

Analysis of COVID-19 Supply Chain Disruption on Supply Chain Performance

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Abstract

This research as a case to analyse the effects of the Covid-19 supply chain interruption on supply chain performance. The study's goals were to assess how much the Covid-19 supply chain interruptions impacted Kantanka Automobile firm's supply chain performance and to identify the firm's steps to lessen the disruptions' impact. A descriptive and analytical sample survey was employed for the study, and the researchers purposefully chose 2-line managers (heads of departments) to participate. In addition, a closed-ended interview was employed as the research tool for the study.

According to research findings in the literature, the Covid-19 Pandemic caused supply chain disruptions, including demand, supply, process, and environmental disturbances. In order to lessen the impact of the COVID-19 supply chain interruptions, supply chains also developed tactics such as protecting inventory from damage, local sourcing, staff training, coordination with other supply chain members, agile manufacturing, and improved incoming material visibility. The study's findings also indicate that the Covid-19 supply chain disruption has had a detrimental impact on Kantanka Automobile's supply chain performance via revenue losses from operations suspension, company closures, delays, and customer losses. The study's implications for business practice were that supply chain participants might use various mitigation techniques to maintain high-performance standards even when the world experiences Covid-19.

Keywords: COVID-19 Supply Chain | Supply Chain Disruption | Supply Chain Performance

1.0 INTRODUCTION

The chapter provides an overview of the study's history, problem statement, aims, research questions, and hypotheses as well as its importance, range, restrictions, and organisational structure.

1.1 Study's Background

Due to numerous illness outbreaks that have happened all across the globe, commercial organisations have experienced significant interruptions throughout time. The intensity of the outbreaks in issue determines the scope of the disruptions these organisations must endure. The Covid-19 pandemic, in contrast to other outbreaks, affected every node of the supply chain simultaneously (Gunessee and Subramanian, 2020; Paul and Chowdhury, 2020), significantly disrupting the supply chain's flow. While this is going on, supply, transportation, and production all confront difficulties that limit their potential. Along with ongoing economic and financial difficulties (Dontoh et al., 2020), they include border closures, lockdowns, delays in vehicle movements, and interruptions in global supply chains. As a result, the pandemic is likely to have a significant impact on these networks.

Officially known as Covid-19, the new infectious virus has human-to-human transmission. The name refers to both the years in which it was found and the coronavirus classification. The infection is brought on by SARS-COV2, or the severe acute respiratory syndrome coronavirus. The Covid-19 virus, according to Addi et al. (2020), is a kind of zoonotic infection that may spread via both people and animals. Fever, shortness of breath, and a dry cough are symptoms. The World Health Organisation (WHO) designated it a worldwide pandemic in March 2020 as a result of the illnesses' quick spread to several nations (Anaba et al., 2021). According to reports, this unique virus first appeared in Wuhan, China, in December 2019 and afterwards spread to other countries. According to the WHO, as of August 2021, there has been a total of 4,378,951 deaths from the pandemic in 220 countries and territories, including the UK, USA, Italy, France, Canada, Brazil, Germany, India, Spain, and Russia, among other nations.

The majority of African nations, including Ghana, continue to report COVID-19 instances (Munthali et al., 2020), however there has been a sharp decline in both the number of cases and hospitalisations.

The COVID-19 epidemic has also resulted in the forced closure of several enterprises, which has severely disrupted supply chain business operations.

According to Revilla and Saenz (2017), supply chain disruption happens when there is an unanticipated halt in the transportation of commodities, components, parts, raw materials, and work-in-progress items. Natural disasters (Gunessee et al., 2017), supplier delivery failure (BCI, 2018), riots and protests (Pereira et al. Silva, 2014), the loss or withdrawal of financial capital (Hendricks and Singhal, 2003), problems with plants (Marley et al., 2014), and epidemics and diseases (Natarajarathinam et al., 2009) are just a few of the events that can disrupt a supply chain. The productivity and performance of the whole supply chain are greatly impacted by supply interruption (Marley et al., 2014). This is especially concerning in light of the significant disruption that the Covid-19 worldwide epidemic has caused for producers, distributors, retailers, and consumers over the last three months. Managers all across the globe are searching for what they perceive and ways to minimise harm to production schedules in the face of disturbance when it's time to go (Kumar et al., 2020).

The manufacturing sector continues to be one of the key contributors to Ghana's GDP, with a growth rate of 24.3% of GDP in 2016. The manufacturing sub-sector saw a lower growth rate of 5.0% in the first quarter of 2020 compared to 5.6% in the same period of 2019, according to the GSS (2020). According to the research, more than half of businesses (51.4 percent) report having trouble finding inputs. Accommodation and food (58.9%) and wholesale and retail (53.7%) were the most impacted industries. It was determined that the enterprises experiencing problems obtaining inputs were mostly affected by their unavailability and high cost. In order to understand how the Covid-19 pandemic's effects on the performance of the whole supply chain, it is necessary to critically analyse the role that logistics and supply chain organisations continue to play in the growth of the Ghanaian economy.

This is what motivated the present research to look out how the covid-19 supply problems affected Ghana's supply chain performance.

1.2 Problem Description

A vibrant economy with the proper sort of active and healthy labour force, materials, and required resources is necessary for the successful functioning of supply chains. Manufacturing, vendors, distribution, shipping, warehousing, and retail businesses have all made significant contributions to the socioeconomic progress, employment, and GDP increases of the nation throughout time. Ayittey et al., 2020; Enu et al., 2013; UNCTAD, 2020) all point out that the COVID-19 pandemic has become a significant threat to the Ghanaian economy, particularly for manufacturing companies and significant disruptions within their supply chains. According to a PwC research from 2021, when the COVID-19 pandemic eases, supply chain interruptions caused many organisations across the supply chain to experience ongoing downward somesthesia on demand, creation, and revenues. Numerous people are also struggling to manage their financial commitments and their cash flow. Therefore, depending on how forceful and successful any possible government involvement and concord may be, and how long the COVID-19 crisis lasts, industries may suffer minor challenges in attempting to recover and equally adjudge bankruptcy. The majority of supply chain companies can be overcome, particularly when the majority of their employees is working in onsite positions that cannot be completed remotely. A few of the negative repercussions of the COVID-19 Pandemic on Ghana's supply chains include uncertainty, production reductions, employee layoffs, wage cutbacks, increased raw material costs, and more, particularly on the country's suffering food processing sector (UNDP, 2021).

All worldwide activity across all economic sectors and industries have been interrupted by COVID-19. The lockdown measures that nations throughout the world devised and put into effect as a health policy to lessen the effects of the pandemic's spread on the human population are mostly to blame for the disruptions. Fallout from the COVID-19 lockdown measures includes production halts, limitations on persons and products moving across borders, border closures, logistical challenges, as well as a slowdown in trade and economic activity. The World Health Organisation (WHO) headquarters in China initially received word of the COVID-19 pandemic, which started in Wuhan, China, on December 31, 2019. There were about 22.1 million recorded cases as of August 17, 2020. Its growth in China, one of the world's main centres for production and distribution, has an impact on the flow of completed and semi-finished goods to Ghana and other nations that rely on China for trade (PwC 2020). Few studies have been done

so far, particularly in the context of supply chain disruptions brought on by the covid-19 epidemic, since the pandemic shocked Ghanaian businesses and their supply chain partners. In light of this, the researchers looked at how the COVID-19 supply chain disruptions affected Ghana's supply chain performance in an effort to inform industry players about the best and most innovative strategies to use in order to stay in business and compete on a global scale.

According to a poll conducted by PwC in 2021, supply chain disruptions prompted many organisations to have a persistent negative impact on demand, output, and revenues as the COVID-19 pandemic is still active. Additionally, a lot of people struggle to manage their debt commitments and cash flow liquidity. Accordingly, depending on how strong and successful any potential government involvement and assistance may be, and how long the COVID-19 problem lasts, industries may struggle to recover and perhaps file for bankruptcy. The majority of businesses in the supply chain are susceptible, particularly because most of their employees perform in-person professions that cannot be completed remotely. A few of the negative repercussions of the COVID-19 Pandemic on Ghana's supply chains include uncertainty, production reductions, employee layoffs, wage cutbacks, increased raw material costs, and more, particularly on the country's suffering food processing sector (UNDP, 2021).

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1.3 Objectives of the study

The main objective of the study is to examine the impact of COVID-19 Supply chain disruptions on the Supply chain performance in Ghana. From this main objective the following specific objectives are derived to;

- i. To examine the extent to which Covid-19 supply chain disruptions has affected the supply chain performance of kantanka automobile company.
- ii. To determine measures adopted by kantanka automobile company to mitigate Covid-19 supply chain disruptions.

1.4 Importance of the research

The research is important in a variety of ways. The COVID-19 pandemic has significantly interrupted supply chain operations, particularly after some countries, notably the Government of Ghana, implemented different steps to stop the spread, such as lockdowns, border closures, and other measures. Since that time, very little study has been done on how the pandemic's impact on the supply chain negatively impacted the performance of different companies in Ghana. As a result, the study will provide academics and researchers access to extensive material for further research on the Covid-19 Supply Chain Disruptions and its effects on the performance of businesses and industries across the board in the Ghanaian economy. It will contribute to our understanding of how supply chain disruptions influence corporate operations both favourably and unfavourably.

Once again, the research will aid in reorienting supply chain participants so they may obtain a better grasp of the pertinent concerns included in the study and devise more inventive and imaginative methods to conduct their operations even in the middle of the present epidemic and beyond. This is so that management, staff, and practitioners may learn and be able to continue doing business under such situations. This is because some of the new operational tactics employed by certain organisations appear to yield some considerable output.

Finally, the study will help government organisations, regulatory bodies, and policy makers create the best laws and policies to safeguard local businesses and their supply chain partners during a pandemic of this kind, allowing them to remain resilient and continue to make their fair share of contributions to the country's development.

1.5 Study's Purview

The research focused on Covid-19-related supply chain disruption and how it has impacted end users as well as manufacturing, services, distribution, and retail companies' supply chain performance. Although many topics were covered, the Covid-19 supply chain disruptions brought on by government-imposed regulations were the main focus of this research. It also looked at how these changes affected company operations and had an influence on how well Ghanaian companies performed in their supply chains as a result. It also examined how Supply Chain disruptions would develop in the post-Covid-19 world. The study's geographic emphasis will mostly be on the Kantanka Automobile Company Limited.

The exploration was restricted to the centre area since I was unable to go to other districts or regions to contact other firms for information. Additionally, I encountered obstacles online since I was preoccupied with other exploration-related findings.

2.0 LITERATURE REVIEW

A overview of the works in accordance with the study's goals is included in the section on the literature. The review was organised into themes and sub-themes. The review of ideas that covered the explanation of the research variables and their discussion of empirical measurement is touched on. A review of the body of existing literature was done along with an examination of the theories supporting the research. The study looks at how the Covid-19 supply chain disruptions affected the performance of the supply chain using a case study of the Kantanka automobile company. To do this, various academic papers on supply chain disruptions and their effects on performance were reviewed, with a focus on the Covid-19 related supply chain disruptions.

2.1 Review of Conceptual Data

The paper discusses the terms and terminologies of Covid-19 supply chain interruptions and how they affect supply networks' effectiveness.

2.1.1 Supply Chain Disruptions Due to Covid-19

At both a global and local level, the new coronavirus (COVID-19) pandemic has severely affected supply chains (SCs). The virus, which first surfaced in Wuhan, China, in late 2019, has had an effect on people's economic and social lives in practically every nation on the earth. By the end of March 2021, there were more over 128 million instances, up from over 80 million at the end of December 2020 (Worldometer, 2021). A second and third COVID-19 wave with much more instances than the first has also occurred in numerous countries. Additionally, the Covid-19 virus has lately developed a new delta version that has spread to other nations. The entire supply chain has slowed down dramatically, particularly in shipping activity, and the economy of the majority of nations have undergone considerable reductions. Many nations have seen a significant decline in industrial operations as well as the closure of stores and food chain locations. For instance, due to the government lockdowns in Malaysia, South Korea, and Europe, as well as a lack of components and supplies from their sub-suppliers, Apple's assembler, Foxconn, is operating below capacity (Ivanov & Das, 2020).

Although COVID-19 had a significant detrimental effect on the world economy, it also gave birth to and underlined the significance of digitalization. Oldekop et al. (2020) highlighted that the pandemic has greatly aided in slowing the spread of COVID-19 and has tremendously expedited digitalization across several industries. They also emphasised how digital logistics planning and online work had lessened the negative effects of COVID-19. However, the volume of information exchanged by businesses and governments on numerous digital platforms raises concerns about possible invasions of privacy or even political spying. Global economic activity has significantly slowed down as a consequence of the epidemic. According to a study by the International Monetary Fund (2020), the COVID-19 pandemic had a more detrimental effect on economic activity in the first half of 2020 than was first predicted. There is no

indication by early 2021 that the COVID-19 will dissipate anytime soon, and as a result, the negative effects on the world economy will continue to be seen for a sizable period of time. Despite the many measures put in place by various nations to combat the pandemic, which have had an impact on companies and economic activity, the world economy is predicted to decrease by 5.4% in 2021 (from 4.9% in 2020).

Never before have supply chains been under such intense strain, as a result of the restrictions placed on the free flow of commodities as a result of the lockdown measures put in place by governments all over the globe. Lockdowns in particular force businesses to halt the transfer of raw materials, which presents a significant issue for the suppliers and their logistics divisions. Prices have increased as a result of the decreased supply and a strong, unaffected demand. Second, Covid-19 has halted manufacture, and several items are no longer in high demand. Because of the lockdowns, sales in the food business have decreased by 80 to 100% in particular (Magzter, 2020). Additionally, the flow of cash to merchants has slowed. This indicates that, with the exception of providers of necessities goods, cash rotation will continue to slow down. The tourist, retail, and hospitality industries have all suffered as a result of this scarcity, which has also had a negative impact on product manufacture and distribution (Magzter, 2020).

According to Correia et al. (2020), the main factors influencing a country's supply capacity are anticipated to be a reduced labour supply brought on by self-isolation policies, movement limitations, sickness, and higher mortality. According to a recent research, the management of global value chains has been severely disrupted as a result of the COVID-19 (Ivanov, 2020). Additionally, several big economies that are experiencing a scarcity have increased export restrictions, which has resulted in a rise in price. Last but not least, McKibbin and Fernando (2020) highlighted a decline in overall consumer demand as well as an even bigger distortion in consumption patterns and market anomalies as a consequence of consumer panic purchasing owing to a shift in consumer preferences for certain commodities.

2.1.2 Pandemic History and Economic Effects

The Greek word "pandemos," which meaning "everyone," is where the term "pandemic" originates. A pandemic is a situation when it is thought that everyone on Earth will likely be exposed to an illness and that some of them could perhaps get ill (Ryan, 2020). In various periods of human history, pandemics have occurred (Ferguson et al., 2020). Although there have been many outbreaks and human tragedies, the frequency of pandemics has significantly increased starting in the year 2000 and continuing to the present. This is especially true given the rise in viral animal illnesses (Madhav et al., 2017). Many researchers, including Garret (2007), Keoghbrown et al. (2008), and most recently Madhav et al. (2017) and Fan et al. (2018), contend that a large-scale worldwide pandemic was unavoidable due to the disease's recurrent nature. In the last 1,800 years, there have been more than 20 worldwide pandemics, according to Feyisa (2020). The biggest pandemics that have occurred throughout history are listed in Table 2.1 below.

Table 2.1: Historical Timeline of Major Pandemics

Name	Time Period	Type/ host	Estimated Death
Antonine Plague	165-180	Smallpox/measles	5million
Plague of Justinian	541-542	Variola major virus	1million
Japanese smallpox epidemic	735-737	Yersinia pestis bacterial/rats	30 to 50 million
Black Death	1347-1351	Yersinia pestis	200million
New world smallpox	1520-onwards	Variola major virus	56million
Great Plague of London	1665	Yersinia pestis	100,000
Italian Plague	1629-1631	Yersinia pestis	1million
Cholera Pandemic 1-6	1817-1923	V. cholera bacteria	1million+
Third Plague	1885	Yersinia pestis bacterial/rats	12million (China and India)
Yellow Fever	Late 1800	Virus/mosquitoes	100,000 – 150,000 (US)
Russian flu	1889-1890	H2N2	1million
Spanish Flu	1918-1919	H1N1 Virus/pigs	40-50 million

Asian flu	1957-1958	H2N2 Virus	1.1 million
Hong Kong flu	1986-1970	H3N2 virus	1million
HIV/AIDS	1981 – present	Virus/chimpanzee	25 to 35 million
Swine Flu	2009-2010	H1N1 Virus/pigs	200,000
SARS	2002-2003	Coronavirus/bats/civets	770
Ebola	2014-2016	Ebolavirus/wild animals	11,000
MERS	2015 – present	Coronavirus/bat	850
COVID-19 Pandemic	2020 – present	Coronavirus	Over 4.6 million

Source: World Economic Forum (2020).

At least temporarily, pandemics are predicted to have a significant negative effect on economic activity, particularly in the industrial sector. Numerous studies have attempted to predict the financial damage that a pandemic might cause. For instance, Jonung and Roeger (2006) predicted that the European Union (EU) would see a 1.6 percent decline in GDP as a result of demand and supply dynamics in the event of a fictitious worldwide pandemic. Other research use a historical comparison to analyse the effect. For instance, how might the 1918 Spanish Influenza pandemic's fatality figures change today?Barro et al. (2020) predict that the COVID-19 pandemic will result in around 150 million fatalities globally (compared to the world's population of 7.5 billion in 2020), based on the 2.1 percent fatality rate during the Spanish Influenza pandemic in 1918-1920. The authors also found that, on average, a mortality rate of 2.1 percent results in a 6 percent reduction in GDP and an 8 percent decline in private spending, both of which have a significant negative impact on supply chains.

2.1.3 Supply Chain Disruptions Explained

According to Craighead et al. (2007), supply chain disruptions are unplanned and unforeseen occurrences that interrupt the regular flow of products and materials in a supply chain and expose businesses to operational and financial risks. One supply chain interruption is likely to have an impact on both the upstream and downstream portions of the supply chain. According to Kaur and Singh (2019; Albertzeth et al., 2020), a disruption is defined as an unexpected incident that significantly influences society, prevents regular functioning, and results in losses to lives, economy, and the environment. Natural catastrophes including hurricanes, earthquakes, volcanic eruptions, floods, and landslides have an impact on global supply chains. According to the Centre for Research on the Epidemiology of Disasters (CRED, 2019), there were over 11,000 fatalities and 95 million people impacted by over 400 natural disasters in 2019.

Asia, the centre of world manufacturing, was most hit, accounting for 40% of catastrophes worldwide. Supply chain disruptions are seen as significant breaks in the operations that connect the manufacturing process to the end consumer. Reddy et al.'s (2016) definition of disruption—which may happen at any point in the flow of production—as any substantial breakdown in a Supply Chain node between the activities of production and consumption—supports this point of view. In a similar vein, Araz et al. (2020) claimed that disruptions caused by the coronavirus had caused a significant worldwide problem by causing the breakup of several global supply chains.

2.1.4 Covid-19's effect on Ghanaian supply chains

Bullwhip effect has exacerbated the pandemic's early effects of panic purchasing and overstocking, which have had major consequences for supply chains as a whole (Wang and Disney, 2016). The bullwhip effect is the demand distortion that moves upstream in the supply chain from the retailer through to the wholesaler and manufacturer as a result of the variation of orders, which may be bigger than that of sales, according to the Chartered Institute of Procurement and Supply (CIPS). Thus, forecasting is essential for resource management, the backing of strong, evidence-based management choices, and for guiding difficult but crucial decisions like lockdowns, social isolation, etc. There are numerous less obvious effects of the pandemic, including as manufacturing stoppages and shortages of raw materials, sub-assemblies, and final items, but shortages of critical supplies are also one evident effect on consumers. Global supply shortages were caused by quarantines, lockdowns, and limits on people's and resources' movement. Import restrictions on both raw materials and finished goods caused

supply chains in Ghana to break down. In order to address this, there has been a temporary shift in emphasis towards supporting local manufacture, particularly for pharmaceutical items, and regional sourcing (Steele et al., 2020).

Additionally, the limitations put in place by every nation, including Ghana, to stop the new coronavirus from spreading have had a detrimental effect on the movement of commodities, people, and information. The pandemic will permanently alter how supply chains in Ghana and elsewhere utilise transportation networks at various levels (Ivanov, 2020). Additionally, Covid-19 has had a detrimental influence on travel patterns, amount of transport, and freight capacity (de Vos and Loske, 2020). Covid-19 has caused significant supply chain disruptions that have significantly influenced inventory management, making it challenging for supply chain managers to maintain adequate quantities of inventory and prevent stock-outs. Increased panic purchasing and other supply chain bottlenecks during the early stages of the epidemic made this problem worse. Businesses in Ghana are finding it difficult to maintain the best ordering practises because to gaps in inventory control and inventory management brought on by the epidemic. Companies are making changes to their supply chains to assist with this by carefully balancing interdependent aspects such localization, complexity reduction, dual sourcing, and investing in modern manufacturing technology (Garvey and Carnovale, 2020).

Additionally, the epidemic has presented difficulties for distributors, since there has been a substantial fall in demand due to the industry being severely affected by physical isolation and government-recommended isolation standards. On the other hand, demand for various goods and services, such as home entertainment, sanitizers, toilet paper, canned goods, delivery applications, and medical supplies, has increased dramatically (Abdelnour et al., 2020). Due to the rising demand, this has raised the risk of staff contracting the virus. Companies have invested in online skills and digital-sales training as a result of the pandemic's forced conversion of distribution enterprises to e-commerce (Guan et al., 2020).

Finally, the Covid-19 supply chain problems have resulted in an information glut, making it difficult to preserve data quality and authenticity. Evidence-based decision-making has grown dramatically in importance for all supply-chain businesses, not only the healthcare industry. An emerging trend is the scaling up of global lessons learnt via open data sharing and the promotion of an information sharing culture (Ma, 2020).

2.1.5 Issues Businesses Ran into During the Pandemic's Peak

Key participants in Ghana's industrial sectors have had to deal with a variety of supply chain difficulties during the last year that have an influence on cost, time, and impose risks on every aspect of their enterprises. According to a research by the United Nations Development Programme (UNDP) and the Ghana Statistical Service Business Tracker, the shock brought on by the COVID-19 Pandemic has a significant effect on businesses in Ghana. According to the research, during the partial lockdown, 35% of commercial establishments, including manufacturing, had to shut, and 16.1% of those businesses remained closed after the lockdown was lifted. Businesses in the hotel and food processing industries were the most negatively impacted (24% had to close).

In the employment sector, 46.2% of businesses cut pay for around 25.7% of their workforce (or 770,124 people, on average). 4% of businesses lay off 41,952 people total. The results show that firms in Ghana are impacted by several factors, including supply shocks, demand shocks, financial shocks, and ongoing uncertainty, and they may anticipate ongoing effects in the future. Policies that aid businesses in coping with financial shocks, such as raising public knowledge of existing programmes, might be anticipated to be advantageous in the near term. Longer term, it is anticipated that policies that boost consumer and company confidence, aid in the restoration of broken supply routes, and support companies in adapting to the new reality by using digital technologies would aid in the recovery of enterprises from the shock (UNDP, 2021; GSS, 2021). A large negative supply shock (such as the COVID-19 shock) may result in a deficit in aggregate demand that surpasses the impacts of the original supply shock, according to a model given by Guerrier et al. in 2020. While health shocks have large supply-side impacts on economic and commercial activity, Abo-Zaid and Sheng (2020) provide a dynamic general equilibrium model incorporating a health shock.

2.1.6 Steps to Reduce Supply Chain Breakdowns

Global supply chains play a significant role in promoting sustainable production and consumption worldwide. As a consequence, a disruption in one nation might have an impact on the manufacturing sectors of other nations throughout the global supply chains. To maintain resilience during and after disruptions (whether caused by pandemics, man-made events, or natural catastrophes), supply chains from all over the world must work together. Following are a few mitigating strategies to lessen the effects of supply chain disruptions:

Supply Chain Digitization

According to Beatriz et al. (2020), COVID-19 has drastically disrupted formerly seamless supply chain activities, which has reduced their ability to satisfy demand. Handfield et al. (2020) claim that COVID-19 and other supply chain disruptions have produced new barriers that will change how future supply chain flows are designed. Players in the supply chain have been pushed to consider the optimal designs for Supply Chain architecture and operations as a result of the COVID-19 pandemic. Many have advised that supply chain participants acquire resources locally to decrease supply chain pathways since the worldwide transportation of commodities has been severely affected. Of course, each Supply Chain would need a different optimum solution.

Sarkis et al. (2020) used a wider viewpoint and proposed that new technologies, such as smart manufacturing, might solve a number of Supply Chains issues. participants will be able to make the best judgements in both typical and disruptive circumstances with the use of information technology that can connect participants in the supply chains and provide real-time updates on what is happening there.

Localising the Supply Chain

Offshoring and global sourcing have gained attention in recent years as businesses have shifted a significant portion of their manufacturing operations from industrialised to developing nations like Ghana. Offshoring is mostly done to reduce costs (Gurtu et al., 2019; Gyarmathy et al., 2020), but it has also led to issues with how quickly and nimbly businesses can react to customer demand. Gurtu et al. (2019) made the argument that cost reductions shouldn't be the only factor considered when deciding whether to outsource jobs. Numerous businesses have reviewed their supply chain arrangements as a result of the protracted interruption brought on by COVID-19. Local businesses that may eventually turn into long-term suppliers must be seriously developed and nurtured if imports are to be replaced by local sources of supply. Since transportation distances are shorter and the Supply Chain will be less susceptible to global shocks, localization provides improved resilience (Nandi et al., 2021). In order to create robust local supply networks, a few additional writers (Sarkis et al., 2020; Zhu et al., 2020) have also backed the localization of manufacturing. Van Hoek (2020) recommended that supply chains strike a balance between international and domestic sourcing and take flexibility into account as a key factor in supply chain design.

Enhancing JIT, agility, and efficiency

At the core of the efficiency spirit are the ideas of lean manufacturing and just-in-time (JIT) production. These two ideas are more ideologies than techniques or instruments. JIT, quality systems, continuous improvements, and cooperation are just a few of the principles that are integrated into lean manufacturing, which attempts to create products or services with less resources (Shah and Ward, 2003). JIT's first goal is to significantly lower the inventory level (Matsui, 2007). The JIT mindset is founded on the knowledge that inventory arises from a variety of problems, including subpar quality, poor maintenance, erratic and protracted lead times, protracted setup periods, and erratic demand. If a business can significantly enhance all these factors, JIT works effectively. One of the key JIT practises for reducing supply lead times and enhancing dependability has been localising the supply chain. Depending on how volatile or stable the business environment is, a supply chain should be constructed to facilitate rapid and simple transitions from agile to efficient techniques. The fundamental concept is actively employing resilience assets to produce value rather than only as a safety net against unusual interruptions.

2.1.7 Performance of the Supply Chain

Supply chain performance assessment is a vital problem to ensure an effective supply chain management process in a competitive company environment, according to a study by Balfaqih, et al., and others (2018). Since supply chain performance metrics let a lot of information inside, they may improve how well a business integrates with its supply chain partners. However, supply chain performance demonstrates and makes provision for systems to meet end-customer needs, product availability and capacity, on-time delivery, and all required inventory and capacity in the supply chain to achieve that performance in a quick-response manner. Basic materials, components, subassemblies, completed goods, and distribution via different channels to the end consumer are included in evaluating and measuring supply chain performance at various phases of the business. Additionally, the success of a supply chain organisation relies on each supply chain partner's capacity to concentrate on end users and adapt to changes in their needs. Since the ability of the supply chain as a whole to respond to shifting customer demands, to restructure the supply chain in response to shifting markets and economic environments, and to align production, marketing, and financial strategies throughout the supply chain are all necessary for each organisation that makes up the supply chain to be successful (Demetew et al., 2018),

According to Jayne et al. (2010), supply chain performance measures how well an organisation accomplishes a set of predetermined goals that are consistent with its purpose. Customer value, team performance, supply chain management, and strategic focus are among the most prevalent performance drivers, and they may all be attained via effective planning, appraisal, execution, and control. While non-financial performance indicators include corporate social responsibility, innovation, and responsiveness, financial performance measurements for the supply chain include return on equity, profit, return on assets, and market share. Gathungu and Mwangi's (2012) study makes it abundantly evident that a company's skills may be effective in identifying and evaluating possibilities within its environment via the investigation of technology, market research, and customer feedback.

The COVID-19 Global pandemic has significantly impacted supply chain efficiency and consumer happiness. The degree to which the strategic, economic, production, and other technology advantages of seamless operations free from pandemics or other global health crises may be achieved can be used to gauge supply chain performance. The COVID-19 pandemic is without a doubt a serious danger to the Ghanaian economy, particularly the industrial and foreign commerce sectors (Ayttey et al., 2020; Enu et al., 2013; UNCTAD, 2020). Supply Chain operations have really been interrupted, forcing them to adopt a variety of actions to survive and remain in business. There are currently relatively few academic research that take the potential effects of COVID-19 infection onto Supply Chain performances into consideration. Operations halts, alterations to company operations, and firm closures were among the recorded events (Larcker et al., 2020). A survival model may be a sustainable company strategy (Obrenovic et al., 2020). Early studies have also shown that organisations' corporate success is significantly impacted on the revenue side, casting doubt on their sustainability (Kells, 2020; Larcker et al., 2020). In order to be competitive, supply chain organisations must maintain their agility and proactively adjust both production and sales (Mather, 2020).

2.2 Review of the Theory

2.2.1 The Swift Even Flow Theory

According to Chen et al. (2013) and Schmenner (2014), this theory may be used to explain how supply chain interruptions affect both the performance of organisations and the supply chain partners. The productivity and efficiency of the process are improved by improving the flow of materials through it. Lowering variation, which is evaluated by looking at changes in quality, quantity, and timing, and lowering process time, which is the amount of time it takes to manufacture a good or provide a service, are the two main components of this approach (Schmenner, 2014). Variability in the incoming material flow in terms of quality, quantity, and timeliness would have a negative influence on the supply chain's productivity and effectiveness. This shows a negative correlation between process variability and the performance outcomes it is linked to (Devaraj et al., 2013). Therefore, from the standpoint of this theory, there is a negative relationship between supply chain disruptions and organisational performance, as revealed by

the emergence of the Covid-19 pandemic, where an organisation faces different variations such as demand, supply, and environmental disruptions.

2.2.2 Systemic Risk Theory

The relationship between disruptions and business performance is explained by the systemic risk theory (Scheibe and Blackhurst, 2018). According to the systemic risk theory, errors in one part of a system may start off a cascade of events that affects the whole system (Ray, 2010). The idea places a strong emphasis on the impact of errors and interruptions in the supply chain's regular operations. However, it does not address how these supply chain failures might affect organisational performance outcomes or if various supply chain disruption causes, such as supply, demand, or the environment, would have varied effects on organisational performance.

2.2.3 Theory Of Information Processing

Risk identification and response methods are the two processes involved in managing supply chain disruptions (Grötsch et al., 2013). The adoption of a sequence of measures based on thorough risk evaluations in order to mitigate hazards has been defined as disruption detection, a risk control measure (Heckmann et al., 2015; Tummala and Schoenherr, 2011). After disruptive situations, it's critical for businesses to achieve dynamic control and adaptive management (Ivanov and Sokolov 2012). This is a method of reducing the risk of supply chain interruption by building information processing capabilities. The capacity to track the source of a product's ingredients is referred to as visibility (Lee and Rammoan, 2017). A company can look through its suppliers at multiple levels when it can track the material flows, which would increase the company's understanding of its suppliers and other supply chain partners. This ability helps to prevent supply chain disruptions from happening.

According to Swift et al. (2019), a company that has great supply chain visibility has better control over the supply operations and exchanges. End-to-end visibility allows exchange participants to coordinate choices on hedging strategies and practises to mitigate possible risks based on accurate and timely information exchanged across the parties (Wei and Wang 2013). This visibility extends from first-tier suppliers to end consumers.

2.3 Conceptual Foundation

Thomas (2010) defines a conceptual framework as a collection of overarching concepts and guiding principles drawn from relevant disciplines of study and utilised to organise a future presentation. Its purpose is to help a researcher gain awareness and comprehension of the subject under investigation and to express that knowledge from a wide viewpoint. It draws attention to the key research variables and demonstrates how they relate to one another (Thomas, 2010). This conceptual framework was created to examine the study's variables. Supply chain performance was the dependent variable while Covid-19 supply chain disturbances were the independent variable. The Covid-19 Pandemic has led to four main supply chain problems. Below is a discussion of them: The upstream portion of a company's supply chain is where supply side disruptions occur (Christopher and Bode, 2008; Samvedi et al., 2013).

A supplier's operational inefficiency, variations in product quality and quantity, delays in logistics and transportation, or a lack of coordination between a supplier and the company may all lead to supply disruptions (Kumar et al., 2010; Chen et al., 2013; Sarker et al., 2016). When they extend across the whole supply chain, product and service quality may dramatically reduce supply interruption (Tse and Tan, 2012). Additionally, suppliers must be able to adjust to changes in consumer tastes and maintain their competitiveness via the creation of new products (Zsidisin and Ellram, 2003; He et al., 2020). Furthermore, a recent research found that having a complicated supply network that was vulnerable to many human mistakes and safety concerns may have contributed to the COVID-19 pandemic lockdown's detrimental impacts on the interruption of global supply (Gunessee and Subramanian, 2020). Supply interruptions may impair outbound logistics, which in turn worsens supply chain performance in terms of delivery time and their detrimental effects on company performance (Chen et al., 2013).

On the other hand, a disturbance in the supply chain's downstream portion leads to a disruption in demand (Jüttner, 2005). According to Nagurney et al. (2005) and McKinnon (2006), events that cause demand disruption include those that cause delays in the delivery of goods to clients owing to traffic jams

or other logistical inefficiencies. They may also result from unstable and unexpected customer demand. According to Ho et al. (2005) and Manuj and Mentzer (2008), demand fluctuations such as altered order quantities, shorter product life cycles, and the introduction of new items pose serious hazards to the company. According to COVID-19, clients who participate in social withdrawal and panic purchasing cause demand to fluctuate, which has an impact on supply chains (Gunessee and Subramanian, 2020). The correct balancing of supply and demand is a key component of a supply chain. Demand disruption may also happen when a company is unable to balance supply and demand due to inaccurate forecasts effectively, the bullwhip effect, or ineffective supply chain coordination (Chen et al., 2013).

Process disruption happens when internal business activities are disrupted; examples include capacity constraints, equipment failure, quality issues, and ineffective IT infrastructure (Talluri et al., 2013; Gunessee and Subramanian, 2020). Businesses are more susceptible to IT-related issues like hardware failure or cyberattacks as their reliance on their IT infrastructure for supply chain function grows (Chopra and Sodhi, 2014). The capacity of organisational processes to adapt to changes in the internal and external environment is one of their major characteristics (Valença et al., 2013). Cross-functional teams, improved departmental communication, and efficient knowledge exchange practises are all ways that organisations may reduce process variability (Chen et al., 2013).

Environmental disruptions include pandemics like Covid-19, epidemics, natural catastrophes (like earthquakes), socio-political unrest, economic downturns, and terrorist attacks (Parast, 2020; Gunessee & Subramanian, 2020). These rare, exogenous occurrences have a major influence on a firm's supply network while being exogenous to the company and its supply chain. Due to the vulnerability of manufacturing facilities, logistics, and transportation networks to terrorism or natural disasters, supply chain interruptions may have a significant detrimental effect (Kamal Ahmadi and Parast, 2016; Kamal Ahmadi and Parast, 2017).

2.4 Empirical Analysis

On the effect of supply network interruptions on supply chain performance, several research have been done. However, given that the Covid-19 worldwide epidemic is still ongoing, not a lot of study has been done on the supply chain disruptions it has generated. The association between supply chain disruption drivers and supply chain performance and firm performance outcomes was studied by Parast et al. in 2021. To ascertain the association between supply chain disruption risks and supply chain performance and firm performance outcomes, the research used a cross-sectional survey methodology with a sample of 315 Chinese enterprises. Demand disruption, supply disruption, process disruption, and environment disruption risks are the four disruption risk drivers for a supply chain. The research demonstrates how supply chain disruption risks affect supply chain performance and firm performance in various ways. The size of the effect of disruption risks on supply chain performance is bigger on the upstream side of the supply chain than on the downstream side of the supply chain, according to the research, which is a significant conclusion.

Another research by Pujawan (2021) reviewed the literature on supply chain disruptions brought on by the COVID-19 pandemic. The growing significance of safety, digitization, localization, the need to reconsider what efficiency means, and the manufacture and distribution of COVID-19 vaccination were some of the main conclusions. The research demonstrated that, although there are higher demands for digitization and supply-base localization, the majority of mitigation methods presented before COVID-19, such as redundancy and flexibility, are still taken into consideration as potential ways to offset supply chain disruptions caused by COVID-19.

Additionally, Nayler and Subramanian (2021) made an effort to comprehend the effect of Covid-19 on African health supply chains and the degree of readiness at different stages. The South-South Knowledge Network (SoSoKe) and the International Association of Public Health Logisticians (IAPHL) platforms were two of the distribution methods used for the online questionnaire that was part of the research methodology. 41 people responded to the poll, with 88% of those replies coming from Africa, 10% from Asia, and 2% from South America. 41% of responders were from national groups, 15% from state organisations, 5% from local organisations, and the remaining 39% were from "other" organisations. The findings backed up the need for better forecasting tools and a coordinated strategy to address supply chain disruptions.

In a pharmaceutical firm in Maryland, Opata (2013) investigated the methods supply chain managers use to reduce the impact of supply chain interruption on business performance. In interviews with 11 supply chain managers, participant perspectives of the ways to lessen the impact of supply chain interruptions were extracted. Data source triangulation was used to process and analyse information from interviews and supporting documents in order to identify emerging themes.

Supply chain design, planning, forecasting, flexible and diversified supplier bases, and resource allocation and demand management were the key themes that developed. The research was undertaken by Ekpenyong in 2020 to determine how the coronavirus (Covid-19) pandemic will affect significant businesses in Nigeria in terms of supply interruption, productivity, client satisfaction, and company performance. A cross-sectional survey design and stratified sample method were used for personnel selection and data collection. The structural equation model was used to test hypotheses, and confirmatory factor analysis (CFA) was utilised to analyse the data and model fitness. The research found that although the pandemic caused supply interruptions, it did not directly affect manufacturing enterprises' productivity. Another study investigates the steps/countermeasures that purchasing and distributing companies adopt to resolve COVID-19-related supply chain interruptions.

3.0 METHODOLOGY

This chapter outlines the approach that was used to carry out the study's predetermined research goals. This section specifically covers the study's research design, research methodology, target population, sample size and sampling approach, data collecting tool, data sources, data collection, and data analysis.

3.1 Research Approach

The research employed a descriptive and analytical sample survey as its study design. The fact that it is a small-scale research with a brief duration and that data is systematically collected and presented to provide a clear picture of a specific scenario were factors in the decision to use it. It was designed to investigate the effects of the COVID-19 supply chain interruption on the efficiency of the supply chain of the Kantanka Automobile Company Limited. The questionnaire, interview, and observation are the three main methods or instruments used in descriptive survey design, according to (Bryman & Bell, 2007). The study was suited for a descriptive survey since it enabled the researcher to get information on the effects of the COVID-19 supply chain interruption on supply chain performance. The goal of a descriptive case study is to gather data on people's attitudes, beliefs, and behaviours (Orodho, 2002). A researcher is then able to extrapolate the results from a sample of replies from a population thanks to the data gathering. In other words, the researcher utilised original data in addition to secondary data and qualitative techniques of study analysis.

3.2 Target Audience

A population is a group of objects with similar features accessible for analysis or investigation. The population represents A group you want to generalise your findings to Kantanka Automobile Company Limited's management is the study's intended audience.

3.3 Sample Size and sample methods

According to Fink (2003), sampling is a fraction or subset of a big group. It is also possible to consider it a limited portion of the statistical population whose characteristics are researched to learn more about the total. Regarding subject availability, the optimum sample should be both big enough to serve as good representation of the population and small enough to be picked economically (Bryman & Bell, 2007). Purposive sampling was the method the researcher used for the study. Purposive sampling is when researchers attempt to collect data from a target population willing to do so by predetermined criteria (Sanders et al., 2007). Given this, the researcher purposefully chose department heads and 2-line managers for the study.

3.4 Sources of Data

Both primary and secondary data sources from the Kantanka vehicle manufacturer were heavily used in the research. The core data for the study came from interviews, which made up the primary data, while secondary data came from online resources and library collections of published and unpublished materials from other researchers. Since the study's focus was on the effects of the COVID-19 supply chain interruption on supply chain performance, information from these sources significantly influenced the research.

3.5 Data Gathering Device

The study's research tool was an interview with closed-ended questions. According to Agyei, Kusi, and Owusu (2013), interviews had a higher response rate than questionnaires. Additionally, interviews may be used to clarify and explain issues as well as build rapport with respondents to get more accurate responses. Based on the research questions put forward for the study, the interview was created from the evaluation of the literature. The five-point Likert Scale served as the foundation for the design of the study's open-ended questions. Part A and Part B were used to categorise the interviews. Part A of the survey covered the respondent's demographic data, while Part B included questions about the study's goals.

3.6 Data Gathering Technique

In order to establish a connection with the respondents chosen for the study, a cover letter was requested from the department head of the University of Education's Winneba-School of Business (Marketing, Procurement and Supply Chain Management). The respondents were informed of the study's objectives and the interviewing process. In order to get first-hand information, the researcher conducted an interview with participants that included a series of semi-structured questions connected to the study project and addressed to respondents. The interview included open-ended, semi-structured questions. The interview's wording was straightforward and plain, therefore there were no issues with interpretation.

The researcher was able to find the precise information needed thanks to the open-ended inquiries. The researcher also critically analysed data that the respondents themselves had provided. The confidentiality of the information was also guaranteed to the responders. The study's secondary data came from the internet through reading books, journals, and articles that aimed to provide vivid information to aid in examining the effects of the COVID-19 supply chain interruption on supply chain performance.

3.7 Method of Data Analysis

The deductive method is a qualitative data analysis technique used to analyse the data gathered from the fields. The method was used because it aided in the data analysis (such as interviews and other literature reviews) and allowed the researcher to test his or her current beliefs.

4.0 DATA ANALYSIS AND DISCUSSION

This chapter presents the findings from the data collected through interviews. The interview data was collected from two-line managers in order to answer the research questions. What is the extent to which Covid-19 supply chain disruptions has affected the supply chain performance of Kantanka Automobile? What measures has Kantanka Automobile adopted to mitigate Covid-19 supply chain disruptions on supply chain performance? This chapter also contains the interpretation and discussion of the results based on the statistical evidence and literature arising out of the study objectives.

4.1 Data Analysis and findings

The analysis and findings begin with the demographic information of the participants before each of the research questions of the study is discussed. Both sets of data are blended in the discussion for each research question to produce a logical and coherent analysis.

4.2 Demographics

The details of the research participants purposively selected to provide data are in chapter 3 (sample size). The participants' mix of management and collective background emphasizes how germane the information they provided is to the research, thereby making a strong case for the credibility of the study's data and conclusions.

4.4 RQ1. To what extent has Covid-19 supply chain disruptions affected the supply chain performance of Kantanka Automobile?

The research question was to examine the extent to which Covid-19 supply chain disruptions has affected the supply chain performance of the organization under study. A number of specific questions were used to elicit data to address this research question, and the information was analyzed using five theme: *demand disruption, supply disruption, process disruption, environment disruption and supply chain performance.*

4.4.1 Demand disruption

Demand disruption is a result of disruption in the downstream side of the supply chain (Jüttner, 2005). Demand disruption can arise from incidents such as disruptions in the distribution of products to customers due to transportation delays or other logistical inefficiencies, or from unstable and unpredictable customer demand (Nagurney *et al.*, 2005; McKinnon, 2006). When asked if during the Covid-19 period was your company receiving unanticipated or unstable demand from customers, participants provided the information below:

kantanka as we all know is an automobile company and the demand for cars by Ghanaians is not that high or not that rampant, so we are able to anticipate our demand and then demand is stable, but the Covid-19 really didn't affect the demand for our cars. The demand was still stable and we were able to anticipate and meet customers' needs. (participant E)

Participant F also added that:

we did not receive any unanticipated demands from customers. Demand rather went down drastically. A follow up question was asked if the company was exposed to insufficient or distorted information from customers about orders or demand quantities; participants provided this information: we don't really run an online system. We are yet to do that, so we don't see how Covid-19 exposed us to insufficient or distorted information from customers. Mostly we have phone lines that customers can call or reach us on and everything was in order. (participant E)

Participant F also added that:

Our company was not exposed to insufficient information from customers. The company has effective and well-defined channels of communication with customers.

From this finding, it can be submitted that, during the pandemic, the company, in terms of demand for their products, there wasn't any unanticipated demand from customers and also there wasn't any distorted information from customers about their orders or demand quantities. Demand variations such as changes in order quantity, distorted orders from customers, shorter product life cycle, and the introduction of new products pose significant risks to the firm (Ho *et al.*, 2005; Manuj and Mentzer, 2008). But the Covid-19 didn't pose any risk to the demand at Kantanka automobile.

4.4.2 Supply Disruption

Supply disruption can also occur as a result of operational inefficiency in the supplier, deviations in product quality and quantity, logistics and transportation delays, or poor coordination between a supplier and the firm (Kumar *et al.*, 2010; Chen *et al.*, 2013; Sarker *et al.*, 2016). Product quality and service quality can significantly contribute to reducing supply disruption, especially when they extend across the entire supply chain (Tse and Tan, 2012). The participants were asked whether suppliers of Kantanka automobile perform poorly in respect of their capability (delivery, dependability, order fill capability)?

Participant E responded that:

Our suppliers are mostly international partners. We deal with them; they are outside Ghana and we can say for the fact that they are capable. They have high capabilities and their delivery and dependability cannot be questioned. They really don't disappoint us; in fact, we don't have a single supplier,

we have more than three, so if one is occupied, we just move to the next available supplier. But due to the Covid-19 restrictions, most weren't able to stay in business.

Participant F also responded that:

Due to the global supply chain disruptions and the lockdown in Ghana, some of our suppliers went out of business, others too became erratic in terms of reliability and timely delivery. A follow-up question was asked if suppliers are reliable? This was asked to know how suppliers were willing to supply materials to the company, due to a high global demand.

Participant E, said that:

Our suppliers were quite reliable until the pandemic; now their reliability level has significantly reduced, due to high demand for supplies and suppliers' services by competitive firms across the globe.

Participant F, also concluded that:

For a fact, our suppliers were reliable and I said if they won't be able to supply particular materials, they will alert us that they are out of stock of a particular material and we will make contact with an alternative supplier. But during and after the Covid-19 pandemic, the attitude of suppliers has changed drastically due to high demand for their service; now we can't be assured of delivery from them. It can be submitted from this finding that, during the pandemic the company, in terms of supply of materials that suppliers of Kantanka automobile performed poorly with regard to their capability.

A recent study suggested that the negative effects of the Covid-19 pandemic on global supply disruption came from having a complex supply network that was subject to many human errors and safety concerns (Gunessee and Subramanian, 2020). In addition to the negative impact of supply disruptions on firm performance, supply disruptions can affect outbound logistics and consequently deteriorate supply chain performance in terms of delivery time (Chen *et al.*, 2013). From the responses, all the participants made it clear that Covid-19 supply disruption has affected the operation or the performance of Kantanka automobile.

4.4.3 Process Disruption

Process disruption occurs as a result of disruption in a firm's internal operations; examples are capacity limitation, machine failure, quality problems, and inefficient IT infrastructure (Talluri *et al.*, 2013; Gunessee and Subramanian, 2020). As firms increasingly rely on their IT infrastructure to maintain supply chain functions, they become more vulnerable to IT-related problems such as cyber-attacks or hardware failure (Chopra and Sodhi, 2014). One of the key aspects of organizational processes is their adaptability to respond to changes in the internal and external environment (Valença *et al.*, 2013). Participants were asked a series of questions in respect of process disruption in supply chain on the company's performance.

Participants were asked if the company regularly face unforeseen technology failure in its operations. Participant E responded that: *I can say yes, but it is not a regular; we don't really face unforeseen technology failure. Technology is a new thing and we are all trying to get our way around it and as we know, Kantanka is the first company in Ghana to be into automobile, and is a quiet difficult task for us because most of the personnel with high technical knowledge in technology are not Ghanaians. Once in a while we do face some problems in our operations but then it is not regular*

Participant F also said:

The company does face some unforeseen technology failure but not regularly or not often in its operations.

Participants were asked whether the company's products and services often face quality problems?

Participant E said:

ooh sure being a Ghanaian company and we know how Ghanaians are; they prefer foreign goods than made in Ghana goods, so quality is a critical issue and initially we were facing quality issues, but now

we have fixed all our problems and then we met all the requirements. We can say that our products are of high quality.

Participant F also briefly said that:

The company's product does not face quality problems. From the above responses, it was discovered that, with the Covid-19 process disruption, the company does not regularly face unforeseen technology failure in its operations and also the company's products and services doesn't face quality problems. Organizations can minimize process variability by implementing cross-functional teams, improving communication systems between departments, and making effective use of knowledge sharing procedures (Chen *et al.*, 2013).

4.4.4 Environmental Disruption

Pandemics such as Covid-19, natural disasters (such as earthquakes), socio-political instability, economic downturns, and terrorist attacks are examples of environmental disruption (Parast, 2020; Gunessee and Subramanian, 2020). These events are exogenous to the firm and its supply chain. They happen infrequently, and their impact on a firm's supply chain can be significant. Questions were asked to find out the extent to which environmental disruption due to Covid-19 has affected the supply chain performance. The interviewees were asked whether during the pandemic, the restrictions affected Kantanka automobile?

Participant E answered that:

YES, as I said in one of the answers, the pandemic really affected our supply of raw material, because most of the things we use in making automobile are imported and not made in Ghana, so because the borders were closed our production came to a halt and then we had to wait till the restrictions were taken off before we could place orders. Our suppliers were willing to supply but because of the laws they couldn't.

Participant F also said that:

International restrictions affected us in terms of supply of components and distribution across borders There was also an additional question. Do natural disasters frequently affect Kantanka automobile? Participant E lamented that:

By the grace of God, where we find ourselves in Ghana, we aren't really faced with natural disasters so I can say that, since the company's inception, we haven't experienced any natural disaster that could affect the operations of Kantanka automobile.

Participant F also said that:

Natural disasters don't usually affect our production. We barely experience such disasters.

From the findings, it is clear that, Covid-19 environmental variation, international restrictions affected Kantanka automobile operations and/or performance; but since the inception of the company, aside Covid-19, natural disasters barely affect their operations/performance. The negative impact of environmental disruptions on supply chains can be substantial, since production facilities, logistics, and transportation systems are vulnerable to natural disasters or terrorist attacks (Kamal Ahmadi and Parast, 2016; Kamal Ahmadi and Parast, 2017).

4.4.5 Supply Chain Performance

The Covid-19 pandemic presents an interesting scenario whereby an unexpected shock causes acute changes in a firms' performances relative to management's expectations which were held just a few months prior to the crisis (Larcker *et al.*, 2020). Questions were asked to find out how Covid-19 supply chain disruption has affected the supply chain performance of Kantanka automobile. Participants were asked a series of questions as to whether Kantanka automobile is able to supply the requested quantities on a consistent basis? The next question was whether the company is able to meet quoted or anticipated delivery dates on a consistent basis? A further question was whether during the pandemic the company

was able to record an increase in its overall competitive position? And they were also asked if the company has been able to enjoy sustained financial growth?

Participant E responded that:

The company is able to supply desired quantity but not on a consistent basis because supply materials often full short and customers has to wait till we take delivery before, but this doesn't happen often, well for delivery of product to our customers on a specific delivery date, we hardly have issue with because we have our own delivery trucks that are used in delivery product to customers so we don't fall on the services of others, since most of our product are demanded by individuals and agencies within the country. Again during the covid-19 pandemic period we weren't able to increase our competitive position, since most of our materials are imported due to the restrictions we were able to manufacture more of our product to increase our sales with that we weren't able to compete effectively with our competitors and also demand wasn't high. Moreover, well with is before the pandemic the company was enjoying some financial growth until the pandemic occurred which has profoundly affected the revenue side, bringing our sustainability into question.

Participant F also stated that:

Kantanka is able to supply customers with the desired quantities but also not consistently due to uncertainties in supply from suppliers, and the unpredictable behavior from suppliers, again we are able to meet delivery date consistently as and when orders are placed, we make sure that the goods are delivered on time. Moreover, we weren't able to increase our competitive position in the industry because demand fell short. Also, there was some uncertainties with supply of materials from suppliers; the closure of the borders also contributed to it because there wasn't any means to transport the materials from suppliers outside the country. Also, the company was enjoying some financial growth until the Covid-19 set in.

The findings indicate that, Kantanka automobile company is able to supply its customers the required quantities. The participants attested to the fact that supply of specific quantities of goods to customers wasn't consistent; also, it was found that the company is able to meet delivery dates consistently because most deliveries to customers were done by the company, and not third parties, which might sometimes cause delay. Again, the participants were clear that the company wasn't able to increase its competitive position due to several factors such as, delay in the delivery of raw materials due to the Covid-19 restrictions. Also, demand fell short due to uncertainties with supply of raw materials from suppliers. Lastly, the study further discovered that the Covid-19 pandemic affected the company's competitive position and led to a reduced revenue base.

It is clear that the Covid-19 supply chain disruption heavily affected the supply chain performance of Kantanka. It is without doubt that the Covid-19 pandemic has come as a major threat to the Ghanaian economy, especially on the side of manufacturing and international trade (Ayithey *et al.*, 2020; Enu *et al.*, 2013; UNCTAD, 2020).

4.5 RQ2. What measures has Kantanka adopted to mitigate Covid-19 supply chain disruptions on supply chain performance?

The study seeks to determine measures adopted by Kantanka to mitigate Covid-19 supply chain disruptions. Global Supply Chains are key drivers of sustainable production and consumption around the world. As a result, a disruption in one country could affect other countries' production industries along global Supply Chains. The data showed that, throughout the pandemic, the company adopted some mitigating response strategies to reduce the effects of the pandemic on its operations. The strategies appeared effective depending on the circumstance. It was in addition unearthed that the strategies adopted have improved the effectiveness of the company's operations. The participants answered the interview questions as follows:

1.Can you state at least three response strategies the company has put in place to mitigate the effects of the Covid-19 or a similar pandemic? participant E said:

YES, so in the face of the Covid-19 pandemic, the company has put in some response strategies to help reduce its effects and one of it is; Insurance and then we have local sourcing and the we also entered into training. So, with the insurance raw materials are mostly from outside and then sometimes they get damaged on the road or lost at sea so we insured some of them against those loses. And then with the local sourcing as I said earlier, most of our suppliers are from outside and when the pandemic came there was a halt to movement or transport of goods, so we realized that there are some few Ghanaians here who are able to provide similar or alternative raw materials that can be used for the same purpose as the international ones, so we decided to go in for that and we decided to go in for training because we sent a group to go and learn how to manufacture the raw materials and we are hoping that when they are done with their studies they can come back and then make that knowledge available and further ensure that if there is any pandemic in the future we are sure that we have a team that will be able to provide the raw materials that we need.

Participant F, also said:

Effective stock management, that's to make sure that the stock level is always kept at a healthy level to avoid a shortage of supplies as much as possible. The company also varied the marketing campaign; this was done to shift focus on the choice of media from physical location campaigns to more virtual-centered campaigns. Another aim was to widen the supplier list and ensure that there are alternative suppliers to fall onto anytime some suppliers disappoint.

2. Participant during the interview was also asked: Which of the adopted strategies is the most effective in mitigating the effects when implemented?

Participant E responded that:

I can't really point which is most or which is least effective because they are all beneficial in one way or the other, because it will get to a point you will think this one will help but then you will need the other instead, so they are all effective.

But participant F, said that:

The most effective among the strategies is the effective stock management, because it helped the company to maintain stock effectively and efficiently during the pandemic.

3. Which amongst these strategies is the least effective in mitigating the effects of Covid-19?

Participant E lamented that:

But the one that is less effective I can say is the local sourcing because I said it provides similar or substitute or alternative so they are not really the same thing but at least it can serve the same purpose but sometimes you will be putting a square peg in a round hole, so I think that will be the least effective one.

Participant F responded that:

The less effective strategy among them is the increasing of supplier list

4. How has technology or digitization improved the effectiveness of the adopted strategies?

Participant E disclosed to the researchers that:

right now, in the wake of Covid-19, it has introduced online learning and those who weren't able to travel overseas to learn are also doing that over here online, and we are sure that in 2-3 years to come they will be done and we will have a strong team that will be able to implement the knowledge they will gain to create the materials that will be needed to suit our needs.

Participants F, also responded to the above question that:

There are effective apps and software that aid the effective management of stock levels. Also, it has helped created a digital platform that allows for effective virtual marketing campaigns. From the responses above, Supply Chains across the globe need to collaborate during disruptions (whether

pandemic, man-made, or natural disasters) to ensure resilience during and after these disruptions. The response strategies adopted to mitigate Covid-19 supply chain disruptions on supply chain performance were highly adopted. Some of these strategies include insurance, localizing suppliers and training. All these strategies will help in mitigating the effects of Covid-19 supply chain disruption on supply chain performance (*participant E*).

Also, *Participant F*, highlighted some response strategies that were used and it includes; effective stock management, vary marketing campaigns and widen supplier list. Participant E stated that non among these strategies can be singled out as the most effective one but it will depend on the circumstances, while participant F, stated that among the strategies, effective management is the most effective one because it helps to maintain the limited stock level. Among the strategies mentioned, local sourcing and increasing supplier list were the least effective ones. The participants confirmed this during the interview. Last but not the least, technology/digitization was acknowledged to have improved the effectiveness of the strategies.

5.0 CONCLUSIONS

The key ideas covered in the essay are summarised in this area of the research. This was carried out in accordance with the study's goals. This section of the article also discusses the study's ramifications and ideas for further investigation.

5.1 Research Summary

The research used Kantanka as a case study to investigate the effects of the Covid-19 supply chain interruption on supply chain performance in Ghana. To do this, the following two (2) precise goals were established: to assess the impact that Covid-19 supply chain interruptions have had on Kantanka's supply chain performance and to evaluate the steps the car manufacturer has taken to reduce such disruptions. An interview that was organised helped gather the data for the research. The two-line managers at Kantanka were the study's target population. The replies from the interviews were utilised in this study. Regarding the first research goal, the study showed that Kantanka Automobile Company did not experience any unexpected customer demand during the pandemic, and they also confirmed that there was no customer misinformation regarding orders or demand quantities.

Additionally, both respondents agreed that, in terms of supply interruption, Kantanka's suppliers underperformed in terms of their capacity (delivery, reliability, and order fill capabilities) during the pandemic. Additionally, participants E and F agreed that suppliers can't be relied upon to provide raw materials. Furthermore, both panellists agreed that despite Covid-19's disruption, the firm still sometimes has technological failures in its operations. However, this is because Ghanaians often lack access to highly skilled technology experts. The business sometimes has operational technology failures. The attendee went on to say that the company's products and services are of high quality. The participants also came to the conclusion that, aside from Covid19, natural disasters have had little impact on Kantanka Automobile operations or performance since the company's founding because those events haven't occurred. The participants also concurred that international restrictions have affected Kantanka Automobile operations and or performance.

Regarding the impact of the Covid-19 disruption on supply chain performance once more, it was discovered that Covid-19 had a significant impact on Kantanka's supply chain performance in that the company's revenue had decreased since the outbreak of Covid-19 and that it had also lost some of its competitive edge in the market. Lastly, the second goal was to identify the steps taken by Kantanka to lessen Covid-19 supply chain interruptions. The participant's comments revealed that the organisation used a number of tactics to lessen the effect of Covid-19 supply chain interruptions on supply chain performance. Insurance, localising suppliers, and training are some of the solutions. Effective stock management, a variety of marketing initiatives, and expanding the supplier list are just a few of the response techniques that were mentioned by the respondents.

A strategy's effectiveness will depend on the circumstances under which it is used, participant E said, thus none of them can be singled out as the most successful. Participant F said that of the solutions listed, competent management is the most successful since it helps to keep the limited stock level at a healthy level. Local sourcing and expanding the supplier list were also the least successful techniques,

as both participants in the interview affirmed. Last but not least, technology and/or digitalization have increased the tactics' efficacy.

5.2 The Verdict

In regard to the study's goals, the following conclusions may be drawn from the study's results. In respect to the conclusions on the study's first aim, the article goes on to look at how much the Covid-19 supply chain interruptions impacted Ghanaian businesses. The suppliers' poor performance on their ability (delivery, reliability, and order fill capability), as well as their unreliable supply of raw materials, was evident from empirical data. The corporation had certain technological setbacks as a result of the Covid-19 process interruption, it was also discovered. These are a some consequences of the Covid-19 supply chain interruptions. Supply interruptions adversely impacted outbound logistics on the upstream side of the supply chain, which negatively impacted delivery time performance. The company's financial situation rapidly deteriorated, which further lowered its edge over rivals in the market. The aggregate demand for goods and services farther down the supply chain was not significantly impacted by either variable and unexpected consumer demand, transportation delays, or other logistical inefficiencies. Customers' panic purchasing and social withdrawal led to demand instability, which had an impact on supply chains. As a result, the Covid-19 supply chain interruption had a very significant negative impact on overall supply chain performance.

The research subsequently set out to evaluate the steps taken by Kantanka to alleviate Covid-19 supply chain interruptions in light of the results on the study's second aim, i.e., the actions taken by Ghanaian businesses. The empirical evidence from this study suggests that, in order to lessen the negative effects of the supply chain disruptions brought on by the pandemic, the company adopted strategies like insurance, localising suppliers, training some employees, effective stock management, varying marketing campaigns, and expanding its supplier list. The business has implemented a number of steps to lessen the consequences of the Covid-19 supply chain interruptions. These include agile productions, where businesses choose to handle the influx and outflow of resources, money, and information using responsiveness, flexibility, and rapid methods. Businesses may prevent possible shortages and get rid of extra inventory by using an agile manufacturing approach. Businesses may monitor and trace goods across the supply chain with improved incoming material visibility to prevent delays and meet client demands. It was also discovered that businesses have to interact closely with their suppliers to get insight into the inventory, manufacturing, and fulfilment status of tier-1 suppliers. These results are consistent with the body of previous research.

5.3 Recommendation

According to the study's findings, digitalizing the supply chain via smart manufacturing might solve a number of supply chain issues. Internet of Things (IoT), block chain technology, RFID, and other information technologies may link supply chain participants and deliver real-time updates on what is occurring there. Players will be able to decide wisely in both typical and disruptive situations with the aid of this. Utilising technology to model comparable supply chain interruptions might help identify possible bottlenecks and capitalise on advantages.

Second, both public and commercial sector organisations should consider regionalizing or localising their supply chains. However, it is necessary to boost the growth and nurturing of regional businesses that may turn into reliable providers if imports are replaced by local supply sources. Since transportation distances are reduced and the supply chain may be less susceptible to global instability, localization provides improved resilience. The researchers agree with Van Hoek's (2020) recommendation that supply chains should strike a balance between international and domestic sourcing and see flexibility as a key requirement for supply chain architecture.

Depending on the volatility or stability of the business environment, a supply chain should be constructed in such a manner that it permits simple and rapid switching from agile to efficient techniques, or vice versa. Finally, to minimise interruptions and improve supply chain performance, effective supply chain design, planning, and forecasting may be put into practise together with a flexible and diverse supplier base.

3.4 Plans for More Research

The research looked at supply chain performance and supply interruption caused by the Covid-19 epidemic. On the implications of Covid-19 on supply chain disruptions on Not-for-profit organisations like Non-Governmental and Humanitarian based supply chains, further study may be done. Additionally, additional study might be done on how to actually digitise supply chains in the future to avoid interruptions in the Ghanaian environment.

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