

Global Supply Chain Disruption Management Post Covid 19

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Abstract

This study demonstrates this pandemic as absolute catastrophic, which has distracted the overall supply chain activities, with significant shortcomings for businesses, consumers, and the overall global economy. Though in a regular time, it has been extremely challenging to ensure seamless supply chain operations, and senior management had to struggle to respond to critical uncertainties to protect their employees, safeguard supply security, alleviate the financial collision, tackle reputational risks, and steer the market uncertainty. The life-threatening virus has not only caused disaster in our healthcare system but also has destroyed the global economy. During this global economic turbulence, the world's economy, including Bangladesh's economy uncovers itself in an unbearable state, particularly due to slumping apparel exports, declining remittances, increasing job losses, and unpredictable consumer demand. Even before the pandemic, managing seamless supply chain operations were highly challenging and stressful. For many years, multinational corporations pursued to aggressively optimize cost through economies of scale, frequently by relocating production facilities to lower-cost labor regions—opted at the expense of other critical supply chain attributes like flexibility and agility. In the meantime, enterprises and governments have occupied in business continuity and resilient supply chain management planning exercises in recent years, outdated risk management undertakings have largely involved responding to national events relating to a specific geography or sector. The current global disruptions emphasize the importance of a new paradigm to improve supply chain resilience at a significant level. Finally, the study classified ten supply chain performance measurement attributes to diagnose the performance and efficiency of an organization. This study illustrates critical challenges and the urgency of the revalidation to be needed in our strategic framework, thus the study emphasizes the importance of comprehensive performance measurement attributes. This study also demonstrates an Integrated Supply Chain

Performance Measurement (ISCPM) model connected to these attributes that can supersede the currently practiced models which are not sufficient to address all the issues in the current context.

Keywords

COVID 19, Resilience, Disruptions, Vulnerability, Risk Management, Supply Chain Performance Measurement

1. Introduction

Without any dispute, all supply chain practitioners admit: between the pandemic, shortage of containers, prolonged winter, the blockage of the Suez Canal by a container ship, frequent logistics miseries, things have been extremely challenging for the professionals to grip the operations under control. These disturbances have already led to the current global shortage of raw & packaging materials, petrochemicals, bulk chemicals, basic suppliers, emergency medical equipment. The consequences of these limitations on the supplies lead to production at a halt, price inflation, and production (Taghipour et al., 2015). The impact has been multiform and across all industries both backward and forward. The raw materials made from these are used for food packaging, medical supplies, household appliances. The critical challenges faced due to COVID 19 during and post pandemics are global supply crisis at production site due to shortage of labor, container constraints to ship goods at buyers and customer premises, shortage of staff due to quarantines and medical safety and/or lower supply, restrictions on transport and distribution operations to deliver goods or services, under-staffed, under-supplied, and store closures (Kottala & Herbert, 2019).

Lack of consumers, unavailability of transport operation crews, lack of demand for certain goods, and challenges to reach consumers for delivery restrictions. The impacts are resulted due to production shortage, unfulfilled customer orders, and spike of inventory, the uncertainty of raw material and other input arrivals for production, slow shipments, and inconsistent delivery, frequent delivery schedule failure, fewer products on the shelves, diminished ability to serve the customers, delivery is inconsistent, a timing model is faulty, and increased costs, avoid shipping, delayed delivery timeline, and more volatile demand patterns (Hussain et al., 2019). Due to the change of the business dynamics in the demand and supply in **Figure 1** as well as in the micro and macro environmental factors, it is now an urgency to revalidate our supply chain management strategic framework. The catastrophic disaster COVID 19 has compelled us to rethink different aspects of supply chain management such as disruption management, resilient supply chain operations, supply chain collaboration and so many other issues which are now a priority. Otherwise, it will be unmanageable for organizations to sustain and handle post-COVID challenges and future disasters similar to this.

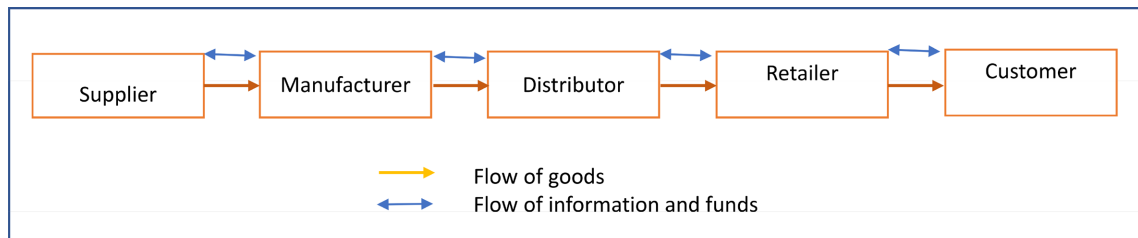


Figure 1. Flow of SCM (Saleheen & Habib, 2022b).

In **Figure 1**, a basic SCM conventionally entails suppliers, manufacturers, distributors, retailers, and customers. Every SCM prevails to satisfy customers' needs as well as to make a profit. Hence, the primary emphasis of all SCM is the customer (Samadi & Kassou, 2016). Before the modern SCM notion, it was previously recognized as inventory management within an SCM. Consistently, the researcher explained that SCM is now involved within the management of all platforms and hierarchies of the enterprise to maximize profit (Chopra & Meindl, 2016).

The first step of any change process or reengineering is to have a thorough diagnosis of current operations how an organization and its supply chain have been performing. And this performance assessment has to be integrated with the balance sheet, income statement, and cash flow so the top management can understand the top line and bottom-line impacts.

This study highlights different aspects and challenges in the supply chain industry during and posts COVID 19 both in the upstream and the downstream of the supply chain in **Figure 1**, as well as customer's points of view in the context of different industries such as manufacturing, ready-made garments, shipping, transportations, port congestions, and handling issues, etc.

And finally, this study elaborates supply chain performance measurement (SCPM), its attributes, the timeline from inception, current gaps in the measuring process and recommends ten attributes of supply chain performance measurement through which an organization can diagnose its overall business and operational performance and finally can overcome the current challenges. These attributes are to be incorporated into our strategic supply chain framework.

The study demonstrates an Integrated Supply Chain Performance Measurement (ISCPM) model which integrates the above ten attributes, which is an urgency in the context of performance evaluation of a business as well as SCM. Currently, applicable models such as the Balanced Scorecard (BSC) and the SCOR model are not comprehensive enough in our present context and require modification.

Therefore, this study has been organized in six sections—1) Introduction. 2) literature review. 3) Current challenges in supply chain operations where impacts on readymade garments (RMG), shipping & transportation, Chottrogram (CTG) port, global manufacturing suppliers, global trade and investment have been illustrated in 3.1 to 3.5. 4) In section 4, the discussion was made on research methodology. 5) Way forward. In this, this subsection 5.1 supply chain performance

measurement (SCPM) has been illustrated and in 5.2. Integrated Supply Chain Performance Measurement (ISCPM) model has been demonstrated. 6) And finally, in section 6 was Discussion. 7) Conclusion, and Recommendation and Future Research was made in 7.1

2. Literature Review

The COVID-19 catastrophe has wrinkled the garment sector for countries like Bangladesh, India, and major exporting countries upsetting millions of workers and factory owners in the supply chains and with “ripple effects” across several magnitudes. The global garment trade got nearly stagnant in the first half of 2020 and this industry has been passing through extremely challenging times due to supply chain disruptions (Bhagwat & Sharma, 2007). The Bangladesh Garments Manufacturers and Exporters Association (BGMEA) President has claimed that global brands have already canceled USD 1.1 billion worth of orders, to date, and the association is fearing that this trend might proliferate in the coming days. In the worst-case scenario, the value of canceled orders might quadruple to USD 4 billion

The majority of the workforce staying in the Gulf region and Europe are employed in the un-skilled classification and there is a possibility for loss of jobs resulting in a sharp falling-off in incoming remittances in 2020 and beyond. Falling oil prices may also diminish the GCC economies. Small and medium businesses (SMB) globally drive over 25 percent of the \$18 trillion maritime trade and this sector has been approaching an overwhelming and widespread crisis since the commencement of the Covid-19 pandemic and the rising economic decline (Kottala & Herbert, 2019). The economic slump due to Covid-19 led to the dilemma of the sector. Be it the supply chain disruption, the unavailability of shipping containers to high freight costs over the last year, many elements have collectively increased the troubles of the SMBs across the globe. China is the major exporter in the world, with 16.1 percent of global exports (Altay et al., 2018).

Global shipping trade will drop by 4.1% in 2020 due to the pandemic. CTG port in Bangladesh has been suffering tremendously during this lockdown as most of the operations run with one-third of manpower where many people have been tested Covid positive. The virus has also spread in geometric proportions and there was the loss of human life due to insufficient medical support and ventilation facilities (Kurien & Qureshi, 2018). The port alone occupies 80 percent of the foreign trade of the country.

At this time at the CTG port, there is a long queue of vessels in the jetty waiting to get birthing (McKibbin & Fernando, 2020). Thus, will cause large trading and consumer goods companies to delay production and distribution, eventually, end consumers will suffer from basic commodities, this will have a spiral impact of price escalation and create havoc to the middle income and mass people.

Few traditional supply chain practices will require immediate ratifications as

the world is no longer the same place before. Previously our business did not require much attention on the resilient supply chain. However, now we need to address the course of actions during the risk management period (Maghsoudi & Pazirandeh, 2016). Thus, traditional theoretical aspects such as inventory reduction through centralized production or operations, selection of the suppliers due to the cost efficiency, are no longer feasible at this moment. Global operations that have contract manufacturing sites most based in China have been exposed to the fragility of the so-called supply chain (Narayanan et al., 2015).

Dependency on digitalization, a man fewer operations, supplier base close to the production site is now inevitable. The catastrophe has slashed global commerce and challenged them in an unbelievable situation on their future existence.

Global MNCs and local conglomerates encountered an initial demand shock due to global standstill situations and gradually consumer demand moved frequently and finally a massive supply shock when irrespective of regions started countrywide lockdown and people shifted towards online orders.

3. Current Challenges in Supply Chain Operations

Without a dispute, there is an accord that more resilience in supply chain operation is an urgency in the wake of extreme uncertainty. This requires revision of company safety stock policies, reorder point and reorder quantities, alignment of lead times, and shipping voyage time discussion with the shipping lines and freight forwarders. As most of the global seaports have high congestion, such as Singapore and Sri Lanka.

At the same time, local port operations are also moving at a snail's pace. Therefore, safety stocks and building buffer is extremely necessary (Saleheen et al., 2018b). The continuous update on consumer demand and market dynamic movement is also important as consumer trend is shifting on a day to day basis and consumers are inclining more on commodity, health and hygiene, medical equipment, and many new products which do not have any historical records (Saleheen et al., 2018a). As such understanding, the market is extremely important. This will also impact the warehousing comes at a greater cost.

It is now inevitable for operations to ensure the consistency of the cash inflows as planned, balanced approach on the cash-out flow, freezing new investments unless the return of the investment is guaranteed, monitor the cash to cash cycle time (Saleheen & Habib, 2022a). Due to the liquidity crisis, firms and manufacturing companies are filing bankruptcy and many companies are unable to pay back the bank on their scheduled term loans. However, at the same token, it is essential to ensure the smooth flows of operations from the supply side (Verónica et al., 2017).

Therefore, payment needs to remain smooth for the critical suppliers. Large companies have already made contracts with their suppliers having advance payments to ensure the inventory is reserved and delivery assurance (Miraz et

al., 2017). The government will need to address the accessibility of microcredit for the working capital at a relaxed term to roll the wheels of the industry.

3.1. Impacts on the RMG Industry

The COVID-19 catastrophe has wrinkled the garment sector for countries like Bangladesh, India, and major exporting countries upsetting millions of workers and factory owners in the supply chains and with “ripple effects” across several magnitudes (McKibbin & Fernando, 2020). The majority of the garment supply chain occupations are dependent on foreign consumer demand from countries in the US, Canada, and Europe where highly stringent lockdown and sharp declines in retail sales were observed. The global garment trade got nearly stagnant in the first half of 2020.

3.2. Impacts on Shipping & Transportations

Small and medium businesses (SMB) globally drive over 25 percent of the \$18 trillion maritime trade and this sector has been approaching an overwhelming and widespread crisis since the commencement of the Covid-19 pandemic and the rising economic decline (Miraz et al., 2022).

The economic slump due to Covid-19 led to the dilemma of the sector. Be it the supply chain disruption, the unavailability of shipping containers to high freight costs over the last year, many elements have collectively increased the troubles of the SMBs across the globe (Panova & Hilletoft, 2018). China is the major exporter in the world, with 16.1 percent of global exports. Global shipping trade will drop by 4.1% in 2020 due to the pandemic.

3.3. Impacts on CTG Port Operations

CTG port in Bangladesh has been suffering tremendously during this lockdown as most of the operations run with one-third of manpower where many people have been tested Covid positive. The virus has also spread in geometric proportions and there was the loss of human life due to insufficient medical support and ventilation facilities. The port alone occupies 80 percent of the foreign trade of the country. At this time at the CTG port, there is a long queue of vessels in the jetty waiting to get birthing (Miraz et al., 2016). Thus, will cause large trading and consumer goods companies to delay production and distribution, eventually, end consumers will suffer from basic commodities, this will have a spiral impact of price escalation and create havoc to the middle income and mass people.

3.4. Impacts on Global Manufacturing and Supplies

Few traditional supply chain practices will require immediate ratifications as the world is no longer the same place before. Previously our business did not require much attention on the resilient supply chain. However, now we need to address the course of actions during the risk management period.

Thus, traditional theoretical aspects such as inventory reduction through centralized production or operations, selection of the suppliers due to the cost efficiency, are no longer feasible at this moment. Global operations that have contract manufacturing sites most based in China have been exposed to the fragility of the so-called supply chain. Dependency on digitalization, a man fewer operations, supplier base close to the production site is now inevitable.

3.5. Impacts on Global Trade & Investment

The catastrophe has slashed global commerce and challenged them in an unbelievable situation on their future existence. Global MNCs and local conglomerates encountered an initial demand shock due to global standstill situations and gradually consumer demand moved frequently and finally a massive supply shock when irrespective of regions started countrywide lockdown and people shifted towards online orders (Shamsuddoha, 2015).

4. Research Methodology

The study applied an exploratory study method based on primary and secondary data. A review of journal papers on supply chain performance measurement was made. The target population in this study was the Bangladesh manufacturing industry, which consists of twenty-four manufacturing sectors. Based on the analysis, twenty-four manufacturing sectors have around 7570 manufacturing companies. Therefore, the population size is 7570. From the 7570 lists of the respondent companies, 1832 individual companies have been chosen randomly and emails have been sent to the supply chain heads to respond.

An individual company's supply chain professional has been considered as the unit of analysis. This study applied simple random sampling and used the Taro Yamane table at $\pm 7\%$ precision level, and confidence level at 95% the sample size of this research is 199. In this study, the researcher composed 207 respondents from the manufacturing industry. Hence, 207 respondents are the sample size in this study. Apart from these, the study also explored secondary data from Emerald, IJSCM, IGI, Nova publishers, etc.

5. Way Forward

Without a dispute, there is an accord that more resilience in supply chain operation is an urgency in the wake of extreme uncertainty. This requires revision of company safety stock policies, reorder point and reorder quantities, alignment of lead times, and shipping voyage time discussion with the shipping lines and freight forwarders. As most of the global seaports have high congestion, such as Singapore and Sri Lanka. At the same time, local port operations are also moving at a snail's pace (Bevilacqua, 2017). Therefore, safety stocks and building buffer is extremely necessary. The continuous update on consumer demand and market dynamic movement is also important as consumer trend is shifting on a day-to-day basis and consumers are inclining more on commodity, health and

hygiene, medical equipment, and many new products which do not have any historical records. As such understanding, the market is extremely important. This will also impact the warehousing comes at a greater cost (Theodossiou, 2020).

It is now inevitable for operations to ensure the consistency of the cash inflows as planned, balanced approach on the cash-out flow, freezing new investments unless the return of the investment is guaranteed, monitor the cash to cash cycle time. Due to the liquidity crisis, firms and manufacturing companies are filing bankruptcy and many companies are unable to pay back the bank on their scheduled term loans. However, at the same token it is essential to ensure the smooth flows of operations from the supply side.

Therefore, payment needs to remain smooth for the critical suppliers. Large companies have already made contracts with their suppliers having advance payments to ensure the inventory is reserved and delivery assurance (Huda et al., 2014). The government will need to address the accessibility of microcredit for the working capital at a relaxed term to roll the wheels of the industry.

5.1. Supply Chain Performance Measurement

Managing risk and resilient supply chain in a borderless economy are getting exponentially challenging due to uncertainties in demand and supply to shorter product lifecycles outsourcing, and many other issues.

In reality, business is harshly influenced by multifold factors such as financial unpredictability, merger & acquisition, the innovation of technologies, e-business, shorter time-to-market, natural disasters, pandemic, terrorist activities, accidents in the shipping lines, etc. that pushes organizations to embrace a smarter way of doing business. Due to internal & external interruption, and exponential vulnerability, risk management has become significant for SCM operations. Several factors fuel the risks in the supply chain (Saleheen & Habib, 2022b).

Macro factors like globalization, open internet access, and e-commerce provide opportunities for diversification of supply and trigger an intricate SC vulnerability. The urgency on efficiency and operating cost optimization motivated firms towards lean manufacturing, low-cost sourcing, just-in-time inventory, reduced product lifecycle, centralized distribution centers, and supplier rationalization (Saleheen et al., 2018b). All these new supply chain management (SCM) concepts allowed the firms towards optimization on cost, time, investments, and service. A few series of threats recently evolved into the supply chain cycle-natural catastrophe, demand shocks, systemic vulnerability such as oil dependence and information fragmentation, cyber risk, rising insurance, trade finance costs, and the SC authorities are to investigate a new mitigation process. The researcher highlights that nowadays, the majority of the large corporations have the highest priority on the resilient issues in its end to end operations.

Significant research has been carried out on supply chain performance evaluation (SCPM) in the manufacturing industry, yet a lot of corporations were un-

successful in implementing effective performance measurement methods in their operations. Supply chain attributes and performance measurement index are not established, connecting with bottom-line impacts of an organization. Therefore, companies could not adopt any integrated SCM performance measurement model to measure the performance.

The term logistics in **Figure 2** was adopted as a general concept for the physical distribution of goods. Years before the adoption of logistics for strategic and managerial purposes are known as “dormant years” (Haraburda, 2016). The military-based orientation about logistics was reviewed during the “Transformation” era in the 1950s. This was when logistics was introduced as a term for transporting tangible goods (Ballou, 2007).

Based on the literature review and gap analysis in **Figure 2**, the study unlocks ten significant gaps and potential opportunities where an organization has to work significantly to improve efficiency as well as need to take strategic directives to handle Post COVID and respond to the market dynamics. Otherwise, it will be extremely challenging to respond to future uncertainties which are financial health in the supply chain, information sharing and partnership, capacity & speed in the supply chain, traceability in the supply chain, risk management in the supply chain, dependability on internal operations, culture to achieve performance, leadership and corporate governance, absenteeism to damage society &

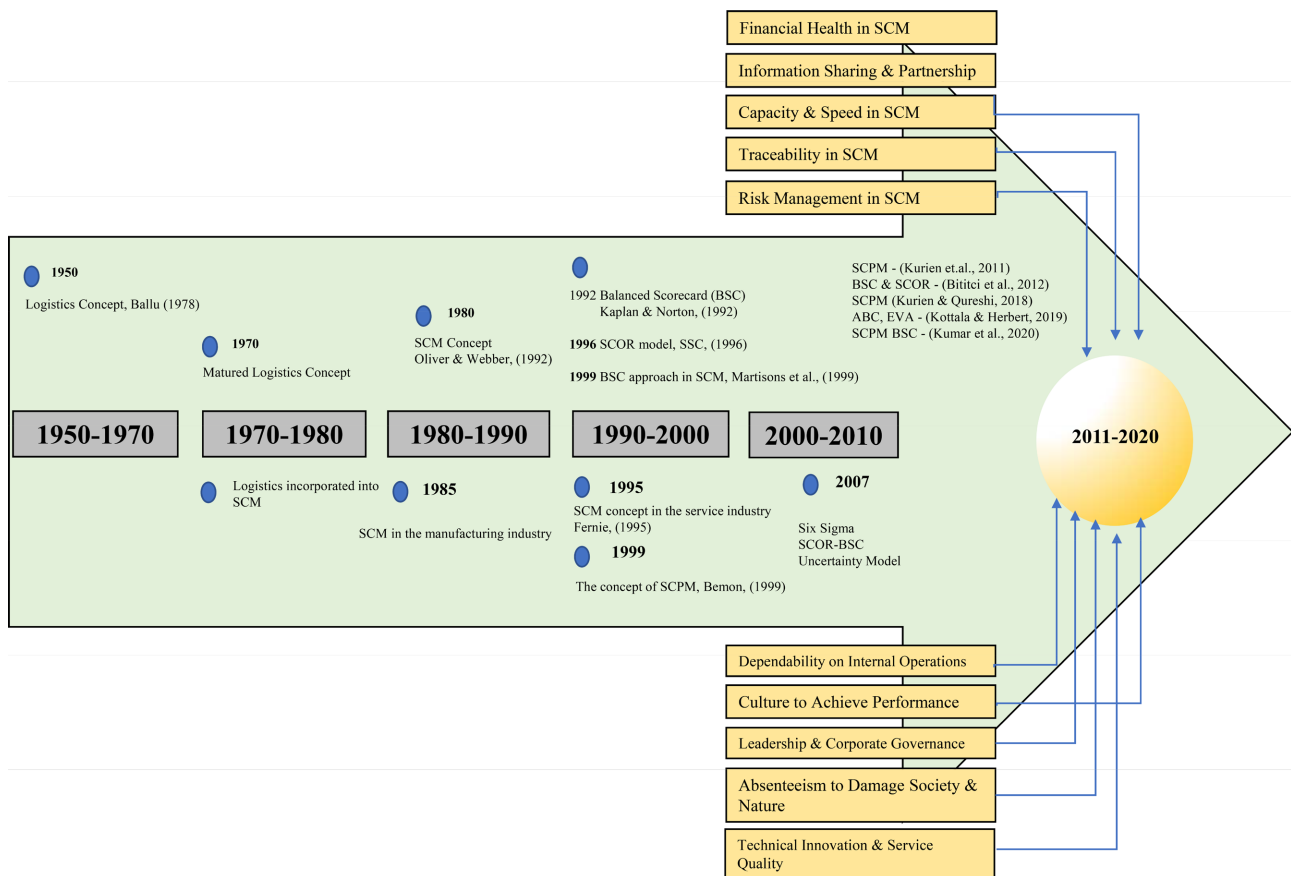


Figure 2. Supply chain performance measurement gaps (Saleheen & Habib, 2022b).

nature, and technical innovation & service quality.

5.2. ISCPM Model

There are several tools and methods are available to measure the supply chain performance measurement. However, each model had its own merits and criticisms and a large number of articles, and models which have been investigated in the literature review on supply chain performance measurement (SCPM). The ISCPM model illustrated in **Figure 3**, outlines supplier relationship management (SRM), international supply chain management (ISCM), and customer relationship management (CRM).

This ISCPM model illustrates ten supply chain performance measurement attributes for the manufacturing industry are—Financial Health (FH), Collaboration (CL), Velocity (VC), Resilience (RE), Reliability (RL), Continuous Improvement (CI), Visibility (VS), Work People Health (WPH), Sustainability (SS), and Service Excellence (SE) (Saleheen & Habib, 2022a).

As of now, most organizations currently apply either the BSC model or the SCOR model to evaluate the supply chain performance of an organization. However, in the context of the current market dynamics, companies need to adopt the ISCPM model.

6. Discussion

The pandemic has unearthed the vulnerabilities and complexities of a global supply chain’s fundamental business operation thoughts and philosophies. The healthcare industry drastically needs massive corrective measures and strategic realignments, as there is severe scarcity for protective types of equipment (like PPE, oximeter, hand gloves, etc.) As of now, the supply was mostly a single source, dominated by cost efficiency and centralized inventory associated with multifold risk factors which was not given much priority as well as attention.

The world which never imagined or experienced previously was a whole

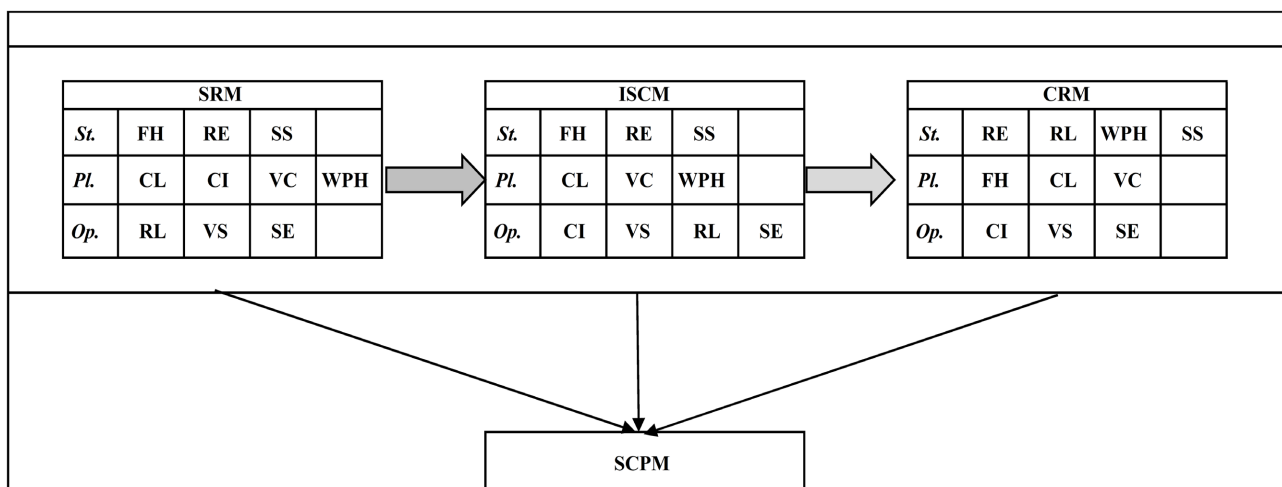


Figure 3. ISCPM Model (Saleheen & Habib, 2022b).

country or a state could have lockdown for months where their full manufacturing operations could be completely shut. The situation could have been realized when it was observed as China's all major manufacturing sites were fully closed due to the catastrophic situation. At that time, global companies across the world from North America to Europe which were fully reliant on China sourcing had no option, and businesses were struggled to support the availability of raw or finished goods materials, due to which their final output was seriously affected and some plants back were shut as well, eventually end consumers suffered.

This lifetime experience has compelled the global MNCs that they need ratification on their strategy and diversifications on their supply source instead of relying on a single supply base from China.

It is expected that global corporations will focus on decentralization of their manufacturing facilities fully or partially nearby to their home country to avoid a similar catastrophe that can cause the whole business to shut down due to supply unavailability (Salam, 2017). Many new concepts will get priority such as small batch production, more emphasis on digitalization to reduce the gap of the buyer-supplier relationship, introducing of man fewer operations wherever possible, possibilities of remote operations, more introduction of technology-driven operations such as Artificial Intelligence (AI), and Internet of Things (IoT), etc. (Gunasekaran et al., 2017).

This catastrophe has challenged the traditional concepts and processes which was being followed and will create smart and agile industry-driven supply chains, the key to building a global trade and investment network that's capable of weathering future storms (Saleheen & Habib, 2021).

7. Conclusion

Managing risk and resilient supply chain in a borderless economy are getting exponentially challenging due to uncertainties in demand and supply to shorter product lifecycles outsourcing, and many other issues. In reality, business is harshly influenced by multifold factors such as financial unpredictability, merger & acquisition, the innovation of technologies, e-business, shorter time-to-market, natural disasters, pandemic, terrorist activities, accidents in the shipping lines, etc. that pushes organizations to embrace a smarter way of doing business.

Due to internal & external interruption, and exponential vulnerability—risk management has become significant for SCM operations. Several factors fuel the risks in the supply chain. Macro factors like globalization, open internet access, and e-commerce provide opportunities for diversification of supply and trigger an intricate SC vulnerability. The urgency on efficiency and operating cost optimization motivated firms towards lean manufacturing, low-cost sourcing, just-in-time inventory, reduced product lifecycle, centralized distribution centers, and supplier rationalization.

All these new supply chain management (SCM) concepts allowed the firms

towards optimization on cost, time, investments, and service. A few series of threats recently evolved into the supply chain cycle—natural catastrophe, demand shocks, systemic vulnerability such as oil dependence and information fragmentation, cyber risk, rising insurance, trade finance costs, and the SC authorities are to investigate a new mitigation process. The researcher highlights that nowadays, the majority of the large corporations have the highest priority on the resilient issues in its end to end operations.

In this current context, manufacturing companies failed to evaluate their overall performance holistically as the currently prevailed model does not consider factors like risk management, market uncertainties, resilient supply chain operations, or the urgency of supply chain collaboration. This paper outlines ten supply chain performance measurement attributes for the manufacturing industry to measure the supply chain performance in an organization which is Financial Health (FH), Collaboration (CL), Velocity (VC), Resilience (RE), Reliability (RL), Continuous Improvement (CI), Visibility (VS), Work People Health (WPH), Sustainability (SS), and Service Excellence (SE) (Saleheen & Habib, 2022a). The application and implementation of the ISCPM can supersede all previously applicable models and help an organization to diagnose its overall performance and navigate how an organization can take precautionary measures and connect its day to activities with its balance sheet, income statement, and cash flow statements to understand their operational performance.

Recommendation and Future Research

The industry needs a comprehensive model which can apply both qualitative as well as quantitative factors and focus on a holistic approach from supplier relationship management (SRM), international supply chain management (ISCM), and customer relationship management (CRM).

Therefore, it is recommended to have the application of the Integrated Supply Chain Performance Measurement (ISCPM) model in the outlook of input, process, and output which can embed the Balanced Scorecard (BSC) model and the SCOR model in different decision levels through which the performance of operations could be diagnosed and decisions can be made for operational improvements. However, in this study, the ISCPM has not been elaborated in detail with its ten attributes and other performance measurement index which surely unlocks the frontier for future research in the context of manufacturing as well as in the service industry connected to disruption management.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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