



Operations, Logistics and Supply Chain During and Post-Covid-19: Challenges, Lessons and Way Forward; Case Study of Sultanate of Oman

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Abstract. The unprecedented coronavirus pandemic has exposed many industries leading to massive losses of property and lives. In order to prevent the spread of the virus and more loss of life, governments across the globe have enforced some restrictions. This has also been the case in Oman where these restrictions have unfortunately impacted movement of people and activities across different industries including supply chain, logistics and operations adversely. This research paper assesses the challenges that the virus has brought to these three industries, lessons and provides recommendations on the way forward. Given the current problems in the supply chain, the recommendations provided by this study will be useful to properly manage the industry and come out strong.

Keywords. COVID-19, Supply Chain, Disruption, Risk management

Introduction

Since time immemorial, business operations and global supply chains have often been disrupted by pandemics, disasters, and epidemics. However, none of the disasters in the past can match the damage that has been caused by the COVID-19 pandemic. The coronavirus pandemic COVID-19 is an unprecedented event that has affected almost every industry globally. It has put different industries under immense pressure leading to losses of jobs and business opportunities, in addition to sickness and loss of life that has been seen in the past two years. Some of the industries that have suffered the most are supply chain logistics (Meyer, The impact of the coronavirus crisis on supply chains and their sustainability: A text mining approach. , 2021). The COVID-19 pandemic has adversely affected operations, logistics, and supply chains, and the challenges are expected to last during and post-pandemic, giving lessons to various industry players.

Since the discovery of COVID-19 in December 2019, it has spread to most countries leading to extensive lockdowns and sweeping regulations, all meant to reduce the transmission and spread of the virus among communities. In Oman, things are not so different from what the rest of the world is experiencing. While these measures might be well-intentioned, they have provoked unimaginable social and economic disruptions globally, mainly because of strong social distancing and travel regulations. The measures have resulted in one of the most significant global recessions since the Great Depression back in 1930 (Meyer, The impact of the coronavirus crisis on supply chains and their sustainability: A text mining approach. , 2021). While all these things are occurring due to the global outbreak in 2020, the supply chain has had to cope with countless troubles that were never predicted before. Although there was a massive demand for some products, other items saw reduced demand. Similarly, the production of some commodities and their movement from the manufacturer to the consumer suffered significantly.

Businesses have been trying their best to cope with the new situation and find new ways of addressing the challenges occasioned by the pandemic. This is evident through various discussions that are taking place and scientific research that focuses primarily on enhancing resilience in the supply chains during crises, such as pandemics and disasters. The unmatched challenges presented by the outbreak have brought many human activities to a halt. With the discovery of the virus in Wuhan, China, where it was first reported, China, a leading manufacturing powerhouse, was severely affected. It had to reduce the interactions between people, significantly cutting down industrial activities, which the rest of the world depends on for survival. The instigation of lockdowns soon ensued in many other cities around the nation, which would soon show the world's dependence on the Chinese manufacturing and supply chain capabilities for the survival of many businesses. This put many factories at considerable risk, with others cutting down production due to a shortage of materials. After some time, the closures and suspension of operations became a global problem as the virus spread everywhere. Millions of people were infected in over 216 countries worldwide, and by June of 2020, nearly half a million people had perished (Farooq, 2021).

The adverse effects of the pandemic have gained the interest of healthcare professionals, scholars and researchers from other fields, and industry leaders. Apart from medical professionals who want to know how to tackle the pandemic and treat the diseases, industry leaders and economists are exploring the impacts of the pandemic on supply chains and operations and how organizations can emerge from it much stronger and resilient. Moreover, various scholars are assessing different dimensions of the pandemic in relation to the disruptions. On the other hand, industries are trying to figure out ways to use digitization to combat future disruptions. Accordingly, this research seeks to find out the challenges of the coronavirus disease on supply chain, logistics, and operations, and the lessons and way forward during and after the pandemic, using Omani context.

Background

Coronavirus disease is a highly infectious disease that affects the respiratory system. Given the massive infections and its high rate of transmission and danger it presents to the public, the stringent measures that governments across the world have enacted have limited movements of people and products. In Oman, like the rest of the world, the response to the pandemic by the public and businesses has led to various issues that experts warn can lead to adverse effects on the economy (Zhu, 2020). With this, supply chains, air, sea and land transport are facing massive disruptions and problems in adjusting to the rising demands in an environment that have been locked down and freedom limited. In a 2020 report published by Accenture, 94% of the Fortune 1000 companies have encountered disruptions due to the pandemic. On the other hand, 75% of the companies have had negative or strongly negative impacts on their businesses, while 55% are planning to or have had to downgrade their growth outlook (WILSON, 2021).

With the new situations, businesses are trying to adapt to the changes. They will probably face countless challenges now and after the pandemic that will become suitable lessons in the future occurrence of similar events. However, the problem is that there are very few research, primarily in Oman, on the supply chain, logistics, and operations challenges posed by the pandemic and the lessons that people and businesses in this country can learn from the pandemic. There are also limited studies on the way forward during and after the pandemic since most of the literature seems to dwell more on the effects of the pandemic and challenges on other countries. On the other hand, the traditional research paradigms, which could have worked for other disasters, fail to keep up with the pace of the current pandemic and economic developments. Since this kind of pandemic is still new, there is little empirical evidence on its impact on the supply chain, operations, and logistics. As such, a new study is necessary to figure out the impact of COVID-19 on supply chain, operations, and logistics and its implications now and post-pandemic in Oman. With this, there is a need to assess the lessons from the pandemic and a way forward. This research assesses the supply chain, logistics, and operational challenges that the COVID-19 pandemic presents and the lessons that can be drawn from it to forge a way forward now and in the future in the context of Oman.

According to the International Civil Aviation Organization ICAO, supply chain activities have substantially reduced due to the COVID-19. This has affected the GDP due to the disruption of economic activities. As the challenges continue coming up, industries are rethinking technology's role in averting future disasters and disruptions. With the massive scale of the pandemic, many operations have been disrupted because of lack of preparedness and inability to identify the flaws in the supply chains before they occur. Therefore, early detection in the future and the precious lessons learned from this pandemic will play a critical role in keeping businesses operational even when there are large-scale outbreaks or disasters. Furthermore, these measures will allow industry leaders to take quick action and enforce remedial measures to lower the severity of the effects (Farooq, 2021).

According to Farooq et al. (2021), building multi-tiered systems enhances supply chain and logistics capacity to conduct operational optimization and improve access to the customer to minimize the ripple effects. Although there has been a failure in many areas when addressing the pandemic, the lessons from the past pandemics and disasters such as hurricanes have helped to some extent. Therefore, understanding the challenges presented by COVID-19 and extracting some key lessons from it as it pertains to the supply chain, logistics and operations will shine a light on the way forward and present a perfect learning point that can be used in the future.

Aim of the Research

This research aims to identify the challenges that the COVID-19 pandemic has presented to the supply chain, logistics, and operations. The study also intends to identify lessons that the pandemic teaches the players in the industry and proposes a way forward now and after the pandemic.

Objectives of the Research

The objectives of this research are:

- To provide a comprehensive assessment of the COVID-19 pandemic on the supply chain, operations, and logistics sector.
- To explore the challenges that the pandemic has had on the supply chain, operations, and logistics sector.
- To find out lessons that organizations and agencies can learn from coronavirus outbreak and how they can use those lessons to respond better in the future.
- To find out the best way forward during and after the pandemic.
- Develop a framework for managing supply chain operations, preparedness, vigilance, and readiness strategies.

Literature Review

Understanding Supply chain and its role

For Oman, as it is for any other country, supply chains play a critical role in the day-to-day running of many industries and the survival of humans. According to Mentzer et al. (2001), supply chains are made up of three or more entities (organizations or persons) involved directly in the flow of goods, services, finances, and information upstream or downstream from the source to a customer. On their part, Meyer et al. (2021) note that supply chain management SCM is made up of the management of activities in the supply chain and relationships with the aim of ensuring companies have a competitive edge. SCM also entails maximizing customer value by ensuring the supply chain is effective and efficient at all times. In Bozarth and Handfield (2016), the author notes that successful organizations must carefully manage their supply chain operations through proper planning, scheduling, and controlling activities.

In furtherance of Mentzer's definition of SCM, Seuring and Müller (2008) define SCM as the management of material, information and flows of capital, and cooperation among companies along the supply chain to enhance sustainable development. The literature further argues that the sustainability of the supply chain is critical for the success of businesses. Meyer et al. (2021) posit that companies with sustainable supply chains have properly aligned financial support and environmental goals that protect supply chains from commodity traps.

Effects of COVID-19 on Supply chains

The outbreak of COVID-19 in China has forced many companies and entire industries to rethink ways to transform their supply chain models. According to Kilpatrick, (2020) the disruption of China in 2019, a leading manufacturer, has destabilized the globe regarding the movement of raw materials and finished products (Kilpatrick, 2020). The pandemic exposed the vulnerabilities of many businesses, primarily those who rely on China to fulfill their needs for raw materials and finished items. In Zhu et al. (2020), the author appreciates this by noting that the pandemic has significantly affected the supply chain, affecting business operations. In this literature, the author points out that lockdown and stringent policies put in place to curb the spread of the virus as the leading cause of problems.

In Parsons (2020), stockpiling is one of the challenges that organizations are facing. According to this literature, stockpiling is a spike in demand for the short term, leading to empty shelves. The impact of this is that created, according to Micalizzi (2021), resulted in scarcity. This resulted in stress, fear, anxiety, and panic, leading to many of them resorting to stock items in their homes. In Parsons (2020), larger businesses are better off in the event of this scenario. However, smaller businesses that lack proper inventory control and diverse supply base are in danger when this happens. Stockpiling creates variability in demand for small businesses, which makes it hard for them to absorb

because they lack the scale and flexibility required to maintain the availability of products when demand surges.

Effect of COVID-19 on road transport, aviation and shipping

The COVID-19 pandemic has profoundly affected many areas of the economy of Oman, including public and private lives. These include how people travel and how goods reach their destination. During the beginning of the pandemic as the world sought to understand what they are dealing with, lockdowns were implemented as the only option available then as seen in ITF (2021). The literature posits that the pandemic has led to suspension of transport, closure of borders and lesser movement of freight. As confinements increased, the Omani transport sector and logistics including air, land and sea transport was substantially affected. Al Amri (2021) goes further into the arguments and points out the impact of the pandemic on the economy and transportation taking into account the fact that Oman depends on oil exports. The effect of the COVID-19 crisis on transport has seen the use of fuel dwindle substantially, profoundly affecting the economy and living standards of many Omani citizens.

Although most scholars agree that lockdown is an excellent approach to curb the spread of the virus in the short term, they are also wary of the problems it causes to the economy. While it may help minimize transmission, infection, and spreading of the virus at the local level, it does not curb the community spread. It also causes scarcity of labor force while disrupting operations, logistics and damages food and other critical supply chains. The hoarding behaviors of essential items occasioned by lockdowns were also the biggest problems caused by the pandemic crippling the economy and bringing the world to a standstill. According to Akintokunbo et al. (2020), all sectors in the economy have a connection to the complex network of supply chains and logistics. However, some activities were put on hold during the pandemic, and the economy was affected significantly. Akintokunbo et al. (2020) further posit that the lockdowns have substantially affected the movement of essential goods like medical equipment and food items while at the same time showing severe weaknesses in the global supply chains and logistics. Although most of these literatures do not talk directly about Oman, the challenges that other countries are facing are similar to those faced in Oman.

According to Linton and Vakil (2020), the prolonged pandemic and the strict social distancing and lockdown measures are affecting the transportation of products. It is also causing the unavailability of processed and packaged goods because of the slowdown in manufacturing due to social distancing guidelines and shortages of labor caused by these restrictions. The same literature posits that the slowdown of agricultural production has affected the food supply chains, driving many people to poverty. In Zhu et al. (2020), the bullwhip effect is described as a resulting problem caused by the pandemic that substantially affects supply inputs. Like Parsons (2020), Zhu et al. (2021) posits that the pandemic has led to diminishing global pipelines of items and a shortage of goods from manufacturers. The pandemic has not spared the health supply chain. It has resulted in a shortage of

critical items like N-95 masks, as seen in Akintokunbo et al. (2020). From this literature, the author assesses the influence of the pandemic on medical supply chains and how companies are unable to meet the rising demand for critical items due to restrictions. The global shortage of ventilators and PPEs is an example of shortages that are visible during the pandemic. The logistics and transportation aspects of supply chains have not been at their best and lack optimization with the current situation.

Research Methodology

To carry out this research, the method that has been selected is a systematic literature review. According to Queiroz (2020), a systematic literature review is a technique used to summarize the findings of the existing literature, find out the consistency of the reported studies and confirming that specific findings are not unique to the current discussion. Different researchers have used this methodology on various occasions to map out and identify challenges in the supply chain and logistics sector. Since various studies have already been carried out in this area, it will be a practical approach for this study in rigorously evaluating the status of the supply chain during and after the pandemic. The process entails various steps, which begin with defining the research questions, the scope of the research, and limiting the areas for the research, all of which fall under planning. These are followed by searching, screening, and extracting evidence from the studies.

The process involved reviewing literature and comprehensively assessing peer-reviewed journals, research studies, and articles using key databases and keywords. A systematic search was carried out on databases such as Google, Google Scholar, ScienceDirect, and JStor to identify the articles relevant to the topic under research. The literature review began with identifying the topic for research, coming up with keywords to be used in research, and inputting the keywords into the search box of the databases identified above, then drawing and drawing conclusions, as posited by Chambliss and Schutt (2018). Articles, journals, books, and newspapers published recently (within five years) were used to ensure the findings are as accurate as possible. The subjects researched are challenges of COVID-19 on logistics, operations, and the lessons that can be drawn from the pandemic. Supply chain problems during the pandemic were also assessed. All the reviewed works were referenced in the “reference” section.

Data Analysis and Findings

Impact of the Pandemic on Businesses

Supply and demand shocks due to policies

The coronavirus pandemic has adversely affected the supply inputs for a majority of businesses. Because of lockdown, most businesses have been closed due to the inability of people to move. Zhu et al. (2021), the factories that lay down idle in China affected supply leading to diminishing global pipeline of items. When the lockdown began, the demand for some products while those of others dropped. On the contrary, the supply dropped due to the low number of individuals

allowed at a workplace. As shown in the figure below, the pandemic led to a significant drop in hours worked. Although the figure shows the leisure and hospitality sector as the one that was affected the most, the truth is that all industries, including the supply chain and logistics sector, have been affected significantly. The bullwhip effect- an increasing swing in inventory in response to the demand by the customer, meant increased uncertainty in the supply chain. This effect occurred because of a lack of transparency in the supply chain. With panic buying during the pandemic, there are increased demand fluctuations and stockpiles as people try to stock items they think they will need. This leads to inefficiencies that include poor customer service, ineffective transportation, missed production schedules, and lost revenues. All of these are caused by the unpredictability of the demand patterns during the pandemic.

While some industries experienced more shock, others did not, as seen in the diagram below.

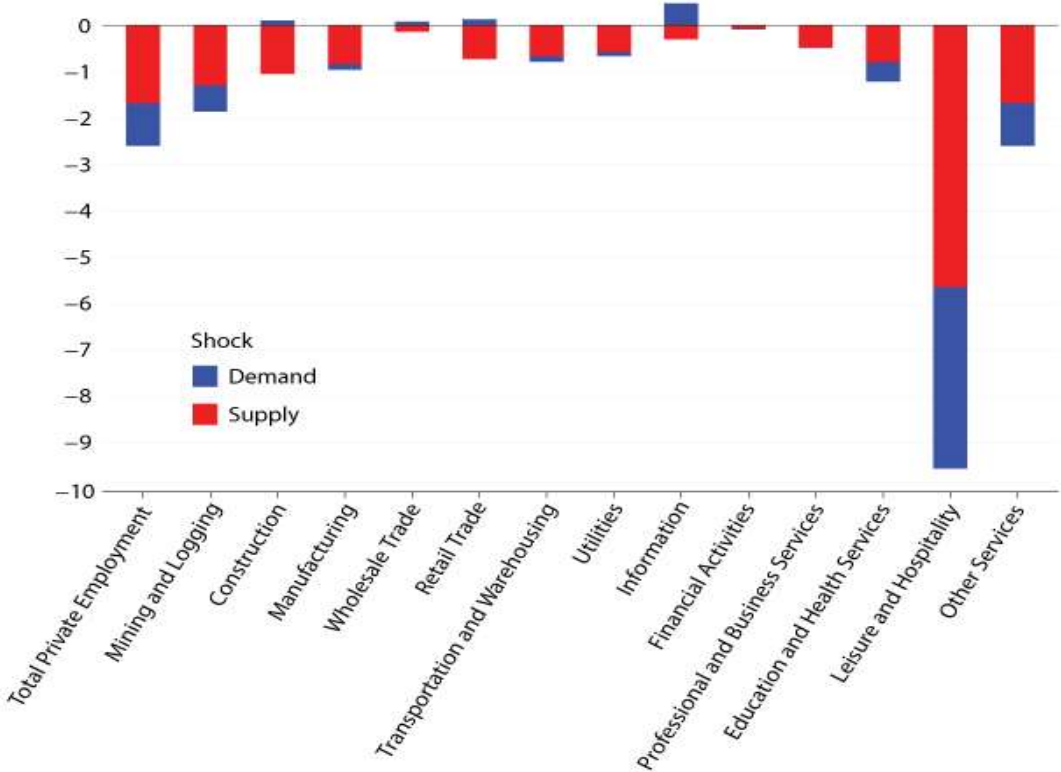


Figure 1: Supply and Demand Shocks

The supply shocks affected the most are procurement and supply chain planning and distribution with 49% and 46%, respectively (Nayler, 2021) as seen below. As the pandemic continues disrupting the supply chains, it has exacerbated uncertainty in inventory management, sourcing, and quantification, all affected to varying degrees.

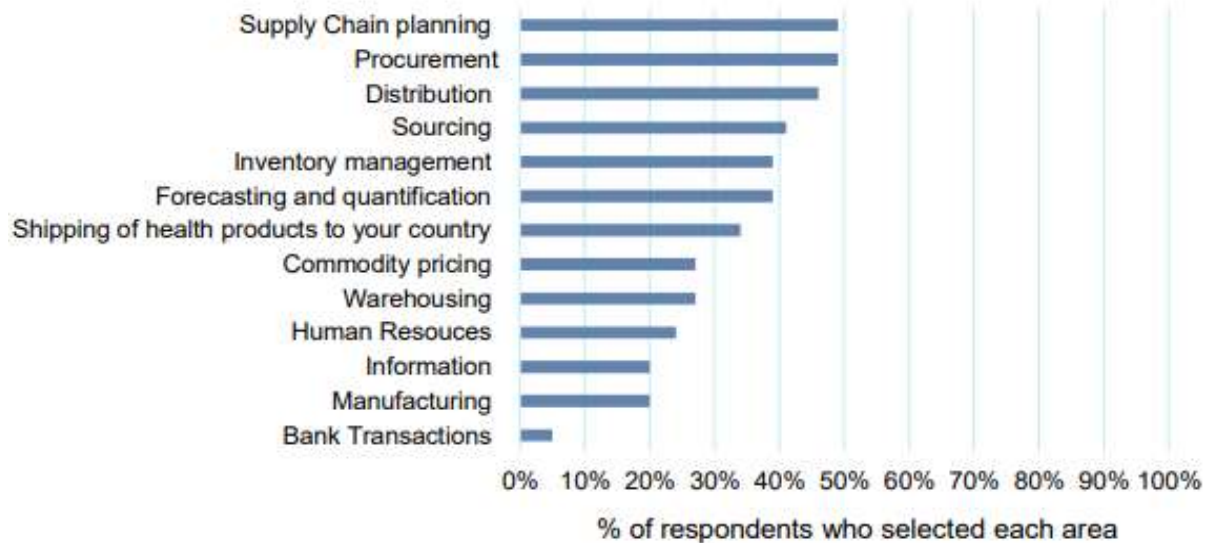


Figure 2: Supply Chain Areas Affected by COVID-19

From figure 2 above, it is evident that supply chain planning, procurement, and distribution have been affected more by the protracted pandemic. Some of the reasons for this are the reduced movement of people and shortage of materials due to panic buying and unavailability of the workforce to deliver. Because of the overbearing impact of the pandemic, companies have been forced to fulfill orders and attempt to allocate resources to serve customers as best as they could. However, the restrictions have made it impossible to attain all the desired needs, even for products in high demand. The result of this has been increased customer needs and the inability of the supply chain to meet the demand. Although there are many ways that companies can evaluate their priorities and make tradeoffs, one cannot risk workers' lives. The bullwhip effect due to the pandemic has also made it impossible for supply chain companies to predict what comes next.

Challenges to transport and logistics

From the assessed literature, it was found that transport and logistics firms that help businesses get the products have been affected substantially by the pandemic. In China, for example, the total volumes of containers handled by the ports dropped by more than 10% in the first months of 2020, according to the International Finance Corporation IFC. DHL notes that as the pandemic continues hitting, the low demand on some items will continue affecting routes between Asia, Europe, the US, and Latin America.

Statista points out that almost all forms of transport have been affected by the pandemic. In their study, rail, road (light goods transportation) and road (heavy goods transportation), and sea and air have been affected in varying degrees. For instance, among those interviewed on the effect of the pandemic on the rail, 8% claimed that the pandemic has affected this mode of transport significantly,

14.4% somewhat affected, 15.7% slightly affected, 9.7% slightly affected, while the remaining 51.4% not applicable. On road (light goods transportation), the results were 8.6%, 27.5%, 25.5%, 18% and 20.3%, respectively. On road (heavy goods transportation), the same were 12.6%, 21.9%, 20%, 13% and 32.6%, respectively. When it comes to sea transport and air transport, the results were 14.6%, 19.7%, 14.1%, 8.5% and 43.2% and 34.9%, 15.2%, 11.1%, 5.1% and 31.8%, respectively.

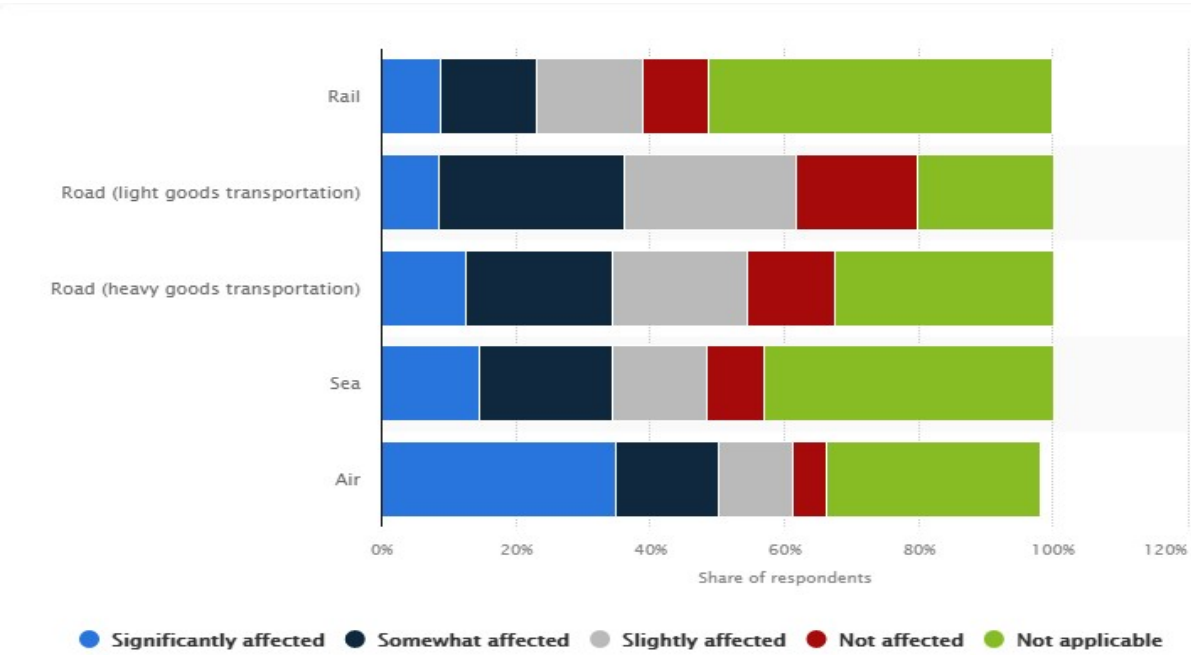


Figure 3: Effect of COVID-19 on Forms of Transport Available at: <https://www.statista.com/statistics/1182306/impact-covid-19-transportation-logistics/>

From the data above, it is visibly apparent that the pandemic has substantially impacted all forms of transport. Regardless of the extent of the damage the pandemic has had on each method of transport above, the victim is the supply chain and logistics business that depends on these modes of transport to avail products to the customer and markets. The effect goes on to affect the economy, and indeed the living standards of the people.

Lessons and way forward

Diversification of supply sources

The pandemic forced many companies to look for alternatives when the Chinese market was faced with disruption and uncertainties due to the pandemic. While those with multiple options survived, those who solely depended on China faced challenges, some being forced to suspend operations. According to McKinsey, businesses have learned the disadvantage of relying on one source for all their supply needs. For instance, in the US, companies and government agencies are exploring the importance of using diverse locations for their supplies. Companies in the US are trying to bring their supply chains closer home to avoid future problems in case of disruptions in supply chain

and logistics (Zhu, 2020). For Omani companies, the lessons can also be drawn from the challenges faced by other countries such as the US. The pandemic highlights the need for companies in Oman to diversify their supply chains by looking for alternatives in Middle East countries as a way of minimizing risk in case another disruption occurs.

Localization of supply chains

Overseas supply chains were proven dangerous for operations by the pandemic. As such, more and more companies are compelled to manufacture specific products in the region closer to home. The overreliance on China for almost everything has proven to be a costly affair in case of a disruption such as the one experienced during the peak of COVID. Localization of supply chains can help companies deliver products fast and win customers while at the same time enhancing transparency (Larson, 2020). For the Omani companies, companies must consider looking for locally available suppliers to complement those in far off countries such as East Asia and Europe to minimize risk.

Creating flexible supply chains

The trade tensions among countries had already made companies rethink the flexibility of their supply chains and the risk of failing to invest in resilience. The flexibility of supply chains is a bigger lesson that companies have taken during the pandemic as it helps companies adjust faster during stressful times. Certain businesses were able to adapt to the shockwaves of the pandemic more than others and meet the demand of the changing market faster than others, which is a significant competitive edge. During the pandemic, some companies adapted to the new demands and served increasing customers, while others could not. This was the difference in flexibility among the supply chains of these companies.

Limitations

One key limitation of this study is that it was conducted using a literature review approach. This means that research from other studies was relied upon in the study. Therefore, there is no primary data that the researcher obtained personally from the respondents. Furthermore, a review of literature fails to provide details of the overall strategy employed in research, which includes selecting articles and the quality of the articles used. This might sometimes affect the quality of the outcome. Secondly, since the pandemic has been here for just two years, there is no extensive literature on its impact, and many things are yet to be understood. Although many people have written about the pandemic and its challenges on various industries in the past two years, most of these studies cannot be relied upon because many changes may occur.

Contribution

Despite a few limitations of the study, the comprehensive survey on supply chain, logistics, and operations and the inefficiencies that have been explored in this study can contribute to a better future. For instance, the lessons regarding flexibility, transparency, localization of supply chains, and diversification will help companies prepare better for future pandemics. On the other hand, scholars will further the studies to come up with more recommendations to businesses, decision-makers, stakeholders in the supply chain sector and governments to address the vulnerabilities in the supply chain, logistics, and operations policies.

Recommendations

There are specific findings and recommendations that need to be enforced moving forward. One of them is to enforce digitization. With the challenges that the pandemic has caused, technology might be the key solution to the problems of lack of transparency and inefficiency that have defined supply chains and logistics. With technologies such as the internet of things (IoT), and artificial intelligence, transparency can be enhanced, and the movement of items can be tracked from one location to another. Localization and diversification of supply chains are also recommended to address the lack of flexibility and delay of supplies when there is disruption.

Conclusion

The events of the past two years have shown that pandemics and other disasters, both natural and man-made, can indeed wreak havoc to supply chains around the world. In this study, a systematic analysis of COVID-19 challenges on supply chains, logistics, and operations has been assessed accordingly by a structured literature review. In the context of Oman, the results indicated that the pandemic had presented numerous challenges that included disruption of transport operations due to social distancing and lockdowns, shortage of goods, labor shortages, and supply and demand shocks. Furthermore, it became evident that the economy of Oman has suffered substantially, considering the country largely depends on export of oil, which is often transported to other countries through road or sea. Using the outcomes, recommendations were made on the things that need to be implemented going forward. Some of the recommendations include diversification of supply chains, adopting technology, and increasing the safety stock.

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