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Disaster Resilience Plan Towards Flexible Regional Logistic Management

Raja Marzyani Raja Mazlan*, Nurul-Ain Idrus

Faculty of Artificial Intelligence, Universiti Teknologi Malaysia, Jalan Sultan Yahya Petra, 54100 Kuala Lumpur, Malaysia

*Corresponding author: b-marzyani@utm.my

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Abstract

COVID-19, which emerged in 2019, was the most recent pandemic, significantly affecting populations worldwide. It led to a global catastrophe, in the aspects of politics, environment, social life, health, and economy. Since therapeutic care had not been able to mitigate the spread of the virus, prevention tactics were adopted, which include movement control orders, lockdown, mandatory distancing, and mask wear. Some of these inevitable severe containment measures have been found to disrupt the global supply chain where the consumer manufacturing sector was affected the most. With the certainty that future disasters will happen in one form or another, and to avoid future disruption, the supply chain management of an organization should be prepared with a resilience plan to be more flexible, dynamic, and agile in ensuring supply chain continuity. One way to achieve this is through management of the logistics in the supply chain. This paper aims to present alternative guidelines and strategies in the form of a contingency plan for disaster resilience and flexible logistics management. A qualitative study was conducted on a consumer electronic goods company located in Malaysia, with a factory in Thailand and retailer distribution centres in Myanmar, Laos, Cambodia, and Malaysia. A thematic analysis of the semi-structured interview results identified seven key impacts of COVID-19 on logistics management. The most critical impacts found are 'shortage of storage capacity' and 'lack of containers'. Meanwhile, necessary qualities required in withstanding disasters were revealed, including 'the ability to be flexible', 'adaptability to new things', and 'finding alternative solutions'. Finally, this paper concludes with a proposal of guidelines and strategies for resilience and contingency plan implementation.

Keywords: Disaster Resilience Plan, Logistic Management, Covid-19, Supply Chain Management

■ 1.0 INTRODUCTION

Before the availability of the vaccines, prevention tactics and therapeutic care have been adopted globally in mitigating the Covid-19 virus breakout. However, due to the abrupt surge in the mortality cases and lack of expertise, these measures were no longer adequate and there was a pressing need for a more drastic move. As a result, a prophylactic approach began to be implemented at national and sub-national levels to help contain and halt the spread of the pandemic. Although most countries in the world have their own various procedures and policies, the use of social distancing, limiting physical contacts, compulsory wear of facial masks and lockdown were commonly implemented (OECD, 2020b). Then, when COVID-19 hit globally in 2020, several nations experiencing sharp surges in cases began to implement national lockdown. The effort aims to limit transmission and manage the burden on the health sector. This measure had brought together with it some severe impacts to the running of business operations and their survival.

COVID-19, however, is not the first pandemic outbreak in human history. Several pandemic outbreaks have occurred throughout history, including the plague, cholera, and influenza pandemics. The most well-known pandemic outbreaks include the Black Death Plague (1347-1351), the First Cholera Pandemic (1817-1824), and the Russian Flu (1889-1893) (Piret & Boivin, 2020). The COVID-19 category pattern is primarily associated with the severe acute respiratory syndromes (SARS); that is the severe acute respiratory syndrome (SARS-CoV) outbreak in Guangdong, China in the 2002-2003; and the 2012-2013 Middle East Respiratory Syndromes (MERS-CoV) outbreak in the Arabian Peninsula (Kumar et al., 2021). With the possibilities disasters to recur in its many forms and frequencies, it's therefore imminent for all organizations to be equipped with disaster mitigation plans and strategies for their survivability.

■ 2.0 LITERATURE REVIEW

2.1 COVID-19 Impacts on The Supply Chain Management

COVID-19 has a big impact on various sectors, including politics, the environment, society, and economics, as well as a direct impact on the health sector (OECD, 2021). The worldwide Gross Domestic Product (GDP) performance in 2019 and 2020 may reflect COVID-19's economic impact. The world's most powerful countries were significantly influenced by COVID-19, as may be seen in Table 1.1. In comparison to the 2009 financial crisis, the impact of the pandemic was found to be more severe (Mou, 2020).

Table 1 World's Gross Domestic Performance (GDP)Source: Mou (2020) and Bank (2022)

GDP Growth Rate	2008	2009	2019	2020
World	3	-0.1	2.9	-3
China	9.7	9.4	6.1	1.2
Japan	-1.1	-5.4	0.7	-5.2
Korea	3	0.8	2	-1.2
US	-0.1	-2.5	2.3	-5.9
European Union	0.9	-4.2	1.7	-7.1
ASEAN - 5	5.4	2.5	4.8	-0.6
Malaysia	4.8	-1.5	4.4	-5.5

Donthu and Gustafsson (2020) reviews the implications of Covid-19 on economic sectors to include consumer behavior, business, marketing concepts and strategies, human resources management, corporate social responsibility, multiple sourcing, contract leverage, and business risk management. At the same time, in comparison to other disasters like the Haiti earthquake in 2010 and the 2003 SARS pandemic, the impacts of COVID-19 pandemic were more catastrophic as it was spread worldwide and not localized to a certain geographical area. Similarly, when the pandemic impacted supply chain management, it caused major supply chain disruption for global trade in goods, services, and manufacturing activities (MATRADE, 2021). As there are many parties and levels may be involved in a supply chain, disruption to one party would inevitably affects the rest. Supply chain management integrates a few networks: suppliers, sales, marketing, and logistics management (Sherer & Soliman, 2005). Logistic management alone consists of the integration of customer response, transportation, inventory, warehousing, and suppliers, which means that the impacts on all the networks combined would involve a bigger radius in multiple stages. The impacts of the pandemic may be concluded to have created turbulence in three main stages: the supply, demand, and logistic sides (Raj et al, 2022).

Consequently, numerous scholars have emphasized the widespread impact of COVID-19 on supply chain management challenges across various industries worldwide. Butt (2021) highlighted the effects of COVID-19 on the supply chain of a manufacturing firm located in Sri Lanka, China, India, and Pakistan due to the virus containment measures, such as border closures at the national and international level. Meanwhile, Rinaldi et al (2021) summarized the impacts of COVID-19 on an Italian logistic service provider that is proficient in a fast supply chain for the distribution of foodstuffs, beverages, pet food, health and beauty products. Similar to that are, researchers Eldem et al (2022) which focused on a Turkish automotive manufacturing company, while Xu et al. (2021) focused on the logistics sector in the Chinese market. In their research, Singh et al (2020) discussed the impact of COVID-19 on the food supply chain in the public distribution system in India. At the same time in local context, Hazim (2021) and the OECD (2020a) summarized the impacts based on Malaysia's experience.

2.2 Disaster Resilience Plan for Flexible Logistic Management in Supply Chain

Resilience is the ability of an entity-asset, organization, community, or region- to anticipate, resist, absorb, respond to, adapt to, and recover from disturbance (Carlson et al, 2012), and resilience plan is therefore a tool of which may be used to help achieve the condition of being resilient. The importance of a resilience plan has been highlighted by Black and Glaser-Segura (2020) as one of the strategies in supply and demand to help ensure organization continuity. Meanwhile, Singh et al (2020) emphasized the importance of contingency plans during pandemics due to the impact of COVID-19 on logistic management. In parallel, The BNM (2022) summarized the resilience action that helps the continuity of Malaysia's trade as the ability of the company to have flexibility to quickly adapt to the new situation and requirements in the operation. With all these, this study proceeded to explore on resilience plan with flexibility as its main characteristic.

In the context of supply chain and logistics management, the authors Breen and Hannibal (2021) indicate that in case of a shortage of transportation in logistic management, the possibility of adopting new procedures and

selecting another mode of transport should be considered. They further indicate that proper planning, controlling ability and good driving are needed for greater resilience capacity in logistic management. The authors added that the resilience plan should be executed efficiently since the operation's continuity is essential.

■ 3.0 RESEARCH METHODOLOGY

In the development of a resilience plan for this study, the works presented by a few scholars have been referred to as guidance. For instance, Rinaldi et al. (2021) suggested a few procedures of resilience plan that can be adapted to logistic management, and they need to be quickly adapted during a pandemic. At the same time, Breen and Hannibal (2021) highlighted that a contingency plan can be created by understanding the case study of other countries' execution and performance during the COVID-19 outbreak in each sector. Meanwhile, the mitigation models by Black & Glaser-Segura (2020) and IFRC (2021) have also been reviewed.

Due to limitations, this study was conducted with a case study design on one Malaysian-based consumer electronic goods company, (from hereon will be referred to as 'the Company') whose business operations critically dependent on efficient supply chain management with its counterparts located in several other countries in Southeast Asia. The method of transportation included in considerations for the logistics management in this study were also limited to trucks and vessels, and not inclusive of air freight. The research was conducted based on the following operational framework in three phases.

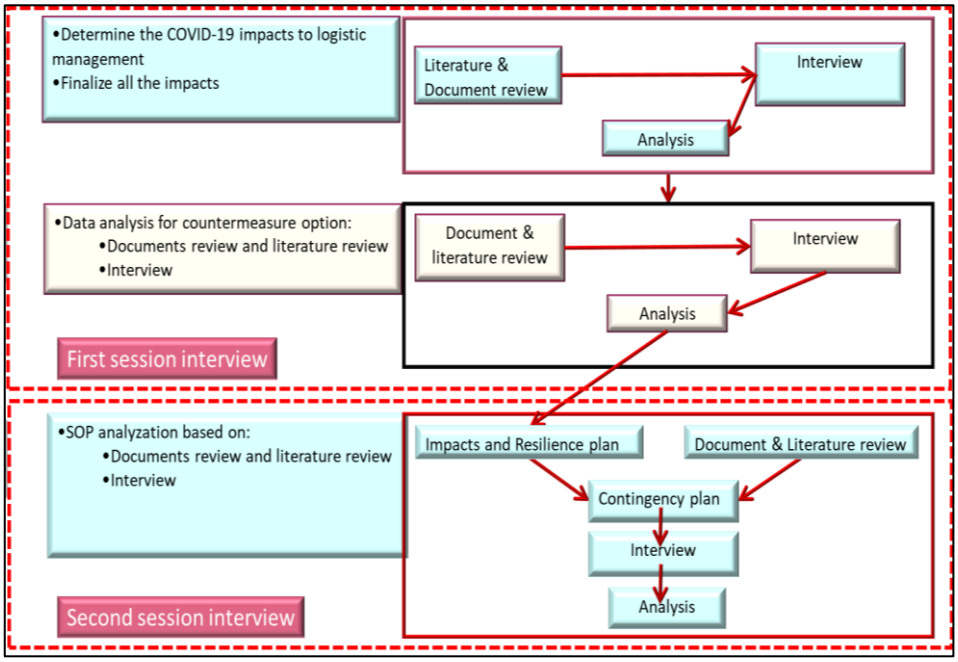

Figure 1 Research Operational Framework

Phase 1: During this phase, the impacts of COVID-19 on logistic management in Malaysia's consumer electronic industry and throughout the world were identified.

Phase 2: Applicable resilience measures in logistic management caused by COVID-19 were identified and analysed to find the best way to propose a resilience plan in this study's context. The main consideration is to be able to mitigate the impacts identified in Phase 1. A contingency plan was then developed based on all the information collected.

Phase 3: Validation of the developed disaster resilience plan.

2.2 Data Collection

The primary data was gathered through one-to-one semi-structured interviews with the respondents, as per Table 2 and Table 3. This method was selected for both its structured characteristics while allowing new information to be obtained through the process. The sessions were split into two; one in phase 2 and the other in phase 3, with each session aimed at achieving different objectives. The first session of the interview was aimed at identifying the impacts of the pandemic to the company on logistic management, and their available resilience plans or strategies to address

the impacts and ensure their business continuity. Meanwhile, the second session was aimed to validate a proposed resilience plan developed based on the information obtained in Phase 2, with references and considerations of the models and plans found in literature review. The semi-structured interview respondents were 10 professional personnel from the company under study.

Table 2 Semi-Structured Interview Respondents for Session 1 (Phase 2)

Respondents	Position	Working Experience with Company 'A' Study	Location	Technique
Person 1	Head of departments for SCM and Logistic for Malaysia	23 years (since 2000)	Malaysia	Face-to-face
Person 2	Head of SCM-OBD business MSNB (Maldives, Sri Lanka, Nepal, Bhutan) and MLC (Malaysia, Laos, Cambodia)	15 years (since 2008)	Malaysia	Face-to-face
Person 3	Sales control in factory	4 years (since 2019)	Thailand	Online (Zoom apps)
Person 4	Logistic Manager	7 years (since 2016)	Malaysia	Face-to-face
Person 5	Sales Manager in Myanmar	3 years (2019-2023)	Myanmar	Online (WhatsApp)

Table 3 Semi-Structured Interview Respondents for Session 2 (Phase 3)

Respondents	Position	Working experience	Location	Technique
Person 6	Head of SCM-OBD for MSNB (Maldives, Sri Lanka, Nepal, Bhutan) and MLC (Malaysia, Laos, Cambodia)	15 years (since 2008)	Malaysia	Face-to-face
Person 7	Manager at factory	3 years	China	WeChat apps
Person 8	Procurement manager at aviation industry	2 years	Malaysia	Online (WhatsApp)
Person 9	Manager at Research & Department for Part approval and Factory audit	13 years	Malaysia	Face-to-face
Person 10	Export department in Thai	20 years	Thailand	Online (Line Apps)

The respondents were selected from different locations to reduce bias of work environment in the effort of understanding the regional operation for the company. Due to mobility constraint, some of the interviews were conducted via several online meeting applications that allow face-to-face communication. The selection on the type of online application for each respondent was determined based on the respondent's accessibility, which may be influenced by its availability, the respondent's location, government approval, and preference. Some other interviews however were managed to be conducted through physical meetings.

■ 4.0 FINDINGS AND RESULTS

The following is the summary of findings on the study conducted, presented in accordance with the phases.

Phase 1: Based on the literature studies, the most common impacts of the COVID-19 pandemic include transportation constraints, response of customer and supplier, and inventory and warehousing areas.

Phase 2: Based on the thematic analysis done on the transcribed recording of the interview session, the most significant impacts on the company's logistic management are container shortages and storage capacity, which are detected in supply chain management, logistics, and the factory side. Other impacts mentioned by the respondents are on cash flow, shortage of finished goods, customer demand, standard operating procedure and

delayed shipment. Then, each impact was mapped with the respondents' input on their respective countermeasures, now identified as disaster resilience plan which may be represented in the following Figure 2.

Also included further down the third layer of the hierarchy are the enablers, which are what would be required to make the resilience plan of action to be successfully adopted. This information was also gathered and summarized based on the experience of the company, shared during the structured interview session. In dealing with all impacts, good communication plays an important role for the implementation of the resilience plans.

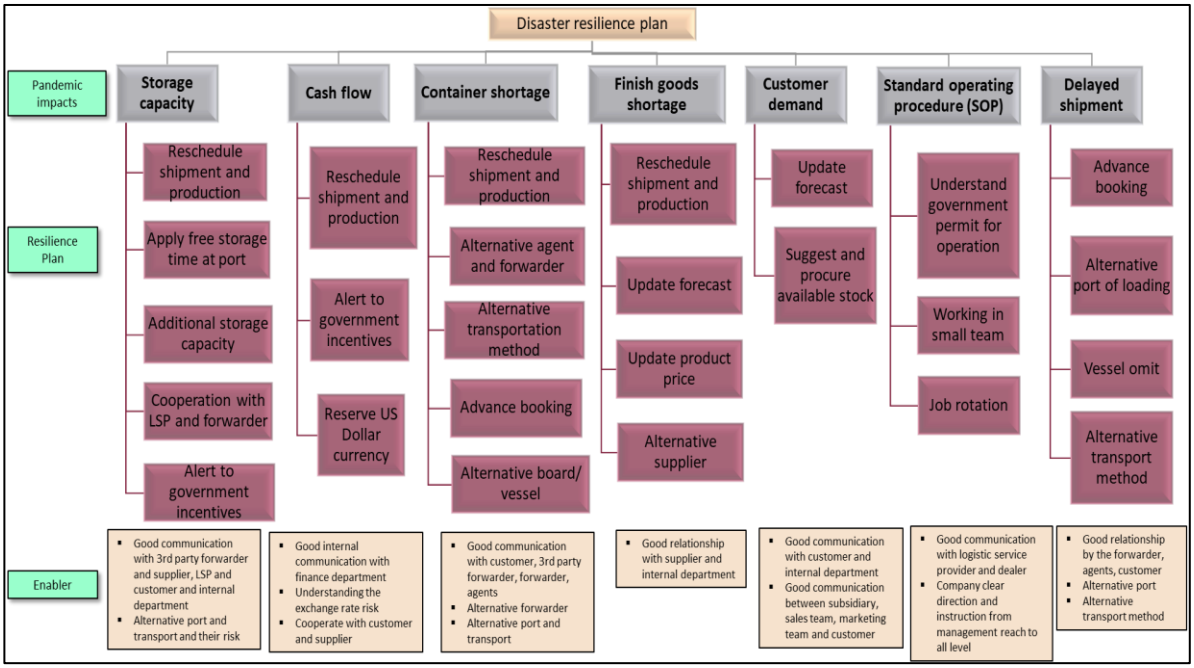

Figure 2 Summary of Disaster Resilience Plan in Accordance with the Pandemic Impacts to the Company's Logistic Management

Phase 3: The information obtained in the previous phases were then further analysed and compiled to form a contingency plan for disaster resilience towards flexible logistic management, which was then distributed to the respondents for session 2 of the interview activity to be validated for implementation. The outcome of the validation process revealed positive indications on the plan to be adopted by other similar companies in business nature, and there is possibility of implementation of the plan to be adopted in different industries and countries. Among the implementations suggested by the respondents are adaptation in daily operation and preparation for a systematic database for alternative information such as supplier, products, and hierarchy of operations. Others suggest that good communication and cooperation with another department, supplier, or forwarder in the supply chain will help implement this in the future. In addition, knowledge of job functions for other departments and the overall process will be helpful for the implementation of this plan. Further, it was suggested that with the plan adopted and implemented in daily operations, it could also further improve the job operations.

■ 5.0 DISCUSSION

Despite its relatively recent emergence in 2019, COVID-19 has exerted a significant and far-reaching influence on a global scale. Due to its relatively short existence, this phenomenon has already exhibited profound global effects, necessitating the emergence of numerous new fields of study. Regrettably, there exists a dearth of research about the implementation of a shipment plan that facilitates seamless logistical operations across the organization amidst the COVID-19 pandemic. This study aims to contribute in the aspect of logistic management, through development of disaster resilience plan for companies to address problems likely to arise during disaster for their survival.

Through this research, this study has identified the impacts of COVID-19 on the Company's logistic management, and the resilience measures that were taken to ensure the sustainability of their operations. From the semi-structured interview conducted with the five personnel from the Company, a total of seven impacts on logistics management in Figure 2 (Layer 1 in the hierarchy) were identified; namely cash flow, container shortage, finish goods shortage, storage capacity, delayed shipment, standard operating procedure (SOP), and customer demand.

The primary factors impacting the logistic management of the Company are the shortage of containers and storage capacity. According to the respondents, the issue of container scarcity was of such severity that it could not be resolved through financial means. One additional factor that exerts a noteworthy influence is the constraint on storage capacity resulting from the disparity between incoming and outgoing product movements.

This study also yielded a total of 26 resilience actions as in Figure 2 (Layer 2 in the hierarchy) which have been implemented by the Company to address the seven impacts arising from the COVID-19 pandemic, both during and after the transition period. The most frequent resilience actions taken are 'negotiation with the supplier to reschedule shipping and manufacturing', and 'to provide an alternative option to the operation'. The implementation of resilience measures was predicated upon the core principles of flexibility, adaptation to new things, and alternative solutions. The capacity to adapt is essential when strategizing alternative courses of action that entail modifying the shipping method, agent and forwarder, board or vessel, port of loading at an additional cost, and supplier.

Finally, a contingency plan for disaster resilience in the realm of flexible logistics management was formulated based on all the information gathered. In the second session of the interview, all five respondents validated the implementation of this contingency plan, as shown in Table 4. The plan is recommended to be incorporated into the daily operations of logistic management in the applicable area. It is imperative to regularly update the plan for continuous improvement to document any newly discovered information. Furthermore, it is important to establish and regularly update a comprehensive database with alternative information pertaining to forwarders, ports, and suppliers. In the event of a prospective pandemic outbreak, the operation may be sustained. Strong relationships among stakeholders in logistics management are equally important to facilitate the effective implementation of the plan and ensure its success in the long term..

The findings reveal that the company exhibits key qualities, such as adaptability and flexibility, which are recognized in existing literature as critical for survival. The organization demonstrated a willingness to transition from familiar processes and procedures to new, viable approaches that enhance productivity through its outlined resilience actions. This adaptability, involving the adoption of innovative solutions, has been shown to play a vital role in sustaining the organization's long-term viability.

6.0 IMPLICATIONS AND CONCLUSIONS

In conclusion, it is important to acknowledge that the extent to which we can adequately comprehend the present circumstances and prepare for potential pandemic occurrences hinges upon our capacity to effectively analyze the COVID-19 situation. Therefore, research conducted within the domain of supply chain management should be able to furnish valuable insights and suggestions pertaining to future occurrences of pandemic outbreaks.

Notwithstanding its contribution, this study exhibits several limitations that may be addressed in future research endeavors. Among others, it is imperative to note that the investigation conducted solely pertained to the circumstances of a Malaysian enterprise specializing in the production of consumer electronics. Future research might potentially focus on exploring additional sectors and regions. In another aspect, to alleviate the burden on frontline workers during the COVID-19 attack period, the Malaysian government has implemented stringent Movement Control Orders (MCO). It may therefore be worth considering that the implementation of various MCO strategies in different countries could have had other implications for logistical management.

Other than that, the scope of this study is limited to the domain of logistics management in relation to supply chain management networks. Subsequent investigations may carry the potential to encompass a broader range of factors and yield more innovative outcomes, as well as foster more resilient and adaptive reactions. In addition, it is important to note that the present study employs a qualitative data analysis approach, thereby excluding the inclusion of any quantitative data. It is recommended that future investigations consider alternative study designs and employing diverse methodologies. Finally, it is also recommended that a greater sample size of participants to be involved to yield more robust results and conclusions.

Table 4 Validation of the Proposed Resilience Plan

Respondents	Industry	Job Function	Location	Case Study Company	Part Of Logistic Management	Applicability	Implementation (of Proposed Contingency Plan)	Remarks
Person 6	Electric & Electronics	SCM	Malaysia	Yes	YES	YES	Daily job	Cover all in the logistic management
Person 7	Electric & Electronics	Research & Development (R&D) Part approval & factory audit	Malaysia	Yes	NO	YES	Scenario 4: Finish goods shortage - Database of supplier for substitution part Scenario 6: SOP - Work together and good communication with related department	Different term since not in the same work environment
Person 8	Aviation industry	Procurement	Malaysia	Not related	YES	YES	- Adapt in daily operation as a normal practice to solve working issue, and gradually adapt the better process in this contingency plan	Similar logistic management operation and action, even different industry
Person 9	Electric & Electronics	Sales	China	Not related	YES	YES	Scenario 5: Container shortage - Selection of supplier criteria - Agreement in advance	Similar logistic management operation and action, even different company
Person 10	Electric & Electronics	Shipping (Export, import, custom clearance)	Thailand	Not related	YES	YES	Scenario 7: Delayed Shipment - Understand the job scope - Work together and good communication with related department	Cover all in the logistic management

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