

INVESTIGATIONS ON THE RELATIONSHIP AMONG COVID-19 AFFECTED SUPPLY CHAIN MANAGEMENT BARRIERS: A CONCEPTUAL REVIEW

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Abstract: COVID-19 has caused a great deal of damages to the society in every manner. It has also affected human created systems like, transportation, production, and even services. Supply chain is one of the systems which have experienced a worse condition all around the globe, due to which all the humans got affected during the period of Pandemic. In the research work, investigations on the contributions of researchers on the effects of COVID-19 on supply chain as well as barriers proposed by different researchers in the field of supply chain management are presented.

1. Introduction

Till now, COVID-19 pandemic has affected almost all the types of supply chains at global level, in a totally unexpected manner, which in turn has given a great damage to the all segments to the society. In last three years, people related to supply chain activities, have seen many unexpected events, which they couldn't have thought of. The initial cases of a new type of corona virus were emerged in Wuhan, china in early December, 2019, but within 2-3 months it spread with unexpected speed all over the world, and affected billions of people, in direct as well as in indirect manner. It was also observed that while a lot of businesses saw great downfalls, many fields such as pharmaceuticals, hospitality, etc. found sudden rises in their balance sheets. COVID-19 caused a great damage in India, where strictest lockdowns were imposed, however, which was the dire need of that time. Figure shows the graph for deaths due to COVID-19 in last 2 years as well as searches made for the term COVID-19, in India.

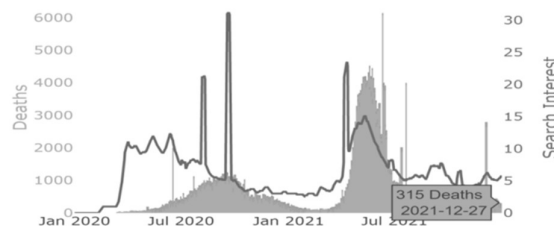


Figure 1.1: Graph of Deaths due to COVID-19 in India in last 2 years

(www. datanalytics.worldbank.org)

The effect of COVID-19 pandemic was found on the three sides of supply chain, namely, supply side, demand side and logistic side. In India multinational companies equally faced supply shock, demand stock s well as delivery shocks, due to which all the aspects of supply chain got affected. The old concept of just in time inventory failed during COVID-19 which was a great deal of damage in its own. Plus, the pandemic has importance of risk management as well as mitigation strategies. Pandemic has made the organizations obligated to think about

their supply chains again. Present research work presents the overview of research contributions of different researchers regarding the effects of COVID-19 on supply chains as well as the barriers investigated by different researchers, and concludes with investigated gaps in the research and the objectives of a new research.

2. Contributions of Researchers

Figure 2.1 shows a radar graph for research publications on scholar.google.com in last three years, for the terms supply chain management, COVID-19 and pandemic.

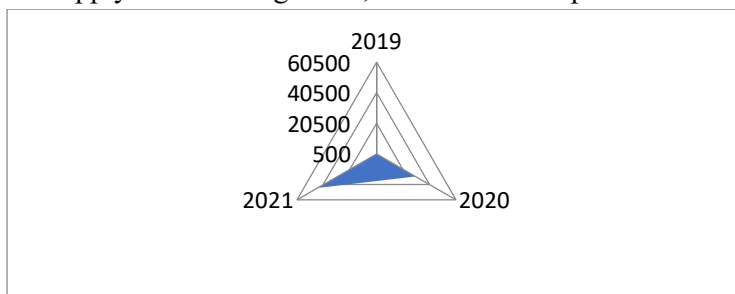


Figure 2.4: Radar Graph for Publications on COVID-19 affected SCM (for 3 years)

Following are the summaries of contributions of researchers on supply chain management during COVID-19:

According to Amami and Skarkodie (2022), supply chain is considered as one of the most important factors for development of industries. In last two decades these concepts have attracted many new industries due to their versatility. In their research work researchers have focus on meat industry.

According to Yusuf and Seodiantono (2022), supply chain is being used in different industries for the purpose of enhancement in their productivity. In their research work, focus has been made on the implementation of total productive maintenance in different industries and providing research recommendations on Defense industry. During the research the researchers has focused on literature review to buy collecting understanding and analyzing the 30 International Publications from the year 2010 to 2021. All this research papers were based on the implementation of supply chain management practices on different industries. The searchers also focused on 25 types of contents of journal articles for the purpose of discussion and drawing conclusions. The results of literature review analysis show that effect of implementation of supply chain management contributes in minimizing the inventory activities, inventory levels and other associated information. With the help of these practices one can reduce cost also. Plus reduction in Lead time data has also been reported.

According to Sombultawee et al. (2022) Supply chain management is a practice that can drive the economy of the entire world and it has proved this thing during covid-19. During the pandemic, the whole world has realized the importance of supply chain management practices for their existence. Present research work is based on the bibliometric analysis of research work done during the period of covid-19. During the research work, the researcher has analyzed 257

research articles published during the years 2020 and 2021 for the purpose of determining the nature of the research conducted during that period. As a result of the research paper four types of thematic clusters, namely, the impact of a pandemic on supply chains, the improvement of supply chain resilience for viability innovation for supply chain sustainability, and risks as well as Technology were investigated.

Another research work showing the importance of supply chain management during a pandemic is presented by Raj et al. (2022). Researchers also reported that the pandemic has affected supply chain at Global levels at an unbelievable speed and scale. Their research paper tells about the challenges faced by supply chain-based organizations during the pandemic in developing countries. Research presented a conceptual framework with the help of dynamic capability theory for the purpose of analysis. During the research, researchers investigated 10 types of major challenges based on literature reviews emerging articles as well as discussions with the experts. In the next step, the relationship among the the challenges was established with the help of the Grey-Decision-making Trial and Evaluation Laboratory (Grey-DEMATEL) method.

Razhkov et al. (2022) focused on the adaptation of supply chain operations during the COVID pandemic. The researchers investigated the impacts of pandemics and their activated mediation by adopting operational decisions in different types of network designs. In simple words, the researchers contributed to understanding the effect of preparedness and decision-making capabilities during the period of a pandemic. Researchers also focused on the pre-positioning of inventory levels during pandemics.

Sharma et al. (2022) conducted a research work that focuses on the effect of supplier visibility on the adoption of Sustainable practices including supply chain management. During the research work, researchers analyzed 263 responses to Surveys conducted at UK retail grocery stores. Responses were collected from executives and managers for perishable food items during the pandemic.

Ozdemir et al. (2022) also reported that the pandemic has greatly challenged the supply chain. The researchers also reported that during the pandemic, managers associated with supply chain management were forced to be dependent on the solutions developed for limited and foreseeable crises. There is much work that focuses on investigating the dependency of supply chain management practices on existing solutions for the UK perishable goods market. For this purpose researchers developed a model based on supply chain resilience literature and tested it with the help of covariance-based structural equation modeling. For this purpose data from 280 retail employees was collected. The findings explain that the pandemic-related solutions have greatly affected the resilience-building activities in the supply chain.

Montoya-Torres et al. (2021) Reported that supply chains are constantly facing new problems due to pandemic. Present research work focuses on the issues related to the impact of covid-19 on supply chain on the basis of research works published in the year 2020. During the research work focus has been made on the major disruptions that challenge supply chain management

operations. The researchers have considered characteristics of supply chains performance mattress for sustainability and attributes from external distractions and at the end of the research work a list of topics deserving future research has also been presented.

Chowdhury et al. (2021) tell that pandemic has drastically affected the supply chain management practices all over the world. Considering academic aspects the researchers point out that from the beginning of the pandemic, academicians were writing research papers on the effect of a pandemic on supply chain management practices but all these papers were making the research complicated so, therefore, the researchers have conducted systematic research where 74 research papers published before 28 September 2020 and have found broad themes in the existing research papers namely impacts of covid-19 pandemic resilience, strategies for managing impacts and recovery, the role of technology and the issues of sustainability of supply chain practices during a pandemic. Other than this the researchers have also described the context and theories for each result. The researchers also realized that still there is a lack of a weakly designed research in this field and so therefore the results cannot be generalized. They also realized that majority of research papers are focusing on Healthcare products and ignoring small and medium enterprises to a greater extent.

On the issue of effect of pandemic on supply chain management practices, Micheli et al. (2021) reported that the pandemic has significantly changed the societal organizational and personal levels globally. Countries have seen the unexpected death rates, losses to all the segments of society, businesses and humanity. And still all the things are going on in an unexpected manner. The researchers also reported that the pandemic has changed the usual ways of life we live and work and made us to think about the management of operations and supply chains.

Abdullah et al. (2021) has dedicated his research work to the supply chain for the food industry. Researchers have reported that due to the pandemic, issue of the supply of food-grade ingredients has raised a lot globally. For this problem, researchers have used blockchain technology for the purpose of pressing the distributors in a decentralized and transparent manner. Their method focuses on the effective delivery of food supply change including physical conditions and geographical positions in different segments of the society. The research paper also introduces a new model and methodology for supply chain management techniques and supports the suppliers, logistics, and distributors. The research also focuses on the centralized distribution system of supply chain management during pandemics.

Illahi and Mir (2021) reported that due to COVID-19, all the governing bodies across the world are obligated to stop all the movements in their countries, due to which great hurdles in supply chain management practices were observed at all the levels of society. During that period it was very important to analyze the importance of logistics and supply chain management operations. As a result of the research trends of analysis of post-event as well as pre-event-based research papers were obtained. Additionally, the research also provided 12 key areas

which needed attention for increasing the overall efficiency of logistics and supply chain management operations.

Ivanov (2021) guides that the concept of supply chain resilience activities is considered in case of anticipated events. During pandemic supply chain activities has faced many difficulties in their deployment and question has been raised on supply chain resilience capabilities. In this matter, the researchers have presented a framework that focuses on different angles of supply chain resilience and renders utilization of its capabilities for the purpose of value creation. For this purpose, researchers have investigated the design of active usage of resilience assets framework for the analysis of post covid supply chain management activities with the help of existing literature. According to the researchers, the outcomes of their research may be used by the managers for the purpose of effective decision-making and value creation.

According to Schleper et al. (2021), there is a strong need on emphasizing pandemic-induced knowledge in operations management and supply chain management. And this research work focuses on this aspect of management. This research work highlights the impacts of a pandemic on operations and supply chain management. The research is based on the retail industry and focuses on internal, operational, upstream, and downstream as well as customers' perspective.

The research work of Esper (2020) primarily focuses on the relation between supply chain management and covid pandemic. These researchers also advocate about the negative impacts of pandemic on the performance parameters of supply chain management. During the research work, researchers highlighted different aspects of society including health, finance and others. At the end of research work the researchers try to see the future effect of pandemic on the supply chain management practices at Global levels.

Farooq et al. (2020) presented a detailed literature review on supply chain management under the umbrella of a covid-19 pandemic. About the situation, the researchers report that the pandemic has caused chaotic situations in supply chains all over the world which may lead to challenges for the survival of humanity. Researchers also report that due to unexpected pandemics all the businesses are affected drastically and we should be ready to use the strongest strategies against these natural calamities. The research work focuses on the issues of sustainability formation of Strategies and viability perspectives for supply chain management practices with the help of a literature review. The study also focuses on the justified research objectives and methodological approaches as well as implications for supply chains. Additionally, a strong emphasis has also been made on the effect of pandemic outbreaks on business environment resource allocation supply and demand instructions, and other parameters. The research paper also emphasizes the integration of industry 4.0 techniques, sustainability techniques, and resilience to counter this type of pandemic.

Koncar et al. (2020) focus on implementation of the internet of things in FMCG supply chain sustainability during the pandemic. The research work has been carried out among different

participants in a standardization chain belonging to retail wholesale distribution and production departments in western Balkans region during the pandemic. The results show considerable differences between the existing sectors of business in the terms of drawbacks in the successful implementation of the internet of things. Based on the results obtained from research it was suggested that 8 FMCG supply chains should apply for digitalization.

Tasnim (2020) also highlighted the Global food supply chain and the impact of digitalization through blockchain during the pandemic. Research work focuses on the reasons for disruption in the food industry. The research work also focuses on the long-term effects of covid-19. At the end of the research work, different policies and steps, as well as recommendations for implementing digitalization and formation of Sustainable Global supply chain formulation, are suggested.

Siebert et al. (2020) suggested guidelines for existing managers to cope with the unexpected situations generated during pandemics. Researchers report that during pandemics many organizations face numerous strategic decisions of the greatest importance for their survival. Considering these aspects the researchers suggested comprehensive sets of relevant objectives and processes for managers.

Pinto (2020) suggested the importance of knowledge management as a support system for the planning of supply chain logistics. The research work was carried out on the basis of a bibliographic literature review from the main database. The result of the research work shows the suitability of knowledge management in Logistic planning is very effective.

Craighead et al. (2020) demonstrated that the pandemic has paralyzed the world and made the world realize the importance of supply chain management. The destruction and damage made by the pandemic strongly show that it was totally different from the conventional ones. The researchers further add that the pandemic has made the researchers obligated to think about supply chain management practices from a new perspective. During the research, work research has focused on different theories which are helpful for research scholars and managers to have a better look of existing and future-based supply chain management practices. The theories used in the research work are resource dependence theory, institutional theory, resource orchestration theory, structural inertia, Game Theory, real options theory, event systems theory, and others.

Iyenger et al. (2020) focused on the challenges made by pandemic on the supply chain of Healthcare systems. According to the researchers the main challenge is managing the supply chain of production and distribution of surgical supplies, medical devices and pharmaceuticals to the needed personnel. The research work also focuses on the evolving solutions for the betterment of healthcare supply chain management.

This research paper by Sarkis (2020) is working as a tentative guideline for other researchers working in the field of sustainability in supply chain management after covid-19 environment.

During the research work the researcher has adopted literature review, personal research experience and other associated procedures for design of experiment.

The research work of Ishida (2020) focuses on different perspectives of a product based supply chain management in context with covid-19. During the research work focus has been made on the distributed management and centralized management of single location and dynamic capability of organizational theory derived from supply chain risk assessment studies. The results of research work show that auto industry is shifting to a centralized management model while the computer industry is shifting to a model based on global supply chain management, the furniture industry still needs some tighter vertical integration for its development and sustainability.

Black and Glaser Segura (2020) explain that organizations established all over the world have worked hard for the purpose of developing efficiency in their supply chain systems by reducing wastages, lowering cost, consolidating suppliers and distributors, making better management of costs, goods, inventory, developing efficient systems of packaging, storages & shipping of products as well as using digital analytics for managing customer choices and demands. But due to covid-19, these organizations are suffering from great damage to their supply chain efficiencies. Due to this fact, the present research work is devoted to the review of literature that provides a strategic mitigation model.

Ketchen and Craighead (2020) stress the interactions of entrepreneurship supply chain management and strategic management and highlight the opportunities for firms. During the research work, the researchers focus on the relationship between the three parameters and explain the importance of all these factors individually as well as collectively. The researchers also guide about the possible opportunity in coming years for the manager to develop their firms. During the research work, researchers also give examples of interactions between entrepreneurship supply chain management and strategic management for guiding the managers.

Golan et al. (2020) mention that at Global levels uncertainty of a business also increases. They also guide that the covid-19 pandemic clearly shows the lack of resilience in supply chain management practices due to which descriptions at the global level and different nodes of the supply chain fail. These failures make us realize the strong need for network analysis and advanced resilience analysis in existing supply chain management systems as well as their literature. The research paper reviews search literature that focuses on resilience Modeling and quantification and connects the supply chain to other networks. Research realized the lack of a comprehensive approach for quantification of network resilience in supply chain.

Ivanov (2021) proposed new model entitled as viable supply chain model which consists of rigidity resilience and sustainability perspectives. The researchers also provide a viable supply chain-based model in an existing supply chain ecosystem. Researchers also discuss the

relationship between resilience and viability. According to the researchers, the viable supply chain model can be useful for decision-makers to design supply chain for adopting positive changes as well as to absorb negative disturbances to recover and survive during short-term disturb instructions and long-term destructions. Researchers also advocated the viable supply chain model by telling that it can be used by entrepreneurs rebuilding their existing supply chains.

Rizou et al. (2020) focuses on the safety aspects of food items as well as the food supply chain and environment during the covid-19 pandemic. The researchers inform that food items have suffered a lot during the period of the Pandemic. Many people have suffered from the shortage of food items and improper quality of food items received from shops. Due to this reason, there is a strong need for developing analytical tools for the safety of food and the environment after lockdown.

2.1 Contributions of Indian Researchers

Table 2.1 shows the contributions of Indian researchers, investigated on effect of COVID-19 on supply chain management.

Table 2.1: Contributions of Indian Researchers

S.No	Researcher(s) (Year)	Contribution
1.	Thulasiraman et al. (2021)	The research work stresses on the balance between integrated food processing industry and short food supply chains during COVID-19
2.	Rajak et al. (2021)	Focus on critical success factors on sustainability initiatives during Pandemic
3.	Narsimha et al. (2021)	Analysis of impact of pandemic on seaport transportation and maritime supply chain
4.	Sinha et al. (2021)	Suggested the strategies for COVID-19 vaccine supply chain
5.	Biswas and Das (2020)	Finalization of SCM barriers for the manufacturing sector of India during COVID-19
6.	Dohale et al. (2021)	Analysis of risk mitigation strategies of Indian apparel industry during pandemic
7.	Agrawal et al. (2020)	Investigations on the effect of pandemic on supply chains as well as the economy of the country
8.	Mahajan and Tomar (2020)	Analysis of disruptions caused in food industry due to COVID-19
9.	Ray (2020)	Analysis of management of supply chain management aspects during pandemic

10.	Mahajan and Tomar (2020)	Effect of COVID-19 disruptions on supply chain management
11.	Tripathi et al. (2021)	Effect of COVID-19 disruptions on vegetable supply chains
12.	Joshi and Sharma (2022)	Analysis of effects of pandemic on small and medium enterprises
13.	Guerin et al. (2020)	Analysis of effects of pandemic on global supply chain of medical products

3. Barriers in Supply Chain Management Implementation during COVID-19

Following are the contributions of researchers, investigated barriers in supply chain management implementation during COVID-19.

Table 2.2: Barriers in supply Chain Management implementation during COVID-19

S.No	Researcher (s) (Year)	SCM barrier
1.	Rajak et al. (2021)	Social distancing, quality information sharing, lockdown to the society, education campaign and training, emergency logistics systems, emergency backup facilities, strategic planning, supply chain strategy, resource management, capacity management, inventory management, public private partnerships, government policies and support, donation management, clarity about responsibility, stop grey marketing of products.
2.	Poduval et al. (2021)	Strategic barrier, cultural barrier, technological barrier, individual barrier, financial barrier, resource barrier, regulatory barrier, sourcing barrier, innovation barrier, reconfigurable manufacturing system, quality barrier.
3. 2021	Suguna et al. (2021)	Customers' expectations, health, delivery density, cost of last mile delivery, types of goods, achieving routing efficiency, infrastructure, issues from customer's side, unpredictability in transit, meeting fulfillment timeline.
4.	Okorie et al. (2020)	Organization already originally produces PPEs/medical related equipment, fully occupied with running existing and/or increased demand, lack of positive response from government upon offering assistance, financial/costs constraints, safety/ regulatory concerns, lack of technical information, technological capability/capacity, availability of human resources and skills, strategic goals, COVID-19 related health concerns, COVID-19 related government imposed restrictions, complexity in

		repurposing product/infrastructure, supply and demand issues, time constraints, others.
5.	Agrawal et al. (2020)	Lack of labor, lack of raw materials for production, unavailability of imported goods, shortage of livestock feed and their availability, bottle neck in last mile delivery, lack of transportation, slow movement of goods, lack of availability of local transport, ban on overseas transportation, decline in consumption of high value food commodities, lack of awareness in people regarding COVID-19, lack of buyers, perception of scarcity among masses, increased shortage for perishables, slow credit flow banks and non banking financial companies, lack of cash flow, pressure from locals enforcement, E-pass issues.
6.	Alam, et al. (2021)	Manufacturing challenges, behavioral challenges, last mile delivery challenges, cold chain challenges, organizational challenges.
7.	Barman et al. (2021)	National lockdown, lack of labor availability, delay in activity, customer behavior, role of social media during COVID-19 pandemic, COVID-19 impact on the value of housing and real-estate firms, Covid-19 impact on tourism sectors and food supply for tourists, Covid-19 impact on consumption of electricity and GDP growth worldwide, Recovery strategies and market growth of food supply chain.
8.	Das et al. (2021)	Process automation and artificial intelligence, inventory management, outsourcing of business operations, geographical integration of supply chain, quality assurance, monitoring unethical pricing practices, service quality and customer satisfaction, human recourse management, government support, cost optimization, contingency planning.
9.	Mahmud et al. (2021)	Reluctance to share information, poor information quality, poor systems connectivity, intra-organizational weak relation, incentive obstacles, leadership deficit, short term relationship, cultural differences, non standardized performance matrices, forecasting problems, customer taste variations, lack of commitment on delivery time, information flow disruption, lack of communication, vehicle routing problem, decision de-synchronization, opposition to change, lack of trust,

		behavioral uncertainty, different goals, lack of commitment on quality, reluctance to deal with small firms, government interventions.
10.	Yadav et al. (2020)	Requirement of change in organizational policies, Requirement of huge development cost, Uncertainty of potential outcome against complexity involved, Lack of technical expertise to vaccine distribution, multiple dose vial, Decentralized accountability, linking all the stakeholders of value supply chain with upgraded technology, Requirement of large IoT infrastructure, Immaturity of block chain in healthcare management, Threat to data security and its accountability, Lack of government policy and legal framework to counter conflict, Data storage issues, Latency and Scalability issues, Immutable nature of block chain technology, Lack of trust for freely data sharing, Data standardization, Lack of awareness of block chain technology opportunities in supply chain, Energy consumption/ Environment issues, Insufficient research and development on block chain adoption.

4. Gaps in the Research and Objectives of a Proposed Research

Following points represent the gaps, investigated from the survey of available literature:

- a) There is very limited research which focuses on the generalization of barriers in implementation of supply chain during COVID-19.
- b) There is also a very limited research which focuses on the firms belonging to Madhya Pradesh and modeling of barriers of supply chain management implementation for these firms.

Following points represent the objectives of a proposed research:

a) To investigate the barriers affected the implementation of supply chains

With the help of this objective, actual barriers responsible for implementing supply chain shall be investigated, which shall open new insights of the problem;

b) To investigate the relationship among the barriers

With the help of relationships among the barriers, critical, sub-critical as well as non-critical ones shall be identified, as well as future researchers shall be able to prioritize them with respect to their importance.

5. Conclusion

Till now, in different countries, the pandemic is continuing and different variants of the virus are appearing, which is not a good sign for us. Yet, different countries, including India, have launched vaccines, and majority of countrymen are vaccinated, but, still the future is uncertain. In this regard, the importance of supply chain management related problems cannot be overlooked, and in this sense, the, the present research work seems to be appropriate.

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