

A STUDY ON INTERNAL FACTORS AFFECTING SUPPLY CHAIN RESILIENCE

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Abstract: *This study has been undertaken to investigate and conduct qualitative research on the internal factors of an organization that affect supply chain resilience. The research will consider the supply chain managers as the central decision-makers and organizers of the management processes within the supply chain. Qualitative interviews with managers will be conducted to understand factors affecting supply chain resilience and managerial control over the situations. A snowball search will be performed to identify relevant information to improve the article. Qualitative data for resilience and sustainability of the supply chain will be collected. The theoretical focus will be on elements and strategies that can enhance resilience in the supply chain of a company which will provide basic lessons for theory builders and practitioners.*

INTRODUCTION

Supply chain resilience is the supply chain's ability to be prepared for unexpected risk events, responding, and recovering quickly to potential disruptions to return to its original situation or grow by moving to a new, more desirable state to increase customer service, market share and financial performance.

Firms in the supply chain face internal and external risks from technological changes, globalization and a turbulent business environment. Given high levels of operational inter-dependencies, the risks faced by an individual firm not only harm its own operations but can also negatively influence the operations of its supply chain. Disruptions to the flow of materials or information caused by internal capabilities can harm the financial, market and operational performance of firms within the supply chain as a whole.

1.1. Problem statement: "Several Papers focus on quantitative analysis for achieving insights of supply chain resilience therefore the approach to this research paper will be to perform qualitative analysis with managers to better understand factors over which manager has control regarding supply chain resilience."

In this paper, a qualitative research will be conducted and consider the supply chain managers as the central decision-makers and organizers of the management processes within the supply chain.

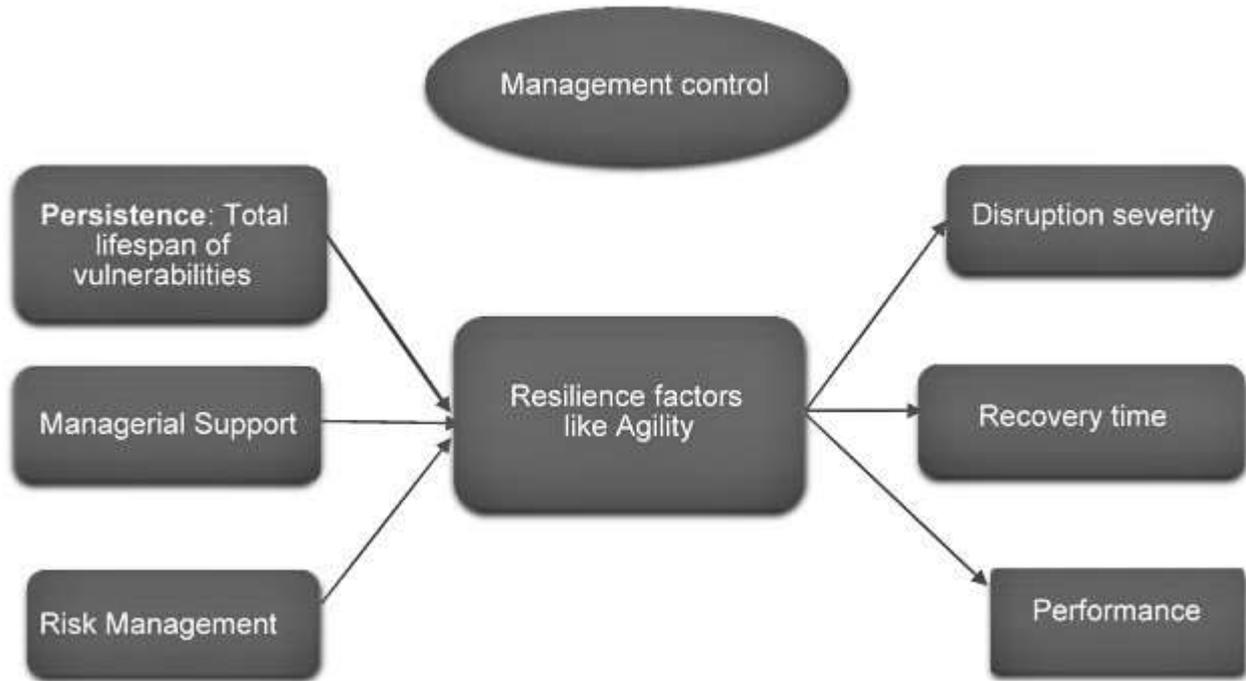
After researching about the topic by performing a literature review, we came across certain gaps and limitations which could build the base of our research for this paper. The gaps identified and the future work prospect given in the existing articles gave us the objectives and problem statement for our research paper. Some of the gaps for our objectives were as follows:

- The approach in the paper (Brusset, X., & Teller, C. (2017, February)) is quantitative in nature. Qualitative interviews or focus group discussions with managers would help to understand better why external capabilities do not affect resilience whereas the other capabilities do.
- If a field study will be conducted, it will help to collect qualitative data from different supply chain managers regarding supply chain resilience and sustainability. (Chowdhury, M. H., Dewan, M. N. A., & Quaddus, M. A. (2012)).
- The paper could not highlight the vital lessons for theory builders and practitioners, with a clear guidance on how to cope with uninspected supply chain events in today's disruptive business environments. (Alfarsi, F., Lemke, F., & Yang, Y. (2019)).
- In the paper (Karl, A. A., Micheluzzi, J., Leite, L. R., & Pereira, C. R. (2018)) snowball search is not applied in the literature review. If the snowball search was considered in this study, it would have been interesting to check if it would identify additional relevant articles to improve the results.

1.2. Objectives: To overcome and work on the above-mentioned gaps for better learning, there will be the following objectives to be undertaken as stated below:

- To perform qualitative interviews with managers to understand factors affecting supply chain resilience and managerial control over the situations.
- To perform snowball search and identify relevant information to improve our article.
- To collect qualitative data for resilience and sustainability of supply chain.
- To theoretically focus on elements and strategies that can enhance resilience in supply chain of a company which will provide basic lessons for theory builders and practitioners.

1.3. Research Framework:



Independent Variables:

- Persistence: Total lifespan of vulnerabilities
- Managerial Support
- Risk Management

Moderating variable:

- Management Control

Dependent Variables:

- Disruption Severity
- Recovery time
- Performance

Intervening Variable:

- Resilience factors like Agility

1. LITERATURE REVIEW

Supply chain risk management remains a key managerial challenge that affects the performance of organizations. An important aspect for all supply chain managers is the capacity of their supply chain to withstand upheavals, disruptions and unforeseen events. A supply chain that is still able to perform and deliver products and services under such circumstances is characterized as resilient. The supply chain managers are considered as the central decision-makers and organizers of the management processes within the supply chain. As such, they organize, deploy and control all the necessary investments, assets, resources, routines, processes, and systems to achieve the strategic goal of enabling the supply chain to be resilient.

For a sustainable supply chain, a balance of economic, social and environmental factors has emerged enormously important as customers are demanding sustainable supply chain and products. Some disruptions can be assessed in advance and some are not. Supply chain managers need to be proactive to get signal of disruptions in advance and to develop resilience capacity for mitigating the disruptions. The measurement of resilience and sustainability which will also help the manufacturers and supply chain managers to get idea about the degree of resilience and sustainability to set target and improvement needed in specific area in future to be truly resilient and sustainable.

In today's uncertain and turbulent markets, supply chain vulnerability has become an issue of significance for many companies and appropriate researches on resilient supply chain are yet to be conducted. Managing the supply chain is quite a challenging task as supply chains are more complex today. Although the operational efficiency of well-structured supply chain is high, the risk involved is still a concern and should not be neglected, as in today's uncertain and turbulent markets, supply chain vulnerability has become an issue of significance for many companies. The only way to bounce back after these disruptions is by developing and implementing a supply chain resilience strategy.

Resilience is not only multidimensional, but it is also a multidisciplinary concept. It has emerged from a production of disciplinary ideas and concepts which started in materials science to describe the material ability to bounce back to its normal shape after any deformation. Interviews offer researchers the opportunity to uncover information that cannot be accessed using other qualitative research methods. Supply Chain Resilience is defined as "the adaptive capability of the supply chain to prepare for unexpected events, respond to disruptions, and recover from them by maintaining continuity of operations at desired level of connectedness and control over structure and function".

Resilience means recovering to initial state after disturbances. The term "Resilience" is commonly used in most areas of research ranging from engineering sciences to social sciences. Resilience is defined as the ability of a substance to absorb and store energy and release it without any deformation. It is frequently discussed that we can control what we can measure, this approach may help managers to explore supply chain threats from resiliency point of view to achieve more reliable supply chain. A questionnaire has been formed from resilient practices identified in prior stage and the study is going to evaluate their

implementation performance in the supply chain. Resilience is the company's ability to react to disruptive events and maintain normal activities following a disruption.

Supply chain resilience is defined as “the ability to proactively plan and design the supply chain network for anticipating unexpected disruptive (negative) events, respond adaptively to disruptions while maintaining control over structure and function and transcending to a post-event robust state of operations, if possible, more favorable than the one prior to the event, thus gaining competitive advantage”.

Supply chain management efforts do not explicitly link the aspects of resilience to the dimensions of sustainability, despite there being situations where resilient practices influence the sustainability of supply chains. Managing resilience requires an assessment of the type of risk and vulnerability in the supply chain. The supply chain risk assessment should consider the probability and consequences of the disruptive event occurring.

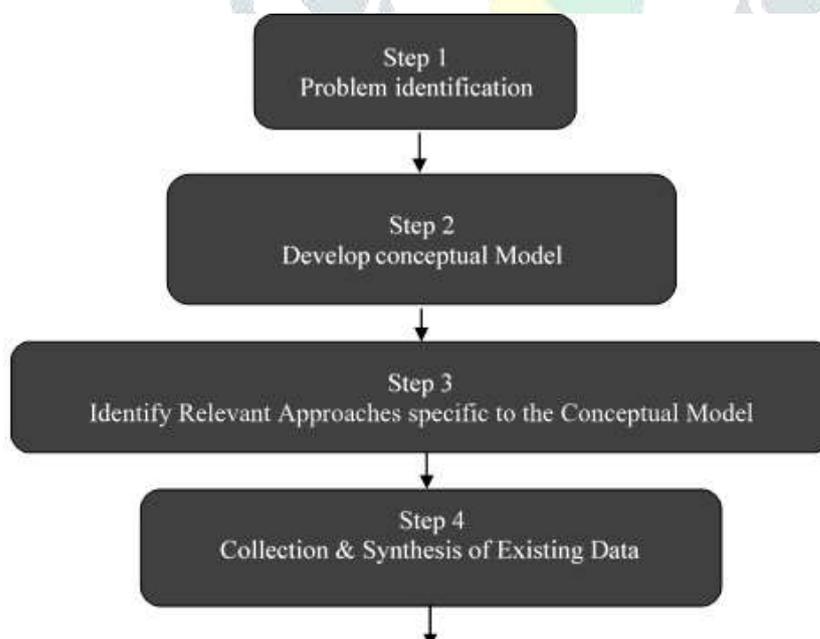
Supply Chain resilience has been noted as a major element of risk management. An organization's resilience generally refers to its capacity to respond quickly to various situational changes. SC elasticity primarily describes how quickly an SC can recover effectively when it collapses due to unforeseen internal and/or external factors. SC resilience is significantly associated with sustainable SCM. Sustainable SCM can be defined as “the strategic, transparent integration and achievement of an organization's social, environmental, and economic goals in the systemic coordination of key inter organizational business processes for improving the long-term economic performance of the individual company and its SC”. Resilience to each risk is significantly associated with the network centralization level and betweenness centrality.

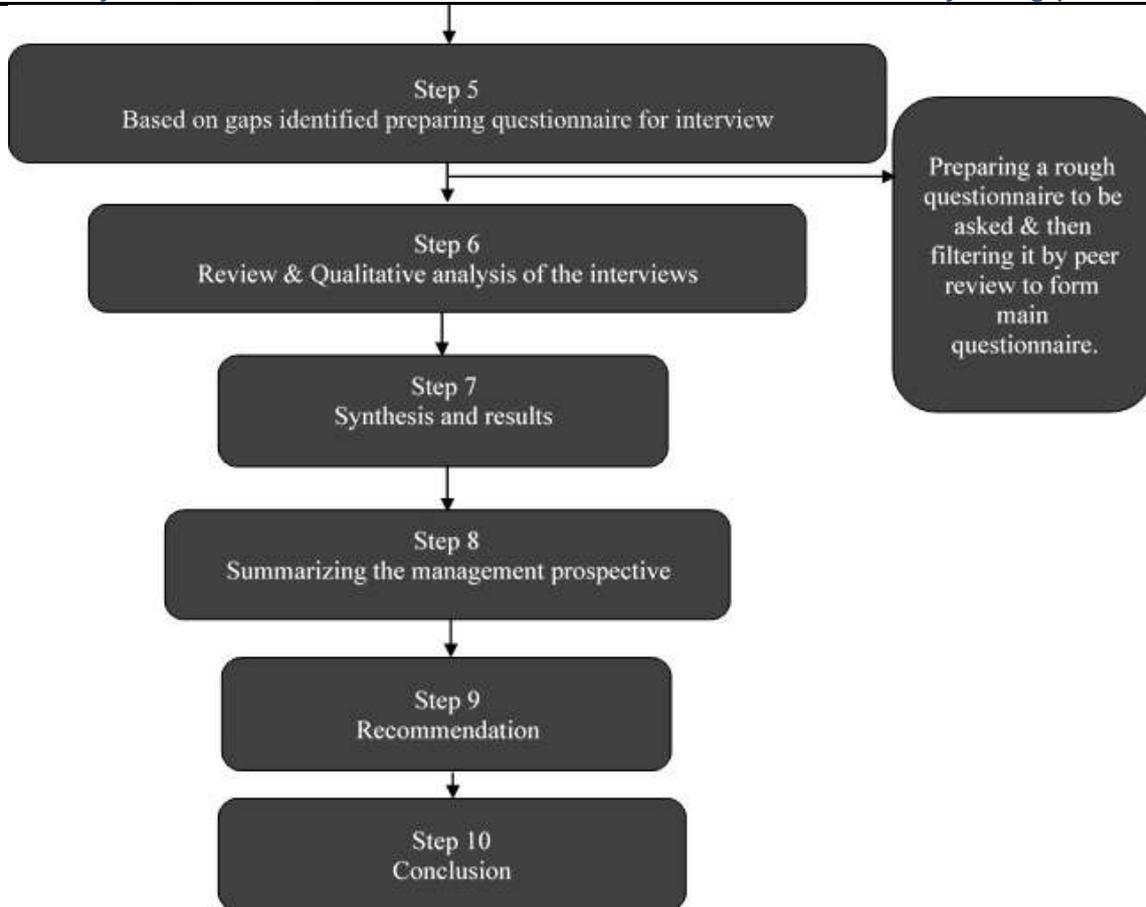
Reducing supply chain vulnerability and improving supply chain resilience requires to categorize and analyze risks as well as requires to understand the effect of information sharing on visibility along the supply chain. The environmental risks have to be regarded as uncontrollable and sometime unpredictable events that strongly affect the supply chain vulnerability and resilience. Each new business opportunity is always characterized by risks that strongly affect supply chain vulnerability and resilience. In effect the supply chain change management should pursue optimal tradeoffs between technical-economic advantages and resilience by considering the company and its processes, the rules and the controls, the organizations, the infrastructures, the business strategies and the environmental conditions.

2. RESEARCH METHODOLOGY

3.1. Description of Research Design and Procedures Used: Exploratory-descriptive designs, usually field studies in natural settings, is combination of exploratory and descriptive research designs. The data collected either contribute to the development of theory or explain phenomena from the perspective of the persons being studied. We have chosen such a design for our study. After identifying supply chain resilience as our main topic of study, we tried to gather a few existing papers and articles for our study to better understand the concept of supply chain resilience. We have made a literature review of the existing papers where we were able to understand aim of the research, methodology, scope of the paper, limitations, gaps identified and scope for further research. The identified gaps in the existing papers helped us on where we can work on our paper and in coming up with a title of our paper. The nature of the paper will be qualitative and the focus of the study will be industry managers to whom we will provide a questionnaire to help us with our study to reach a conclusion.

The below flow chart gives a brief overview of step-by-step procedure which will be followed by the authors during the research and study.





3.2. Sources of Data:

- Primary Data Sources: Observations, focus groups and interviews by preparing accurate questionnaire.
- Secondary data sources: Existing research articles, Internet, and college online library.

3.3. Methods and Instruments of Data gathering: The authors will observe and learn by performing interviews and surveys with managers of different sectors to get insights about their perspective regarding factors and processes involved in supply chain resilience of a company.

3. ANALYSIS

4.1. Industry Experience:

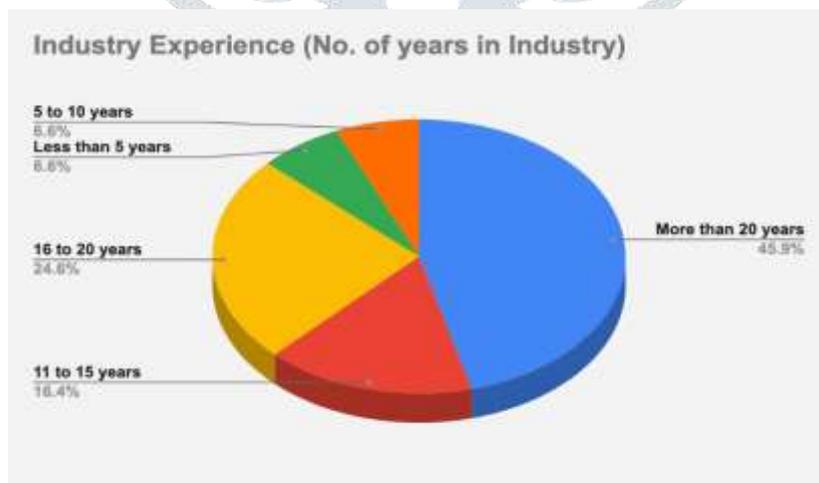


Figure 1

The following figure shows the industry experience of the managers involved in the questionnaire responses where we tried to cover newly working managers as well as the senior experienced managers possible with the major target audience being the managers having industry experience of more than 20 years with 46% of the responses pertaining to it.

4.2. Countries Involved:

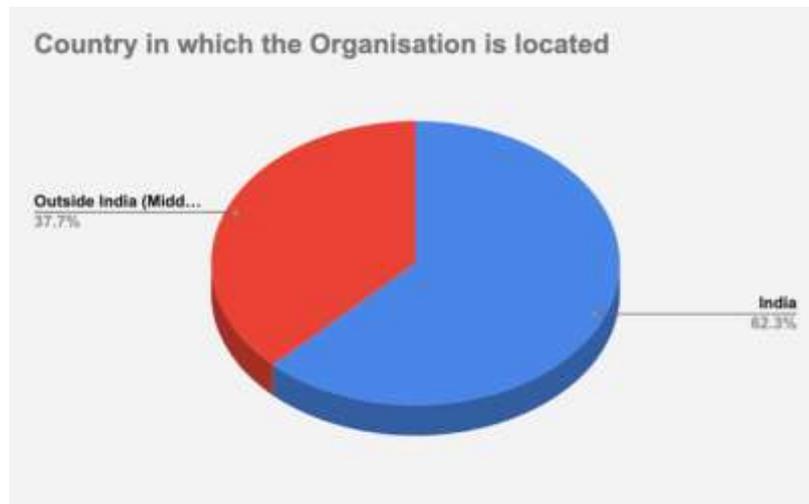


Figure 2

Because of the pandemic situation, the point of contact was virtual and we focused on managers of mostly manufacturing and logistics sector present in India and Middle Eastern countries including responses from Saudi Arabia, United Arab Emirates (UAE) and Bahrain.

4.3. Questionnaire:

Question – Why do you think agility (ability to think and understand quickly) is important across supply chain? (Choose the most suitable option) *

It allows to:

- quickly detect changes, opportunities, and threats
- quickly access relevant data
- make resolute decisions about how to act
- quickly implement those decisions

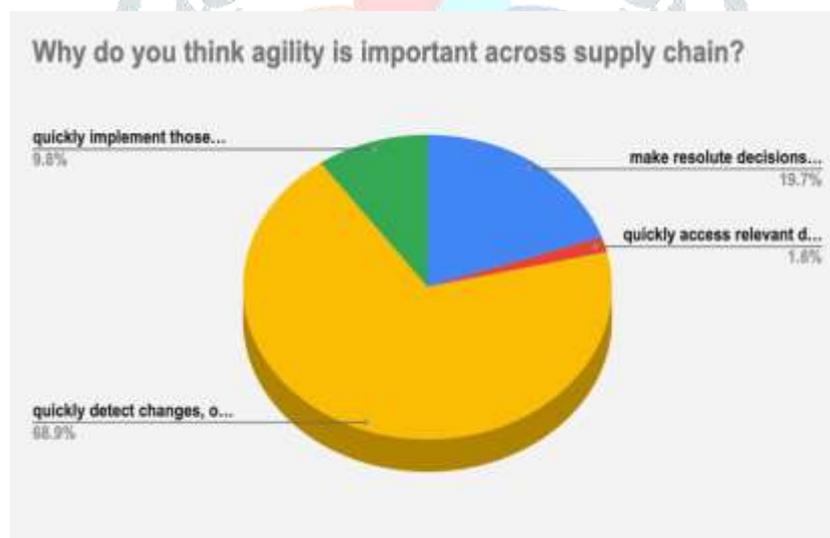


Figure 3

Agility is the fundamental characteristic of a supply chain needed for survival in turbulent and volatile markets, which are becoming norms as product life cycles shorten and environmental forces create additional uncertainty resulting in higher risk in the supply chain management. Agility further helps in providing the right product, at the right time to the consumer, which is the main objective of any supply chain. A clear majority of responses (69%) went towards the option of “agility in supply chain is about quickly detecting changes opportunities, and threats”

Question – Which of the following factors of sustainability (ability of meeting your own needs without compromising with the future needs) affect supply chain resilience? *

- Innovation
- Brand enhancement
- Cost control

- All of the above
- None of the above

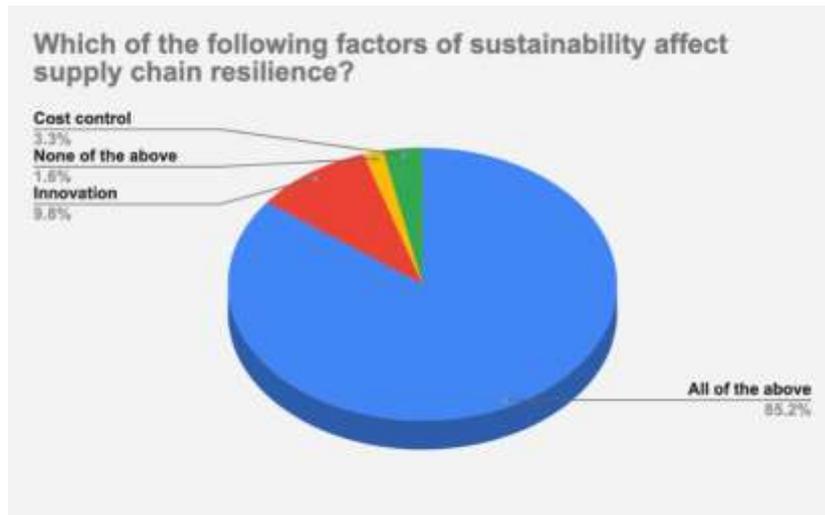


Figure 4

As the figure suggests, more than 85% of the audience considered that sustainability is about all the factors which were given as the option. Thus, it gives a clear opinion about what sustainability as a term plays a role when it is connected to supply chain resilience.

Question – What are the top five risks most likely to cause systemic (affecting the whole system or organization) supply chain disruptions? (Select any 5) *

- Conflict and political unrest
- Pandemic
- Information and communications disruptions
- Export/import restrictions
- Shortage of labor
- Sudden demand shifts
- Border delays
- Commodity price volatility
- Ownership/investment restrictions
- Currency fluctuations
- Nuclear/biological/chemical weapons
- Terrorism
- Weather
- Natural disasters (example: fire, volcano, earthquake)

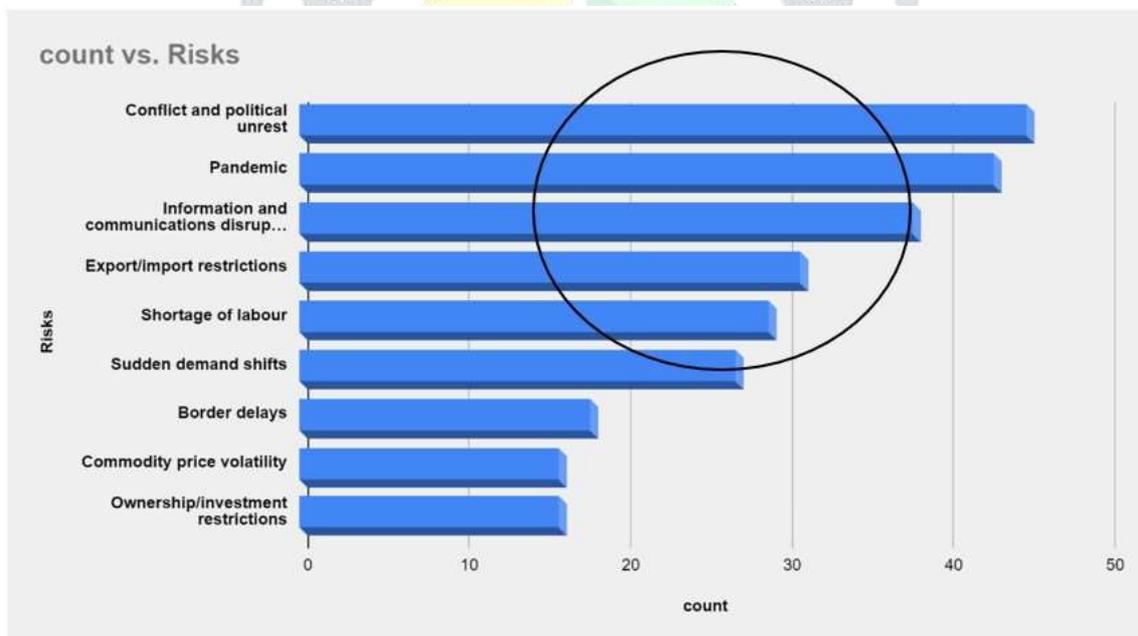


Figure 5

The top 5 risks related to supply chain disruptions came out to be as following:

- Conflict and political unrest
- Pandemic
- Information and communications disruptions
- Export/import restrictions
- Shortage of labor

The risk of sudden demand shift was also amongst the popular opinions contributed by nearly 50% of responses. This information becomes very vital as it provides an insight towards identifying risk factors which contribute towards more supply chain disruptions.

Question – Has risk management of supply chains networks become a higher priority now than five years ago?

- Yes, it is a significantly higher priority
- Yes, it is a higher priority
- It has stayed the same
- No, it is a lower priority
- No, it is a significantly lower priority

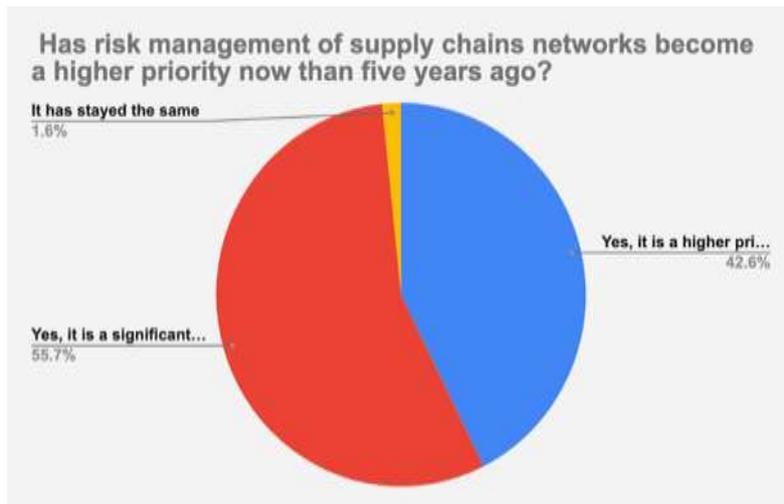


Figure 6

The figure above suggests that Managers consider risk management in organizations with utmost seriousness in today’s time as compared to times belonging from a decade number of years ago. Nearly 98% of the managers agreed to the statement that risk management has attracted attention in recent times and more than 50% of the responses showed very strong sense of agreement with the same.

Question – From a risk perspective, how effectively are the following supply chain elements being managed globally? (On a scale of Very Effective, Effective, Not very Effective, Don’t know)

- Extensive sub-contracting
- Customs and border control sophistication
- Customer demand profile
- Availability of shared data/information
- Inventory levels
- Mergers of transport providers
- Increased vessel/vehicle size
- Quality control
- Low-cost country sourcing
- Management of multiple suppliers
- Single source suppliers
- Reliance on specific raw materials



Figure 7

The figure here gives a little wider picture in terms of elements of supply chain being managed globally where managers agree to elements like customer demand profile, quality control and low-cost country sourcing being managed at the best possible level. Whereas elements like single source suppliers and vehicle size require more attention in terms of management on the global level.

Question – To what extent do the following entities need to do more to prepare for global supply chain disruptions? Rate under a five-point Likert scale (1-Not at all and 5-Very Significantly). *

- Companies Individually
- Governments Individually
- Non-governmental organizations
- Collaborations within industries

- Collaborations between industries
- Public/private partnerships

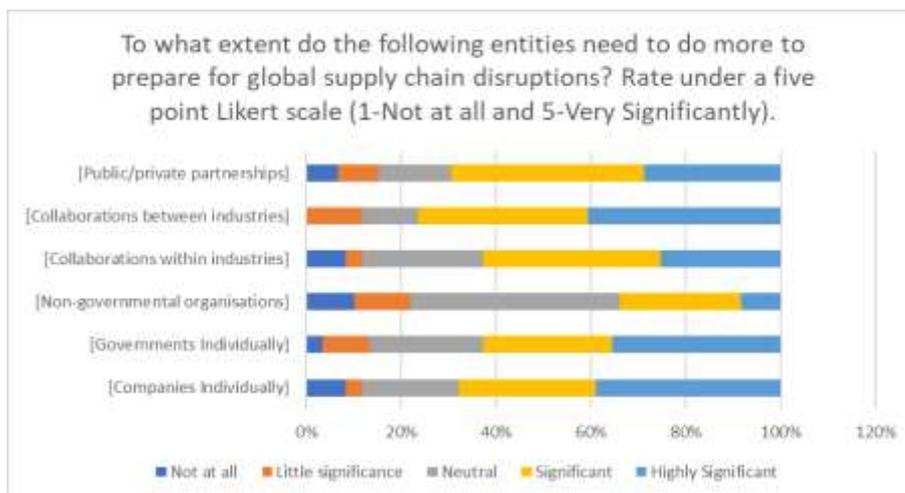


Figure 8

The above figure shows that the managers are very much concerned in terms of global supply chain disruptions and feel that all the entities individually or with collaborations need to be more prepared when it comes to this topic. Companies individually and collaborations between industries were shown more concern for preparation by the managers according to the figure shown above.

Question – In reference to the previous question, who should take a leading role in addressing systemic risk (affecting the whole system or organization)?

- The answer to this question from the managers provided a clear majority to the Board/cabinet i.e., the topmost level of management department company to take a leading role in addressing systemic risk which affects the whole organization or system.

Question – Does your organization formally track its resilience and the financial impact of disruptions to supply chains? *

- Yes, at the board level
- Yes, at the executive management level
- Yes, at the operational level
- No

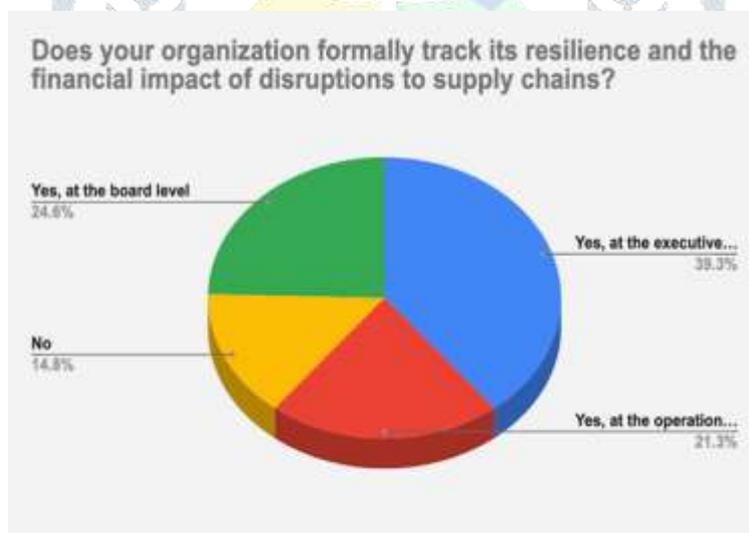


Figure 9

The question asked here tries to give a brief understanding about companies analyzing their financial trends after getting affected by disruptions to their supply chain. We don't quite see an influencing response in the given figure but we could still consider that companies look to track their resilience at the senior levels of the department.

Also, when asked about details of tracking resilience in brief in the succeeding question, Managers who could open up about on this question gave answers which showed variations such as tracking impacts by “verbal discussions and rough observations” or by conducting senior level meetings in equal intervals. Some companies do this on monthly basis whereas some perform this on quarterly basis as well. One of the supply chain managers talked about emphasizing such tracking on individual basis as well which will keep every employee updated with the same.

Question – Please give a rough estimate (if possible) of the average annual financial impact of disruptions to your supply chain network, as a percentage of your revenue.

- This question was asked as a non-compulsory question as we don't look to consider managers to cross their company policies and disclose their confidential data. The managers who had the allowance and freedom to disclose this data

majorly answered as the estimated value of the financial impact of disruptions to fall under the range of 10-15% which they also consider to be very high and thus needs to be reduced.

4. CONCLUSION

After summarizing and analysing the survey and its results, we can draw some clear conclusion about the managers perspective about supply chain resilience. It gave a clearer picture of the thinking of the managers and their approach towards supply chain resilience. We tried to involve managers with major target audience having more than 20 years of experience mostly from India and the Middle East. Majority of the managers consider agility, which is the fundamental characteristic of a supply chain, as quickly detecting changes, opportunities and threats. Factors of sustainability such as innovation, brand enhancement and cost control, all play a major role is affecting the supply chain resilience. With the help of our analysis, we could easily prioritize the risk factors that could cause systematic supply chain disruption. These are some of the conclusions which can infer from the detailed analysis and discussions done with the help of precise and accurate questionnaire done during survey.

5. LIMITATIONS & FUTURE SCOPE

6.1. Limitations:

- The respondents to the survey were mainly managers from India and the Middle East (Saudi Arabia, UAE and Bahrain), which results in a bias towards a Middle Eastern and South Asian supply chain context.
- The research relies exclusively on the perspective of supply chain managers. Using experts from other parts of the organization, such as marketing or finance, could complement the findings.
- Optimal allocation of resources needs to be more developed for selecting efficient resilient supply chain with the trade-off between vulnerability reduction and resilience capacities enhancement.
- Further, it also remains unclear what specific advantages firms could gain from supply chain resilience.

6.2. Future Scope:

- Due to the COVID-19 pandemic, a virtual interaction was done to collect the responses. Future scope for this research could be physically interviewing supply chain managers for better understanding.
- Further, the target audience for the data collection can be expanded beyond South Asia and the Middle East.
- Further studies may also focus on the impact of resilient practices on supply chain performance. This type of research could help in monitoring the performance levels during a disruption and in the recoverability phase and in assessing the response of supply chain to a specific disturbance.
- Several areas of research will be interesting in future, such as, which specific supply chain capabilities are needed for reducing the chances of supply chain disruptions? Along with the triple bottom line elements: economic, social, and environmental which are the other components of supply chain sustainability?
- Also, a study can be done to observe the disruptions in a non-resilient organization compared to a more resilient organization practicing the given strategies, and the length of time it takes the organization to bounce back and resume operations.
- Further extensive research is needed about the role of managerial expertise in building upon information technology across organizations as a means to enhance resilience.

6. ACKNOWLEDGMENT

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