AN EMPIRICAL STUDY ON INFLUENCE OF COVID19 ON SUPPLY CHAINS OF INDIAN INDUSTRY

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ABSTRACT
This study and research are an endeavour to present and understand the impact of the COVID19 pandemic on the Supply Chain Management of Indian industry. The supply chain of the industry is the backbone of its efficiency, effectiveness, productivity, service-commitment and the cost management. The whole industry thrives on the connectivity of the supply chain and inter-woven effect. It creates an ecosystem of hierarchy of suppliers, their business models, their integration into servicing the consumer and in the bargain serving the society through generation of employment and setting self-propelling motion in the economic cycle. The pandemic of COVID 19, not only brought to halt the whole economic activity in the country but it also exposed the industry to the vagaries of such inter-woven supply chains. Industry had built this supply chain with unidirectional focus on the benefits such integration can generate. The pandemic exposed the hidden face of the havoc such integration could have on the industry, especially so when the lockdowns extended for longer periods and the re-start hasn't been as homogenous across geographies, as the lockdown was. This paper showcases the effects of a pandemic of this magnitude on the supply chains, the potential mitigation strategies, the model of resilient digitally connected supply networks of the future and precipitates a discourse on why the industry should rethink and challenge its best practices in the light of disruption COVID19 has created. **Keywords**: Supply chain management, manufacturing, operations, productivity, efficiency, COVID19, resilience, vulnerability, disruption.

Introduction:
COVID19 has struck the world like a bolt-from-blue. A pandemic, which swept across the globe in no time and decimated the bold & mighty nations equally as the weak & timid, is unparalleled in modern history. The pace of the sweep has been so magnificent that nobody could even react or prepare for it. The economies of the world, with the unique exception of China, have come to a stand-still.

The coronavirus (much before it was declared pandemic) heralded itself in January 2020 (at least officially), when during the Spring festival holidays in China, the province of Hubei reported the news of spread of a dangerous virus, which engulfed the local population like wildfire. The epicentre of this spread was the municipal limits of Wuhan. The first containment action from the Chinese government was extension of the Spring festival holidays by two weeks nationwide and gradually starting the economic activities from mid-February only, with exclusion of Hubei province in this restart. These three weeks created the first panic in the manufacturing world. China has been the world's factory for different types of raw materials, sub-components, components, assemblies, tools, equipment, machines. Just to draw a perspective to China's stakes in the modern world, in 2003 when SARS hit mainland China, it contributed only 3% of global GDP. As of today, China's share of global GDP is 17-20%, making it one of the main centres of the global economy. When the supply chain did not start after the usual one-week break of spring festival, the global supply chain started to feel starved and gradually suffocated.

Manufacturing industry from Mexico to Korea has been dependent on the China factory for over two decades now. But this was the first time that the pipeline had seen a major disruption. On March 11, 2020, the Institute for Supply Management (ISM) released the first results of its survey focused on the impact of COVID19 on the supply chains and the business. The results showed that overwhelming 75% of the companies reported some sort of supply chain disruptions due to the transport restrictions. Over 44% of respondents to the survey acknowledged that they had no plan-B in place for supply disruptions from China. Around 53% respondents reported facing difficulty in receiving supply chain information from China. Almost 16% organisations had already downgraded their revenue targets by 5.6% due to this virus impact.

However, this disruption was short, and restart was the good news. Hubei province was an important part of this supply chain but alternatives from the rest of China were not unknown. The industry sort of started to relax, thinking the worst was over. However, within a matter of next two to three weeks, the virus showed its ugly face in the other parts of the world, including Korea, Europe, US, Middle East, Australia, Rest-of-Asia. The spread was almost akin to forest fire fuelled by the high-speed winds and high temperatures. Governments, one after the other, started to lock down their nations and isolate themselves. This time the receiver side of the supply chain started to starve the supply side. But the impact was still the same, the supply chain of the manufacturing industry had been disrupted. The world acknowledged the power and existence of the virus by declaring it as pandemic. COVID19 brutally exposed the vulnerabilities of the global supply chain strategies followed by industry, which had been too focused on efficiency, low inventory buffers and minimization of costs as the key drivers of consolidation and leaner supply chains. This narrow focus had been devoid of any measures of de-risking the ultra-globalised supply chains, which now lay exposed with shortages precipitated due to this virus.

After almost eight to ten weeks of the isolation and stop of all economic activities, governments across the globe were forced to rethink. Depending on their capacities and the deterrents they could create in terms of the preventive measures and information campaigns, the governments began to realise that economic activity needed to restart, and their resistance began to give-away. For the manufacturing sector, in this step from governments, there was an optimism mixed with scepticism, optimism as the economy prepared to graduate to normalcy; scepticism as the challenges of re-establishing the supply chain occupied centre-stage in all the strategic discussions. Any chain is as strong as its weakest link, and supply chains are no exception. Manufacturing sector, as it prepared to restart, was worried about such weakest links in their supply chain. One of the key questions is what if the bullwhip effect strikes the industry? A lot of vigilance will be required as the industry moves forward, to ensure the right priorities are in place whilst filling the supply chains.

The COVID-19 pandemic is a Black Swan event and lessons need to be learnt from such events very quickly. The industry must recognize this factor and quickly manoeuvre to a new position, as it limps out of this economic shattering event. The first actions would be towards creating the resilient and in-vulnerable supply chains post this crisis. The directions which are evolving are leading businesses towards departure from linear supply chains towards digital supply networks, the connected world which provides end-to-end visibility of full supply chain, enabling greater agility, optimization, responsiveness and resilience through efficient risk management and effective anticipation of disruptions.

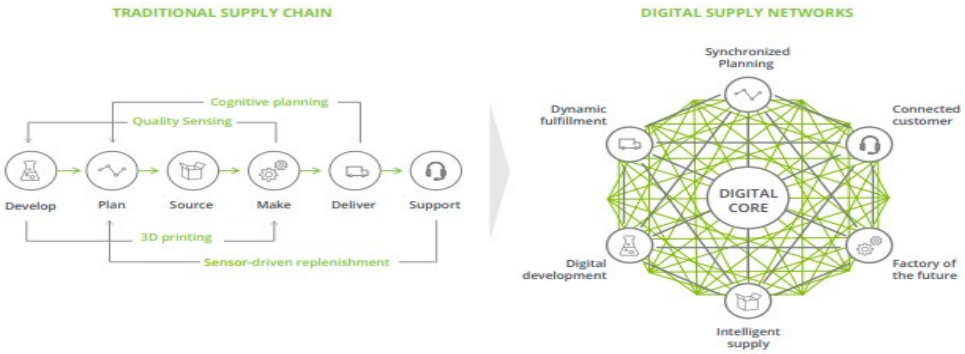


Figure 1: Traditional Supply Chain versus Digital Supply Networks (Courtesy: Deloitte) [5]

The obvious element of human vulnerability will be the key focus and interventions would be driven by reducing human dependency through the core digital technologies of Industry 4.0. Whatever be the recourse, the current situation will precipitate the acceleration of the digitization and technology-driven global digital transformation endeavours will gain priority investments to map the supply chains of tomorrow.

Conceptual framework:

Operations management in an industry is a multidisciplinary function, encompassing in its fold basic strategic planning, material planning, manufacturing and production systems, cost control and industrial labour relations. One of the most significant parts of the operations is Material and Production Planning**,** which draws heavily from the

Supply Chain Management.

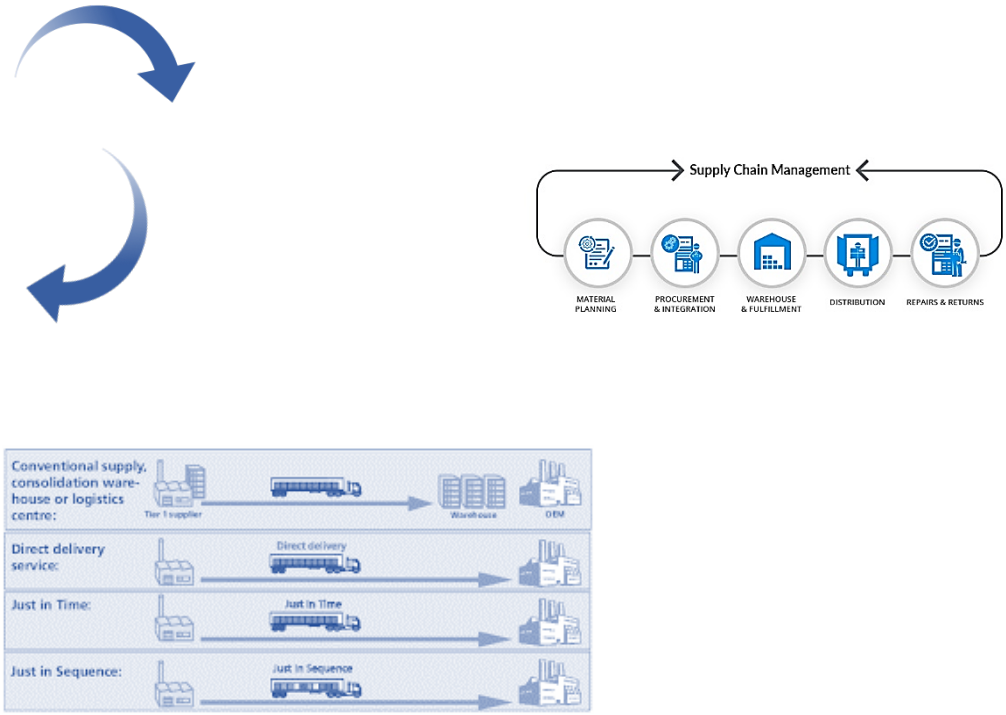


Figure 2: Correlation between Operations Management and Supply Chain Management

Supply Chain Management (SCM) is the management of the flow of goods and services and includes all processes that transform raw materials into final products. It involves the active streamlining of a business's supply-side activities to maximize customer value and gain a competitive advantage in the marketplace. SCM represents an effort by suppliers to develop and implement supply chains that are as efficient and economical as possible. Supply chains cover everything from production to product development to the information systems needed to direct these undertakings.

Typically, SCM attempts to centrally control or link the production, shipment, and distribution of a product. By managing the supply chain, companies can cut excess costs and deliver products to the consumer faster. This is done by keeping tighter control of internal inventories, internal production, distribution, sales, and the inventories of company vendors. SCM is based on the idea that nearly every product that comes to market results from the efforts of various organizations that make up a supply chain.

A **Supply Chain** is the connected network of individuals, organizations, resources, activities, and technologies involved in the manufacture and sale of a product or service. A supply chain starts with the delivery of raw materials from a supplier to a manufacturer and ends with the delivery of the finished product or service to the end consumer. Supply Chain is the complete end-to-end movement of the materials from source to the end-customer. It not only involves in-bound and out-bound logistics but also encompasses planning, scheduling, storage, supplier management, packaging, delivery, warehousing, and dealer management. Inventory is nothing, but the organization's money and resources locked into physical material, which is expected to generate the returns on investment. So, it is imperative for any organization to manage its supply chain and inventory very well, to lock in a minimum amount of money, without compromising on the operational efficiencies of the organization. As the Japanese guru and father of Toyota Production System, Taiichi Ohno said, the more inventory a company has, the less likely they will have what they need.

The level of flexibility that a company has directly reflects its ability to anticipate, adapt or react to changes in its environment of supply chain system. All supply chains in their endeavour to be lean and efficient, are designed on the basic assumption that globally there is a free-flow of materials and sourcing can be done from the lowest-cost locations around the world. This premise automatically builds in the elements of risks, vulnerabilities and resilience.

According to the International Organisation for Standardization (ISO), the risk would be defined as a "combination of the probability of an event and its consequences". **Risk** is thus the probability that an accidental phenomenon produces in a given point of the effects of a given potential gravity, during one given period. The International Federation of Red Cross and Red Crescent Societies states, **Vulnerability** in the context of a

disaster can be defined as the diminished capacity of an individual or group to anticipate, cope with, resist and recover from the impact of a natural or man-made hazard.[8] Psychology Today describes resilience as: "**Resilience** is that ineffable quality that allows some people to be knocked down by life and come back stronger than ever. Rather than letting failure overcome them and drain their resolve, they find a way to rise from the ashes." In a nutshell, resilience can be defined as the ability – and tendency – to "bounce back".

Aim and Objectives:
This paper aims to understand and surmise the influence and impact of the COVID19 pandemic on the Indian manufacturing industry. COVID19 is a Black Swan event which has traumatised the supply chains, this paper aims to provide some analysis of the extent of the influence it has had and answer the potential strategies which could evolve towards future shape of the supply chains. Additional aim of this study is to present an integrated document to provide a consolidated snapshot of vulnerability and resilience of supply chains.

The key objectives of this paper are:

1. To study the influence of COVID-19 on Supply Chains in the manufacturing Industry.
2. To identify the impact of COVID-19 on the Supply Chains in Indian Industry.
3. To summarise the potential strategies and guidelines for the future of supply chains to be resilient.

Research Design and Methodology:
To realise the aims and achieve the objectives of this study, a controlled research approach is proposed to explore the actual impact of COVID-19 on the industry in India. The existing literature, industry reports, consulting reports, articles and published papers serve as an additional guide to understand the influence of COVID-19.

A research questionnaire was administered to the controlled group of respondents, randomly drawn from industry and their response was sought on the impact and future course of their organization w.r.t Supply Chains. The responses were analysed and interpreted to drive towards logical conclusions.

Literature Review:
There are some research papers in the literature about the topic. Agrawal, Jamwal & Gupta (2020) have studied the effect of Covid-19 on the Indian economy and on supply chains in India. They have listed 18 critical barriers which affected the supply chains in India.

Ron & Wright (2008) state that "Supply Chains vary significantly in complexity and size but the fundamental principles apply to all the operations whether they be large or small, manufacturing or service, private or public sector. Supply Chain Management is not just for large big-name businesses such as Dell Computers, Wal-Mart, and Toyota Motors. It is for all businesses and for all operations."

Boyd, (March, 2020) in this survey it was found that 75 percent of companies are facing supply chain disruptions in some capacity due to the restrictions of transportation due to coronavirus and more than 80 percent of the respondents believe that their organization is going to experience some or other impact because of disruptions of COVID-19. Results also revealed that one in six (16%) companies report adjusting revenue targets downward an average of 5.6 percent because of coronavirus.

Elleuch, Dafaoui ,Elmhamedi & Chabchoub (2016) reviewed on vulnerability management and resilience in this context. Result shows that the optimization model and simultaneous methods could be used for dealing with recoverability of disrupted supply chains.

Kilpatrick & Barter (April 2020) studied that from long years emphasis on supply chain optimization was to reduce costs, inventories reduction moreover utilization of assets that has removed inventory buffers and also flexibility to absorb Supply chain disruptions and results reflected that COVID-19, companies are not fully aware of the vulnerability of their supply chain relationships to global shocks.

Michelman & Paul (2007) found that given the global nature of supply chains, their length, unpredictable business conditions, and shortened product cycles; they remain under threats due to natural disasters, accidents, terrorist acts, epidemics and intentional disruptions. Only those organizations which possess the critical trait of resilience, would be able to survive such situations. A resilient supply chain can be built with elements of redundancy, flexibility, and strong corporate culture.

Mukhtyar & Bhargava, (April 2020) found that the Chinese OEMs: The average resuming capacity utilization rate is around 70%, and it is estimated that production in China will resume from April. Findings show that OEMs in China remain very optimistic for the future and will maintain the planned schedule, going forward.

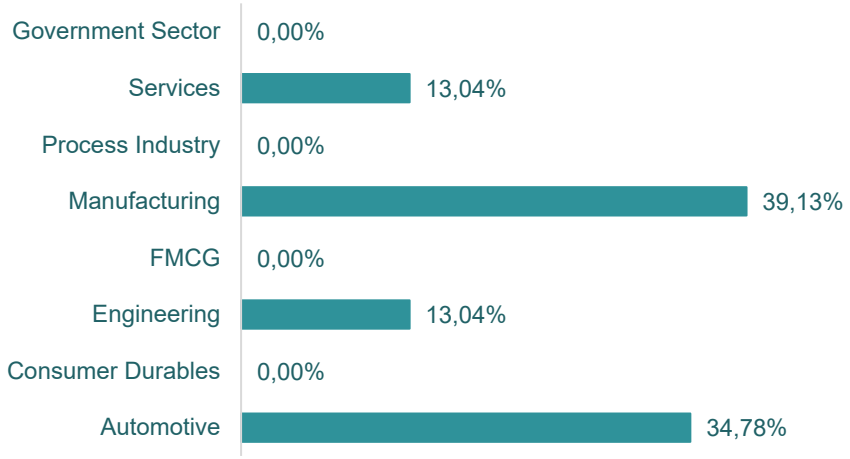
Rudzki, Douglas, Michael & Shelley (2006) say that Straight to the Bottom Line: An Executive's Roadmap to World Class Supply Management, suggest that "If you still think of your process as purchasing, you are living in the 1960s. Competition today is no longer company to company, but rather supply chain to supply chain…….The company that does the best job of integrating its supply network – in terms of objectives, strategies, processes and data linkages – creates optimal competitive advantage for entire supply chain and optimal value for its shareholders and customers."

Schwichtenberg & Achim (2020) say that Director of Operations Consulting at KPMG, Switzerland, in his report titled 4 Steps towards supply chain resilience in context of COVID-19 recommends that key factors are achieving full transparency across supply chain, assessing realistic customer demand, and taking longer term view of resilience.

Weigel (2010) says that Supply Chain Resilience Management: Is the Japanese Automotive Supply Chain resilient enough? which is a case study of Riken Corp. in Japan, highlights how even a small portion of the supply chain can be very critical. Riken Corp. was a supplier of small engine components viz. piston rings, etc. In 2007 when an earthquake decimated the plant of Riken Corp, it caused a chain reaction of plant closures of eight major Japanese car manufacturers and paralysed nearly 70% percent of the world's biggest production industry. Author argues that it is not only important to have an efficient and effective supply chain, but it also needs to have capability of event readiness, which is the active resilience preparation for a supply chain disruption.

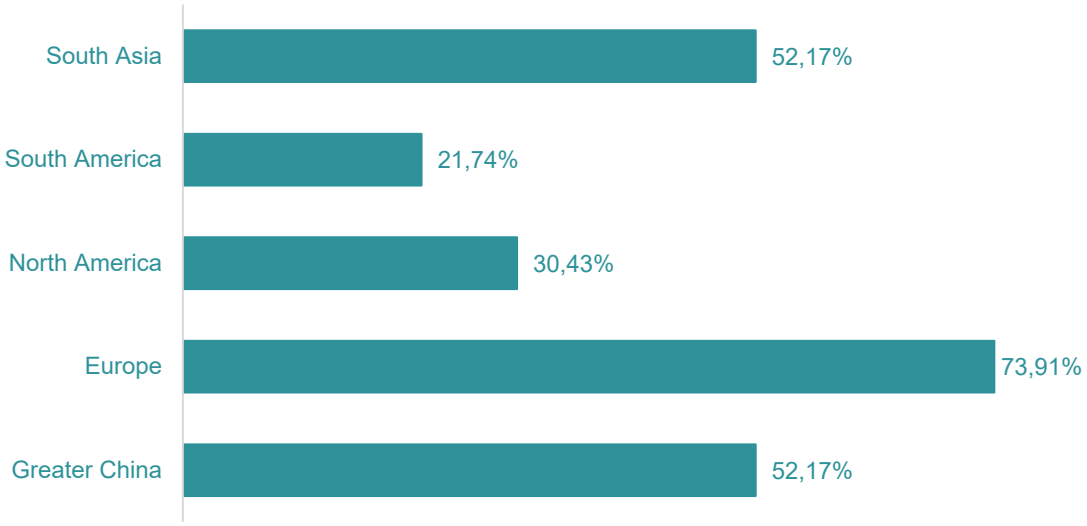
Findings | Influence of COVID19 on Supply Chains:

The research was conducted with random respondents of a controlled group of people working in the industry. The respondents represented 8 different locations in India, with respondents being from the Manufacturing sector, automotive sector, Engineering sector and Services sector. Key results are reported here:



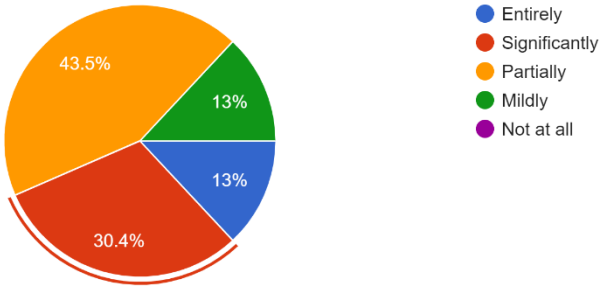
Graph 1: Frequency of respondents from various Industries

1. The globalization of the supply chains is evident in the following response, which shows the direct or indirect dependence of companies on one or more of the supply regions.



Graph 2: Frequency of respondents shows the direct or indirect dependence of companies

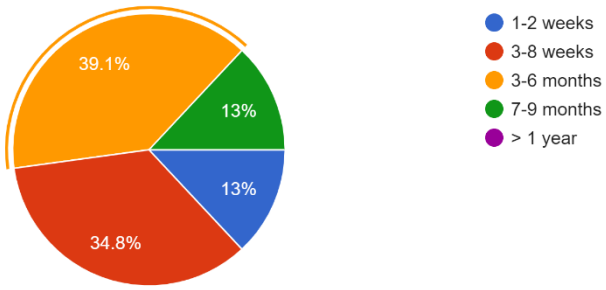
2. 100% respondents reported their supply chains being impacted by the COVID-19 pandemic.



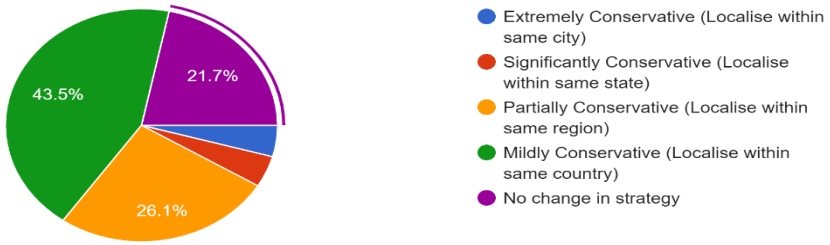
Graph 3: Frequency of respondents shows impacted by the COVID-19 pandemic.

3. All respondents reported their supply chains would normalise to its pre-COVID19 state within 9 months from restart.

Graph 4: Frequency of respondents impacted by the COVID-19 pandemic.

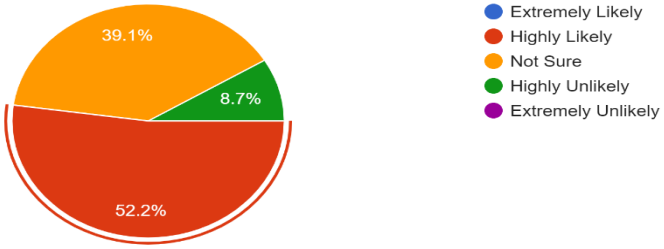


4. A significant 21.7% respondents reported that their organisations would not change its strategy w.r.t supply chains, despite COVID-19



Graph 5: Frequency of respondents would not change its strategy w.r.t supply chains

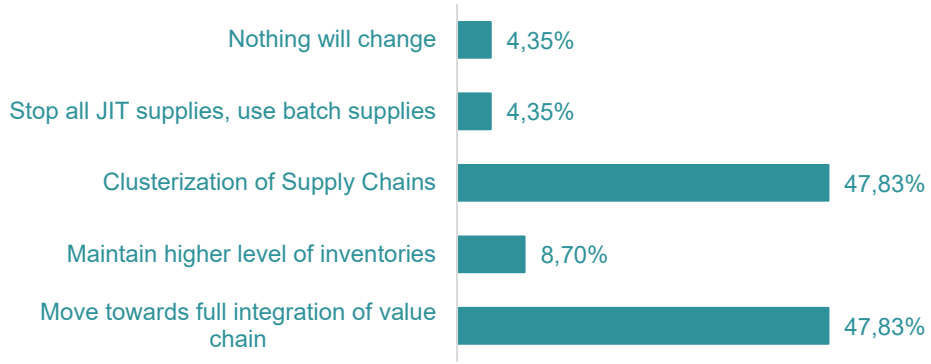
5. More than half (52.2%) respondents endorsed that their organisations' will opt for multiple supply chains instead of the current time-tested single chain, after COVID-19.



Graph 6: Frequency of respondents organisations' will opt for multiple supply chains instead of current time-tested single chain

6. The respondents were almost evenly split about the future strategies their organizations may opt for, to mitigate the risks of pandemics like COVID-19.

7. **Graph 7: Frequency of respondents' organisations to change future strategies**



Graph 7: Frequency of respondents' organisations to change future strategies

Conclusion

In this paper, the researcher aimed to understand the impact and influence of COVID-19 on the supply chains of the Indian Industry. It was a clear conclusion that Indian industry has huge dependence on the inter-woven and globalised supply chains, with dependence on different regions of the globe. Moreover 100% of the organizations have seen their supply chains impacted by this pandemic. The industry is hopeful that as there has been a restart in May-2020, the situation would normalize to pre-COVID state by January 2021. It was surprising that 27% of the industry still feels that it would not change its futures strategies with respect to its present supply chains but majority of them (52%) foresee their organizations opting for multiple supply chain strategies in future, to mitigate the risks. The most preferred alternative strategies of the future show an equal leaning towards full integration of their value chain and cauterization of their supply chains, indicating a very conservative and defensive approach. The researcher is sure that these trends will provide a key insight in

understanding the influence COVID-19 has had on the supply chains of Indian industry and create a baseline for future comprehensive research in this direction.

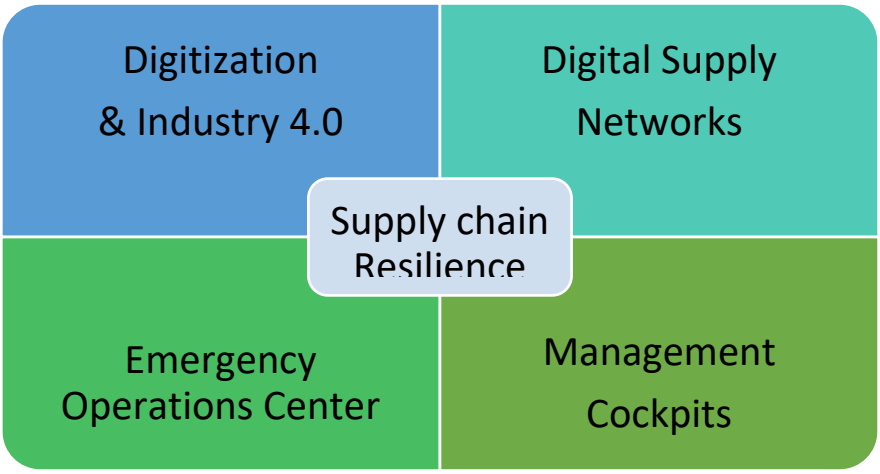


Figure 3: Suggested Model for Supply Chain Resilience

During the study the researcher also realised that there are several strategies required to adopt by future looking organizations, to avoid the influence of such pandemics in the future. One key theme that emerges is that digitization and adoption of industry 4.0 tools will be key to building resilient and flexible supply chains. The digital transformation needs to be accelerated to adopt intelligent procurement infrastructure, based on supply chain data management using intelligent automation and data analytics, which would enable simulation and modelling of newer supply chain strategies and maximize the insulation from supply chain disruptions. There would also be a need for accelerated migration towards cloud-based digital infrastructure, which will reinforce the future of working remotely from any part of the world, thus minimizing the impact of lockdowns. From the perspective of business strategy, the resilient supply chain models will call for integrating and aligning the digital supply networks with strategy and making flexibility, adaptability and risk management, an integral element of the supply chain design.

Organizations would need to look at establishing Emergency Operations Centre or Supply Chain Control Towers for controlling the communications and coordinating the action plans, including risk assessment and risk mitigation of their current supply chains. Management cockpits would need to be developed to provide a bird's eye-view of the end-to-end supply chain and a transparency approach will have to be fostered across the tiers, to build flexibility and resilience.

This paper is an attempt to present an integrated document on the consolidated snapshot of vulnerability and resilience of supply chains. This study cannot be a conclusion, but it can be a precursor to future research and studies on building resilient and digitized supply chains of the future.

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