

**COVID-19 INDUCED SUPPLY CHAIN DISRUPTION AND RESILIENCE OF
PHARMACEUTICAL FIRMS IN KENYA**

BY

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**A RESEARCH PROJECT SUBMITTED IN PARTIAL FULFILMENT OF THE
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NOVEMBER 2022

DECLARATION

I, the undersigned, declare that this research project is my original work and has not been submitted for a degree in this or any other university.

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SUPERVISOR

This research project has been submitted for examination with my approval as the university supervisor.

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DEDICATION

To my husband Elijah, my children Silantoi, Sampaen and Olowuasa. To my parents, siblings and friends for their moral support.

ACKNOWLEDGEMENT

To God be the glory without whom this would not have been possible. I further acknowledge the contribution of my research project supervisor, Dr. Michael Chirchir for his invaluable support.

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ABBREVIATIONS AND ACRONYMS

COVID-19	Coronavirus Disease-2019
FAO	Food and Agriculture Organization
IOM	International Organization for Immigration
LMICs	Low and Middle Income Countries
SPSS	Statistical Package for Social Sciences
UNDP	United Nations Development Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNICEF	United Nations Children's Fund

ABSTRACT

The research's objective was to examine the degree to which COVID-19 induced supply chain disruption affected the resilience of pharmaceutical companies in Kenya. Premised on the predictions of Disruptive Innovation Theory, Dynamic Capability Theory, and Contingency Theory, the research used Descriptive Cross-Sectional Study targeting fifty pharmaceutical businesses found in Nairobi County, Kenya. The units of research were, therefore, the 50 pharmaceutical firms in Nairobi while the units of analysis were 200 respondents, four from each firm. A research questionnaire was applied to bring together data, while data was analyzed by applying SPSS. The null hypothesis stating "There no significant influence of Covid19 Disruptions on Organizational Resilience" was not accepted because the p-values were all lower than 0.05. The findings imply that the Covid-19 Induced planning, sourcing, manufacturing, delivery, and returns Disruptions each had significant influence on Organizational Resilience of the Pharmaceutical companies in Kenya. Although previous studies have investigated similar phenomenon, there were still knowledge gaps. For instance, majority of such studies were conceptual in nature, with limited empirical investigations. The findings are consistent with theory, including Disruptive Innovation Theory, and Contingency Theory. The findings were, however, inconsistent with the postulates of Dynamic Capability Theory. This implies the need for further investigations to enhance theoretical precision. The findings are also crucial for policy makers. In this regard, there is need for policies to enhance supply chain resilience among organizations, public and private. This implies that policy makers should make deliberate effort to undertake policy analysis with a view to identifying policy gaps that may require enhancement so that organizations are better prepared for similar disruptions. Practitioners ought to anticipate disruptions and develop contingency strategies to counter the effects of potential supply chain disruptions in future. This may include strategies in Business Process Re-engineering (BPR), scenario analysis, risk management, among other strategies. Particularly for the pharmaceutical industry, there is need to re-evaluate the traditional supply chain models, to assess their sustainability. The current study has made meaningful contribution to knowledge. However, there are opportunities for further research due to the prevailing knowledge gaps. Although the current study established a strong negative correlation between Covid-19 induced supply chain disruption and resilience among pharmaceutical companies in Kenya, there is need to conduct similar studies in other cities outside Kenya due to disparities in operating and business environment that may confound the findings. Moreover, most studies on the Covid-19 subject are conceptual in approach hence the need for more empirical investigations to adduce further evidence. Moreover, there is need to conduct similar studies in service sectors due to inherent differences that may render the findings of the current study inapplicable.

CHAPTER ONE: INTRODUCTION

1.1 Background of the Research

Firms are legal entities normally with perpetual life expectancy (Cavinato, 2004; Montgomery, Bowers, & Subedi, 2021). However, the perpetuity principle is not guaranteed due to environmental turbulence that often threaten the existence of firms. The ability, therefore, of a firm to thrive and survive depends on its resilience. Firms exist to deliver goods and/or services to markets that are normally separate for it in time and space. This separation of demand from supply is bridged through supply chain. In this regard, any environmentally induced aggression to a firm often impacts its supply chain as well, leading to potential disruption of the latter. Therefore, supply chain disruptions have the potential to test resilience of organizations. An example is the impact of COVID-19 on the global supply chains, implying that firms seeking resilience have to reconfigure their supply chains to align with the COVID-19 induced disruptions (Nayler & Subramanian, 2021).

The study was premised on the prediction of Theory of Disruptive Innovation by Christensen (1997) which holds that organizations that continuously innovate to wade through disruption of business models are likely to be more resilient. The investigation was also anchored on the argument of Dynamic Capabilities Theory by Teece, Pisano and Shuen (1997) which postulates that organizations that develop diverse strengths in form of resources, systems and processes are likely to remain resilient under disruptive conditions. The study was also guided by the postulates of Contingency Theory which holds that the capacity of a firm to endure and thrive rest on on the strategies deployed to respond to the emerging environmental conditions (Halldorsson, Herbert & Tage, 2003).

COVID-19 pandemic has disrupted business models worldwide (World Economic Forum, 2021). Supply chains have particularly been impacted by the pandemic, causing unprecedented breakdowns in the systems through which goods and services flow from producers to consumers (Delloite, 2021). Despite the theoretical postulations of Disruptive Innovation and Dynamic Capabilities Theories, few empirical studies have

been undertaken on the connection linking COVID-19 induced supply chain disruptions to resilience of organizations. This informed the motivation of the current study.

The Kenyan pharmaceutical industry has yet to progress to the most complicated activities throughout the value chain (Kenya Pharmaceutical Industry Diagnostic Report, 2020). Many businesses still produce simple non-patented goods or rely on transfer of technology agreements with overseas multinational corporations. Because the local capability for transforming raw inputs is undeveloped, the enterprises create raw materials that are eventually exported (Kenya Pharmaceutical Industry Diagnostic Report, 2020). The supply chains of Pharmaceutical Companies in Kenya are, therefore, highly integrated with global pharmaceutical supply chains. Due to the impact of the COVID-19 pandemic on global supply chains, pharmaceutical companies in Kenya have been affected by COVID-19 induced supply chain disruptions, hence the need to develop coping strategies to enhance resilience.

1.1.1 Supply Chain Disruption

The idea of supply chain “as a network of inter-related entities that combine to enable the satisfaction of customer demand is well established” (Yadav, Luthra & Garg, 2020). Many descriptions of supply chain management (SCM) are there and the one of the various definitions that has been adopted for specifically this study is: “The management of upstream and downstream relationships with suppliers and customers in order to create enhanced value in the final market place at less cost to the supply chain as a whole.”

There are many risks that are experienced by various companies worldwide which apply supply chains through an extension over several tiers (Straight, 2020). Largely, most of such risks have been differentiated into two categories: risks arising within the supply chain and risks that are external to it. First, the risk that revolve around supply chain is clearly portrait through interaction among the integral companies transversely in supply chain (Montgomery, 2021). It is caused by sub-optimal interaction and co-operation between the entities along the chain. Such supply chain risks result from a lack of visibility, lack of „ownership“, self-imposed „chaos“, just-in-time practices and inaccurate forecasts. On the other side, external risks can be seen on the basis of relation linking the

supply chain to its environment. Some of the relations that can be highlighted in the study are the disruptions that are related to some factors like terrorism, strikes, and natural catastrophes. Moreover, at any given time, disruptions affecting supply chain and are related to environmental origins are described ascribed to external risks (Das, Datta, Kumar, Kazancoglu & Ram, 2021).

Croxton, García-Dastugue, Lambert and Rogers (2001) have outlined five dimensions of supply chain management, each of which was potentially disrupted by COVID-19, namely: returns, sourcing, planning, delivery and manufacturing. The planning stage states that supply chain strategy can be developed with a condition that the other four elements are specialized in the independent roles of plan execution process. Specifically, sourcing phase of SCM encompasses an act of procuring the raw materials and components that are necessary for operations in any organizational setup. Manufacturing phase is concerned with scheduling of activities that pertain production, material or product testing/sampling of products, including packing and release. Return phase of supply chain management is connected with handling of all returns of flawed products, as well as the process of identification of the conditions of the product, okaying returns, organizing for their shipment, and if need be, replacement of such flawed products and provision of refunds.

1.1.2 Organizational Resilience

Organizational resilience denotes to the capability of a company to survive and thrive in a disruptive environment (Mahmoudi, Javed & Mardani, 2021). This definition has been adopted for purposes of the current study. Five dimensions of organizational resilience have been identified by Deloitte (2020), namely: preparedness, adaptability, Collaboration, Trustworthiness, and responsibility. Preparedness refers to the ability to plan for all eventualities, both long and short term (Pelfrey, 2005). This dimension entails the ability of an organization to successfully poise addressing long- and short-term priorities (Kaplan, 2001).

Adaptability refers to ability to have versatile employees, especially after a disruption. Association indicates the importance of alliance within their organizations since it speeds

decision-making, mitigates risk, and leads to more innovation. This component entails breaking down barriers and strengthening alliances. Building trust requires focusing on enhancing communication and transparency with important stakeholders, in addition to leading with empathy (Maak, & Pless, 2006).

Responsibility entails acknowledging business world has a responsibility beyond the bottom line; balancing all stakeholders" needs. Although some protagonists argue that organizational resilience is better measured using time series, evidence from others such as Delloite (2020) demonstrate that each of the indicators of organizational resilience can in fact be measured through opinions in a graduated scale.

1.1.3 Pharmaceutical Firms in Kenya

Kenya's pharmaceutical value chain is divided into three phases input production, medicine production, and consumer distribution, with value distributed fairly throughout these steps (Pharmaceutical Industry Diagnostic Report, 2020). Over the previous five years to 2019, pharmaceutical manufacturing companies saw annual compound growth of 12 percent (Barasa, Kazungu, Orangi, Kabia, Ogero, & Kasera, 2021; Rockers, Laing, Ashigbie, Onyango, Mukiira, & Wirtz, 2019). The top five manufacturing firms export between 40% and 85% of their output, primarily to other East African countries (KNBS, 2020). Large and small pharmaceutical companies import about 60 percent and 35 percent of their packaging materials, correspondingly.

The industry also imports manufacturing machinery and equipment from Europe and Asia, as well as skilled manpower for equipment installation, management, and repair facilities. The pharmaceutical industry in Kenya is confined and regulated primarily by family-run enterprises that specialize in the most basic types of manufacturers (Pharmaceutical Industry Diagnostic Report, 2020). The largest 10 firms account for nearly 80 percent of local production, and they mainly produce unbranded generics. Most local firms compete in the same market segments with similar product portfolios.

The Covid-19 pandemic has had a catastrophic human impact and has put tremendous strain on pharmaceutical and healthcare supply chains (Nayler & Subramanian, 2021). Simultaneously, supply chain readiness is critical to overcoming any hurdles posed by the current pandemic (Ivanov, 2020). The Covid-19 situation is unprecedented. As of 4

February 23rd, 2021, there were 111 million confirmed cases of Covid-19 worldwide, with over 2.5 million deaths (Wang, Wang, Wang, Lau, Zhang, & Li, 2021). Disruptions in the health supply chain have resulted from government actions such as social separation and lockdowns. According to a recent modeling study, low-and-middle-income countries (LMICs), notably in Africa, are more sensitive to the independent impacts of Covid-19 on supply chains (Osendarp et al., 2021). As a result, supply chain resiliency is critical to overcoming any obstacles posed by the current epidemic (especially given the introduction of new Covid variants, such as the one that just surfaced in South Africa) and any external events that may occur in the future (Donthu & Gustafsson, 2020; Nayler & Subramanian, 2021).

1.2 Research Problem

Resilience is a necessity for organizations that seek to thrive and survive due to the dynamism, unpredictability and munificence of the external environment. Inability to develop resilience is, therefore, an existential risk. Supply chains of organizations are increasingly becoming integrated abated by technological advancement and globalization, among other factors. In this regard, disruption to supply chains in any part of the world is likely to have major effect across the entire chain. The link between organizational resilience and supply chain disruption is, therefore, attracting intellectual debate, especially in the times of crises (Cavinato, 2004; Montgomery, 2021).

Cases of COVID-19 have been reported across the world. Different states imposed various procedures to curb the contacting of the virus from one another that has been considered highly infectious. Among the measures was controlled mobility of humans, goods and services within and across states, regions and continents (Ivanov, 2020). The measures led to disconnection of components of supply chains that are normally integrated and operate in unity. The import of this is that goods and services could unprecedentedly delay across the supply chains or fail to reach the final consumer altogether. The phenomenon disrupted the business models of virtually all players across supply chains. The effect of this was a dip in the performance of various organizations and a risk to survival. Due to the global nature of their supply chains, pharmaceutical

companies were impacted as well and many attempted to develop and implement resilience strategies (Nayler & Subramanian, 2021).

Although COVID-19 is novel in nature. Studies on its impact on various aspects of organizational performance are increasing. There are also studies focusing the organizational resilience and general supply chain disruption which is an older concept. In spite of this, there still knowledge gaps that warrant further study. Venuprasad & Ungerer (2021) conducted a study on a conceptual study dubbed “COVID-19: The Great Lockdown and its Impact on Small Business”. The study established that African exporter might miss out over \$2.4 billion when it comes to worldwide business supply chain exports, since there is a factory closure in China, the European Union (EU) and the United States. Since this was a conceptual study, there is need for an empirical investigation on the COVID-19 induced supply chain disruption on organizational resilience.

A conceptual study by the Betti and Kristian (2021) entitled “The Resiliency Compass: Navigating Global Value Chain Disruption in an Age of Uncertainty” determined that although “the COVID-19 pandemic accelerated innovation and strengthened cooperation to help stakeholders overcome unprecedented challenges, it is essential to step back and draw lessons learned, as they serve as a critical guidepost towards building long-term resilience.” Since this was a conceptual study, there is need for an empirical investigation on the COVID-19 induced supply chain disruption on organizational suppleness.

Das, Datta, Kumar, Yigit, Kazancoglu and Ram (2021) conducted a study entitled “Building supply chain resilience in the era of COVID-19: An AHP-DEMATEL approach”. The study incorporated multi-criteria decision approach using Analytic Hierarchy Process (AHP) and Decision-Making Trial and Evaluation Laboratory (DEMATEL) to analyze factors that affected the supply chain networks with the onset of COVID-19. The study found that the significance of management was very low while attempting to diminish vulnerabilities of networks of supply chain. The analysis from DEMATEL approach on the other side showed that support from the government is a substantial causal factor which can successfully eradicate the issues afflicting supply chains during the COVID-19 pandemic. There is need for research to find connection

between COVID-19 induced supply chain disruption and organizational resilience since it was not within the scope of the research by Das et al. (2021).

A study by Deloitte (2021) investigated the various resilience strategies used by organizations in Kenya. Using qualitative approach and key informant interviews, the study established that organizations used five dimensions of resilience, namely: preparedness, collaboration, trustworthiness, adaptability, and responsibility. Since the study was exploratory, its focus was not on the antecedents of organizational resilience. The current study seeks to draw a linkage between supply chain disruption and organizational resilience.

A study by the Canton (2021) focused on overall state of the pharmaceutical industry in Kenya. Using desktop research and exploratory method, the study established that the pharmaceutical industry in Kenya had supply chains that are highly integrated with global supply chains. It also determined that all pharmaceutical companies in Kenya relied exclusively on technology transfer arrangement with their global partners. Since the focus of the study was not on the consequence of COVID-19 on supply chains and organizational resilience, the current study seeks to address the knowledge gap.

A study by Unit (2020) sought to articulate the trails of the Socio-Economic influence of the Coronavirus pandemic on the economy in Kenya. The study research determined that considering the adverse socio-economic impacts of the COVID-19 pandemic on the health and livelihoods of families and communities, in particular the most vulnerable groups which will regress progress across the Sustainable Development Goals (SDGs).

However, the focus of the study was too broad hence the need for industry specific investigations on influence of COVID-19 on resilience of organizational supply chains.

The study, therefore, pursued the following research question: What is the impact of COVID-19 induced supply chain disruption on the resilience of pharmaceutical firms in Kenya?

1.3 Research Objectives

The research was guided by the following objectives;

- i. To determine the extent to which COVID-19 induced supply chain disruption occurred among pharmaceutical firms in Kenya.
- ii. To examine the effect of COVID-19 induced supply chain disruption on the resilience of pharmaceutical businesses in Kenya.

1.4 Value of the Research

An understanding of the linkage between COVID-19 induced supply chain disruption and organizational resilience was crucial for theory development, practice and policy. Firstly, the predictions of Disruptive Innovation and Dynamic Capability theories would be compared with actual observations of phenomena. This would provide an opportunity for the postulations of the theories to be refined based on the actual findings of the study.

The study would also provide empirical evidence on the linkage between COVID-19 induced supply chain disruption and organizational resilience which may be used to address various policy gaps. Some of the gaps include: policies on corporate governance and business process recovery. Based on the output of the study, various action-based policy reforms would be proposed.

The study would, finally, provide empirical evidence that may be utilized by the individual pharmaceutical companies to develop strategies for business process re-engineering and particularly supply chain resilience. A strong positive association between COVID-19 induced supply chain supply chain disruptions may, for instance, provide a basis for negotiating resources for capacity building, compensation plan, among others.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

The section outlines the theoretical perspectives on the linkages among the variables in the investigation. The section comprises analysis of key propositions in supply chain management theory, their central ideas, and leading accounts on the selected variables of the proposed study. The section also consists of empirical discourse on each of the variables under examination, including the knowledge gaps.

2.2 Theoretical Literature Review

The relationship between COVID-19 induced supply chain disruption and organizational resilience can be studied from the postulates of Disruptive Innovation Theory (DIT), Dynamic Capability Theory and Contingency Model. These ideas were chosen because they are the most applicable to this research. The overarching theory in this study is the Theory of Disruptive Innovation which holds that for an organization to attain resilience, it has to pre-empt disruption and develop coping strategies a priori.

2.2.1 Disruptive Innovation Theory

DIT evolved from disruptive technology concept developed by Christensen (1997) and it is a phenomenon where a novel technology that has lower cost and relative performance as indicated by the ordinary measures but whose ancillary impact is immense. It explains how a product/service originally emanates from the lower segment of the market characterized by lower costs and accessibility, and eventually seeps the upper segments (Downes *et al.*, 2013). For disruptive innovation to be successful the following ingredients must be well aligned starting with enabling technology that avails a more affordable and accessible product to a board market.

Secondly, delivers a product targeting the least profitable market segment. Christensen (1997) argues that it only qualifies as disruptive innovation if it is able to balance the various interests of the stakeholder such as consumers, suppliers, and other partners upon its proliferation. The theory predicts that under disruptive innovation, firms that make the right strategic choices are likely to be more resilient. However, the theory overly implies that management has complete access to knowledge concerning disrupting environmental

developments (Buchanan & Huczynski, 2019). The theory also ignores the influence of firm heterogeneity in its supposition on the influences of disruption to the state of firm competency (Cherkashin, Demidova, Kee & Krishna, 2015; Helfat et al., 2007; Georgopoulos, & Glaister, 2018).

2.2.2 Dynamic Capabilities Theory

Dynamic capabilities concept is mainly attributed to Teece, Pisano and Shuen in 1997. It argues that for an organization to be resilient, it has to develop and regularly reconfigure a mix of strengths in terms of resources, systems, and processes. According to the theory, development of capability emanates from multiple types of investments including formal R&D projects, adoption of technology, physical and human resources, reorganization of operational process, and learning curve. However, development of dynamic capabilities transcends investment strategy and action (Pisano & Corsi, 2012)

Others such as Winter (2008) hold that an organization may possess a desirable investment strategy but with uncertain outcomes. The strategy for developing the right capability sets may be uncertain, but even where it is clear the choice of the right path may still be uncertain. Some capabilities entail lower levels of obligation to particular markets or product strategies (Ghemawat & Pisano, 1997). On one end, generic capabilities as the technological abilities deployable in a reasonably broad scope of applications and markets. On the other end, there are abilities that may only be applied in a very small scope of applications.

The theory is appropriate to the research since it provides an explanation on the variability of resilience among organizations under conditions of disruption. The prediction of the theory, therefore, is that a firm with more dynamic capabilities is likely to be more resilient in a disruptive ecosystem. The limitation of the theory is that it presupposes an optimal mix of capabilities and is overly premised on a perfectly predictable external environment whose dynamism is to be matched through configuration of the internal capabilities.

2.2.3 Contingency Theory

Contingency theory holds that the relationship between variables is dependent on the situational outlook. Conferring to Halldorsson, Herbert, and Tage (2003), fluctuations in output variables are thought to indicate performance induced by variations in input measurements. Therefore, variability of supply chain disruption can be a determinant of demand organizational resilience. In this regard, supply chain disruption is hypothetically related organizational resilience.

According to the theory, it is important for organizations to innovate their supply chains by, for instance, determining the current and future supplies for all types of inbound and outbound inventory to ensure the safety and supply security, avoiding degradation, fraud, waste, and obsolescence. Coyle, Bardi and Langley (2003) argue that the type and level of demand can spur an organization to reinvent its supply chain to match the changes. The movement of those materials as they pass by the various phases of the operation is also important and ought to be designed with the market dynamics in mind (Miller, 2010).

The prediction of contingency theory is that supply chain disruption and demand organizational resilience are related (Snyder, 2011). Being the nature of theoretical arguments, the limitation of contingency theory is that it does not provide empirical evidence on the connection linking supply chain disruption to organizational resilience. The current study, therefore, tested the prediction of contingency theory in light of the link connecting supply chain disruption to organizational resilience.

2.3 Supply Chain Disruption

The dimensions of supply chain disruptions have been drawn from Croxton, García-Dastugue, Lambert, and Rogers (2001). The planning phase denotes the emerging of a general approach for the supply chain, however, the other four elements focus in the vital necessities for implementing that plan. For the company to determine what need to be produced on a specified time of operation and other related logistics until the product is fully produced, planning is essential factor. Specifically, sourcing phase of SCM encompasses establishing the process of procuring the raw materials and components. Items that are needed to be used in the production process must be outsourced or internal

modification is key process. All the raw materials required are then procured based on the right quantification (Croxtton et al., 2001).

Manufacturing phase is concerned with scheduling of activities related to production, process of product test, sorting for further process of packing and then releasing. The products that are supposed to be in the production line might take time to be confirmed if they are feasible for processing because they are supposed to undergo testing progression. Products that qualify the testing phase are then sorted for packing and customization before releasing (Tomlin & Wang, 2011).

Return phase of supply chain management is linked with dealing with returns holistically which are not limited to identification of products which have some impairments which is realized by assessing the conditions of the product. When some goods have been found to have some defects, authorization process begins to seek the managing authority allow the products to be returned to the supplier. This is followed by the process of planning for shipment of such items. After allowing the defective products to be shipped then replacement is next then finally refunding process.

2.4 Empirical Literature Review

A number of researches have been carried out on resilience of firms globally. However, the emergence of COVID-19 has opened a new frontier whose research stream is novel but of great concern to scholars. Therefore, there are knowledge gaps with respect to the extent to which COVID-19 induced supply chain disruptions have affected the resilience of organizations from various industries.

Venuprasad and Ungerer (2021) conducted a study on a conceptual study dubbed “COVID-19: The Great Lockdown and its Impact on Small Business”. The study established that “African exporter may lose more than \$2.4 billion in global industrial supply chain exports, due to factory shutdowns in China, the European Union (EU) and the United States.” Since this was a conceptual study, there is need for an empirical investigation on the COVID-19 induced supply chain disruption on organizational resilience. A conceptual study by the

Betti and Kristian (2021) entitled “The Resiliency Compass: Navigating Global Value Chain Disruption in an Age of Uncertainty” determined that although the COVID-19 pandemic accelerated innovation and strengthened cooperation to help stakeholders overcome unprecedented challenges, it is essential to step back and draw lessons learned, as they serve as a critical guidepost towards building long-term resilience. Since this was a conceptual study, there is need for an empirical investigation on the COVID-19 induced supply chain disruption on organizational resiliency.

Das, Datta, Kumar, Yigit, Kazancoglu and Ram (2021) conducted a study entitled “Building supply chain resilience in the era of COVID-19: An AHP-DEMATEL approach”. The study incorporated multi-criteria decision approach using Analytic Hierarchy Process (AHP) and Decision-Making Trial and Evaluation Laboratory (DEMATEL) to analyze factors that affected the supply chain networks with the onset of COVID-19. The study found that management was the less significant aspect in the process of minimizing susceptibilities of the supply chain. The analysis from DEMATEL approach also “indicate that government support is a significant causal factor which can effectively eliminate the issues plaguing supply chains during the COVID-19 pandemic.” There is need for a study to determine the connection between COVID-19 induced supply chain disruption and organizational resilience since it was not within the scope of the research by Das et al. (2021).

A study by Deloitte (2021) investigated the various resilience strategies used by organizations in Kenya. Using qualitative approach and key informant interviews, the study established that organizations used five dimensions of resilience, namely: preparedness, collaboration, trustworthiness, adaptability, and responsibility. Since the study was exploratory, its focus was not on the antecedents of organizational resilience. The current study seeks to draw a linkage between supply chain disruption and organizational bounciness.

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exclusively on technology transfer arrangement with their global partners. Since the focus of the study was not on the consequence of COVID-19 on supply chains and organizational resilience, the current study seeks to address the knowledge gap.

A study by Unit (2020) sought to articulate the paths of the Socio-Economic influence of the Corona virus plague on the economy of Kenya. The desk research determined that considering the adverse socio-economic impacts of the COVID-19 pandemic on the health and livelihoods of families and communities, in particular the most vulnerable groups which will regress progress across the Sustainable Development Goals (SDGs), policymakers, should adopt a whole of government and society approach to lessen the adverse impacts. However, the focus of the study was too broad hence the need for industry specific investigations on consequence of COVID-19 on resilience of organizational supplies chains.

It is evident that knowledge gaps abound in light of the extent to which COVID-19 induced supply chain disruptions have affected resilience of pharmaceutical companies in Kenya. It is clear, for instance, that most studies close to the subject are applied in nature with limited pure research stream in that respect. Most of the studies are also exploratory and qualitative in approach with little descriptive and quantitative investigations on the subject. The current study, therefore, seeks to contribute to the knowledge stream by determining the extent to which COVID-19 induced supply chain disruptions have affected resilience of pharmaceutical companies found in Kenya.

2.5 Summary of Literature Review

The summary of the researches by various scholars based on the literature review findings are shown in Table 2.1. The table captures the research objectives, research findings, research methodology, and gaps in the research and how some of the gaps are addressed in the research.

Table 2. 1: Summary of Empirical Literature Review

Author	Title	Objectives	Research methodology	Findings	Research gaps	Ways some of the gaps were addressed
Venuprasad & Ungerer (2021)	Covid-19; The great lockdown and its impact on small businesses	To establish the impact of the lockdown on small businesses	Conceptual study	It was found that the loss realized by the African exporters may be over \$2.4B in worldwide industrial SC exports.	The study was based on small businesses and did not focus on pharmaceutical firms	This study will focus specifically on pharmaceutical firms in Kenya
Betti and Kristian (2021)	The resiliency compass; Navigating global value chain disruption in an age of uncertainty	To establish how to navigate global value chain disruption in an age of uncertainty	Conceptual study	Even though the covid 19 pandemic hiked innovativeness with enhanced collaboration to stake holders, it's important to draw lessons learned	Since it was a conceptual study, it did not provide empirical investigation.	This study will provide empirical evidence of the findings
Das,Datta,Kumar, Yigit,kaz	Building supply chain resilience in	To establish how to build	Multi-criteria	Management was found to be much ineffective aspect in	The study did not focus on the	The target of the study focuses on

ancoglu and Ram (2021)	an era of covid -19	supply chain resilience in the covid 19 era	decision approach using analytic hierarchy process APH	minimization of susceptibilities of the supply chain	relationship between covid-19 induced supply chain disruptions and organizational resilience	the relationship between covid-19 induced supply chain disruptions and organizational resilience
Delloite (2021)	Resilience strategies used by organizations in Kenya	To establish the various resilience strategies used by organizations in Kenya	Quantitative approach and informant interviews	Organizations used five dimensions of resilience; Preparedness, Collaboration, Trustworthiness, Adaptability, and responsibility.	Since the study was exploratory its focus was not on the organizational resilience	Aim of study focuses on COVID-19 and organizational resilience
Canton (2021)	The overall state of the pharmaceutical industry in Kenya	To establish the overall state of pharmaceutical industry in Kenya	Desktop research and exploratory method	Pharmaceutical industry in Kenya had supply chains that are highly integrated with global supply chains	the study did not focus on the effect of covid 19 on supply global partner	The target was to check the effect of covid-19 on the supply chains

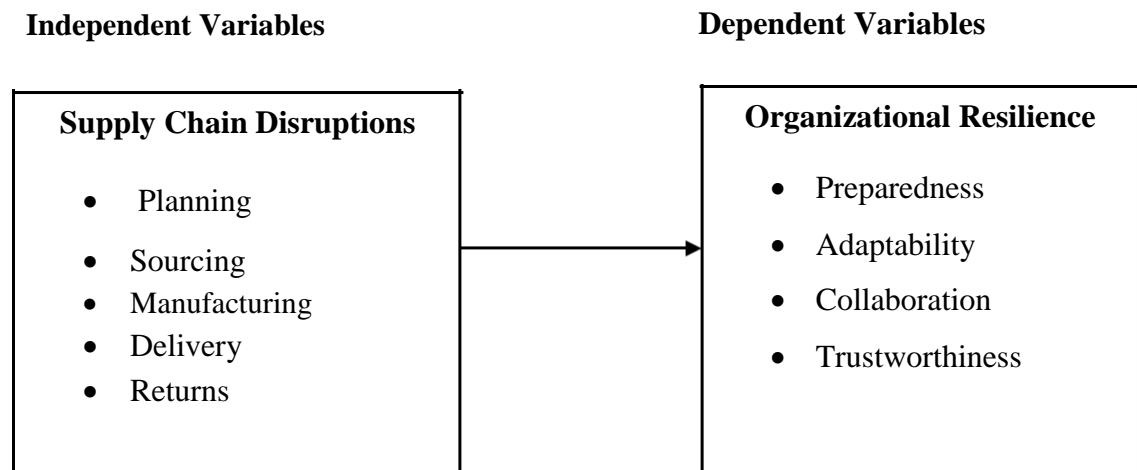
Unit (2020)	The social economic impact of covid-19 on the Kenyan economy	To articulate the pathways of the social -economic impact of covid-19 on the Kenyan economy	Descriptive statistics	Livelihoods of families and communities which will regress progress should implement a whole of government and society approach to lessen the adverse impacts	The focus of the study was broad	This study will narrow down to pharmaceutical firms rather than the entire economy
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Source; Researcher (2022)

2.6 Conceptual Framework

The conceptual framework in Figure 2.1 depicts a connection between supply chain disruption and organizational resilience. The input variable according to the framework is supply chain disruption, while the output variable is organizational resilience. Various dimensions of each variable have been outlined in the framework based on their consistent use among the researchers in the area of Supply Chain Management.

Figure 2.1 Conceptual Model



Source: Researcher (2022)

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Introduction

This chapter explains the methodology that was used in the study. It presents the research design, a presentation on the research population, collection of data, then ends with the data analysis techniques used.

3.2 Research Design

The research implemented a descriptive cross-sectional survey design because the focus was on pharmaceutical firms in Kenya, with the conceptual focus being on the relationship between COVID-19 induced supply chain disruption and resilience.

A cross-sectional study normally seeks to determine the association of variables at an instant so as to describe the incidence of a phenomenon and how the variables are related (Saunders et al., 2019). Descriptive statistics was used to prepare the data for further statistical analysis to enhance the chances of generalization from the study sample to the study population (Myers, Well, & Lorch, 2013). Statistical analysis provided the basis for establishing the probabilistic association between the variables, and drawing of conclusions (Aneshensel, 2012; Yin, 2013). The analysis and interpretation were done in accordance with the objective of the study.

3.3 Population of the Study

The target population of the study was the pharmaceutical firms in Kenya. The population was chosen due to the nature of the research problem and objective of the study. A list of the firms was obtained from the Pharmacy and Poisons Board of Kenya (2020) showing that there were 50 pharmaceutical firms in Kenya (appendix II) Saunders *et al.* (2019) and Kothari (2004) argue that when the research population is small, sampling becomes unnecessary and a census survey would be desirable. The number of pharmaceutical firms in Kenya as stated is relatively small; hence a census survey was applied. Mapping of the physical addresses of the firms was undertaken in readiness for the actual survey, with logistical preparations considered.

3.4 Data Collection

Primary data was collected using a structured research questionnaire. Mugenda and Mugenda (2003), and Cooper et al. (2006) agree that a structured questionnaire is

often appropriate for a descriptive design and can enhance data analysis. Descriptive statements in a rating scale were offered to the participants, on which they were expected to indicate the level to which they perceived specific sentiments as descriptive of the COVID-19 induced supply chain disruption and resilience in their organizations.

The tool had 5-point Likert scale, the questionnaire was structured into 3 segments: section A collected data on the Demographics of the participants; section B gathered info on COVID-19 Induced Supply Chain Disruption; and section C collected data on Organizational Resilience. The questionnaire was then administered to the Head of Supply Chain function of each firm. Four other respondents were identified from each company, namely: the Heads of Sales, Customer Service, Systems or their equivalents. This brought the total number of respondents for each firm to four. Hence the expected number of respondents was 200.

3.5 Data Analysis

Data analyses techniques applied was according to the objectives and general information of the study. Data in section A (general information) and Objective one which was to examine the degree to which COVID-19 induced supply chain disruption occurred among pharmaceutical firms in Kenya was analyzed using descriptive statistics. Objective two, which was to examine the impact of COVID 19 induced supply chain disruption on the resilience of pharmaceutical firms in Kenya was analyzed using linear regression analysis. The regression model is presented as follows:

$$Y = a + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + e$$

Whereby:

Y – Organizational Resilience as measured by; preparedness, adaptability, collaboration and trustworthiness individually. X_1 – Planning Disruption

X_2 – Sourcing Disruption

X_3 – Manufacturing Disruption

X_4 – Delivery Disruption

X_5 – Returns Disruption

b1, b2, b3, b4, and b5 – Model Coefficients

a – Regression constant

e –Term of error

Table 3.1 provides a summary of data collection and analysis techniques

Table 3.1: Summary of Data Collection and Analysis Techniques

Objective	Questions	Data Analysis Method
Background information	Part A	Descriptive Statistics - – Means, frequencies, & percentages
Extend to which COVID 19 induced supply chain disruption occurred among pharmaceutical firms in Kenya	Part B	Descriptive Statistics - – Means, frequencies, & percentages
The impact of COVID19 induced supply chain disruption on the resilience of pharmaceutical firms in Kenya	Part C	Inferential Statistics- multiple Regression Analysis

Source: Researcher (2022)

CHAPTER FOUR: DATA ANALYSIS, PRESENTATION AND INTERPRETATION

4.1 Introduction

This chapter presents data analysis, presentation of the findings and interpretation of the results. Data analysis includes questionnaire return rate, background information of respondents, descriptive, correlation, and regression analyses. Interpretation of findings includes explanations about the analytical output.

4.2 Response Rate

The questionnaires were administered to 200 participants drawn from the 50 pharmaceutical firms in Nairobi County-four from each firm. Out of the 200 research questionnaires, 143 were filled and returned, representing questionnaire return rate of 71.5%. 57 surveys were not returned, notwithstanding the researcher's extensive efforts to have them answered and returned.

As per Mugenda & Mugenda (2003), a return rate of 70percent of total or more is regarded excellent for inferential analytical purposes. The response rate of 71.5% in the current study, therefore, met the criteria set by Mugenda and Mugenda (2003).

4.3 Background Information of Participants

The background information about the respondents are an important part in social research since it informs the nature of responses obtained. Position in the organization is a major consideration in understanding the dynamics about the respondents since it demonstrates the grasp of issues in the organization; respondents from the top management team would be deemed to have deeper understanding of issues about the organization, especially at strategic level. The years worked in the industry, a surrogate for experience, is equally deemed important since it determines the quality of responses, in terms of the validity of the responses obtained. The level of education of respondents also plays a critical role in determining the nature of responses obtained from a study since it determines the manner in which the educationally diverse respondents express opinions about a research problem.

4.3.1 Job Positions of Participants

The research pursued to know the job positions of the participants in their organization. The outcomes were as shown in Table 4.1.

Table 4. 1: Job Position

Gender	Frequency	Percent	Valid Percent	Cumulative Percent
Head of Supply Chain	41	28.6	28.6	28.6
Head of Sales	32	22.4	22.4	51.0
Head of Marketing/ Customer Service	35	24.5	24.5	75.5
Head of ICT	35	24.5	24.5	100
Total	143	100.0	100.0	

Source: Research Data (2022)

Table 4.1 above shows that 41(28.6%) of the respondents were Heads of Supply Chain in their organizations. 32(22.4%) were Heads of Sales, while Heads of Marketing/ Customer Service, and Heads of ICT were each 35(24.5%). This demonstrates that highest number of the participants were Heads of Supply Chain. This may be attributed to the fact that they were the direct contact points in their organizations as far the study was concerned. They were, therefore, requested to mobilize the other respondents in their organizations. In this regard, their response rate would be expected to be higher than any other category of respondent, and this also means their grasp of supply chain issues is elaborate hence the likelihood of valid responses.

4.3.2 Firm Experience

The research pursued to know the years of experience of participants in their respective firms. The results were as displayed in Table 4.2 below.

Table 4. 2: Firm Experience

Period in years	Freq.	Percent	Valid %	Cumulative Percent
Below 4	35	24.5	24.5	24.5
4-6	44	30.7	30.7	55.2
7-10	48	33.6	33.6	88.8
More than 10 years	16	11.2	11.2	100.0
Total	143	100.0	100.0	

Source: Research Data (2022)

Table 4.2 demonstrates that 35(24.5%) of the participants had been in their respective firms for below 4 years; 44(30.7%) had been in their firms for 4-6 years; 48(33.6%) had been in in their firms for 7-10 years; while 16(18.1%) had been in their firms for more than 10 years. It is evident that majority of the respondents had been in their firms for between 7-10 years. This demonstrates that their grasp of issues about the firm was elaborate, hence the likelihood of valid responses.

4.3.3 Industry Experience

The study wanted to know the years of experience of the participants in the pharmaceutical industry. The presentations were as shown in Table 4.3 below.

Table 4. 3: Industry Experience

Duration in years	Freq.	%	Valid Percent	Cumulative Percent
Below 4	30	21.0	21.0	21.0
4-6	42	29.4	29.4	50.4
7-10	45	31.5	31.5	81.9
More than 10 years	26	18.1	18.1	100.0
Total	143	100.0	100.0	

Source: Research Data (2022)

Table 4.3 demonstrates that thirty (21.0%) of the participants had been in the industry for below 4 years; 42(29.4%) had been in the industry for 4-6 years; 45(31.5%) had been in in the industry for 7-10 years; while 26(18.1%) had been in the industry for more than 10 years. It is evident that majority of the respondents had been in the pharmaceutical industry for between 7 and 10 years. This demonstrates that their grasp of industry issues was elaborate, hence the likelihood of valid responses.

4.3.4 Level of Education

The research pursued to know the level of education of the participants. The outcomes were as displayed in Table 4.4 below.

Table 4. 4: Level of Education

Education Level	Freq.	%	Valid Percent	Cumulative Percent
Diploma	25	17.5	17.5	17.5
Bachelor's Degree	57	39.9	39.9	57.4
Master's Degree	49	34.3	34.3	91.7
PhD	12	8.3	8.3	100.0
Total	143	100.0	100.0	

Source: Research Data (2022)

Table 4.4 displays that 25(17.5%) of the participants had Diploma, 57(39.9%) had Bachelor's Degree, 49(34.3%) had Masters's Degree, while 12(8.3%) had PhD. This demonstrates that mainstream of the participants attained a level of Bachelor's Degree.

4.4 Extent to which COVID 19 induced supply chain disruption occurred among pharmaceutical firms in Kenya

The first objective of the study was to determine the extent to which COVID-19 induced supply chain disruption concurred among pharmaceutical firms in Kenya. Five dimensions of Covid-19 Induced Supply Chain Disruption were analyzed, namely: Planning Disruption, Sourcing Disruption, Manufacturing Disruption, Delivery Disruption, and Returns Disruption. On the other hand, four dimensions of Organizational Resilience were analyzed, namely: Preparedness, Adaptability, Collaboration, and Trustworthiness.

Data was collected using Likert- type scale (1-5), where 1-strongly disagree, 2-disagree, 3- neither disagree nor agree, 4-agree, and 5-strongly agree. Descriptive analysis was conducted to bring out the dispersion and central tendency. The Mean was applied to determine the central tendency, while Standard Deviation was used to measure dispersion Table 4.5 presents a summary of COVID19 induced supply chain disruption ranked by mean

Table 4. 5 Extent to which COVID 19 induced supply chain disruption occurred among pharmaceutical firms in Kenya

Supply Chain Disruption	Mean	Std. Deviation
Sourcing disruption	4.653	0.524
Delivery disruption	4.304	0.639
Manufacturing disruption	3.807	0.909
Planning disruption	3.106	0.446
Returns disruption	3.106	0.446

Source: Research Data (2022)

The respondents tended to be neutral that their firms experienced Planning disruption as a result of the Covid-19 pandemic. This is demonstrated by the composite mean score of 3.106, and std dev of 0.446. The respondents tended to agree to a large degree that their firms experienced Sourcing disruption due to the Covid-19 pandemic. This is demonstrated by the composite score of 4.653, and standard deviation of 0.524.

Moreover, the respondents tended to agree that their firms experienced Manufacturing disruption due to the Covid-19 disease. This is demonstrated by the composite average score of 3.807, and std dev of 0.909. Also, the respondents were neutral that their firms experienced returns disruption as a result of Covid-19 pandemic, as displayed by the composite mean score of 3.106, and std dev of 0.446. The participants agreed to a large degree that their firms experienced delivery disruption as revealed by the Composite average of 4.304 and std dev of 0.639.

A study by Delloite (2021) investigated the various resilience strategies used by organizations in Kenya. Using qualitative approach and key informant interviews, the study established that organizations used five dimensions of resilience, namely: preparedness, adaptability, collaboration, trustworthiness, and responsibility. The current study, not only recognized the five dimensions of organizational resilience, but also found a negative correlation between Covid-19 induced supply chain disruption and organizational resiliency.

4.5 Effect of COVID 19 induced supply chain disruption on the resilience of pharmaceutical firms in Kenya

The second objective of the study was to determine the effect of COVID-19 induced supply chain disruption on the resilience of pharmaceutical firms in Kenya. Covid-19

induced supply chain disruption were a combination of independent variables in the study, and data was collected using five-point Likert-type scale. The study used multiple regressions to achieve the objective. Four regressions were carried to cater for each measure of resilience; Preparedness, adaptability, collaboration and trustworthiness.

4.5.1 Preparedness as Measure of Resilience

The relationship between planning, sourcing, manufacturing, delivery and returns against the dependent variable preparedness of supply chains among pharmaceutical firms in Kenya was established as follows;

Table 4. 6: Regression Coefficients on Preparedness

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	7.816	1.923		5.952	.000
	Planning	-.135	.230	-.123	-2.476	.004
	Sourcing	-.433	.289	-.328	-3.386	.000
	Manufacturing	-.056	.181	-.070	-2.200	.029
	Delivery	-.226	.262	-.186	-2.752	.001
	Returns	-.046	.218	-.046	-2.098	.040

a. Dependent Variable: Preparedness

Source: Research Data (2022)

The regression modal that was derived from the findings is:

$$Y = 7.816 - 0.135X_1 - 0.433X_2 - 0.056X_3 - 0.226X_4 - 0.046X_5$$

Y – Organizational Resilience (Preparedness)

X₁ – Planning Disruption

X₂– sourcing Disruption

X₃ – Manufacturing Disruption

X₄ – Delivery Disruption

X₅– Returns Disruption

From Table 4.6, planning disruption showed a negative impact on preparedness as a measure of organizational resilience among pharmaceutical firms in Kenya with a coefficient of -0.135. This means that it decreases preparedness of organizational resilience among pharmaceutical firms in Kenya by 13.5% as a result of a unit change. To test for statistical significance, a T value greater than 1.96 in magnitude or P value lower than 5% will indicate that a parameter is significant. The relationship

was negative and significant as indicated by T- value of -2.476 and p-value of 0.004 which is less than 0.05.

Sourcing disruption has a negative influence on preparedness of organizational resilience among pharmaceutical firms in Kenya. The coefficient of 0.433 indicates that any change in unit of the sourcing disruption will cause preparedness of organizational resilience among pharmaceutical firms in Kenya to decrease by 43.3%. The relationship was significant as indicated by T- value of -3.386.

Manufacturing disruption, with a coefficient of -0.056 exhibited a negative influence on preparedness of organizational resilience indicating that it decreases preparedness of organizational resilience among pharmaceutical firms in Kenya by 5.6% as a consequence of a unit change. The association was significant as indicated by T-value of -2.200. Furthermore, change in delivery disruption was confirmed to cause a decrease in the preparedness of organizational resilience among pharmaceutical firms in Kenya as illustrated by the coefficient of -0.226. The connection was substantial as shown by T- value which was -2.752 and a p-value less than 0.05.

Finally, it was established that a decrease in unit of returns disruption, while other factors held constant, will result to a negative change in preparedness of organizational resilience among pharmaceutical firms in Kenya with a value of -0.046 (T=-2.098, p = 0.001).

Table 4.7: Model Summary on Preparedness

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.830 ^a	.585	-.430	.45312

a. Predictors: (Constant), Planning, Sourcing, Manufacturing, Delivery, Returns

Source: Research Data (2022)

The outcomes in Table 4.7 point to the Covid-19 Induced Supply Chain Disruption had a combined substantial impact on preparedness of Organizational Resilience among pharmaceutical firms in Kenya as indicated by value R that is 0.830. A model with a variance of above 70% is considered a very good model, 60-69% is a good model, 50-59% is a satisfactory model, and below 50% is considered a poor model. The R squared of 0.585 illustrates that the independent variable accounting for 58.5% of the variance on preparedness among pharmaceutical firms in Kenya is satisfactory. Additional aspects not counted in the model affect preparedness as a measure of organizational resilience among pharmaceutical firms in Kenya by 41.5%.

Table 4. 8: ANOVA Table on Preparedness

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	103.131	5	20.626	4.860	.000 ^b
	Residual	13.829	137	.728		
	Total	116.960	142			

a. Dependent Variable: Preparedness

b. Predictors: (Constant), Planning, Sourcing, Manufacturing, Delivery, Returns

Source: Research Data (2022)

The outcomes in the ANOVA indicate the significance in the full model because the significance level of 0.000 was below the 5% level of significance which was too small. This was supported by the F calculated value which is larger than the critical value of 2.21. This is quite good indication that Covid-19 supply chain disruption changes preparedness as a measure of organizational resilience among pharmaceutical firms in Kenya.

4.5.2 Adaptability as Measure of Resilience

The relationship among sourcing, delivery, manufacturing, planning and returns against the dependent variable adaptability of supply chain disruptions in pharmaceutical firms in Kenya was established by performing multiple regression analysis.

Table 4. 9 Regression Coefficients on Adaptability

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.093	1.576		2.619	.010
	Planning	.055	.188	.060	2.219	.022
	Sourcing	.225	.237	.204	2.875	.003
	Manufacturing	.153	.148	.227	2.958	.002
	Delivery	.320	.215	.314	3.413	.000
	Returns	-.112	.178	-.136	-2.555	.019

a. Dependent Variable: Adaptability

Source: Research Data (2022)

The regression model that was derived from the findings is:

$$Y = 1.093 - 0.055X_1 + 0.225X_2 + 0.153X_3 + 0.320X_4 - 0.112X_5$$

Y – Organizational Resilience (Adaptability)

X₁ – Planning Disruption

X₂– Sourcing Disruption

X₃ – Manufacturing Disruption

X₄ – Delivery Disruption

X₅– Returns Disruption

From the outcome, planning disruption showed a positive impact on adaptability of organizational resilience among pharmaceutical firms in Kenya with a coefficient of 0.055. This means that it increases adaptability of organizational resilience among pharmaceutical firms in Kenya by 5.5% as a result of a unit change. The relationship was positive and significant as indicated by T- value of 2.219 and p-value of 0.022 which is less than 0.05.

Sourcing disruption has a negative influence on adaptability of organizational resilience among pharmaceutical firms in Kenya. The coefficient of 0.225 indicates that any change in unit of the sourcing disruption will cause adaptability of organizational resilience among pharmaceutical firms in Kenya to decrease by 22.5%. The relationship was significant and negative as indicated by T- value of -3.386 and p-value of 0.003.

Manufacturing disruption, with a coefficient of 0.153 exhibited a positive impact on adaptability of organizational resilience indicating that it cause rise in adaptability of organizational resilience among pharmaceutical firms in Kenya by 15.3% as a consequence of a unit change. The relationship was significant as indicated by T- value of 2.958 and p-value of 0.002 which is less than 0.05. In addition, Change in delivery disruption was confirmed to cause an increase in the adaptability of organizational resilience among pharmaceutical firms in Kenya as illustrated by the coefficient of 0.320. The connection was substantial as shown by T- value which was 3.413 and a p-value less than 0.05.

Finally, it was established that a decrease in unit of returns disruption, while other factors held constant, will result to a negative change in adaptability of organizational resilience among pharmaceutical firms in Kenya with a value of -0.112 (T=-2.555, p = 0.019).

Table 4. 10 Model Summary on Adaptability

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.864 ^a	.615	.409	.29924

a. Predictors: (Constant), Planning, Sourcing, Manufacturing, Delivery, Returns

Source: Research Data (2022)

The outcomes in Table 4.10 pointed that Covid-19 Induced Supply Chain Disruption had a combined substantial impact on adaptability of Organizational Resilience among pharmaceutical firms in Kenya as indicated by value R that is 0.864. The R squared of 0.615 illustrates that the independent variable accounting for 61.5% of the variance on adaptability of organizational resilience among pharmaceutical firms in Kenya. Other factors not included in the study affect adaptability of organizational resilience among pharmaceutical firms in Kenya by 38.5%.

Table 4. 11 ANOVA Table on Adaptability

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	102.550	5	20.510	5.043	.000 ^b
	Residual	9.290	137	.489		
	Total	111.840	142			

a. Dependent Variable: Adaptability

b. Predictors: (Constant), Planning, Sourcing, Manufacturing, Delivery, Returns

Source: Research Data (2022)

The outcomes in the ANOVA indicate the significance in the complete model because the significance level of 0.000 was below the 5% level of significance which was too small. This was supported by the F calculated value which is higher than the critical value of 2.21. This is quite good indication that Covid-19 supply chain disruption changes adaptability of organizational resilience among pharmaceutical firms in Kenya. This result is in agreement with the research conducted by Deloitte (2021) which contend that supply chain disruption leads to adaptability of organizations which enhances it resilience in the global economy.

4.5.3 Collaboration as Measure of Resilience

The relationship among sourcing, delivery, manufacturing, planning and returns against the dependent variable collaboration of supply chain disruptions in pharmaceutical firms in Kenya was established by performing multiple regression analysis.

Table 4. 12 Regression Coefficients on Collaboration

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		

1	(Constant)	4.052	2.300		3.762	.004
	Planning	.214	.275	.151	-2.777	.037
	Sourcing	-.696	.345	-.412	4.016	.000
	Manufacturing	-.142	.216	-.137	-2.654	.011
	Delivery	-.641	.314	-.411	-4.045	.000
	Returns	.200	.260	.158	2.766	.043

a. Dependent Variable: Collaboration

Source: Research Data (2022)

The regression modal that was derived from the findings is:

$$Y = 4.052 + 0.214X_1 - 0.696X_2 - 0.142X_3 - 0.641X_4 + 0.200X_5$$

Y – Organizational Resilience (Collaboration)

X₁ – Planning Disruption

X₂– Sourcing Disruption

X₃ – Manufacturing Disruption

X₄ – Delivery Disruption

X₅– Returns Disruption

From the outcome, planning disruption showed a negative impact on collaboration of organizational resilience among pharmaceutical firms in Kenya with a coefficient of -0.214. This means that it decreases collaboration of organizational resilience among pharmaceutical firms in Kenya by 21.4% as a result of a unit change. The relationship was negative and significant as indicated by T- value of -2.777 and p-value of 0.037 which is less than 0.05.

Sourcing disruption has a positive influence on collaboration of organizational resilience among pharmaceutical firms in Kenya. The coefficient of 0.696 indicates that any change in unit of the sourcing disruption will cause collaboration of organizational resilience among pharmaceutical firms in Kenya to decrease by 69.6%. The relationship was significant as specified by T- value of 4.016 and p-value of 0.000.

Manufacturing disruption, with a coefficient of -0.142 exhibited a negative influence on collaboration as a measure of organizational resilience indicating that it decreases collaboration among pharmaceutical firms in Kenya by 14.2% as a consequence of a unit change. The relationship was negatively significant as shown by T- value of -2.654 and p-value of 0.011. Furthermore, change in delivery disruption was confirmed to cause a decrease in collaboration as a measure of organizational resilience among pharmaceutical firms in Kenya as illustrated by the coefficient of -0.641. The connection was substantial as shown by T- value which was -4.045 and a p-value less than 0.05.

Finally, it was established that an increase in unit of returns disruption, while other factors held constant, will result to a positive change in collaboration among pharmaceutical firms in Kenya with a value of 0.200 (T=2.766, p = 0.043).

Table 4. 13 Model Summary on Collaboration

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.938 ^a	.690	.503	.62028

a. Predictors: (Constant), Returns, Sourcing, Planning, Delivery, Manufacturing

Source: Research Data (2022)

The outcomes pointed out that Covid-19 Induced Supply Chain Disruption had a combined substantial impact on collaboration of Organizational Resilience among pharmaceutical firms in Kenya as indicated by value R that is 0.938. The R squared of 0.690 illustrates that the independent variable accounts for 69.0% of the variance on collaboration as a measure of organizational resilience among pharmaceutical firms in Kenya. Other factors not included in the study affect collaboration as a measure of organizational resilience among pharmaceutical firms in Kenya by 31.0%.

Table 4. 14 ANOVA Table on Collaboration

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	108.061	5	21.612	5.549	.000 ^b
	Residual	19.779	137	1.041		
	Total	127.840	142			

a. Dependent Variable: Collaboration

b. Predictors: (Constant), Planning, Sourcing, Manufacturing, Delivery, Returns

Source: Research Data (2022)

The outcomes in the ANOVA indicate the significance in the complete model because the significance level of 0.000 was below the 5% level of significance which was too small. This was supported by the F calculated value which is bigger than the critical value of 2.21. This is quite good indication that Covid-19 supply chain disruption changes collaboration of organizational resilience among pharmaceutical firms in Kenya. It is therefore in line with the study done by Betti and Kristian (2021) which supports the relationship between supply chain and collaboration among within systems of firm.

4.5.4 Trustworthiness as Measure of Resilience

The relationship among sourcing, delivery, manufacturing, planning and returns against the dependent variable trustworthiness of supply chain disruptions in pharmaceutical firms in Kenya was established by performing multiple regression analysis.

Table 4. 15 Regression Coefficients on Trustworthiness

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	4.975	2.438		4.041	.000
	Planning	-.013	.291	-.010	2.044	.027
	Sourcing	-.329	.366	-.212	-2.899	.009
	Manufacturing	.014	.229	.015	2.060	.023
	Delivery	.124	.333	.087	2.374	.013
	Returns	-.126	.276	-.108	-2.457	.010

a. Dependent Variable: Trustworthiness

Source: Research Data (2022)

The regression modal that was derived from the findings is:

$$Y = 4.975 + 0.013X_1 - 0.329X_2 + 0.014X_3 + 0.124X_4 - 0.126X_5$$

Y – Organizational Resilience (Trustworthiness)

X₁ – Planning Disruption

X₂– Sourcing Disruption

X₃ – Manufacturing Disruption

X₄ – Delivery Disruption

X₅– Returns Disruption

From the outcome, planning disruption showed a positive impact on trustworthiness of organizational resilience among pharmaceutical firms in Kenya with a coefficient of 0.013. This means that it increases trustworthiness of organizational resilience among pharmaceutical firms in Kenya by 1.3% as a result of a unit change. The relationship was positive and significant as indicated by T- value of 2.044 and p-value of 0.027 which is less than 0.05. Sourcing disruption has a negative influence on trustworthiness of organizational resilience among pharmaceutical firms in Kenya. The coefficient of -0.329 indicates that any change in unit of the sourcing disruption will cause trustworthiness of organizational resilience among pharmaceutical firms in Kenya to decrease by 32.9%. The relationship was significant as indicated by T- value of -2.899.

Manufacturing disruption, with a coefficient of 0.014 exhibited a positive impact on trustworthiness of organizational resilience indicating that it cause rise in

trustworthiness of organizational resilience among pharmaceutical firms in Kenya by 1.4% as a consequence of a unit change. The association was significant as indicated by T- value of 2.060. Moreover, change in delivery disruption was confirmed to cause an increase in the trustworthiness of organizational resilience among pharmaceutical firms in Kenya as illustrated by the coefficient of 0.124. The connection was substantial as shown by T- value which was 2.374 and a p-value less than 0.05.

Finally, it was established that a decrease in unit of returns disruption, while other factors held constant, will result to a negative change in trustworthiness of organizational resilience among pharmaceutical firms in Kenya with a value of -0.126 (T=-2.457, p = 0.010).

Table 4. 16 Model Summary on Trustworthiness

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.628 ^a	.452	-.597	.68142

a. Predictors: (Constant), Planning, Sourcing, Manufacturing, Delivery, Returns

Source: Research Data (2022)

The outcomes (Table 4.16) indicated that Covid-19 Induced Supply Chain Disruption had a combined impact on trustworthiness as a measure of Organizational Resilience among pharmaceutical firms in Kenya as indicated by value R that is 0.628. The R squared of 0.452 illustrates that the independent variables accounts for 45.2% of the variance on trustworthiness among pharmaceutical firms in Kenya. Other factors not included in the study affect trustworthiness as a measure of organizational resilience among pharmaceutical firms in Kenya by 54.8%.

Table 4. 17 ANOVA Table on Trustworthiness

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	101.220	5	20.244	4.209	.001 ^b
	Residual	22.220	137	1.169		
	Total	123.440	142			

a. Dependent Variable: Trustworthiness

b. Predictors: (Constant), Planning, Sourcing, Manufacturing, Delivery, Returns

Source: Research Data (2022)

The outcomes in the ANOVA indicate the significance in the full model because the significance level of 0.001 was below the 5% level of significance which was too

small. This was supported by the F calculated value which is larger than the critical value of 2.21. This is quite good indication that Covid-19 supply chain disruption changes trustworthiness as a measure of organizational resilience among pharmaceutical firms in Kenya.

CHAPTER FIVE: DISCUSSIONS, SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter comprises discussions, summary of findings of the study, conclusions and recommendations. The discussions, summary, conclusions and recommendations have been made in accordance with the objectives, methodology, findings, and limitations of the study.

5.2 Discussion of Findings Based on Theory and Existing Literature

The findings of the study have relationship with theory. The study was premised on the prediction of Theory of Disruptive Innovation by Christensen (1997) which holds that organizations that continuously innovate to wade through disruption of business models are likely to be more resilient. It was also anchored on the argument of Dynamic Capabilities Theory by Teece, Pisano and Shuen (1997) which postulates that organizations that develop diverse strengths in form of resources, systems and processes are likely to remain resilient under disruptive conditions.

In addition, the study was also guided by the postulates of Contingency Theory which holds that the capability of a firm to survive and thrive depends on the strategies deployed to respond to the emerging environmental conditions (Halldorsson, Herbert & Tage, 2003). In regard to existing empirical literature, the findings were consistent with some previous studies, and inconsistent with others.

5.2.1 Discussion of Findings Based on Theory

Theory of Disruptive Innovation by Christensen (1997) holds that organizations that continuously innovate to wade through disruption of business models are likely to be more resilient, and would leverage environmentally induced disruptions to further build system resilience. However, the study found a negative correlation between Covid-19 induced supply chain disruption and resilience among pharmaceutical firms in Kenya. It may be argued that due to the unprecedented nature of the disruption, the resilience of supply chain systems of many organizations was overstretched, hence the negative correlation.

Dynamic Capabilities Theory by Teece, Pisano and Shuen (1997), on the other hand, postulates that organizations that develop diverse strengths in form of resources, systems and processes are likely to remain resilient under disruptive conditions.

However, the study established a negative correlation between Covid-19 induced supply chain disruption and organizational resilience among pharmaceutical firms in Kenya. This implies that however dynamic the capabilities would be, some disruptions may be too dire to withstand in the short-run. Contingency Theory holds that the capacity of a firm to endure and thrive rest on on the strategies deployed to respond to the emerging environmental conditions (Halldorsson, Herbert & Tage, 2003).

Despite the negative correlation between Covid-19 induced supply chain disruption and organizational resilience, there is evidence from the study that contingency plans are critical. This is supported by the high frequency of respondents who indicated having strong contingency plans; hence their survival and continued existence.

5.2.2 Discussion of Findings Based on Existing Literature

The findings of the research also have relationship with previous empirical studies. Whereas there are areas of convergence, there are those of divergence. International Trade Centre (2021) conducted a study on a conceptual study dubbed “COVID-19: The Great Lockdown and its Impact on Small Business”. The study established that “African exporters may lose more than \$2.4 billion in global industrial supply chain exports, due to factory shutdowns in China, the European Union (EU) and the United States.” The current study found a negative correlation between Covid-19 induced supply chain disruptions with resilience among manufacturing companies in Kenya. This evidence supports the earlier results by the International Trade Centre (2021).

A conceptual study by the World Economic Forum (2021) entitled “The Resiliency Compass: Navigating Global Value Chain Disruption in an Age of Uncertainty” determined that “although the COVID-19 pandemic accelerated innovation and strengthened cooperation to help stakeholders overcome unprecedented challenges, it was essential to step back and draw lessons learned, as they serve as a critical guidepost towards building long-term resilience.” The aim of the current research was to found a linkage amid Covid-19 supply chain disruption and resilience. It is, therefore, not possible to draw a comparison between the two findings due to different thrusts.

Das, Datta, Kumar, Yigit, Kazancoglu and Ram (2021) conducted a study entitled “Building supply chain resilience in the era of COVID-19: An AHP-DEMATEL approach”. The study incorporated multi-criteria decision approach using Analytic Hierarchy Process (AHP) and Decision-Making Trial and Evaluation Laboratory

(DEMATEL) to analyze factors that affected the supply chain networks with the onset of COVID-19. The study found that management was the least important factor in reducing vulnerabilities of the supply chain. The current study found a negative correlation between Covid-19 induced supply chain disruptions with resilience among manufacturing firms in Kenya. This evidence supports the earlier findings by Das *et al.* (2021).

A study by Deloitte (2021) investigated the various resilience strategies used by organizations in Kenya. Using qualitative approach and key informant interviews, the study established that organizations used five dimensions of resilience, namely: preparedness, collaboration, trustworthiness, adaptability, and responsibility. The current study, not only recognized the five dimensions of organizational resilience, but also found a negative correlation between Covid-19 induced supply chain disruptions and organizational resilience.

A study by the International Finance Corporation (2021) focused on overall state of the pharmaceutical industry in Kenya. Using desktop research and exploratory method, the study established that the pharmaceutical industry in Kenya had supply chains that are highly integrated with global supply chains. It also determined that all pharmaceutical companies in Kenya relied exclusively on technology transfer arrangement with their global partners. The current study adduced empirical evidence in support of the conceptual study findings by the International Finance Corporation (2021).

5.3 Summary of Findings

The outcomes of the research were displayed sub-sections that follow: Background Information; Descriptive Analysis; Correlation Analysis; and Statistical Inference. The findings are summarized below.

5.3.1 Background Information

Marginal majority of the respondents were Heads of Supply Chain. This may be attributed to the fact that they were the direct contact points in their organizations as far the study was concerned. They were, therefore, requested to mobilize the other respondents in their organizations. In this regard, their response rate would be expected to be higher than any other category of respondents. The majority of those surveyed had been employed by their companies for 7 to 10 years.

This demonstrates that their grasp of issues about the firm was elaborate, hence the likelihood of valid responses. The majority of those surveyed had been in the pharmaceutical industry for 7 to 10 years. This demonstrates that their grasp of industry issues was elaborate, hence the likelihood of valid responses. This demonstrates that the highest rate of those who were surveyed had first Degree, hence competent enough to participate in the study.

5.3.2 Descriptive Analysis

On planning disruption, the respondents tended to be neutral that their firms experienced physical disruption due to the Covid-19 disease. This is demonstrated by the composite score of 3.106, and standard deviation of 0.446. The respondents tended to agree that their firms experienced sourcing disruption as a result of the Covid-19 pandemic. This is demonstrated by the composite score of 4.653, and std dev of 0.524. The respondents also tended to be neutral that their firms experienced manufacturing disruption due to the Covid-19 disease. This is demonstrated by the composite score of 3.807, and std dev of 0.909. The respondents agreed that their firms experienced delivery disruption as revealed by the Composite average of 4.304 and std dev of 0.639. The respondents disagreed that their firms experienced returns disruption due to the Covid-19 disease, as shown by the composite mean score of 3.106, and standard deviation of 0.446.

The composite average and std dev for the state of preparedness was 4.060 and 0.702, respectively. This implies that, generally, the respondents agreed that their firms were prepared for disruptions, but with moderate concurrence of opinion among them. The composite average of 3.954 implies agreement with majority of the line items relating to adaptability, while the corresponding std dev of 1.168 implies divergence of opinion on most of the line items. The Composite average for Collaboration was 3.991 while the Composite std dev was 1.126. The Composite Mean, therefore, lies between 3=Neutral and 4=Agree, with very strong skewness towards the latter. This implies that the respondents tended to Agree with most of the line items. The large Composite Standard Deviation of 1.126 also demonstrates a wide dispersion of responses about the Composite Mean.

The Composite Mean for Trust was 3.663 with Composite Standard Deviation of 0.650. The Composite Mean, therefore, lies between 3=Neutral and 4=Agree. This implies that respondents were neutral on most of the line items under Trust

dimension. The relative small Composite Standard Deviation also demonstrates concurrence on most of the line items.

5.3.3 Correlation Analysis and Statistical Inference

Sourcing disruption had the greatest influence on preparedness as a measure of organizational resilience among pharmaceutical firms in Kenya, followed by delivery disruption then planning disruption, then manufacturing disruption while returns disruption had the minimum influence on the preparedness of organizational resilience among pharmaceutical firms in Kenya. Delivery disruption had the greatest influence on the adaptability of organizational resilience among pharmaceutical firms in Kenya, followed by sourcing disruption then manufacturing disruption, then returns disruption while planning disruption had the minimum influence on the adaptability of organizational resilience among pharmaceutical firms in Kenya. Sourcing disruption had the greatest influence on collaboration as a measure of organizational resilience among pharmaceutical firms in Kenya, followed by delivery disruption then planning disruption, then returns disruption while manufacturing disruption had the minimum influence on the collaboration of organizational resilience among pharmaceutical firms in Kenya. Sourcing disruption had the greatest influence on trustworthiness as a measure of organizational resilience among pharmaceutical firms in Kenya, followed by returns disruption then delivery disruption, then manufacturing disruption while planning disruption had the minimum influence on trustworthiness of among pharmaceutical firms in Kenya.

The null hypothesis which stated that “There no significant influence of Covid19 Disruptions on Organizational Resilience” was not accepted because all the p-values were lower than 0.05. The findings imply that the Covid-19 Induced Planning, sourcing, manufacturing, delivery, and returns Disruptions each had significant influence on Organizational Resilience of the Pharmaceutical firms in Kenya.

5.4 Conclusion

This subsection entails concluding remarks based on the objectives and hence findings of the study. Firstly, although previous studies have investigated similar phenomenon, there were still knowledge gaps. For instance, majority of such studies were conceptual in nature, with limited empirical investigations. The current study has, therefore, made contribution to knowledge, adducing empirical evidence in

support of the conceptual study findings. In this regard, the study concludes that there is a strong negative correlation amid Covid-19 induced supply chain disruption and resilience among pharmaceutical firms in Kenya.

5.5 Recommendations for policy and practice

The research found a strong negative correlation between Covid-19 supply chain disruptions and resilience among pharmaceutical firms in Kenya. The findings are consistent with theory, including Disruptive Innovation Theory, and Contingency Theory. The findings were, however, inconsistent with the postulates of Dynamic Capability Theory. This implies the need for further investigations to enhance theoretical precision.

The findings are also crucial for policy makers. In this regard, there is need for policies to enhance supply chain resilience among organizations, public and private. This implies that policy makers should make deliberate effort to undertake policy analysis with a view to identifying policy gaps that may require enhancement so that organizations are better prepared for similar disruptions.

Practitioners ought to anticipate disruptions and develop contingency strategies to counter the effects of potential supply chain disruptions in future. This may include strategies in Business Process Re-engineering (BPR), scenario analysis, risk management, among other strategies. Particularly for the pharmaceutical industry, there is need to re-evaluate the traditional supply chain models, to assess their sustainability.

5.6 Limitations of the study

The aim of the study was; to establish the extent to which COVID 19 induced supply chain disruption occurred among pharmaceutical firms in Kenya and the impact on organizational resilience. The pharmaceutical industry is largely dominated by Indians which operates under strict rules hence most of the respondents were unwilling to give out data. The study was based on pharmaceutical firms in Kenya, this was a narrow focus for a study of this base in terms of scope based on the fact that the study was solely based on pharmaceutical firms in Kenya and no other sectors.

5.7 Suggestions for Further Research

The current research has made meaningful contribution to knowledge. However, there are opportunities for further research due to the prevailing knowledge gaps. Although the current study established a strong negative correlation between Covid-19 induced supply chain disruptions and resilience among pharmaceutical firms in Kenya, there is need to conduct similar studies in other cities outside Kenya due to disparities in operating and business environment that may confound the findings.

Moreover, most studies on the Covid-19 subject are conceptual in approach hence the need for more empirical investigations to adduce further evidence. Moreover, there is need to conduct similar studies in service sectors due to inherent differences that may render the findings of the current study inapplicable.

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APPENDICES

Appendix I: Questionnaire

Please complete the questionnaire to gather information on COVID-19-related supply chain disruptions and pharmaceutical company resiliency in Kenya. Any knowledge you provide will be kept in strict confidence and used solely for academic purposes; your identification will not be divulged.

PART A: BACKGROUND INFORMATION

1. Show the job occupation that you hold in the company_____
2. Please mark the period you have operated in the firm (period in years)
Under 3 []
4-6 []
7-10 []
10 years and above []
3. How many years have you worked in the industry (of your current employer)?
Below 3 []
4-6 []
7-10 []
10 and above []
4. Kindly mark the highest level of education you have achieved?
Bachelor []
Masters []
PhD []
Other kindly specify _____
5. How long has your company been in this industry?
Below 3 years []
4-6 years []
7-10 years []
More than 10 years []
6. How many employees does your organization have?
Below 50 []
50-100 Employees []
100-200 Employees []
More than 200 Employees []

PART B: COVID-19 INDUCED SUPPLY CHAIN DISRUPTIONS

Kindly mark the degree of agreement or disagreement with the following statements regarding *COVID-19 Induced Supply Chain Disruptions* in your firm:

1=Very little degree; 2=low degree; 3=moderate; 4=large degree; 5 = very high degree

No	Dimensions of Supply Chain Disruptions					
SCPD	Planning Disruption	1	2	3	4	5
5	Our procurement plan became irrelevant					
6	Our procurement plan had to change immediately					
7	Our conventional demand forecasting models became irrelevant					
8	Our conventional pricing models became irrelevant					
SCSD	Sourcing Disruption	1	2	3	4	5
9	We experienced delays in inbound logistics					
10	We experienced more returns outwards due to quality issues					
11	We could access the right quantities of materials					
12	We experienced communication breakdown with our key suppliers					
SCMD	Manufacturing Disruption	1	2	3	4	5
13	We experienced more machine down times					
14	Our machine capacity utilization decreased					
15	Our quality control mechanisms were disrupted					
16	Our packaging methods had to change to comply with new protocols					
SCDD	Delivery Disruption	1	2	3	4	5
17	We were unable to deliver confirmed orders as scheduled					
18	Our clients canceled some orders					
19	Our medical representatives were unable to travel					
20	Outbound logistics were unable to reach customers as scheduled					
21	We recorded sudden drop in sales volumes					

22	Some Orders were canceled due to logistical constraints					
SCRD	Returns Disruption	1	2	3	4	5
23	Due to disrupted monitoring, we experienced more returns inwards					
24	Returns from customers could not reach us on time					
25	We could not respond fast to customer queries on defects					
26	We could not follow our conventional policy on handing of returns inwards					

PART C: ORGANIZATIONAL RESILIENCE

Please mark the degree to which you agree or disagree with the following statements regarding *Organizational Resilience* in your firm:

1=Very little degree; 2=low degree; 3=moderate; 4=large degree; 5 = very high degree

No.	Dimension of Organizational Resilience	Measurement Scale				
ORP	Preparedness	1	2	3	4	5
28	We always anticipated potential disruption					
29	We had business recovery plan in place					
30	We are always agile					
31	We were had a disruption risk mitigation strategy in place					
ORA	Adaptability	1	2	3	4	5
32	Our systems are adaptable					
33	We were able to quickly reorganize our systems					
34	Our systems are flexible					
35	We embrace and always change when required to do so					
ORC	Collaboration	1	2	3	4	5
36	We are open to strategic collaboration					
37	We have existing collaborations with partners					
38	Our collaborators add value to us					
39	We manage our collaborations well					

ORT	Trustworthiness	1	2	3	4	5
40	We are trusted by our key stakeholders					
41	We are always truthful					
42	We set reasonable and realistic targets					
43	We trust our customers					

THANKYOU

Appendix II: Pharmaceutical Firms in Kenya

1. Apple Pharmaceuticals Ltd
2. Armicon
3. Astra Zeneca
4. Bayer East Africa
5. Benmed
6. Beta Healthcare
7. Biodeal laboratories
8. Biopharm
9. C.Mehta & Company
10. Cadilla Healthcare
11. Cipla Medpro
12. Comet Healthcare
13. Concepts (Africa) Ltd
14. Cosmos Ltd Cosmos Limited
15. Dafra
16. Dawa Company
17. Diddy Pharmaceuticals
18. Ely Lilly
19. Elys Chemicals
20. Gesto Pharmaceuticals
21. Glaxo Smithkline
22. Indoco Remedies
23. Johnson & Johnson
24. Kam Industries
25. Lab & Allied
26. Laborex Kenya Ltd
27. Lords Healthcare
28. MACs Pharmaceuticals
29. Medina Chemicals
30. Medisel
31. Merck Consumer Health & Life Science
32. Merck Schering Plough
33. Nairobi Enterprises
34. Norbrook Kenya Limited
35. Novartis Pharmaceuticals
36. Novelty Manufacturing
37. Pfizer Laboratories
38. Pharmaceutical Manufacturing Ltd – PMC
39. Phillips Pharmaceuticals
40. Regal Pharmaceuticals
41. Sanofi
42. Servier
43. Simba Pharmaceuticals
44. Sphinx Pharmaceuticals Ltd
45. Square Pharmaceuticals
46. Statim
47. Surgilinks Pharmaceuticals
48. SynerMed Pharmaceuticals
49. Unisel
50. Universal Corporation Ltd

Source: Pharmacy and Poisons Board – Manufacturer Registration Renewal List (2020)