data, facilitating a deeper understanding of the COVID-19 disruptions on resilience of pharmaceutical supply chains in Nairobi County.

4.2 Response Rate

The response rate, in the context of surveys, research studies, or data collection efforts, indicates the proportion of individuals or organizations that actually engage in the process compared to the overall number of those who were eligible or invited to take part. In the specific study at hand, which aimed to gather insights from 71 licensed pharmaceutical firms in Kenya, responses were

successfully obtained from 66 such firms. This translated to an impressive response rate of 92.96%, a statistic that proved to be quite substantial and suitable for conducting a comprehensive analysis and generating valuable recommendations based on the study's findings.

4.3 Reliability Test

A reliability test is a statistical study that is performed to determine the consistency and stability of a measuring or assessment tool, such as a survey or questionnaire. Its goal is to examine how well the tool produces consistent and reliable results across many administrations or across different areas of the instrument. The Cronbach's alpha coefficient is a tool employed for evaluating the reliability and internal consistency of a collection of survey items. A greater Cronbach's alpha value indicates a more substantial consensus among the items in the collection. This coefficient is standardized and falls within the 0 to 1 range. A robust Cronbach's alpha indicates a dependable measurement of the intended construct, as it demonstrates those respondents' responses to a series of questions exhibit consistency. Conversely, lower Cronbach's alpha values suggest that the set of items may not accurately capture the same underlying concept, potentially indicating measurement issues.

Table 4. 1: Reliability Statistics

Reliability Statistics		
Variables	Cronbach's Alpha	N of Items
Y = Supply Chain Resilience	0.505	7
X1 = Supply Chain Pro-activeness	0.520	4
X2 = Supply Chain Technology and Innovation	0.520	4
X3= Supply Chain Collaboration and Communication	0.532	7
X4 = Supply Chain Risk Management	0.460	5

Source: Researcher (2023)

4.4 Demographic Statistics

The study employed demographic statistics, incorporating percentages and cumulative frequencies, to illuminate crucial facets of pharmaceutical firms. By scrutinizing the age of these organizations, the research aimed to discern patterns and trends, providing invaluable insights into the longevity of individual firms. Furthermore, the examination of the position held by respondents within these firms shed light on organizational hierarchies, offering a comprehensive understanding of the distribution of roles. The investigation into the number of years respondents spent working in the firms not only delineated workforce experience but also hinted at potential correlations between longevity in the pharmaceutical sector and specific positions. Additionally, the gender of respondents was a focal point, unveiling gender dynamics within the industry. Lastly, the study explored the supply chain resilience practices adopted by pharmaceutical organizations, contributing to a nuanced comprehension of their operational strategies and adaptability in the face of challenges.

Table 4. 2: Age of the Firm

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	16 years to 30 years	11	16.7	16.7	16.7
	1year to 5 years	18	27.3	27.3	43.9
	6 years to 15 years	32	48.5	48.5	92.4
	A) 1 year and Below	1	1.5	1.5	93.9
	Over 30 Years	4	6.1	6.1	100.0
	Total	66	100.0	100.0	

Source: Researcher (2023)

Pharmaceutical firms, as shown above, had varying ages, with some being 1 year or below, some between 1 - 5 years, some between 6 - 15 years, and others between 16 years and 30 years, while a few were over 30 years old. Those between 6 years and 15 years were the majority and only one firm was below one year.

Table 4. 3: Position Held in the Firm by the Respondent

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Other managerial roles	29	43.9	43.9	43.9
	Supply Chain Department	37	56.1	56.1	100.0
	Total	66	100.0	100.0	

Source: Researcher (2023)

The table depicted the positions held by respondents within the firm, where 43.9% held other managerial roles, and 56.1% were in the Supply Chain Department, accounting for the total of 66 respondents.

Table 4. 4: Number of Years the Respondent has worked in the Firm

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1 year and below	8	12.1	12.1	12.1
	11 years to 20 Years	11	16.7	16.7	28.8
	2 years to 5 Years	24	36.4	36.4	65.2
	6 years to 10 Years	22	33.3	33.3	98.5
	Over Twenty Years	1	1.5	1.5	100.0
	Total	66	100.0	100.0	

Source: Researcher (2023)

The table displayed the number of years respondents had worked in their firms, revealing that 12.1% had worked for 1 year and below, 16.7% for 11 years to 20 years, 36.4% for 2 years to 5 years, 33.3% for 6 years to 10 years, and 1.5% had been employed for over twenty years, making up the entire dataset.

Table 4. 5: Gender of the Respondents

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Female	29	43.9	43.9	43.9
	Male	37	56.1	56.1	100.0
	Total	66	100.0	100.0	

Source: Researcher (2023)

The table above presented data on gender distribution, where 29 individuals were identified as female, accounting for 43.9% of the total, and 37 individuals were categorized as male, representing 56.1% of the total.

4.5 Supply Chain Resilience

The study included the following questions in the questionnaire to assess supply chain resilience:
 SCR1 - SCR after COVID-19 disruptions made the company gain more customers and retain current customers.

SCR2 - The operations of the firm were well maintained during and after COVID-19 disruptions. The firm operated at full capacity.

SCR3 - Products procured during the pandemic were not enough to meet the increasing demand.

SCR4 - Communication was affected by the pandemic restrictions delaying the importation of the essential products which affected lead time.

SCR5 - Freight time was also altered during the pandemic period affecting the shipment of goods.

SCR6 - Some stages in the supply chain structure of our organization were omitted during the pandemic to reduce lead time.

SCR7 - Our firm increased the procurement of the essential products that were on high demand during the pandemic

Table 4. 6: Supply Chain Resilience

		SCR1	SCR2	SCR3	SCR4	SCR5	SCR6	SCR7
N	Valid	66	66	66	66	66	66	66

	Missing	0	0	0	0	0	0	0
Mean		3.80	2.64	3.64	3.41	3.35	3.52	3.50
Median		4.00	2.00	4.00	3.00	3.00	4.00	4.00
Mode		4	2	4	3 ^a	3	4	4
		.915	1.320	1.104	1.052	1.074	1.085	1.154

Source: Researcher (2023)

The table above depicted various statements related to supply chain resilience, revealing that the mean ratings ranged from 2.64 to 3.80, with corresponding std. deviations ranging from 1.052 to 1.320. The statement, SCR2, had the lowest mean rating (2.64) indicating that respondents generally perceived this aspect less positively. The statement, SCR1, had the highest mean rating (3.80) indicating that respondents viewed this aspect more positively. The median ratings and modes also provided insights into the central tendencies and common responses for each statement. The mode for the statement with the lowest mean (2.64) is 2, suggesting a concentration of responses at this lower end of the scale, while the mode for the statement with the highest mean (3.80) is 4, indicating a concentration of responses at the higher end of the scale.

4.5.1 Supply Chain Pro-activeness

The study included the following questions in the questionnaire to assess supply chain pro-activeness:

SCP1 - The management was proactive in defining challenges affecting the supply chain and had made prior control measures.

SCP2 - The supply chain management adopted is flexible to ensure that disruptions do not affect the supply chain.

SCP3 - The firm was able to access competent and qualified staff in supply chain.

SCP4 - The SC is agile and is able to effectively adjust to market disruptions such as shortages, closure of a network chain, government interference, among other risks.

Table 4. 7: Supply Chain Pro-activeness

		SCP1	SCP2	SCP3	SCP4
N	Valid	66	66	66	66
	Missing	0	0	0	0
Mean		3.83	4.12	3.33	4.18
Median		4.00	4.00	3.00	4.00
Mode		4	4	3	4
		.834	.755	1.155	.802

Source: Researcher (2023)

The managements of pharmaceutical firms demonstrated proactive measures in addressing challenges within the supply chain, as indicated by the overall mean score for the statements ranged from 3.33 to 4.18, with a relatively low std. deviation ranging from 0.755 to 1.155, suggesting a relatively narrow spread of responses around the mean. This suggested a generally positive perception of the management's readiness to tackle supply chain issues. SCP4 received the highest average mean of 4.18 and a std. deviation of 0.802, reflecting a strong belief in the statement. The statement's mode and median were both 4, reinforcing the consensus of the respondents with the statement. Conversely, the statement, SCP3, had a lower average mean of 3.33, and a std. dev. of 1.155, indicating that it was viewed less favourably by the respondents. The median was 3, and the mode was 3, suggesting that this aspect faced some variability in responses and did not align as strongly with respondents' perceptions.

4.5.2 Supply Chain Technology and Innovation

The study included the following questions in the questionnaire to assess supply chain technology and innovation:

SCTI1- The firm has robust systems that forecast trends accurately, therefore able to respond to disruptions appropriately.

SCTI2 - The firm uses supply chain engineering effectively to create new processes that help in sustainability.

SCTI3 - The firm uses new and modern technology in the supply chain.

SCTI4 - The firm uses competent data analytics in forecasting and in big data analytics.

Table 4. 8: Supply Chain Technology and Innovation

		SCTI1	SCTI2	SCTI3	SCTI4
N	Valid	66	66	66	66
	Missing	0	0	0	0
Mean		4.03	3.83	3.70	3.77
Median		4.00	4.00	4.00	4.00
Mode		5	4	4	4
		.960	.954	1.007	1.093

Source: Researcher (2023)

The overall mean ratings across the four statements ranged from 3.70 to 4.03, with corresponding std. deviations varying from 0.954 to 1.093. The statement, SCTI1, had the highest mean rating of 4.03, suggesting that majority of responses agreed with the statement, with a std. deviation of 0.960 indicating moderate variability. Conversely, the statement, SCTI3 had the lowest mean rating of 3.70 indicating a less favourable perception regarding the statement, with a std. deviation of 1.007 reflecting higher variability. The consistency in median and mode values, all being 4, reflected a central tendency in respondents' ratings for most statements, indicating an overall positive perception of the company's supply chain practices, albeit with varying degrees of certainty, as indicated by the std. deviations.

4.5.3 Supply Chain Collaboration and Communication

The study included the following questions in the questionnaire to assess supply chain collaboration and communication:

SCCC1 – The firm increased its collaboration with other supply chain networks - locally and internationally.

SCCC2 – The firm integrated more effectively with suppliers, distributors, and customers during COVID-19.

SCCC3 – The firm has long term commitments with the suppliers to enhance committed networks and partnerships that respond effectively to any disruptions.

SCCC4 – Strategic supplier partnerships in my firm have greatly increased our network and strengthened communication channels with our vendors.

SCCC5 – The networking between the suppliers, distributors and the firm are well developed to support the firm in operations

SCCC6 – The distribution network for supplies and raw materials was not affected during covid-19 disruptions.

SCCC7 – Open communications were encouraged during COVID-19 interruptions from all stakeholders in the SC network, that no shortfalls were realized.

Table 4. 9: Supply Chain Collaboration and Communication

		SCCC1	SCCC2	SCCC3	SCCC4	SCCC5	SCCC6	SCCC7
N	Valid	66	66	66	66	66	66	65
	Missing	0	0	0	0	0	0	1
Mean		3.73	2.67	4.08	4.33	3.50	2.48	3.06
Median		4.00	2.00	4.00	4.00	4.00	2.00	3.00
Mode		4	2	4	5	4	2	2 ^a
		1.001	1.232	.791	.709	1.085	1.126	1.236

Source: Researcher (2023)

The table above shows, the overall mean ratings for the statements regarding supply chain activities during the COVID-19 pandemic which ranged from 2.48 to 4.33, with a std. deviation of 0.709 to 1.236. These figures indicated that there was some variability in the responses, with the statements having means closer to 4 suggesting a more positive assessment of the SC performance during the pandemic. The statement, SCCC4, had the highest mean rating of 4.33, with a std. deviation of 0.709, suggesting that, on average, most respondents agreed with the perception of the statement. The statement SCCC6 had the lowest mean rating of 2.67, with a std. deviation of 1.232, indicating that on average, respondents were less positive about the statement. The median values for these statements were generally in alignment with the means, with modes clustered around the most common response, emphasizing the consistency of the ratings. The data suggested that while the company's integration with stakeholders improved during COVID-19, there might have been room for enhancement in its collaboration efforts with other supply chain networks.

4.5.4 Supply Chain Risk Management

The study included the following questions in the questionnaire to assess supply chain risk management:

SCRM1 – Regulations and policies of our company in regard to SCR management delayed the procurement of essential products required during the pandemic.

SCRM2 - Communication was affected by the pandemic restrictions delaying the importation of the essential products which affected lead time.

SCRM3 - The Increased government restrictions in the port on importation delayed essential products imported which increased lead time.

SCRM4 - Some stages in the supply chain structure of our organization were omitted during the pandemic to reduce lead time.

SCRM5 - The supply chain management has documented all risky areas and their impact on the company for the entire supply chain.

Table 4. 10: Supply Chain Risk Management

		SCRM1	SCRM2	SCRM3	SCRM4	SCRM5
N	Valid	66	66	66	66	66
	Missing	0	0	0	0	0
Mean		3.12	3.41	3.52	3.52	3.85
Median		3.00	3.00	3.00	4.00	4.00
Mode		2	3 ^a	3	4	4
		1.247	1.052	1.056	1.085	.916

Source: Researcher (2023)

The table above presented the results of the survey data on various aspects of supply chain risk management of pharmaceutical firms in Nairobi County. The overall mean scores for these statements ranged from 3.12 to 3.85, with a std. deviation ranging from 0.916 to 1.247. The median scores ranged from 3.00 to 4.00, and the mode values varied, with multiple modes observed. Among the statements evaluated, SCRM1 had the lowest mean score of 3.12, indicating a relatively lower level of agreement among respondents regarding this statement. The std. deviation for this statement was 1.247, suggesting some variability in responses. The median and mode for this statement were both 3, indicating that this score was the most frequently occurring response. SCRM5 had the highest mean score of 3.85, indicating a higher level of agreement among respondents regarding this statement. The std. deviation for this statement was

0.916, indicating less variability in responses compared to other statement. The median and mode for this statement were both 4, showing that this score was also the most frequently occurring response.

4.6 Correlation between the Resilience practices and supply chain performance practices

Correlation analysis was applied to explore the connection between the variables in the study. This analysis aimed to establish the determinants that might influence or contribute to the resilience of the supply chain of pharmaceutical firms within Nairobi during and after COVID- 19 pandemic, shedding light on which aspects of supply chain management played a more significant role in achieving supply chain resilience.

Table 4. 11: Correlation Analysis

	Y = SCR	X1 = SCP	X2 = SCTI	X3 = SCCC	X4 =SCRM
Y = SCR	1				
X1 = SCP	.215	1			
X2 = SCTI	-.039	.630**	1		
X3 = SCCC	.260*	.264*	.242	1	
X4 =SCRM	.724**	.225	.020	-.009	1
	.000	.069	.875	.943	

Source: Researcher (2023)

The results depicted that SCRM indicated a significant and positive correlation against SCR, with a coefficient of 0.724. This indicated that as SCRM improved, SCR tended to enhance significantly. Additionally, supply chain collaboration and communication displayed a moderate

positive correlation with supply chain resilience, with a correlation of 0.260 at a significance level of 0.035. This suggested that effective collaboration and communication within the SC could positively influence its resilience. However, supply chain pro-activeness and supply chain technology and innovation did not exhibit statistically significant correlations with supply chain resilience, with correlation coefficients of 0.215 and -0.039, respectively, both having p-values above 0.05. This implied that pro-activeness and technological innovation may not have played substantial roles in determining supply chain resilience. These findings highlighted the significance of effective SCRM strategy and improved collaboration and communication in enhancing supply chain resilience during the pandemic era, while the roles of pro-activeness and technology innovation appeared less significant.

In comparing the current study's correlation findings with various empirical results, commonalities across studies are evident, particularly in the positive correlation observed between supply chain risk management and supply chain resilience. Both the current study and Demirci's (2021) research highlighted the pivotal role of effective SCRM strategies in enhancing overall resilience, reflecting a consistent trend in recognizing the importance of risk management in navigating disruptions. Similarly, Liza et al.'s (2022) emphasized the crucial role of strategic planning, risk management and resilience in post-COVID-19 operational performances. Furthermore, the positive correlation between supply chain collaboration and communication and resilience observed in the current study resonated also with Nordhagen et al.'s (2021) study which suggested that improved collaboration positively influences resilience, emphasizing the significance of cohesive communication and collaboration in enhancing adaptive capacity during disruptions.

However, differences become evident when considering supply chain pro-activeness and technology/innovation. The current study suggested no statistically significant correlation between pro-activeness and resilience, while Demirci's findings highlighted the proactive strategies adopted by Dutch food supply chains. Furthermore, the lack of a significant correlation between supply chain technology and innovation and resilience in the current study contrasted with Meyer, Walter, and Seuring's (2021) study, emphasizing the importance of technology measures. These differences imply that the role of pro-activeness and technology in determining supply chain resilience may vary across different industries and contexts, reinforcing the need for industry-specific strategies in managing disruptions. Additionally, the study by Al-jadir and Alnemesh (2020) introduced nuances and challenges specific to the healthcare supply chain, suggesting industry-specific dynamics in the relationship between collaboration and resilience.

4.7 Diagnostic Tests

Diagnostic tests are used to assess the model's assumptions and detect potential issues with the regression model, such as normality, linearity, autocorrelation heteroscedasticity and multicollinearity. Diagnostics test were undertaken to ensure that the regression model used was valid and free from assumptions before proceeding with the regression analysis. Firstly, the Shapiro-Wilk Test for normality was employed to ascertain the normal distribution of the data, where a p-value lower than 0.05 would indicate non-normality in the dataset. Secondly, scatter plots were utilized to test the linearity assumption between variables. Thirdly, the Durbin- Watson test was calculated to check for autocorrelation, with a value less than 3 suggesting no significant correlation. Heteroscedasticity was examined using the Breusch-Pagan test, where a p-value higher than 0.05 would imply the presence of heteroscedasticity. Lastly, VIF was used to

test multicollinearity, with a VIF value less than 10 signifying non-multicollinearity among the independent variables. These diagnostic tests were crucial in ensuring the robustness and validity of the regression model, allowing the study to make reliable inferences from the subsequent regression analysis.

Table 4. 12: Diagnostic Tests

Test	Definition	Measurement	Hypothesis	Decision
Normality	Data drawn from normal distribution	Shapiro-Wilk Test	P-value greater than 0.05	Some variables not normally distributed and hence moderation of variables
Linearity	Data plots are linear	P-P plots	Plots follow the diagonal line	The data is linear
Test of Autocorrelation	Negatively or positively distributed autocorrelations	Durbin-Watson Test	Ranges between 1.5 to 2.5 Result = 2.319	No significant autocorrelation
Heteroscedasticity	Equal variance of errors	Breusch-Pagan Test	P- value greater than 0.05 Results= 0.369	Constant Variance
Multicollinearity	When two or more explanatory variables in a regression model are significantly connected	Variance Inflation Factor (VIF)	VIF less than 10 All values are less than 10	Absence of multicollinearity

Source: Researcher (2023)

4.8 Relationship between the Study Variables

The research utilized regression analysis to explore how different independent variables influenced SCR in the pharmaceutical sector during the COVID-19 disruptions in Nairobi County. This analysis aimed to identify crucial factors shaping resilience in this specific historical context.

4.8.1 Model Summary

The model summary provided a concise overview of the regression model's performance, offering key statistics such as R^2 and adjusted R^2 to show the proportion of variance accounted by the independent variables and coefficients of determination to evaluate the goodness of fit.

Table 4. 13: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics	
					R Square Change	F Change
1	.782 ^a	.611	.586	.64379667	.611	23.956
a. Predictors: (Constant), X4 = SCRM, X3 = SCCC, Zscore: X2 =SCTI, X1 =SCP						
b. Dependent Variable: Zscore: Y = SCR						

Source: Researcher (2023)

The regression analysis revealed an R^2 value of 0.611, indicating that 61.1% of the variability in the SCR could be accounted for by the predictors included in the model. This implied that around 38.9% of the variability in the SCR (dependent variable) was attributed to factors not considered in the model. The adjusted R^2 , which adjusts for the number of determinants, stood at 0.586. This adjustment acknowledged that roughly 58.6% of the variation in supply chain resilience could still be explained by the independent variables after accounting for their number.

It's worth noting that the adjusted R-squared was slightly lower than the R-squared, indicating that certain elements in the model did not contribute significantly. The substantial R-squared and adjusted R-squared values collectively indicate a strong fit of the model to the data.

4.8.2 Analysis of Variance

ANOVA was used to determine differences between research results from three or more unrelated samples the method was employed to ascertain whether statistically significant disparities existed among the means of several groups or treatments. This was done by comparing variances within and between these groups, aiding in the identification of significant effects or associations among the study's variables.

Table 4. 14: Analysis of Variance

ANOVA ^a						
Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	39.717	4	9.929	23.956	.000 ^b
	Residual	25.283	61	.414		
	Total	65.000	65			
a. Y = SCR						
b. Predictors: (Constant), X4 = SCRM, X3 = SCCC, Zscore: X2 = SCTI, X1 = SCP						

Source: Researcher (2023)

The ANOVA outcomes indicated a highly significant F-statistic of 23.956 ($p < 0.001$), signifying that the model was significant and therefore the study rejected the hypothesis of the study and concluded that there was a significant impact of COVID-19 pandemic on resilience of pharmaceutical supply chain.

4.8.3 Regression Coefficients

Regression coefficients represent the numerical values assigned to independent variables in a regression model, indicating their respective impact on the dependent variable. This represents the degree to which the line slopes upwards or downwards. These coefficients were employed to measure the size and direction of the associations between the study variable. They offered insights into which factors exerted significant influence and to what degree.

Table 4. 15: Regression Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	-6.309	.948		-6.657	.000
	X1 = SCP	.020	.052	.035	.376	.708
	Zscore: X2 = SCTI	-.140	.090	-.140	-1.547	.127
	X3 =SCCC	.077	.022	.290	3.426	.001
	X4 = SCRM	.241	.026	.728	9.111	.000
a. Dependent Variable: Zscore: Y = SCR						

Source: Researcher (2023)

From the table above, the constant term exhibited a substantial negative effect with a coefficient of -6.309 and a p-value of 0.000, implying a significant adverse influence on SCR when other variables remained constant. Notably, SCCC (X3) demonstrated the most significant positive effect, boasting a coefficient of 0.077 and a highly significant p-value of 0.001, signifying that enhancement in collaboration and communication positively contributed to SCR. Similarly, SCRM (X4) displayed a notably positive and highly significant coefficient of 0.241 with a p- value of 0.000, highlighting its robust positive impact on SCR. Conversely, SCP (X1) and SCTI (X2) yielded non-significant coefficients of 0.020 and -0.140, respectively, suggesting that these

factors did not possess a statistically significant influence on SCR. These results implied that, effective risk management and enhanced collaboration and communication were key drivers of supply chain resilience of pharmaceutical firms within Nairobi County during and after the COVID-19 pandemic era, while pro-activeness and technological innovation did not play significant roles in determining supply chain resilience. Therefore, the model was transformed in to: $Y = -6.309 + 0.077X3 + 0.241X4 + 0.948$

In alignment with the current study's findings, Demirci's (2021) investigation highlighted the pivotal role of supply chain collaboration and communication (SCCC) in positively influencing supply chain resilience (SCR). The positive and significance of SCCC in both studies underscored the consensus on the crucial impact of effective collaboration and communication strategies in enhancing supply chain resilience, particularly amid disruptive events. Additionally, the congruence extended to the recognition of supply chain risk management (SCRM) as a key driver of SCR, as identified in the current study and echoed in the study conducted by Liza et al. (2022). The parallel emphasis on proactive risk management strategies implied a shared understanding across these studies regarding the instrumental role of risk mitigation in fortifying supply chains against disruptions during and after the COVID-19 pandemic era. These consistent findings strengthen the broader understanding of the importance of collaborative practices and risk management in bolstering supply chain resilience across diverse industries and contexts.

However, notable differences emerged when comparing the current study's results with those of other empirical studies. In contrast to the findings of Demirci (2021) and Tarigan and Siagian (2021), the current study did not find supply chain pro-activeness (SCP) to be a significant driver of SCR. The non-significant coefficient for SCP suggested a departure from the notion that pro-

active planning and contingency measures significantly contributed to supply chain resilience during and after the pandemic. Moreover, the current study's non-significant coefficient for supply chain technology and innovation (SCTI) contrasted with Tarigan and Siagian's (2021) emphasis on the central role of IT capability in improving firm performance. This discrepancy implies that, in the context of pharmaceutical supply chains in Nairobi County during the COVID-19 era, technological innovation did not emerge as a statistically significant factor influencing supply chain resilience.

CHAPTER FIVE: SUMMARY CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter of the research presented a comprehensive summary of the study's findings. It concluded by summarizing the implications of these findings for pharmaceutical firms in Nairobi County during and after the COVID-19 pandemic. The chapter provided practical recommendations. It acknowledged limitations encountered during the research process and suggested areas for future studies.

5.2 Summary of the Study Findings

The study aimed to investigate the factors influencing supply chain resilience in pharmaceutical firms within Nairobi County during and after the COVID-19 pandemic. The study examined four independent variables which included SCP, SCTI, SCCC and SCRM. The descriptive statistics provided insights into the perceptions and variability among respondents across different aspects of the supply chain. In terms of SCR, mean ratings ranged from 2.64 to 3.80, with std. deviations between 1.052 and 1.320. The lowest mean rating (2.64) suggested that operations faced challenges during the pandemic, while the highest mean (3.80) indicated that supply chain resilience contributed to customer acquisition and retention. The regression model explained approximately 61.1% of the variance in supply chain resilience, with the adjusted R-squared value of 0.586, confirming the statistical significance of the regression model in explaining the variation in supply chain resilience for pharmaceutical firms in Nairobi County during and after the pandemic.

5.2.1 Effect of Supply Chain Pro-Activeness on Supply Chain Resilience

For Supply Chain Pro-activeness, mean scores varied from 3.33 to 4.18, with std. deviations ranging from 0.755 to 1.155. The highest mean (4.18) reflected a positive perception of proactive management in addressing supply chain challenges, while the lowest mean (3.33) indicated less favourability regarding access to competent staff. These findings suggest that adaptability and proactive measures were perceived as strengths, while the availability of skilled staff was viewed less positively. The correlation analysis revealed an insignificant correlation between supply chain pro-activeness and supply chain resilience, suggesting that pro-activeness might not have played a substantial role in determining resilience for pharmaceutical firms in Nairobi County during and after the pandemic. This lack of significance was consistent in the regression analysis, where supply chain pro-activeness did not emerge as a significant predictor of supply chain resilience.

5.2.2 Effect of Supply Chain Technology and Innovation on Supply Chain Resilience

Supply chain technology and innovation, the mean scores varied between 3.70 and 4.03, with the highest score (4.03) indicating proficiency in trend forecasting, while the lowest score (3.70) indicated a potential for enhancing technology adoption. The correlation analysis did not find a statistically significant correlation between supply chain technology and innovation and supply chain resilience, indicating that technological innovation may not have significantly influenced resilience during the pandemic era. This lack of significance was also evident in the regression analysis, where supply chain technology and innovation did not emerge as a significant predictor of supply chain resilience. These results suggest that technological advancements in the supply

chain may not have played a primary role in determining resilience for pharmaceutical firms in Nairobi County during and after the COVID-19 pandemic.

5.2.3 Effect of Chain Collaboration and Communication on Supply Chain Resilience

Supply chain collaboration and communication had mean ratings between 2.48 and 4.33, with std. deviations spanning from 0.709 to 1.236. The highest mean (4.33) highlighted improved integration with stakeholders during the pandemic, while the lowest mean (2.67) indicated less satisfaction with increased collaboration with other supply chain networks. The correlation analysis showed a moderate positive correlation (coefficient of 0.260) between SCCC and SCR, indicating that effective collaboration and communication within the supply chain positively impacted resilience. Similarly, in the regression analysis, SCCC was identified as a significant positive predictor of supply chain resilience.

5.2.4 Effect of Supply Chain Risk Management on Supply Chain Resilience

Regarding SCRM, mean values ranged from 3.12 to 3.85, with std. deviations between 0.916 and 1.247. The lowest mean (3.12) suggested that some supply chain stages were omitted during the pandemic, while the highest mean (3.85) indicated that documenting risky areas for the entire supply chain was a prominent practice. These descriptive statistics provided a nuanced understanding of respondents' perceptions within each supply chain dimension. The correlation analysis revealed a significant positive correlation (coefficient of 0.724) between SCRM and SCR, suggesting that effective risk management positively influenced resilience during the COVID-19 pandemic. In addition, the regression analysis established that supply chain risk management had a significant positive impact on supply chain resilience. These findings

highlight the crucial role of risk management in enhancing supply chain resilience for pharmaceutical firms in Nairobi County during and after the pandemic.

5.3 Conclusion

The study's examination of supply chain technology and innovation revealed that despite a certain level of proficiency in trend forecasting, technological innovation did not significantly influence supply chain resilience among pharmaceutical firms in Nairobi County during and after the COVID-19 pandemic. This suggests that while firms may have the capability to forecast trends effectively, it is not the primary driver of resilience in this context. Therefore, firms should consider that technology adoption alone may not be sufficient to enhance supply chain resilience. A broader and more holistic resilience strategy that encompasses other crucial factors is needed.

The analysis of supply chain collaboration and communication underscored the critical role that effective collaboration and communication play in enhancing supply chain resilience. The study revealed that improved integration with stakeholders during the pandemic positively impacted resilience, highlighting the importance of fostering stronger relationships with supply chain partners. This finding was consistent with the regression analysis, which identified supply chain collaboration and communication as a significant positive predictor of supply chain resilience. Pharmaceutical firms in Nairobi County should prioritize building robust collaboration and communication channels to navigate disruptions effectively.

The exploration of SCRM practices among pharmaceutical firms in Nairobi County demonstrates the pivotal role of effective risk management in bolstering supply chain resilience.

The study's findings consistently indicate a significant positive relationship between SCRM and resilience, both in correlation and regression analyses. Firms that documented risky areas for the entire supply chain exhibited higher levels of resilience, underlining the importance of comprehensive risk mitigation strategies. This suggests that investing in robust risk management practices is crucial for firms aiming to enhance their resilience capabilities during and after crises.

The study's findings related to supply chain pro-activeness revealed that proactive management in defining supply chain challenges did not significantly influence supply chain resilience in the context of pharmaceutical firms in Nairobi County during and after the pandemic. The lack of a statistically significant correlation in the correlation analysis and the absence of a significant impact in the regression analysis suggested that pro-activeness may not have played a primary role in determining resilience. This underscored the need for firms to recognize that pro-activeness alone may not guarantee resilience and a multifaceted approach to resilience enhancement is necessary.

5.4 Recommendations

Based on the study's findings, policymakers should consider developing and implementing a comprehensive framework for enhancing supply chain resilience in the pharmaceutical sector within Nairobi County. This framework should go beyond technological innovation and pro-activeness and encompass a wider range of critical factors. To achieve this, policymakers could establish guidelines and incentives for pharmaceutical firms to adopt holistic resilience strategies. These strategies should include fostering collaboration and communication not only

within the firms but also with external stakeholders such as suppliers, distributors, and regulatory bodies. Policymakers should also promote the adoption of best practices in SCRM and encourage firms to document and address risky areas comprehensively. Such a policy framework would enable pharmaceutical firms to build resilience that is robust and adaptive to various disruptions, not just limited to pandemics.

Pharmaceutical firms in Nairobi County should prioritize the development of robust collaboration and communication channels within their supply chains. This entails investing in technology and platforms that facilitate real-time information sharing and coordination with supply chain partners. Pharmaceutical firms should prioritize building and nurturing strong collaborative relationships with supply chain stakeholders. Regular communication, information sharing, and joint planning should be integral to these partnerships. This will enable swift responses to disruptions and the development of coordinated strategies to maintain supply chain operations during crises. Firms should also invest in comprehensive risk management practices that cover all stages of the supply chain. This includes identifying and documenting risky areas, conducting regular risk assessments and developing contingency plans for each. A proactive approach to risk management will ensure that firms are well-prepared to mitigate disruptions as they arise, ultimately enhancing resilience. Firms should also consider diversifying their supplier base and creating contingency plans to address potential supply chain disruptions effectively.

The study's findings regarding supply chain pro-activeness and supply chain technology and innovation for pharmaceutical firms in Nairobi County, exhibited insignificant relationships with supply chain resilience, underlining the importance of a diversified approach to resilience

enhancement. While these factors may not have shown a statistically significant impact individually, firms should not disregard them entirely. Instead, they should explore ways to integrate pro-activeness and technology and innovation into a more comprehensive resilience strategy. This could involve investing in innovative technologies that support risk management, proactive supply chain decision-making, and efficient communication with partners. Additionally, fostering a culture of pro-activeness within the organization can encourage employees to identify and address potential challenges promptly. It is crucial for them to recognize that while these factors may not directly correlate with resilience, they can still contribute to overall supply chain efficiency and effectiveness, indirectly bolstering resilience in the face of unforeseen challenges.

5.5 Limitations of the Study

The study encountered several limitations. Firstly, the primary data collection method employed, namely the questionnaire survey, had inherent limitations. While questionnaires are a useful tool for gathering quantitative data, they may suffer from response bias, as participants may provide socially desirable responses or misinterpret certain questions. This limitation might have introduced a level of subjectivity into the data, potentially impacting the accuracy of the results and conclusions drawn from the study.

Secondly, the study was based on panel data. This means that the data collected pertained to a specific point in time for pharmaceutical firms within Nairobi County. Consequently, the study might not have captured the dynamics and changes in supply chain resilience over an extended

period. The use of panel data might have restricted the study's ability to track changes and trends over time accurately.

Lastly, the scope of the study focused exclusively on pharmaceutical firms within Nairobi County. While this choice was made to maintain specificity and relevance to the research context, it also limited the generalizability of the findings to other industries or regions. Different industries may face unique supply chain challenges and geographic locations can introduce variations in supply chain practices and resilience strategies. Therefore, the findings of this study might not be directly applicable to pharmaceutical firms operating in different regions or sectors, highlighting a limitation in the study's external validity.

5.6 Areas for further Research

Several avenues for further research can be explored to enhance the understanding of supply chain resilience and its determinants. Firstly, future research could employ mixed-method approaches that combine quantitative data from questionnaires with qualitative insights from interviews or focus groups. By incorporating qualitative elements, researchers can gain a deeper understanding of the nuanced factors influencing supply chain resilience, overcoming some of the subjectivity associated with self-reported questionnaire responses. This hybrid approach would provide a more comprehensive view of resilience drivers and potentially yield more accurate insights.

Secondly, to address the limitation related to the use of panel data, future studies might consider adopting a longitudinal research design. Longitudinal data collection would involve collecting data at multiple time points, allowing researchers to track changes and trends in supply chain

resilience over an extended period. This approach would be particularly valuable when investigating the impact of disruptive events, such as the COVID-19 pandemic, on supply chain resilience, as it would capture how resilience strategies evolve and adapt over time.

Lastly, expanding the scope of research beyond a single geographic region or industry could yield valuable insights into the generalizability of findings. Future studies might explore supply chain resilience in diverse sectors or across various regions, comparing and contrasting resilience strategies and determinants. This broader perspective would contribute to a more comprehensive understanding of supply chain resilience dynamics, helping practitioners and policymakers develop strategies that are applicable across different contexts and industries.

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APPENDICES

APPENDIX 1: List of Pharmaceutical Firms in Nairobi

1. Access Alliance LTD
2. Aesthtics Ltd
3. Alpha Medical Manufacturers
4. AstraZeneca
5. Autosterile(EA) LTD
6. Bayer East Africa Limited
7. B. Braun Medical Gulf Kenya Ltd.
8. BEA Pharmaceuticals Company Ltd
9. Benmed Pharmaceuticals Ltd
10. Beta Healthcare
11. Biodeal Laboratories Ltd
12. BIOPHARMA Limited
13. Centrale Humanitaire Médico-Pharmaceutique (CHMP)
14. Cosmos Limited
15. Dawa Pharmaceuticals Limited
16. Dawa Limited
17. Medisel Kenya Limited
18. Kel Chemicals Limited
19. Dinlas Pharma
20. Diversey Lever
21. Eli-Lilly (Suisse) SA
22. Elys Chemical Industries Ltd
23. Glaxo SmithKline
24. Galaxy Pharmaceuticals Ltd.
25. Glenmark Pharmaceuticals Ltd. (Unit I)
26. Gujarat Liqui Pharmacaps Pvt. Ltd.
27. High Chem East Africa Ltd
28. Hightech Pharmaceuticals and Research Inc
29. Impact Chemicals Limited
30. Innova Biosciences Ltd.
31. Ivey Aqua EPZ Limited
32. Jaskam & Company Ltd
33. Knight Pharmaceuticals
34. Koflan East Africa
35. Kulal International
36. Laboratory & Allied Limited
37. LABOREX KENYA
38. Mac's Pharmaceutical Ltd
39. Manhar Brothers (Kenya) Ltd
40. Medisel Kenya Limited
41. MediTec EA FairLife Ltd
42. Medivet Products Ltd
43. Njimia (K) Limited
44. Nilson Pharmaceuticals Ltd
45. Norbrook Kenya Ltd
46. Novartis Pharma Services Inc, Rep.& Regional Office East Africa
47. NVS Kenya Limited
48. Novelty Manufacturers Ltd
49. Orange Pharma Ltd,
50. Oss Chemie (K) Limited
51. Pharmaceutical Manufacturing Co (K) Ltd
52. Prodigy Healthcare Limited
53. Prunus Pharma.
54. Phillips Pharmaceuticals Limited
55. PZ Cussons East Africa Ltd.
56. Questa Care Ltd.
57. Rangechem Pharmaceuticals Ltd
58. Ray Pharmaceuticals
59. Regal Pharmaceutical Ltd
60. Revital Healthcare EPZ Ltd.
61. Ripple Pharmaceuticals Ltd
62. Sai Pharmaceuticals, Kenya Ltd
63. SkyLight Chemicals Limited
64. Sphinx Pharmaceuticals
65. Stedam Pharma Manufactuting Ltd
66. Surgilinks
67. Tasa Pharma

68. United Pharma
69. Universal Pharmaceutical Limited

70. Viva Healthcare Limited
71. ZAIN Pharma Ltd

APPENDIX 2: Questionnaire

Section A: General Profile

1. Name of the pharmaceutical firm _____
2. How many years has the firm operated in Kenya?
 - A) 1 year and Below
 - B) 1 to 5 years
 - C) 6 years to 15 years
 - D) 16 years to 30 Years
 - E) over 30 Years
3. What is your position in the firm
 - A. Supply Chain Department
 - B. Other managerial roles
 - C. Any Other _____ (Specify)
4. How long have you worked with the firm
 - A. 1 year and below _____
 - B. 2 years – 5 Years
 - C. 6 years to 10 Years
 - D. 11 years to 20 Years

E. Over Twenty Years

5. What's your gender?

Male () Female ()

6. Tick the supply chain resilience practices that are adopted in your organization (you may tick more than one, where applicable)

Supply chain reengineering ()

Supply chain collaboration ()

Agility supply chain ()

Risk management culture ()

Other _____ (Specify)

For the sections below please rate the statements from 1-5 according to the level of your agreement with the statements (1 represent strongly disagree ...5 representing strongly disagree).

Section B: Supply Chain Resilience through COVID-19 Era

The following statements seek to define the SCR as adopted in your firm during and after Covid-19.

STATEMENT	1	2	3	4	5
SCR after COVID-19 disruptions made the company gain more customers and retain current customers.					
The operations of the firm were well maintained during and after COVID-19 disruptions. The firm operated at full capacity.					
Products procured during the pandemic were not enough to meet the increasing demand.					
Communication was affected by the pandemic restrictions delaying the importation of the essential products which affected lead time.					

Freight time was also altered during the pandemic period affecting the shipment of goods.					
Some stages in the supply chain structure of our organization were omitted during the pandemic to reduce lead time.					
Our company increased the procurement of the essential products that were on high demand during the pandemic					

Section C: Supply Chain Pro-activeness

The following statements seek to determine the supply chain pro-activeness adopted by the company and the changes initiated after and during covid-19 disruptions.

STATEMENT	1	2	3	4	5
The management was proactive in defining challenges affecting the supply chain and had made prior control measures.					
The supply chain management adopted is flexible to ensure that disruptions do not affect the supply chain.					
The company was able to access competent and qualified staff in supply chain.					
The SC is agile and is able to effectively adjust to market disruptions such as shortages, closure of a network chain, government interference, among other risks.					

Section D: Supply Chain Technology and Innovation

The following statements assess the supply chain technology and innovation during the disruptions of Covid-19 in Kenya.

STATEMENT	1	2	3	4	5
The firm has robust systems that forecast trends accurately, therefore able to respond to disruptions appropriately.					
The company uses supply chain engineering effectively to create new processes that help in sustainability.					
The firm uses new and modern technology in the supply chain.					
The firm uses competent data analytics in forecasting and in big data analytics.					

Section E: Supply Chain Collaboration and Communication

The following statements assess the SCCC during and after Covid-19 era for the firm.

STATEMENT	1	2	3	4	5
The firm increased its collaboration with other supply chain networks - locally and internationally.					
The company integrated more effectively with suppliers, distributors, and customers during COVID-19.					
The firm has long term commitments with the suppliers to enhance committed networks and partnerships that respond effectively to any disruptions.					
Strategic supplier partnerships in my firm have greatly increased our network and strengthened communication channels with our vendors.					
The networking between the suppliers, distributors and the firm are well developed to					

support the firm in operations					
The distribution network for supplies and raw materials was not affected during covid-19 disruptions.					
Open communications were encouraged during COVID-19 interruptions from all stakeholders in the SC network, that no shortfalls were realized.					

Section F: Supply Chain Risk Management

The following statements assess the SCRM during and after Covid-19 era for the firm.

STATEMENT	1	2	3	4	5
Regulations and policies of our company in regard to SC management delayed the procurement of essential products required during the pandemic.					
Communication was affected by the pandemic restrictions delaying the importation of the essential products which affected lead time.					
The Increased government restrictions in the port on importation delayed essential products imported which increased lead time.					
Some stages in the supply chain structure of our organization were omitted during the pandemic to reduce lead time.					
The supply chain management has documented all risky areas and their impact on the company for the entire supply chain.					

THANK YOU