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Using Data Analytics to Determine the Disruptions in Supply Chain Due to the Covid-19 Pandemic: A Literature Review

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Abstract: ***An Efficient and a sturdy supply chain forms the crux of a stable economy. The outbreak of the novel coronavirus has caused countries and organizations worldwide to take precautions in the interest of public health. Travel restrictions, change in consumer behaviour, hoarding of food, overstocking of essential commodities and over-cautious mindset towards hygiene are some of the repercussions of the pandemic which are malign to the smooth functioning of the supply chain. The food industry is particularly vulnerable during this pandemic and is facing challenges to bridge the demand-supply gap. The enormous amounts of data generated can help companies analyze trends, altered customer expectations, newer demands and take relevant decisions based on this data to help them overcome the disruptions in supply chain. This study discusses the obstacles in supply chain as a result of COVID-19 outbreak. Furthermore, a case study is presented later in the paper to understand the effect of the pandemic on perishable and non-perishable products. Finally, some suggestions are made, based on the available data, which could be beneficial for companies to be back in business.***

Keywords: Supply Chain Management, Data Analytics, COVID-19, Challenges faced by Supply Chains

I. INTRODUCTION TO SUPPLY CHAIN MANAGEMENT

Earlier, supply chain was only concerned with a relatively rudimentary but an exhausting task of delivering goods with the help of manual labor. Eventually, the focus shifted from such an elementary task to a more intricate task spread on a global scale. The term Supply Chain Management is relatively new however it's meaning has taken a shift from being a theoretical approach to tackle logistical problems to a modern solution for burgeoning trade globally. SCM is defined as the encapsulation of all the activities in manufacturing a product/service from sourcing of raw materials to the final delivery to the customer keeping in mind the aim of making the whole process cost efficient, resourceful and laborsaving while meeting the demands of the people involved in it.

SCM is a union of upstream and downstream tasks that take place between the manufacturer and the consumer subsuming every individual or corporation that is involved in any of these tasks directly or indirectly. Broadly, upstream tasks include all those tasks that help in the search for raw materials for the product to be manufactured. Upstream tasks do not directly process the raw materials but instead just source the raw materials for the production. Downstream tasks are generally the manufacturing stages where the raw materials are processed to form the final product. The entities involved in these tasks are solely responsible for the quality manufacturing and timely distribution to wholesalers, retailers and consumers. [1]

II. STAGES OF SUPPLY CHAIN MANAGEMENT

Supply Chain Management unlike any other management technique uses a unique tool known as The SCOR Model where SCOR stands for Supply Chain Operations Reference. This framework is a measure of the performance of the supply chain. It is a reference model aimed at maximizing the productivity of a supply chain while accounting for production flexibility, demand fluctuation, returns and other factors.

This framework covers the 6 major production areas of any supply chain, namely:

1) *Plan:* The first area lays down the plan and strategy for managing the supply and demand. A chain of order and communication is set up to ensure maximum productivity and efficiency while keeping a check on the business plan along with the financial or growth plans of the company.
2) *Source:* This zone deals with the acquisition of raw materials, machinery, professional workers, and at the same time managing verified suppliers for the process. It also handles the inventory and interactions with the suppliers in terms of delivery schedule, payment methods, etc.

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3) *Make:* This zone is the most important as it is associated with the manufacturing of the product. This zone keeps a check on the manufacturing process ensuring the process to be efficient, resourceful and maintaining the quality standard in packaging while testing the product for failures.
4) *Deliver:* Once the product is manufactured and passes all the quality checks, it proceeds towards the delivery stage where it is delivered to warehouses, retailers or to the customers. This step manages the logistics and the invoices. Furthermore, it also examines the inventory and replete with stock if empty. This deals with the management of import and export.
5) *Return:* This step comes into play if or when there is a defective product or a return request placed by the consumer. This inspects the rules involved in the process and manages the inventory, transport and processing costs and handles the regulations concerning with the whole management of returned items.
6) *Enable:* This final stage of the supply chain is associated with the management of the above mentioned processes. This stage acts as an instrument between all the other processes and ensures smooth and a streamlined flow. It keeps a mark on all the processes and their state and ensures uniformity among them. [2]

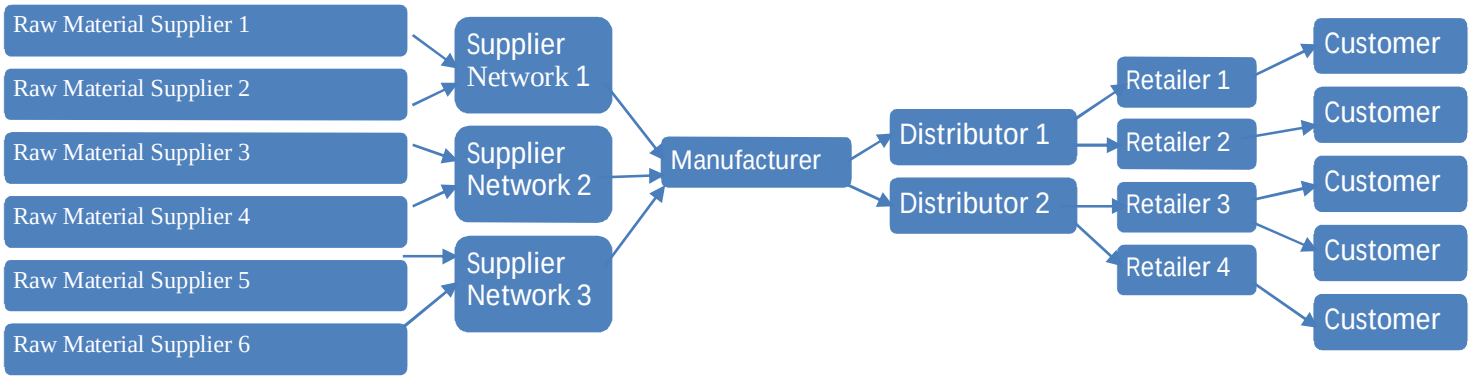

Fig 1. Flow of Supply Chain

III. NEED OF SUPPLY CHAIN MANAGEMENT

SCM is the need of the hour for various businesses and commercial organizations as it handles the supply chain activities that are involved in the production and the timely delivery of the product to the customer. Mentioned below are a few merits of Supply Chain Management (SCM):

A. Cost and Labor reduction

SCM fundamentally manages the inventory and the handling of expensive raw materials which result in cost reduction for handling and at the same time delivers materials to the manufacturing plant reducing labor and cost of production.

B. Enhancing Customer Services

Supply Chain Management emphasizes on customer satisfaction by establishing a quality standard on the products and cost price while ensuring on time delivery. Not only this, but SCM also looks for the after sales service in case of a defective product and ensures prompt solution.

C. Boost Profit Leverage

Since SCM scrutinizes each process for errors and rectifies them making them more efficient, resourceful and cost optimized for the long term, it also makes room for a company or a business to increase their profit and generate more revenue while inculcating minimum production costs.[3]

IV. TECHNOLOGY AND SCM

With an increasing progress in technological advancements, as well as the variations and growth in customer expectations, the need for a unified data management System has become important. The main components of a supply chain which comprise of manufacturers, suppliers, retailers, shippers, distributors and customers are primary sources of database which govern the functioning of the Supply Chain. For companies to build concrete customer bases, digitalisation of business processes has become more of a necessity than just a fad. This has exponentially increased the need for creating a digital platform that coherently integrates the activities carried out by various structures in the supply chain.

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With supply chain management becoming so evolved, many softwares have been developed to enhance supply chain performance. Software products take control over the whole process from supplying information for planning to making the delivery process flawless.

Use of Information Technology and Data Analysis in Supply Chain helps a company to check the validity of their plan, determine the possible risks and foresee the future. Not only does it improve the visibility and accountability of a firm, but it also helps in optimising production, maintaining inventory and effective tracking of orders and deliveries while allowing collaboration between supply chain partners and achieving financial goals. Several Software products have been developed to improve the efficacy of Supply Chain Management. Some of the routinely used Technologies are discussed below:

A. Artificial Intelligence

The introduction of Artificial Intelligence in Supply Chain Management has revolutionised the supply chain process. Since AI is intelligence showcased by machines, the need of human involvement to predict future, analyze current situations, make certain decisions, reinvent business models and ecosystems and enhance customer experience has been more or less eliminated. Currently, Artificial Intelligence is being used in Supply Chain Management in two ways: Automating actions and processes, and assisting humans in day-to-day decision making.

B. Machine Learning

Machine Learning, as the name suggests, is making the machine learn to perform certain tasks or understand algorithms. This technology allows a software to teach itself allowing it to smoothly function. In Supply Chain, Machine Learning uses complex data to analyze trends, detect patterns and provide insights on future to amplify the supply chain management process. Machine learning intimately relates to the supply chain as it plays a major role in optimizing the speed of supply chain, forecast likely demands from customers, plan the movement of goods based on demand, manage suppliers, documentation and ensures quality from suppliers, products and assets.

C. Internet of Things (IoT)

The Internet of Things is a cluster of interconnected physical devices that can exchange, send and monitor data, connected through a wireless network. The main objectives of IoT in Supply Chain management are: Monitoring and Tracking. It majorly revolves around warehouse activities like keeping track of cargo, transportation and inventory. Apart from tracking and monitoring, IoT in Supply Chain helps in improving transparency among separate units of Supply Chain by communicating effectively.

D. ERP

To boost productivity, create more cost effective methods and enhance product quality, developing a software to govern Supply Chain becomes all the more important. Enterprise Resource Planning, abbreviated as ERP, is a unified software system that is developed to integrate all the important functionalities required by a firm.

It consists of several software components (modules) which look after distinct departments such as accounting and finance, production, materials management, resource management and customer relationships. It streamlines the process and selects the most effective path for a product/service to go from suppliers to customers. Therefore, by incorporating ERP, firms can avoid supply chain disruptions. [4]

V. DATA ANALYTICS IN SCM

Analytics deals with the ability to make decisions based on a set of data, usually utilising graphical visualization that is relevant and from a trusted source. Supply chains generate massive amounts of data from the humungous circuit of all the connected devices such as mobile devices, RFID readers, trucks, sensor networks and webcams. This data is futile without analytics which helps to make sense out of all this data by analyzing patterns, creating strategies, improving performance and productivity, making decisions on operational level, generating insights and developing cost-effective methods. [5]

A. Supply Chain Metrics/ Supply Chain Performance Measure

Supply chain metrics are certain mathematical parameters that help in calculating the quantitative productivity of a supply chain while addressing certain other parameters with a logical approach that help us in determining the efficiency of a supply chain. Some widely used metrics are:

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1) *Cycle Time:* A term which is often known as Lead Time, and is defined as the time difference between two consecutive business activities. It gives an insight about the promptness of the service of a business. A few types of Cycle Time are:

a) *Order-to-delivery Lead Time:* This is the time of delay that accounts for the time since the placement of an order by a customer to the delivery of the product to the customer. In case the product is out of stock and needs to be manufactured, it is a cumulative sum of all amount of time taken from the sourcing of raw material, production time, distribution time to the delivery time.

b) *Supply Chain Lead Time:* Supply chain lead time can be explained as the time taken by a supply chain to transform raw materials to a finished product along with the time required to deliver the product to the customer.

c) *Cash-to-Cash Cycle Time:* This can be explained as the duration between the payment done for a raw material required for a product to the actual payment of the product by the customer. Usually, it is estimated over a duration such as a week, month, etc. Since, cash is tied up in this, it is advised to have a fast cash-to-cash chain.

2) *Perfect Order Measurement:* Perfect order measurement is one of the most critical metrics as it determines the success ratio of the ability to deliver orders incident-free .i.e. without damages, delays, etc. A high POM can help in eradicating any issues that may cause a loss in revenue or inventory. The POM is supposed to be as high as possible for reaching the maximum level of customer satisfaction.

3) *On Time Shipping Rate:* As a measure of customer satisfaction which is important for a business to stay afloat, the on time shipping rate is calculated by exacting the number of orders that were delivered before or on the shipping date. Delivery of products on time is an important factor that drives the customer preference to a product of a company. [6]

VI. CHALLENGES FACED BY A SUPPLY CHAIN DURING/AFTER A PANDEMIC

With every passing day, the effects of pandemic are being reflected in our daily lives more severely. It has disturbed the supply chain to a great extend. Some of the possible challenges that companies are facing or will be facing in the future are discussed below.

A. Product and Demand Gap

Considering the current situation, developed countries such as China, USA are struggling to fight COVID-19. At a time like this, a country such as China, who contributes almost 20% to the world GDP is in crosshairs. China is almost a major part in numerous supply chains either as a manufacturer or a consumer, however that is now in consideration and the situation might be reversed soon.

Owing to the current demand of essential commodities in countries like India and USA which enjoy strong trade ties with China, a lack of production and supply has resulted in the failure to meet the demand. Analyzing the current scenario, this has led to a major production-demand gap which is proving to be fatal for the countries suffering from this and can lead to catastrophic destruction.

B. The Disturbance in Logistics

Manufacturing isn't what it used to be decades ago. Owing to globalization and the establishment of trade laws, manufacturing has changed exponentially. Unlike earlier times, when raw materials and sub parts required for the manufacturing of a product were fetched locally, it now requires raw materials and sub parts to be imported from various parts of the world resulting in cost cutting while making the process more complex than ever. Behind this complex manufacturing process there has been the backbone of the supply chain- Logistics.

Now that driving countries such as China, Korea and Britain are experiencing citywide shutdown, logistics is suffering. Owing to the lack of raw materials and parts due to restriction on import-export in various countries, the disturbance in the logistics department has disrupted many supply chains.

C. The Disruption in Inventory

The world is slowed down; there are restrictions and lockdowns imposed on a global scale, which are affecting millions. At a time like this, there has been a shift in demand from 'wants' to 'needs'. Inventory is the concern of businesses as it subsumes capital and cash flow. Owing to the measures taken in fighting the virus, inventory of essential products are desolate justifying the rapid consumption by people, however the demand of a few 'luxuries' has fallen to zero, leaving their inventory replete. Manufacturers and distributors of products which are 'non-essential' are facing enormous inventory backlogs and plummeting sales.

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D. Issues faced by the Assembly Line

With the problems discussed above, it comes as no surprise that the assembly/production line is in disarray and is undergoing challenges. For the production of any product 'essential' or 'non-essential' there has to be enough personnel's to operate the intricate machinery.

Amidst the lockdown, the movement of goods and humans has been restricted such that there aren't enough helping hands in the factory to initiate the production line and keep it running. The distributors and the retailers are running out of stock for 'essential goods' since there is no production. Additionally, the sourcing which precedes the assembly line and the logistics which follows the assembly line, are both a dead end, meaning even if assembly line was getting the work done, the product would have still been at a standstill.

E. Difference of sale of Essential and Non-Essential Goods

The goods available in the market can be broadly classified into – Essential and non-Essential. Essential goods are those goods that fulfill our daily needs.

Cooking Oil, Milk, Rice, Lentils, Sugar etc. are Essential Goods. Contrarily, Items that are not needed on the daily basis make up for the non-essential goods.

These include Fancy food products, toys, bags etc. Due to the ongoing Pandemic, the current situation in many countries demands only the sale of essential goods, which has exponentially increased its sale as people have been stocking up these necessary products out of fear.

However, the non-essential products continue to be in loss. One way to counter this difference in sale of essential and non-essential goods is to modify the production of non-essential goods by prioritizing the goods required according to the situation and producing those beforehand. This will help the sale come back in play once the situation has come under control.

F. Resource Management

The COVID-19 pandemic has had a huge impact on business across several industries in a short span of time, including the cold storage supply chain. According to a latest research by CBRE (US), frozen food sales increased 4.6% during the period of mid-feb to mid-march. Many Local Sources claim that recently customers haven't bought any perishables from them instead they prefer ordering online, which wasn't the case before the pandemic hit. Frozen food and Beverages have been in higher demand than normal because of COVID-19.

This situation might prevail for months once the pandemic will be over and hence, this will generate a need for more cold storage space, as people will be reluctant to buy goods from local markets. In all, the pandemic will accelerate the need for space, resulting in impacts on the cold storage Industry. E-Commerce Grocery will become widely adapted which will in turn increase demand for cold storage. Restaurants will have more take-away customers than Dine-in, which will eventually require more cold storage capacity.

The outbreak of COVID-19 has affected almost all the aspects of the society including political, social and religious. World's strongest economies such as US and China are at the verge of falling. Apart from this, Stock Markets globally have crashed and oil prices have dipped.

Rates of unemployment in developed countries have been higher than ever. Therefore, the impact of the pandemic is severe on the economic structure of the world as people are not willing to spend money and therefore companies are running out of business and shutting down shops. Airlines are operating at an extremely low capacity and hotel chains have been temporarily shut due to the absence of customers.

G. Customer Satisfaction

People are trying to acclimatize to the idea of staying indoors and this has drastically changed their approach to purchasing goods. Consumers are stocking essential commodities while keeping themselves socially distant. People are preferring online platforms over the local market. Customers feel safe by engaging in e-commerce activities. The COVID-19 pandemic is forcing businesses to maintain their customer relationships even in times of distress and hardships. However, the bigger problem is getting used to the customers whose priorities and preferences have been altered by the Pandemic. Though it is true that several changes that have taken place such as change in rate of products, higher delivery time, degraded quality etc. have had an effect on the experience of the customers, It is best to be patient in times like these. [7]

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VII. COMPARATIVE CASE STUDY OF DISRUPTION IN THE SUPPLY CHAIN OF PERISHABLE AND NON-PERISHABLE GOODS DURING COVID-19

In terms of consumption, a perishable good is a product which has a short shelf life. It is one such product which deteriorates due to environmental conditions such as exposure to sunlight, moisture, etc. The period of shelf life makes the inventory convoluted as they must be processed, shipped and sold before they deteriorate in quality or quantity.

Non-perishable goods on the other hand are products with long shelf life. They may be kept exposed to moisture or room temperature and might not require refrigeration. Owing to the fact that they have a long shelf life, consumers often buy them in advance and store them for a long time during everyday course or in case of an emergency. Since they don't spoil, managing inventory and maintaining a supply is easy.

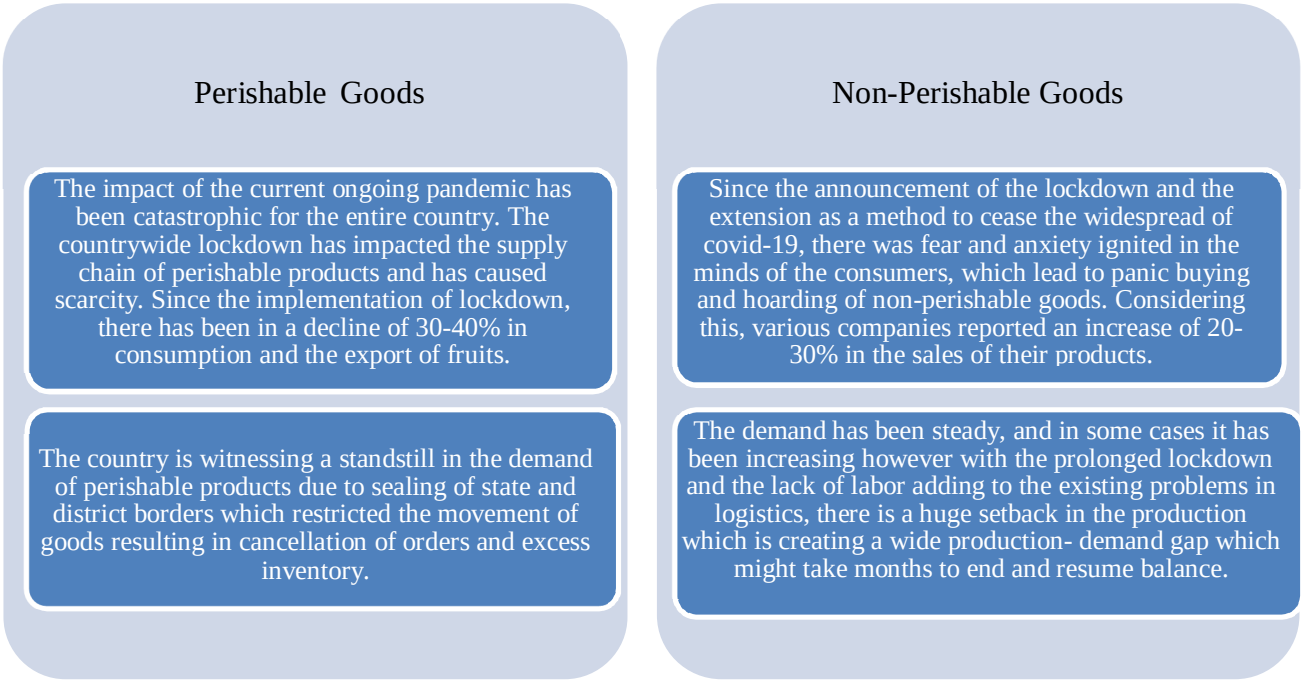

Fig. 2 Effect of Pandemic on perishable and non-perishable goods

The traditional supply chain, which ensures the production and the distribution of a product, is rendered insignificant due to the current situation and the restrictions imposed by the government and worldwide, there is a scarcity of essential goods. According to the Institute for Supply Chain Management, 75% of the companies have reported a disruption in their supply chains. Accounting the disruption, there has been a wide gap between the production and demand of essential and non-essential products, which has caused panic among citizens and famine in certain areas.

The following section discusses a case study which considers supply chains of two products- milk (perishable) and coffee (non-perishable).

A. Brief Introduction Of Traditional Supply Chain Of Amul Milk

Due to the growing awareness and concern for hygiene, demand for packaged milk is not only limited to metros and cities, but also comes from districts and small towns. Amul, based in Gujarat (India) is a dairy cooperative that connects 3.6 million milk producers in India to 135 crore Indians. Amul not only makes profits from its simple supply chain but also thrives to redistribute wealth in the weaker sections of India. The Supply Chain of Amul, as shown below, is made up of farmers, who produce milk from their cattle. The farmers form cooperatives called Village Cooperative Societies (VCS), which supply milk to dairy cooperatives, called Unions, of which Amul is one. These unions supply their products to the Gujarat Cooperative Milk Marketing Federation (GCMMF) which is the marketing entity for milk or milk products for the state of Gujarat. GCMMF serves over 500,000 retailers. The End-Consumers are reached via this effective network, which makes up the cohesive working of India's largest dairy cooperative. The success of Amul can be accredited to the quality of products, pricing and their ultimate goal of benefiting farmers through the intensive supply chain. [8]

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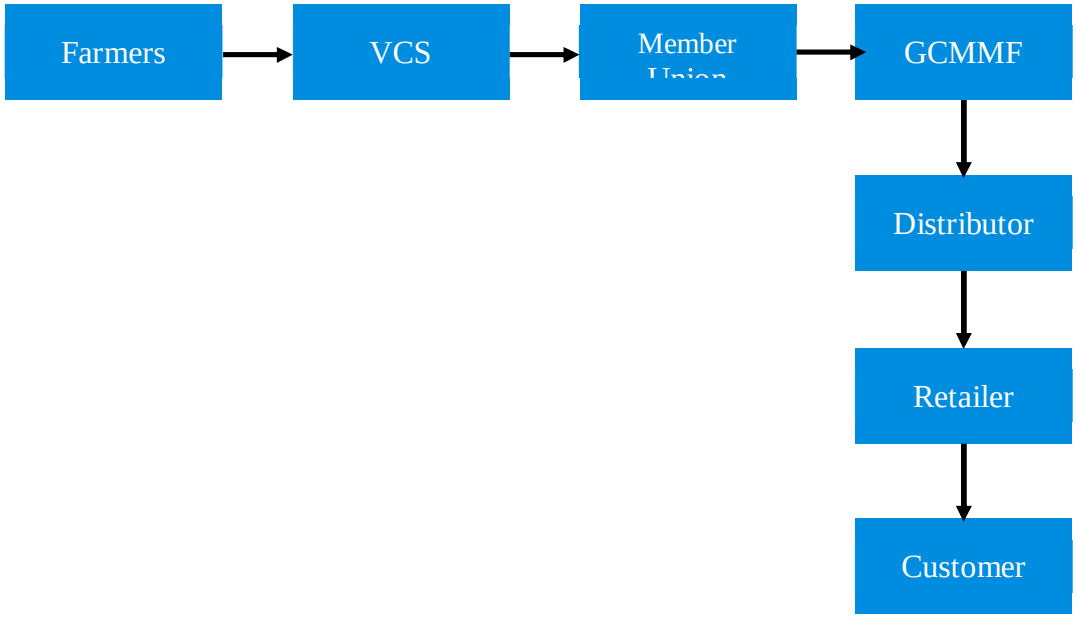

Fig 3. Supply Chain of Amul

1) *Challenges faced by the traditional supply chain of Milk during the pandemic:* The impact of COVID-19 has been disastrous. With the current scenario of this pandemic in our country, the govt. was forced to impose a lockdown. Though the implementation of this lockdown has been proved successful to a certain level, the economy is experiencing a huge dip and the repercussions may be fatal. In the current scenario, with the lockdown, restriction in movement and the sealing of state borders, various supply chains have been shaken to their core. Though the demand of Amul Milk is still constant, the supply chain has been affected such that it is facing glitches. Some challenges faced by the supply chain of Amul are discussed below:

a) Amidst the lockdown, certain areas that come under red zone have stringent laws with no exemption, which restricts the movement of workers from their farms to the factories. Though, sufficient safety measures are taken to ensure safe and hygienic milk procurement, the restrictions are making it difficult for the farmers to reach the factory causing labor shortage.

b) The current methods employed to stop the spread of this pandemic has rendered various supply chains a failure causing certain industries of different sectors to stop their production and supply. These industries include agriculture sector producing rice, bran, corn etc. With the supply to corn, rice, bran ceased, farmers are finding it tough to feed the cattle to ensure the continuous production of milk. With a shortage of cattle feed, milk production might be disturbed.

c) Amul still relies on the versatile road network of our country and hence depends on trucks and heavy vehicles for deliveries and logistics. While delivering the milk, the check posts don't seem as a hurdle however, while the empty trucks are on their way back to the factory, the check posts conducts a certain procedure which causes delays of days for the trucks to reach the factory, ultimately causing logistics issues.

d) Amul Milk has one of the finest packaging that ensures the delivery of the product to be hassle free while maintaining the quality. Nonetheless, this has emerged to be an issue for Amul. There has been a shortage of packaging material since it is provided on per-day basis. The limitation is causing problems which may result in the decline of production of essential/ non-essential packaged goods as the production of packaging supplies may take a hit. [9]

2) *Statistics for Amul Milk before and after Pandemic:* The Gujarat Co-operative Milk Marketing Federation is an association that encompasses 18 District Co-operative Milk Producers' Union. They market their dairy products under the name "Amul". In the financial year of 2019, GCMMF produced nearly 221.25 LLPD. However, even amidst the lockdown, Amul went all guns blazing and ensured sufficient production with a staggering production of 255-260 LLPD which is 15% more than their production in 2019. In contrast to this, the demand saw a steep decline. GCMMF or Amul sold 140 LLPD in Gujarat before the lockdown, precisely in March, however after the decline the sales dropped to 125 LLPD. According to their recent data study, this is the first time in decades that they have witnessed a dip in sales of 10-12% within a month. Amul ensured that there is no need to hoard milk products or panic, as there will be abundant supply of milk. [10]

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B. Brief Introduction Of Traditional Supply Chain Of Nestlé Nescafe

Coffee is one of the most widely consumed product in the world. Many food chains solely revolve around selling coffee. Coffee, which contains caffeine, not only acts as an energy booster but also of helps cure physiological problems such as depression, dullness, suicidal thoughts etc. Nestlé, one on the leading brands in health, nutrition and wellness, is one of the highest producers of coffee in the country. It caters a huge population of people with several varieties of coffee. The Supply Chain of Nescafe is depicted by diagram shown below. Farmers produce coffee in their fields and give it to agents who buy coffee. Nescafe then contacts one of their agents and takes the coffee beans to their factories for refinement. This process of refinement includes drying and packing, bulking, blending and roasting. The Supply Chain of Nestlé uses two channels to distribute Nescafe to the consumers. In one structure, the product goes to the distribution centers (DC) from the factories. From the DC, The coffee goes to the Distributers who in turn provide it to wholesalers. From here, the product moves to the retailers. The Customers can buy coffee from the retailers as and when required. However, According to another structure that Nestlé follows, Coffee moves directly to retailers from the distribution centers. And from the retailers, it is sold to the customers.

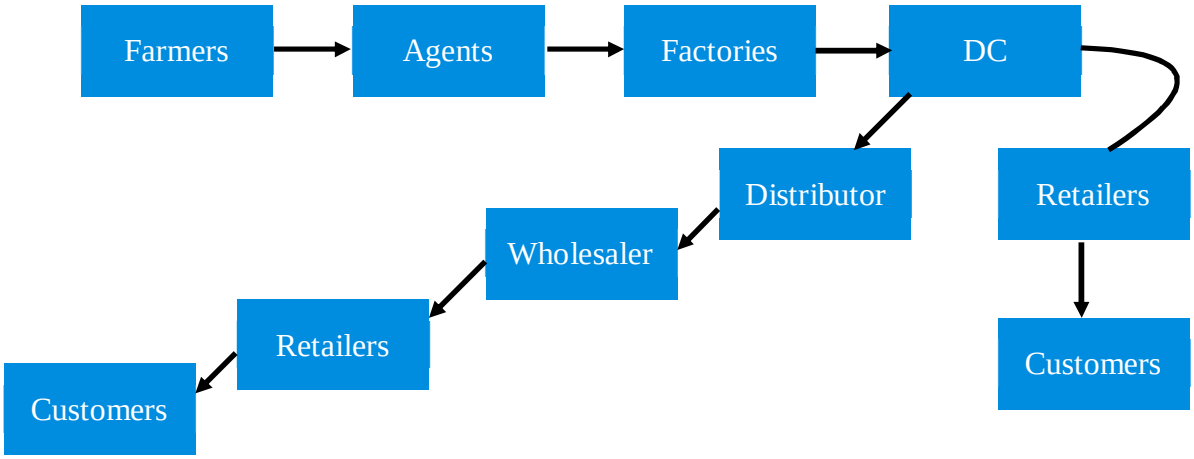

Fig 4. Supply Chain of Nescafe

1) *Challenges faced by Coffee Supply Chain during Pandemic:* With the number of COVID-19 Positive cases increasing worldwide, many countries have been locked down with several businesses being shut. This has greatly affected the global economy and induced fear in minds of people. The Coffee Supply Chain has also been hit due to the COVID-19 outbreak. Various challenges have been discussed below which are being dealt with in the supply chain of Nescafe, Nestlé.

a) Due to the lockdown and strict laws, there is a scarcity of labourers. Since the number of labourers is less, the plantations are unable to produce enough coffee beans resulting in lower efficiency and production.

b) Sale of coffee locally has been disrupted as statistics depict lack of buying of coffee in certain regions of India and panic buying in other regions of the country. Panic buying and Hoarding can cause a huge havoc in the supply chain of any product. Since the sales have been disrupted, the distribution of coffee will need proper planning to maintain the consistency of sales.

c) As several people are losing their jobs or experiencing a dip in their incomes, it could translate into lower demand for coffee in terms of volume and quality.

d) One of the top export destinations for coffee produced by Nestlé is Italy. Since Italy has been under lockdown, all trade is at standstill. Therefore, the export to Italy has been significantly affected and losses have been encountered.

e) The limited availability of shipping agencies and lack of containers has posed a major problem. This has halted transportation.

2) *Statistics of Nestlé Nescafe before and after Pandemic:* Nestlé's relationship with India predates to 1912 and ever since then, Nestlé's contribution to India's coffee Industry has been pretty significant. Nestlé sells its coffee under the name Nescafe. In 2019, Nestlé reported a 33% rise in net profit at Rs.493 cr. Total sales of the company grew by 7.45% while domestic sales grew by 10.05%. The Company's revenue rose 9% to Rs.2,982 crore in the year 2019. However, due to the prevailing lockdown in the country, production has come to a halt. Operations in some of the locations have scaled down or have been suspended temporarily. This has affected its sales in several regions. Moreover, statistics suggest that sales in some regions have boosted as people have stocked and hoarded Nestlé Products.

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C. Inference

Table 1. Effects of COVID-19 on perishable and non-perishable supply chain

Parameters	Amul Milk Supply Chain	Nescafe Supply Chain
Raw Material Sourcing	Raw material sourcing is a problem as food for cattle is not able to reach the farms.	Due to the unavailability of labourers in the farms, coffee beans are not being produced sufficiently.
Production	Production has increased.	No change in production.
Demand	Demand for packaged milk has increased as people do not want to take risks regarding hygiene.	Demand has been constant as coffee has a good shelf life and people have hoarded essential commodities.
Prices	No change in prices.	No change in prices.
Logistics	Logistics is not a problem as milk in an essential commodity.	Logistics is a problem as state borders are sealed due to which coffee from Kerala cannot reach the Nestlé factory.
Customer Preference	Number of customers will increase as people will prefer branded packaged milk over local milk.	Number of customers will not change as coffee is a non-perishable product, most of the households have enough of it already stacked.

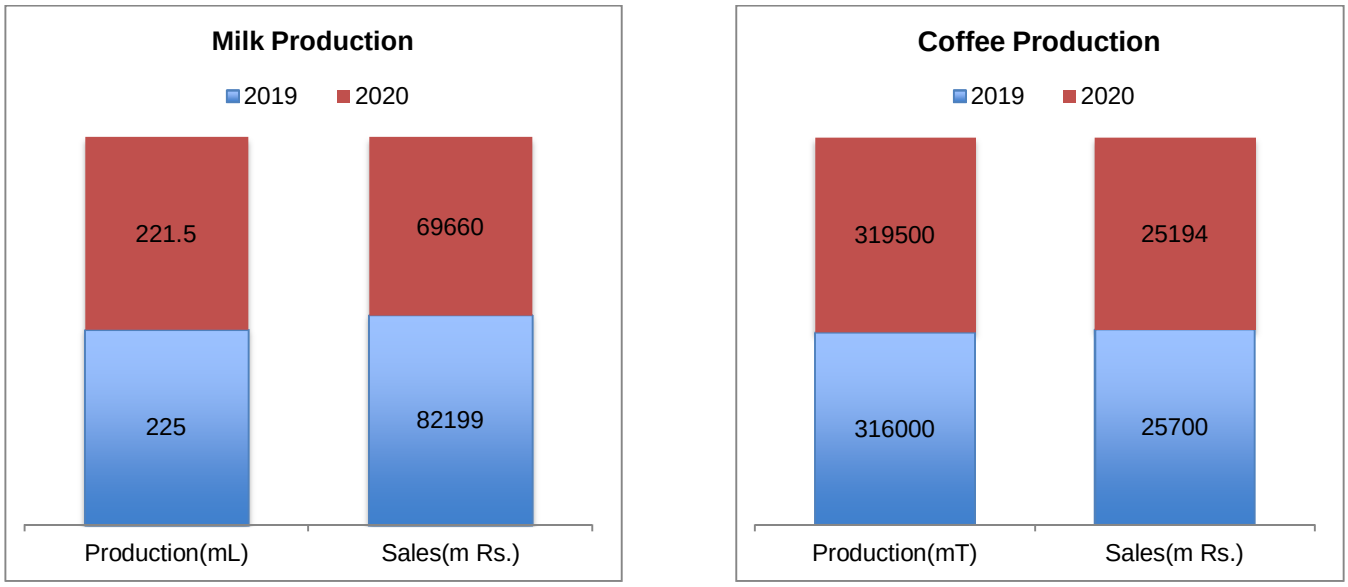

Fig 5. Production and Sales graph for Milk and Coffee

VIII. SUGGESTIVE SOLUTIONS TO NORMALIZE THE SUPPLY CHAIN DURING/AFTER THE PANDEMIC

A. Government Collaborations With E-Commerce Giants

According to the recent developments in lockdown policy, Indian government has allowed certain e-commerce giants to deliver essential products and in some areas deliver non-essential products too. According to a report by Amazon India in 2019, Amazon India strengthened the logistics network with 1400 delivery stations across the country. Additionally, it has 23,000 retail outlets that have the capacity to produce last minute deliveries. Collaboration between the e-commerce giants and the delivery services of India under a neutral point can help fight this problem. Customers can go on to the e-commerce sites like Amazon, Flipkart, Myntra, etc. which are allowed to operate during this time. Once the orders are placed, e-commerce sites can contact the permitted delivery services such as DTDC, FedEx, etc. for the delivery. This collaboration can deliver essential items such as wheat, milk, rice etc. in areas hit by famine or the zones where people are facing a shortage. DTDC has 19 major regional centers which connect all parts of India including small towns, villages etc. [11]

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B. Production of Essential Items while Halting the Production of Certain Non-Essential Items

The production method of essential items includes sourcing of raw material, refining/filtering, packaging and then shipping. While most essential such as rice, wheat, sugar, milk are procured certain industries which package and ship non-essential goods can use their facilities to help with the production of essential goods to help beat the scarcity of essential goods. For example, Amul has different variants for their milk which are sold as flavored milk. However, at a time like this, Amul can halt/ downscale the production of flavored milk and push the production of milk which is needed in certain parts of the country.

C. Improving Road Network Logistics during the Pandemic/after the Pandemic

According to the All India Motor Transport Congress(AIMTC), the supply chain of essential goods has been affected as only 15% of trucks are allowed to cover distances amidst the lockdown. AIMTC has approximately 1.25 million trucks with a national permit, but during this lockdown, only 200,000 to 250,000 trucks are allowed to make the delivery of essential goods. There has been a lack of labor and shortage of personnel for loading and unloading essential goods. Technology can drastically improve the current situation. Databases of the laborers and drivers employed combined with the specifications of each truck can be circulated across all the state borders which can help in the hassle free yet safe movement ensuring timely delivery of essential goods while providing an efficient method. AIMTC has the existing database of workers and trucks and can analyze the data to find the trucks most essential for covering long distances in rough terrains and at the same time can analyze the details of the drivers, laborers and workers to find the nearest workers and the most suitable according to their work profile. This data can be circulated ensuring distancing and safety of workers while continuing the delivery of essential goods.

D. Connectivity based on data-base

While the government has a maintained database of the general store/ grocery store, and has allowed grocery stores of certain neighborhood to open, a platform crosslinking the data base of the grocery stores opened in a particular area with the data base of the residents of that area in need of essential supplies ensuring the distribution of essential and non-essential goods for a particular group of residents in that area maintaining distancing and safety. Government and agencies can send the respective supplies to the local stores and can allocate a certain number of residents to that shop assuring ample supply.

IX. CONCLUSION

The paper has tackled a major issue, which will be encountered by businesses and corporations once the pandemic is over. Several challenges are thoroughly discussed, giving a heads-up to companies who are facing disruptions in their current supply chain. Administrators are using data-driven mechanisms to come up with solution to make amends the supply chain. Data Analytics is acting as a catalyst in this process by accelerating the decision-making based on humongous amounts of data on altered trends and expectations in consumer behavior. The solutions provided by Data Analytics are backed by Artificial Intelligence and Machine Learning Algorithms that offer insights to the problems posed by the novel coronavirus. Probable solutions have been discussed in the paper which can help overcome the discrepancies in the supply chain. Not only the solutions need to be implemented in the corporate world, locals can too take measures to combat the virus. Wearing face masks and gloves can reduce the chance of catching the virus, people need to carry hand sanitizer which will keep their hands clean, restaurants can adopt social distancing seating and can use covered containers for food etc.

The argument on whether the effect of the prevailing pandemic on the economy will be beneficial or detrimental remains moot. However, the timeline of the COVID-19 outbreak is completely uncertain, manufacturers, distributors and retailers must be prepared for changes in current approach of working, with an increased focus on alternative sources of procurement and inventory management.

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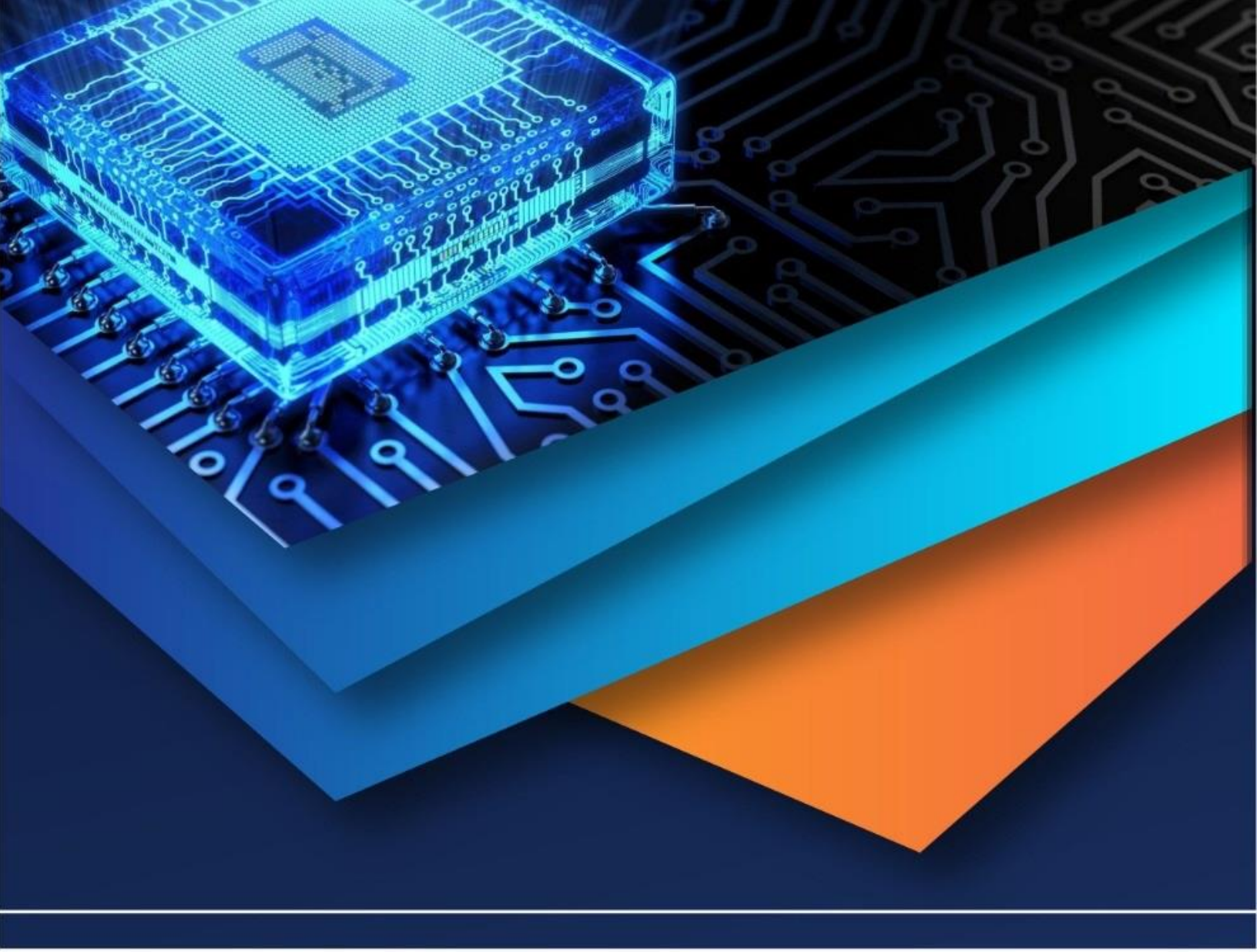

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