

Resilience and Agility as Indispensable Conditions for Sustaining Viable Supply Chain During Pandemics: The Case of Bahrain

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Abstract— The concern of this paper is exploratory. It investigates how the emergence of COVID-19 pandemic raise many risks in the global supply chain resilience and viability. Through archival research we were able to depict how COVID-19 impacted the global supply chain in general and kingdom of Bahrain in specific. We concluded that kingdom of Bahrain was successful in terms of agility and resilience of its supply chain. However, there is a need for more case studies that concentrate on the real mundane practices related to this resilience, and more research is needed to sustain this viability in the Bahraini supply chain. The novelty of this research is the creation of a holistic review of the impact of COVID-19 on supply chain management. Through explaining the resilience, agility, sustainability and viability of supply chains and the questions raised in this emerging market this paper could be a valuable resource for future researchers to seek solutions to supply chain management in pandemic and epidemic times. This work would also be on interest to practitioners from the GCC and other less developed countries in their thinking about facing the pandemic risks and building viable sustainable supply chains.

Keywords— Supply chain, resilience, agility, sustainability, viability, kingdom of Bahrain.

I. INTRODUCTION

“Go ask your portfolio manager for his definition of “risk” and odds are that he will supply you with a measure that excludes the possibility of the Black Swan”

— Nassim Nicholas Taleb

Global Pandemics like Covid-19 constitute a live representation of what Taleb [1] called the black swan. Coronavirus made severe unexpected disruptions in the global supply chain in almost all sectors and countries (e.g. frozen foods, grocery items like toilet papers, ventilators, masks, and even oil) [2-4]. In the last six months we noticed scarcity of food supply to some major hyper supermarkets [2], decreased demand for oil [5], disruptions in both masks, and medical equipment’s supply [6] in many countries. This crisis proved that in the globalized world that we are living in no one is immune from such disruptions in the supply chain [7]. Reviewing Supply Chain (SC) literature revealed concentration on two main correlated topics namely models of SC resilience and SC risks and risk management [2, 8-13]. Most of these studies are theoretical and exploratory in nature.

Mostly, the above-mentioned studies concentrated on industrial counties, and little is mentioned about developing economies and how they tackled this disruption in the global supply chain. Hence, the current study research problem is to investigate how the emergence of Covid-19 impacted the SC in global markets and in Bahraini context. This was done through desk research using meta-analysis of the literature and identify lessons learned and directions for future research to understand the SC risks and resilience strategies in the Bahraini context. Kingdom of Bahrain represent a unique case in handling the impact of this black swan on the Bahraini SC. Bahraini SC is seen to be one of the successful examples that handled the crisis with minimum effect on most of the goods flow. However, this is noticed in the availability of foods, medical equipment and masks with reasonable prices, little is known about how these good results were reached, and many questions are raised regarding the sustainability of the current status in the near future. These issues plea for more case studies to understand the micro level mundane practices for this success and how to sustain this stability in the Bahraini SC in such critical time.

The paper is organized as follows. Section 2 presents the literature related to the Covid-19 as a black swan and how it impacted the SC. Section 3 describes the decreased role of Enterprise Risk Management (ERM) tools and the increased concentration on producing more innovative resilience tools in the crisis time. Section 4 presents supply chain resilience models and propositions for the Kingdom of Bahrain SC. Finally, section 5 presents the concluding remarks of the study.

II. THE IMPACT OF THE BLACK SWAN ON SCs ANALYZED

The black swan is a metaphor that explains a surprising event which has severe impact and is inappropriately rationalized. These unexpected events are designated by their uncommonness, severe impact, and the widespread of their impact [1]. Covid-19 pandemic is described as a being one in one hundred years catastrophic event [14]. SC and logistics researchers and practitioners alike see pandemics and epidemics as rare SC risk. This risk is different from other operational well-known risks as it is distinguished by its long-term escalating disruption (i.e., the ripple effect) along with high uncertainty level in the full network [3, 6, 12, 15].

The globalized SC have numerous risks. These risks can be categorized into two main categories, namely operational and disruption risks. Bullwhip or Operational risks are representing the common daily minor disturbances and disruptions. These include lead-time, supply, and demand fluctuations. While disruption risks represent our black swan, which is characterized by the low-frequency-high-impact situations. Differences between the two types of disruptions is summarized in Fig.1. below. In the literature the black swans were thought about to be natural disasters such as earthquakes and tsunamis, or even man-made catastrophes like factory explosion or so [12]. However, no one thought of the one in the one hundred years event that we have these days [14].

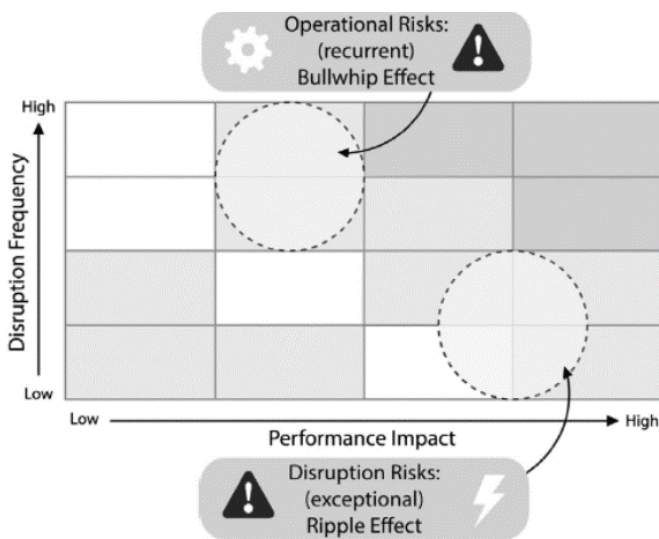


Fig.1. Operational and Disruptive Risks [16]

Black swan events like pandemics has a quick, severe, and sometimes immediate impact on the SC network, as some factories, suppliers, and transportation methods inaugurate unavailable. These sudden changes will have a direct impact on the storage levels, delivery times as many delays are expected at these times. This spiral of disruptions is known in the literature by the ripple effect [7, 12, 17, 18]. The ripple effect on SC is distinguished by three main interrelated criteria: full ambiguity in the situation which entails an expectation of long-term unpredictable disruption [11]; simultaneous disruption propagation in the SC; finally, disruptions in supply, demand, logistics infrastructure and lack of good control over the processes. The ripple effect of Covid-19 impacted the global SC more than other epidemics when compared to SARS, MERS, Ebola, and Swine flu [12]. Hence, this ripple effect should be tackled with agility and resilience mechanisms or it may lead to full paralysis of managers and lead to slowdown or maybe totally stopping the SC [17]. The starting point in facing this critical risk is to ask a series of questions to clarify some of the uncertainties related to the situation, i.e., how much time the SC disruption may continue? how much time is needed to recover? what policies and actions that suits the current situation? how to deal with shortage of supplies, and delays? how much is expected to change our budget to cope the smoothness of the operations? [12]

Based on answering such questions a quick move should be undertaken and this what agility is about [7]. What is more important than agility is the SC resilience. What sort of corrective actions is needed to be resilient?

III. PANDEMIC RELATED RISKS AND SC RESILIENCE

The concept of resilience is well developed and studied out of the SC literature since late 1970s. Resilience studies include fields of ecologists, material scientists, psychologists, sociologists and management scholars [19]. SC resilience started to flourish by early 2000s. Resilience is defined by the National Academy of Sciences as “the ability to prepare and plan for, absorb, recover from, and more successfully adapt to adverse events” [9]. Having said this, SC resilience is a measure of the ability to perform main activities during the crisis time, and to innovate a recovery plan that cope with the new normal that is produced as a consequence of the crisis [8].

The increased concentration on resilience is due to the changes that emerged in SC management in the recent decades. The modern SCs are becoming more complex and vulnerable networks than ever before [8]. The increased risks and vulnerabilities are related to the networks inter-connectedness in the global SC. What derived this globalization ideas are the profitability and competitive advantage forces. These forces pushed producers, and suppliers in the market to think about reducing costs and relying more on lean SC. Through deploying lean operations, supply chains are becoming increasingly complex [4], more interdependent [12, 17], vulnerable [2], and sensitive to disruptions. Sensitive to the extent that any small interruption in any local setting in the network can easily disrupt the full network [9, 20]. Consequently, SC resilience became one of the main trends in the SC literature as the adaptation, recovery, agility, and viability are central elements for companies to survive and grow in such complex market [7, 20].

The emergence of Covid-19 and its ripple effect plea for expanding SC resilience studies to contain not only the recovery side but also the methods through which SCs can resist those disruption in the future [9]. These studies concentrate more on building more proactive and reactive networks [20]. While building these networks two main questions should be asked regarding SC resilience, namely, resilient to what? And resilient of what? [10] If those two questions were answered properly this will decrease the ambiguity related to the market complexity to a great extent [11].

Reviewing SC risks and resilience studies revealed many gaps in the literature of modeling and managing SC networks (e.g., transportation, command, and control), as most of the studies revealed SCs failures due to COVID-19. The current form of SCs were unable to absorb, recover, and adapt with the propagation of the Covid-19 ripple effect [6, 15, 16, 20, 21]. Some researchers argued that the two main reasons led to this failure. Firstly, the increased reliance on outsourcing and the decreased role of supply bases made more power in the hand of suppliers. In one hand, this was seen to be good as it is giving quicker

responses (e.g., just-in-time), on the other hand this was evidenced to decreased flexibility in the time of the crisis [13, 19].

Secondly, Covid-19 revealed the failure of the conventional risk management techniques, as these tools were unable to sustain a resilient SCs. However, pre-Covid-19 literature contains many supporters to the Enterprise risk management (ERM) framework as a strategic process for risk identification, appetizing, mitigating and controlling which in the end entails achieving acceptable levels of risks [22, 23]. Current trend in SC literature is criticizing the existence of ERM and explaining its weaknesses rather than merits [6, 8, 20], which returns us to the early claim by Power [24] “the risk management of nothing”, and confirm our starting quote by Taleb [1] that ERM and risk managers will not be able to deal with the black swans.

IV. POTENTIAL REMEDIES FOR THE BAHRAINI CONTEXT

COVID-19 pandemic revealed the lack of SC resilience in many countries. However, we seen failures in some western countries, the GCC region in general and kingdom of Bahrain particularly shown success cases in both SC agility and SC resilience. GCC region shown this success in its SC management while there were several shocks in these markets, namely, supply, and demand shocks. In the supply side, the crude oil market had witnessed unexpected slowdown due to the lockdowns and the decreased need for oil in general, this situation led to a sharp decrease on the oil prices [5]. In the demand side, the GCC countries increased their demands to have more stocks from their suppliers to secure safety stocks from food [2], masks, and other needs. At that time suppliers were getting increased amounts of orders from many other places while the supplied goods to them were decreasing sharply as the world factory (i.e. China) was locked down, and some countries declared stopping the exports to keep their crops and goods for themselves [14]. In risk terms the GCC countries were faced by operational, supply, demand, and control risks.

Kingdom of Bahrain government was proactive in handling this crisis through instantiating what is called Team Bahrain for handling the crisis. This team made several meetings with all the concerned parties (Private and public) to stand on the main challenges and try to mitigate the impact of the crisis on the Bahraini SC. The main risks identified were raw materials and goods scarcity due to the increasing demands from other countries and the expected delays in the shipments. This was handled through changing ways of transportation to cargo and road shipments if the air shipments were not available and searching for alternative near suppliers in case some of the current suppliers locked down. Moreover, the government had offered generous fund to help the market participants and people to recover from this pandemic in quick way. Finally, all actors in the Bahraini network were informed to recalculate their budgets as suppliers may increase the prices of the goods. It worth mentioning that however the borders were closed in all countries including the GCC counties, the King Fahd Causeway was opened for trading

between Kingdom of Bahrain and Kingdom of Saudi Arabia. This vital road shipment platform helped too much in mitigating the risks related to SC resilience and agility [14].

The above-mentioned key interventions are the only available information relating to the kingdom of Bahrain context. These key interventions are not enough to fully understand how Covid-19 was tackled in the Bahraini context, this plea for future studies that is based on case study methodology to understand more about what sort of mundane practices were adopted on the country level and on companies level to mitigate the impact of Covid-19 on the Bahraini SC. As Covid-19 still an existing risk many questions are raised relating to the sustainability of this viable SC. Questions related to the time of the pandemic, and the proper moves in the future. Therefore, we propose some suggested remedies from the literature that may be useful in sustaining the viability of the Bahraini SC.

The literature is full of ready to use remedies for the SCs resilience and sustainability of viability. We will discuss the most important ones in the remaining of this section. Firstly, Sharma, et al. [13] recommended strategic actions for SC resilience and sustainability that includes more concentration on social aspects of SC; the need for flexibility and potent actions; more investments in technologies like artificial intelligence (AI), automation, IoT, blockchain, edge programming interfaces (APIs); develop a culture of collaboration between all the parties in the SC which will lead to more trust and stability; finally, diversify the suppliers. Secondly, Dmitry and Ajay [17], suggested that proactive measures that were taken by many countries like inventory hoarding is not the right action, as it will help at the beginning of the crisis but by time it will not be helpful. They asked for a drastic shift in handling and managing SCs through moving to situational responses or what they called “real-time changes”, rather old ways of management that relies on making proactive redundancies. Finally, they suggested if a proactive plan should be made ,this should be in the production systems that relies more on robotics and automated production and distribution systems for them this will decrease the disruption, however, it is too costly option and may be rejected by most of the producers because of the cost benefit analysis.

Thirdly, Keenan [21] stressed on the need for the cooperation between private and public sectors as they have a reciprocal relationship that if invested in a good way could lead to sustainability of a viable resilient SC. Fourthly, Bryce, et al. [8], suggested more localization of the important raw materials and goods, or at least suppliers should be in nearby country or region. for them this will make more security and will reduce disruptions in the SC in case of pandemics. Finally, Lopes, et al. [18] suggested four main principle to build a smart more resilient SCs. Their four principles are: Engineering, Collaboration, Agility and Culture. For sure those four core principles may have some contradictions between them from time to time. In this regard, they suggested that trade-offs will be needed to have a viable sustainable SC. To sum up, many propositions, suggestions and ready to use remedies are in

the literature. These future research directions can be summarized in In Fig. 2 below.

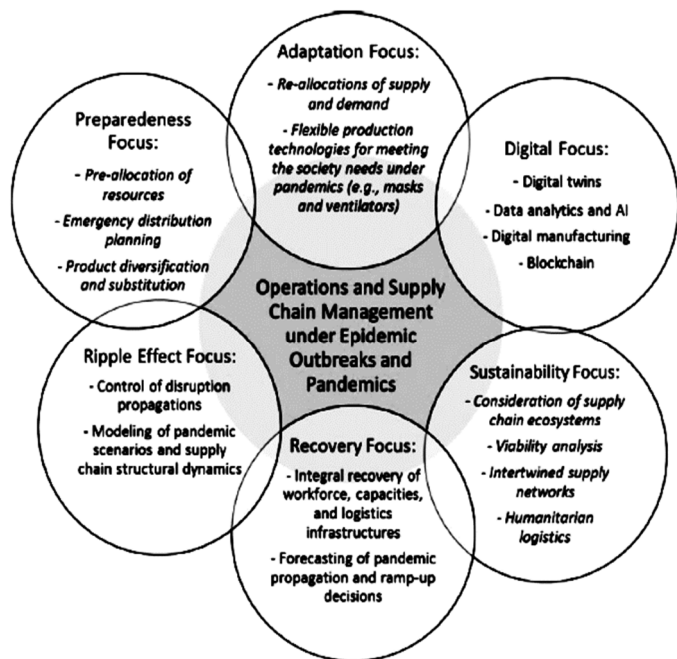


Fig.2. Summary of Future SC Research Agenda [4]

V. CONCLUSION

We concentrated in this exploratory study on the challenges that the global and Bahraini SC faced due to the emergence of COVID-19. Our main concern was to understand the importance of resilience, risk management tools, and agility in the global SC management. We clarified how COVID-19 pandemic represent a black swan that is a case of low frequency and high impact. This black swan caused massive disruptions and sometimes full paralysis to some supply chains around the world. The pandemic has proved that traditional risk management techniques failed to cope with the pace of the changing scenarios during the pandemic.

This remind us with the claims that were raised against ERM in the financial crisis time, and how they failed to resolve the situation at that time. Having said this, Covid-19 plea for the resurgence of these criticisms and re-evaluation of using such technologies again in the post-pandemic SC management. We found that SC resilience and agility were more important for researchers in relation to the impact of pandemic on the global SC. Moreover, even resilience studies started adding new dimensions to the resilience literature. Resilience in pandemic has been expanded to include the resistance to disruptions rather than just recovering from disruptions.

As an exploratory study the current work is limited to the available date on the key intervention in Kingdom of Bahrain. These limited data need further qualitative case studies in the future to understand more about SC resilience in emerging markets. These case studies could reveal more information about the mundane practices that led to this success. Moreover, the importance of these comparative

extended studies is needed as many questions are raised regarding the sustainability of this viable supply chain management. To conclude, the situation remains unclear especially because we are still amidst the pandemic and it is unknown when it will end. Hence, we reviewed the literature for SC sustainability and viability and proposed some ready to use remedies that may be useful for policy makers, company decision makers and academics in their future studies of emerging markets SCs in general and the Bahraini SC in specific.

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