

Developing Strategies to Improve the Performance of the Resilient Supply Chain (RSC) to Rise Back from Post Covid-19

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Abstract – The outbreak of the Covid-19 has revealed the vulnerability of the current supply chains; therefore, many researchers have indicated that supply chains have higher risks than their supply chain managers realize. The outbreak is having a significant influence on industries and institutions that are integral to modern life-style. To be successful in this pandemic scenario, the supply chain of firms should be resilient. Most of the firms realize that with a specific end goal to develop a resilient supply chain, there is a need for assessment of performance. The purpose of this paper is to discuss the Resilient Supply Chain (RSC), to identify indicators that would help to increase the performance, and develop strategies to rise back from this outbreak. Articles published regarding RSC and the effect of Covid-19 towards the supply chain were collected and categorized to filter some meaningful and valid information. Twelve performance indicators for supply chain resilience were identified after the classification and analysis of the literature collected. Supply chain resilience strategies were developed using these indicators under three categories (anticipation, resistance, and recover and response) to support supply chain managers examine and deal with the disruption. This study may influence future researchers to deeply study how a particular industry or a nation can improve supply chain resilience after Covid-19 or any other future disruption, to become more competitive with other industries or countries in upcoming years.

Keywords: Resilient supply chain, Covid-19, Risk management, Resilient framework

Introduction

Many researchers have indicated that modern supply chains have higher risks than supply chain managers realize. There are worst-case situations for them; such as terrorism, natural disasters, credit crunch, cyber-attacks and so now the coronavirus. Disruption of cross-border trade and Just-In-Time (JIT) production is unprecedented in modern days. Most of the countries only focus on getting medical supplies right now, and more than 50 nations have imposed restrictions, making a mockery of resilience in supply chains. Corona virus has not only affected human beings, but has introduced spread of disease through world markets. The supply chain vulnerability has now become a significant problem for many companies. Adequate research on the resilient supply chain is still required in today's uncertain and turbulent markets. The term "resilience" can be described as a substance's capacity to convert its initial structure or situation after deformation, resilient supply chain appears as a major strategy field to be explored (Christopher, 2004). But unfortunately, a lot of organizations are also unaware that a Resilient Supply Chain (RSC) will be taken into consideration in the deployment of their risk control and sustainability management as part of their strategy. The paper thus addresses effective approaches to build supply chain more resilient in order to enable businesses

to recover from failures which may effect on the high and lower supply chain sources; specially during this pandemic.

The research methodologies are mainly qualitative, taking advantage of various scientific journals, related literature, publications, as well as the experience of the publishers in management, simulation and modeling. Otherwise, the extent of loss of productivity due to incidents involving supply chain was also exploited by secondary and quantitative resources. The objective of this research paper is to recognize the essentiality of RSC and develop RSC strategies based on RSC indicators to "rule" the supply chain upper and lower stream including supplies, with the aim of helping companies to recover quickly after the supply chain has deformed (Mensah, 2013). It is necessary to have a better knowledge of the Supply Chain Management (SCM) and Risks of the Supply Chain itself before considering "Supply Chain Resilience".

A. Supply Chain Management and Supply Chain Risks

First, the term supply chain can be described as a network that links the manufacturer to the end consumer through distribution and output to insure that the flow of products, material, information and money is maintained. This is beneficial in seeking

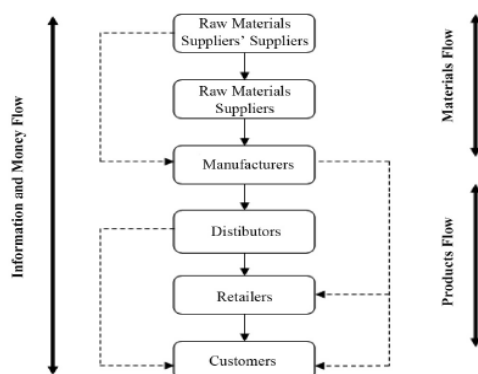


Figure 3 The Covid-19 heat map (Source: Moody's, Covid-19 Impact Heat-map)

Solutions to satisfy to meet the needs of the company. The network of supply chain can be shown in figure 1. By reference to Figure 1, manufacturers purchase their raw materials at the upper level of the supply chain from either supplier of raw materials or suppliers of raw material supplier is then the value will be added to the materials which are transformed into goods for usage in the lower supply chain stage. The companies that sell such goods through related distributors are able to pass these value-added goods to retailers and can quickly meet the target customers. On the other hand, certain manufacturers reach their target consumers though their websites bypassing dealers and retailers. Therefore, not every step in Figure 1 is required. To examine and manage supply chain networks; The necessity of Supply Chain Management (SCM) arise.

According to the Council of Supply Chain Management Professionals "supply chain management encompasses the planning and management of all activities involved in sourcing and procurement, conversion, and all logistics management activities. Importantly, it also includes coordination and collaboration with channel partners, which can be suppliers, intermediaries, third party service providers, and customers" (CSCMP, 2013). As the business has globalized and following new approaches such as lean, efficient customer feedback, quick response programs, the market fluctuations and competitiveness; increased improvements in the supply chain day by day. Such developments improve the complexity and uncertainty of the supply chain Management. (Rao, 2013)

Different researchers and professionals have described possible reasons for distractions in the supply chain as follows;

- Various interruptions of supply
- Risk of Planning and integration of demand and supply

- Price of purchasing
- Obsolescence and inventory
- Compliance and regulatory
- Privacy and confidentiality of information
- Satisfaction with customer service
- Compliance of arrangements and legislation
- Inefficiency of the process
- Fraud against workers and others
- Introduction and cycle time of the product
- Skills and qualifications in human resources
- Management of the project
- Controlling of business behavior and transition
- Integrity and availability of information

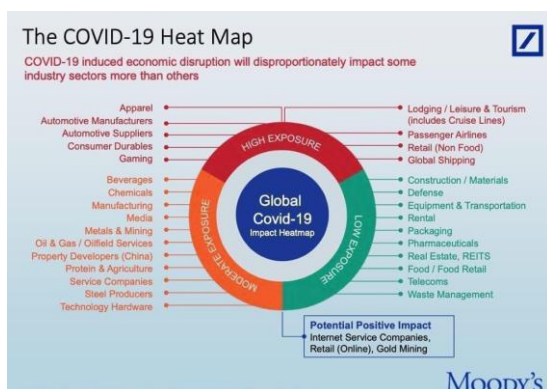


Figure 4 The Supply Chain Network [Source: (Mensah, 2013)]

In the current scenario, the supply chain has become highly unpredictable and unstable due to the Covid-19 pandemic. The outbreak influences industries and institutions which are integral to modern life. Just-in-time supply chain businesses and nations which depend on imported goods are the systems most affected by Covid-19. These established trading lines control not only what customers buy, it also controls what manufacturers of all sizes and types can produce in the first place. Across the world, difficulties posed by Covid-19 are affecting the supply chains that people depend on for food, hygiene

supplies and medicine (Lichtenwalter, 2020).

B. How the Covid-19 pandemic has disrupted to the global supply chains

During the last four decades, a great deal of worldwide development has taken place in global supply chains. (Raw materials and intermediary goods are transported many miles around the world and assembled elsewhere. The final product is re-exported to end users in both advanced and developing markets (UNIDO, 2020). But now, the outbreak of the Covid-19 has revealed the vulnerability of the current supply chains. It induced economic disruption will disproportionately impact some industry sectors more than others; the impact can be shown in figure 2.

Latest statistics indicate that China, the US and Europe have impacted by the crisis week-on-week exchange. Diverse sourcing and computerization are key for the stronger development, sustainable recovery and smarter supply chains. The Covid-19 pandemic entered exponential global commerce and expenditure. Supply disruption and disruption in demand is threatening multinational companies as more and more countries told civilians to stay at home. Governments, businesses, and actual customers immediately struggled against the fragility of the global supply chain and sought to procure essential goods and resources. One of the key lessons of this crisis was the pressing need for smarter, faster and more diversified supply chains (Lanng, 2020).

The scale of the effect on trade and demand is shown by new research from Tradeshift, (a digital supply chain network). It indicates that over the next months, the effects of the initial shock will continue. The week-by-week decline in domestic and foreign trade was 56% in China starting in

mid-February. It was followed by the United States, Britain and Europe with a combined decrease of 26% at the beginning of April and a steady decline of 17% at the end of April. In fact, the trade in any lockdown area is small. Overall weekly Trade shift sales since 9th of March have dropped by an average of 9.8% relative to pre-lockdown estimates, with invoices and orders falling considerably after the end of March.

There have been two negative impacts of global trade contractions. One thing is that payment on an invoice takes longer and a faster payment trend is reversed. Based on the data from Tradeshift, the total invoice processing period in 2019 was 36.7 days, relative to 36.8 in 2018. Average duration of payments increased 1.7% to 37.4 days in the first quarter of 2020. Secondly, the absence of orders in the supply chain leads to another issue, bringing down new orders and with the invoices dropping. Since 9 March, average weekly command volume has dropped 15.9% on the Tradeshift site. Over the same time, invoices dropped by 16.7%. Based on orders issued before the lockout, businesses still receive capital, but they are drying up. For suppliers worldwide, the coming months would be really tough (Tradeshift, 2020).

C. Supply Chain Resilience

It is important for companies that their supply chain be more resilient in order to sustain this changing market scenario. Accurate information, materials, products and money will move through the Supply Chain in order to ensure visibility, integrity and transparency, as discussed in previous segments. These are all a step in the development of a resilient supply chain strategy which will be discussed in this section.

The resilience of the supply chain can be defined as; *“Supply chain adaptability to*

prepare for unforeseen events, react to and recover from disruptions through continuity of operations at the desired level of connectivity and control over structure and function.” (Serhiy Y. Ponomarov, 2009). Or *“The ability to predict the risk, minimize the impact and quickly return to the appearance of turbulence adjustments by survival , development, adaptability and growth.”* (Day, 2014).

These explanations say to a move in organizations far from risk management systems, that do not adhere to the common vulnerabilities, unpredictable disruptions of complex supply chains. When considering the current state of the Resilient Supply Chain studies, building such operating capacities along with their supply chain partners have become required in order to cope with expected or unexpected fluctuations (Pankaj Raj Sinha L. E., 2004). Although several ongoing research work has been undertaken on different perspectives and regions, the performance measurement of the supply chain has not been much considered. An organization's supply chain will not succeed; if the supply chain performance measures have not been able to improve (Uta Jüttner, 2011). Such performance measures and measurements should examine and identify the appropriate techniques without which an instantly recognizable impact for development and acknowledgment of objectives would be really difficult (Ferdoush, 2018). Recently, due to the Covid-19 Pandemic; researchers and industry experts have given more attention to the idea of Resilient Supply Chain. This concept seems to provide a means of preventing the restrictions of traditional risk and protective strategies and addressing the difficulties of global supply chains (Croxtton, 2011). It has been suggested that resilience reduces

traditional risks in many businesses and it is significant (Fiksel, 2015).

In this paper, the literature and framework defines indicators for RSC and provides a roadmap for improving supply chain resilience together with findings and recommendations for further analysis. This study has three objectives:

- 1) Identify the essentiality and indicators of Resilient supply chain.
- 2) Develop resilient supply chain strategies that can contribute to increasing supply chain performance to rise back from post Covid-19.
- 3) Identify current work gaps to be discussed in future studies.

A systemic literature review has carried out and 17 performance indicators were collected from the literature to achieve these objectives. These indicators were used to build the supply chain resilience framework that would help to improve the supply chain's performance. This study would enable supply chain managers in any organization to analyze and develop their supply chain efficiency and make it resilient to disruptions of any nature. Specially, During this Covid-19 pandemic.

This paper has been structured in the following way:

- Section I : Include the introduction of this study, explained the essentiality of Resilient Supply Chain and effect of Covid-19 towards the global supply chain.
- Section II: The methodology for collecting and evaluating articles.
- Section III: The Resilient Supply Chain indicators were listed and described.
- Section IV : Proposed Resilient Supply Chain Strategies/framework and discussion.

- Section V : The conclusions and future directions for research.

Research Design

Articles from different scientific publication and databases were collected to identify the essentiality of RSC, RSC indicators, Relevant to Covid-19, Its impact toward the supply chain and to be updated about latest supply chain statistics. The systemic review used as the research approach (Badhotiya, 2019). A systematic review is identified as a fair approach to minimize biases and random errors which provides a greater transparency of the literature search. The way of gathering relevant literature by using collection of keywords; Supply Chain, Resilience, Risk Management, Covid-19, Global Supply chain in different databases such as; Google Scholar, Research gate, Science direct, Springer, Emerald insight and etc. Initial searching 70 papers were gathered to analyzed for further explore the importance of the topic. A total of 45 articles have been chosen for further study after deletion of insignificant papers. The span of time for the collected articles was the time in between 2000 to 2020. Data refinement is made on the basis of the RSC indicators described by different authors after data collection. Depending on these measures, the data analysis is carried out and, subsequently, RSC approaches are prepared.

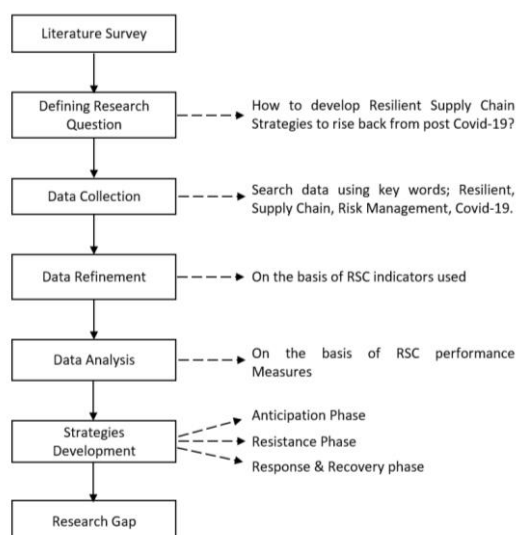


Figure 3 Research design of the current study
(Developed by the Researcher)

Indicators for Resilient Supply Chain

The purpose of the RSC is to handle disruptive supply chain events and recover quickly. It is clearly defined as the capacity to schedule and develop the network of the supply chain to foresee unexpected disruptions or adverse incidents and to react disturbances while retaining leverage over the network and supply chain structure. Following RSC strategies will guide an organization, to raise its role or further strengthen and be more competitive as before the interruption (Ponis, 2012). As mentioned in previous sections; these days every organization has to upgrade their resilient plan, since Covid-19 has affected global value chain. If any organization have comprised following indicators to their supply chain, they certainly imply stability of the supply chain as well as the value chain. One of the objective of this study is to identify RSC indicators which are discussed as follows;

Agility: Agility of the supply chain can be described as ability to respond fast to a rough shift in demand and supply (Christopher, 2004). And it has improved frequency to respond easily to unforeseeable demand or supply shifts

(Croxton, 2011) and speeding up the response period (Hong F. B., 2020). Seems the flexibility needs agility to react rapidly and to maintain an alternate advantage for random occasions in unregulated and fuzzy conditions. Supply chains may reduce stock vulnerability by handling a large reactive supplier (Sodh, 2004).

Collaboration: Collaboration in the supply chain generally means that two or more autonomous companies are jointly planning and executing supply chain operations for mutual benefits (Sridharan, 2008). Collaborative partnerships help prevent and manage risk disruption efficiently (Pankaj Raj Sinha L. E., 2004). In a critical situation, collaboration can keep companies in the supply chain together (Barratt, 2004).

Redundancy: Redundancy means the essential and serious use of additional stocks which can be avoided in an emergency in order to adapt to demand surges or supply deficiencies (Aghaei, 2016). Furthermore, redundancy involves a duplication of the limit with a certain end goal to carry out operations in deception and can also be viewed as a course to flexibility (Inger, 2015). Redundancy often reflects a buffer stock; it may also be expensive ways of creating resilience as it accounts for holding costs (Esmaeili, 2018). Founded that redundancy creates flexibility that promotes response by means of a diverse asset of organization (Ali, 2017).

Flexibility: A supply chain should be flexible in order to be resilient, so it is defined by the willingness of a supply chain to respond to the demands of its stakeholders and the environmental situation within a limited time span (Stevenson, 2007). The literature shows various types of RSC flexibility hones such

as flexible travel, flexible market game strategies, postponement, flexible supply base, and flexibility in ordering satisfaction (Croxtton, 2011).

Visibility: The supply chain visibility is defined as the supply chain manager's ability to see the disruptive event from one end to the other (Christopher, 2004). Visibility is a tool for intercession which enables managers to respond quickly with accurate continuous evaluations to interruptions or disturbing influences (Uta Jüttner, 2011).

Robustness: Robustness is the capability of supply chain's to counteract change, and implies proactive progress expectations before it occur (Wallenburg, 2013). Robustness requires a strategic planning to develop a supply chain network (Inger, 2015).

Awareness: Awareness can be characterized as anticipation of actual demand. Awareness includes understanding the vulnerabilities and arranging for such opportunities, and requires an ability to detect and transform opportunities through early cautioning arrangement to recognize a possible disturbance (Jain, 2017).

Security: Security is a basic aspect of RSC that should be written early rather than looked for during a sequence (JAMES, 2003).

Velocity: Velocity of the supply chain is the level of the supply chain response to announce improvements. The ability to adapt to adjustments greatly relies on the reliability of the data sharing between entities in the supply chain (Uta Jüttner, 2011).

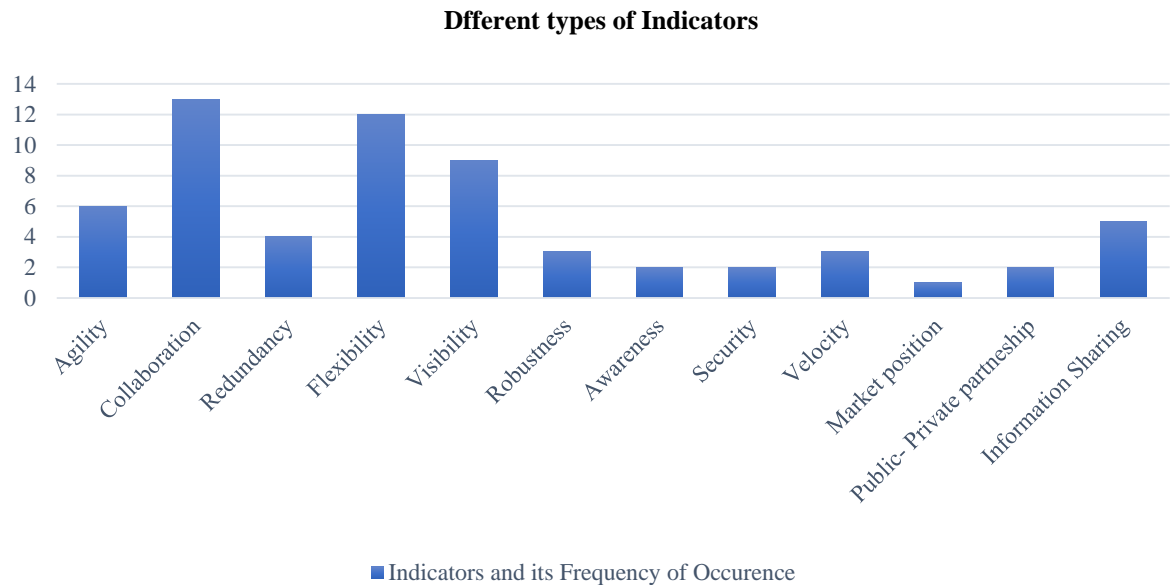


Figure 4 Different types of Indicators (Developed by the researcher)

Market Position: A good market position is related to improved market share, thereby encouraging improvement in RSC, which definitely helps retain consumer relationships during the unexpected incident (Fiksel, 2015). With a strong market position, a company is able to recover from interruptions in the supply chain due to monetary related quality (Uta Jüttner, 2011).

Public-Private Partnerships: Having social capital between supply chain members and other organizations, for instance community shareholders, enhances the power of the company and encourages each other to learn. Post-disruption in the supply chain can be assisted by public-private partnership attributable to human relations and social capacity (Xun Li, 2017).

Information Sharing: Throughout the current complex and undefined supply chain environment, it is important that a group of active participants and that appropriate details should be provided to all partners in that particular category, to

minimize the risk in the supply chain (Mostafa Setak, 2017).

A. Supply Chain Network Design

Sometimes, when a supply chain becomes complex and dynamic, it is more vulnerable to disruption (Christopher, 2004). It is important to have a clear understanding about supply chain network design to make the supply chain resilient (Hong T. Y., 2002).

B. Supply Chain Performance Measures

Covid-19 revealed global weaknesses (Seewald, 2020). Many businesses were unable to make their supply chains resilient, as the measures required to enhance their performances have still not been established (Uta Jüttner, 2011). Incomplete performance measures existing across industries or assessment of the entire supply chain and recommend concentrating on manufacturing lead time an inventory holding costs (Betts, 2009). Measures for all supply chain participants should be clear and supply chain members should provide the least chance for interfere (Pillania, 2008).

Many analysts investigate the supply chain indicators to improve the efficiency and resilience of the supply chain; (Azevedo, 2014) pointed out that redundancy and efficiency of transport as measures of the Portuguese automobile supply chain. (H.Elleuch, 2016) stated that the agro-food industry is tested for collaboration, flexibility and redundancy as indicators. Visibility in maritime supply chain as a resilient supply chain indicator (LamXiwenBai, 2016).

Figure 4 illustrates the frequency of and occurrence of various indicators in various supply chains and shows the most frequent indicator is *collaboration*. Some studies have found that, to make company's supply chain more resilient it should collaborate with others for the mutual profit. The most affected indicator after collaboration is flexibility, to meet the visibility, agility, RSC community and beyond.

Resilience is an organization's dynamic ability to react according to interruption and depends on persons, groups and subsystems (Xun Li, 2017). There are not just a few countries with respect to the idea of resilience. It is a matter of concern to companies worldwide.

Figure 5 shows that Major percentage of the overall supply chain comes from the USA and India, and the supply chain from the different areas of the world analyzed in this report. The remaining 53% falls from the United Kingdom, China, France, Portugal, Ireland, Australia, Hungary, Singapore, the Netherlands, the United Arab Emirates and Germany (Reuters, 2020).

Somehow, the heart of the global supply chain center locations, like China, Europe, and the US, has been impacted by COVID-19. Combined in January and February, factory output in China dropped by 13.5% relative to the previous year. The pandemic has serious implications for foreign

development networks and will leave a mark for future years. In December 2019, Hubei Province in China began with an unknown infections named corona-virus. In response to this outbreak, Chinese authorities imposed severe restrictions on people's movements and effectively imposed curfews and quarantines in the country from the end of January. Then this virus spread to the Europe, UK, USA and India as well. Many manufacturing sites were closed to limit future interactions between people and this inevitably influenced those countries economy too (UNIDO, 2020). China's exports to all regions worldwide have declined. In the exception in North America, this downturn has been extreme across the world. Trade between the all over the world has now declined.

An analysis of statistics on input-output relations from the German statistical office indicate that inputs imported represent about a quarter of industrial production in German manufacturing. 10% was from China with all manufactured materials. (Reuters, 2020).

When considering The latest monthly US data, figure 06 shows the overall imports indicates a substantial decline in manufactured goods from US-Chinese worldwide supply chains relative to February 2019, including computer and telecommunications hardware, motor vehicles bodies and truck equipment and other items.

It is obvious that the emergence of COVID-19 has a destructive impact on development and world supply chains, which has implications for businesses, customers and the world's economy. Many organizations struggle to answer critical question about how their employees can be protected, supply security ensured, the financial impact reduced, reputational risks addressed, and market uncertainty which is driven by demand (Hong F. B., 2020).

Hence, developing a resilient supply Chain (RSC) within the organization and nation is highly essential to overcome any kind of a supply chain related risk including this pandemic.

The resilience of the supply chain includes three parts. Those are Anticipation, Resistance and Recovery and response (Parast, 2016). Can be described as follows;

- a) *Anticipation* for a supply chain manager, it's the impact of the disruption must be anticipated and the supply chains can be prepared for predicted or unexpected changes in the environment. The disruption and its impact should be understood in order to minimize the probability of an occurrence. The forecast phase of the supply chain is a pre-disruption. The key indicators of supply chain resilience during this anticipating phases are awareness, visibility and security.
- b) *Resistance* In a few situations, if any expected or unforeseen disturbance may arise, a supply chain will have the capacity to tolerate it and disable the negative impact before it comes (Alkaff, 2018), For the stability of the supply chain, that will play a vital role. The impact can be withstood by a well-organized supply chain. It is known as a period of disruption. The key indicators in this step of supply chain stability are flexibility, redundancy, collaboration and robustness.
- c) *Recovery and response* Frequently disruption has ability to affect the supply chain. The immediate and appropriate solution based on resources is important to reduce its disruptive impact on the supply chain (Bittencourt, 2018). In addition to being able to regain the position prior to the interruption, a well-planned

supply chain will help to restore market positions to a higher level, which will lead to the competitive advantage. Strong market position, information sharing, velocity, agility and public-private Partnership play a significant role in keeping the supply chain resilient.

Proposed Resilient Supply Chain Strategies / Framework and Discussion

The concept of RSC was analyzed and a conceptual clarity framework was proposed by (Ali, 2017). Their framework revealed three main structures for the definition of RSC: resilience strategies, resilience phase and capacity. The structure outlines the definition and explains the components required to improve the RSC's capabilities as well as details the practices needed to utilize them. (Mandal, 2014) has carried out a systematic analysis of RSC and recommended the framework that defines resiliency and problems in the supply chain performance. (Christopher, 2004) did an RSC development investigation and tried to detect the current state of work. They suggested a structure which defines RSC 's values and indicators.

The frameworks suggested for RSC in the literature unable to provide a detailed understanding of RSC's metrics that can help improve the supply chain 's efficiency. A conceptual framework as strategies has proposed in this study to overcome the gaps and drawbacks in literature. The framework also shows various Supply Chain performance measures and provides knowledge about indicators that contribute to increasing the effectiveness of the supply chain. Strategies proposed allows management to understand the connections between indicators and number of performance indicators. As an example, if a Supply Chain Manager needs to anticipate the right demand during this

pandemic, for example, awareness and collaboration are the two metrics. If two companies collaborate, it will help to minimize costs for holding inventories and, by shipping in on-time improve consumer responsiveness.

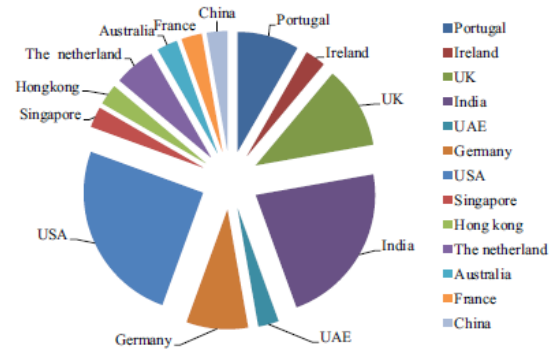


Figure 5 Overall Supply Chain Performance
[Source: (Reuters, 2020)]

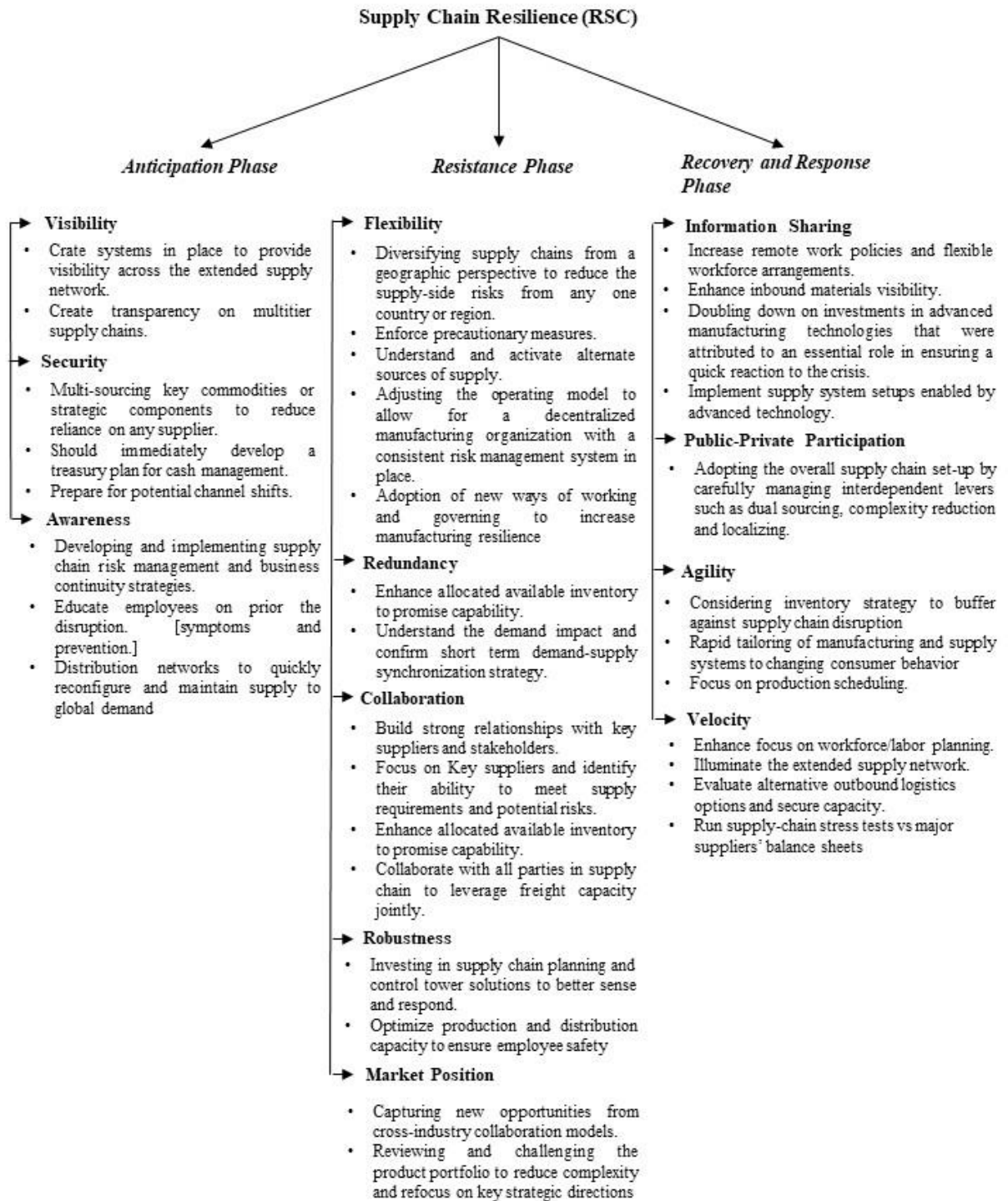


Figure 6 RSC Strategies based on RSC Indicators (Developed by researcher)

The proposed strategies (in figure 6) have tremendous potential for managing a company's or country's strengths, its weaknesses and its priorities. Managers / Supply chain expertise should provide clear knowledge about their capabilities by recognizing top graded measures. These strategies will also expose existing vulnerabilities in their supply chain. New technologies are evolving in the supply chains that will significantly improve the visibility across the end-to-end supply chain, which encourage even more agility and resilience in the supply chain without "overhead". Hence, to implement suggested strategies of this study; the traditional supply chain network (Mensah, 2013) would be insufficient (as mentioned in the figure 01).

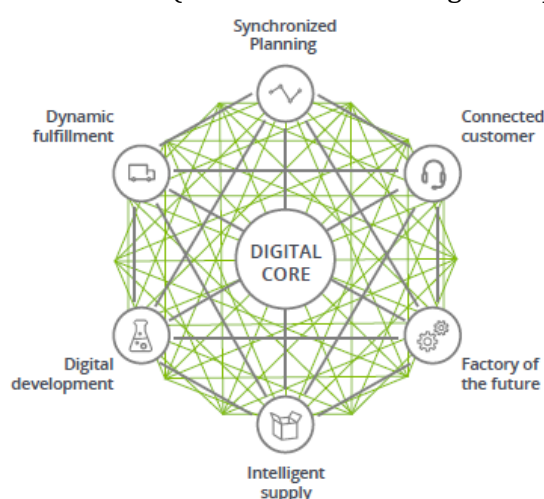


Figure 7 Digital Supply Network (DNS) Source: (Deloitte, 2020)

(Deloitte, 2020) stated that the traditional solutions to the linear supply chain and to optimize for the company itself are transforming into Digital Supply Networks (DSNs). Figure 7 shows how digitalized supply network should work with a digital core. In this manner, organizational silos are separated into an organization linked to a global supply network that offers end-to-end visibility, collaboration, awareness and optimization. Such DNS are progressively being developed and configured to avoid

interruptions, respond to mitigate bad impacts of any disruption and make supply chain more resilient.

At last, proposed strategies provides administrative guidance and setting needs to make a methodology for improve RSC. Implementing these strategies within business may show the path to rise back from this Covid-19 pandemic as well.

Conclusion

The pandemic of Covid-19 is not simply a short-term epidemic. It has long-term impacts on the working of people and supply chains. Companies need to develop their supply chains more resilient to overcome future challenges in the long term. The definition of resilience is a broader concept than integrated control of supply chains, congruity planning, risk control or combination. RSC can be categorized into three aspects from the study of literature, including anticipation, resistance and response and recovery which help supply chain managers to analyze the supply chain and in resisting disturbance.

This research aims to suggest strategies to create an essential managerial tool for increasing performance of supply chain and make it more resilient specially after the Covid-19 pandemic. The outcome this paper is not limited to rise back from this pandemic. Suggested RSC strategies can be used to face any disruption may arise in near future.

This research has some limitations. The RSC indicators were divided into three stages, but apart from those stages, there were other indicators. The investigation of these unexplored indicators should be aimed at further research. Since this study was done during the quarantine period of Covid-19 pandemic; There was no access to collect data from outside. Hence, collection

of previously published literature are the main indicators which are taken into consideration in this study. The review is only limited to 31 research papers in its quantitative material analysis. Thus, the results cannot be generalized on the basis of this study. This study focus only on theoretical side of RSC; practical side should reveal and evaluate how far these theoretical strategies can be implemented to the real world scenario.

However, in future research, should focus on empirical research of supply chain resilience indicators and explore new indicators. Also, this study can be considered as an initial research for anyone who would like to increase and evaluate the performance of RSC indicators either local or global level.

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Abbreviations and Specific Symbols

RSC	-	Resilient Supply Chain
SCM	-	Supply Chain Management
DSN	-	Digital Supply Network

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