SUPPLY CHAIN RISK MANAGEMENT IN HUMANITARIAN OPERATIONS IN MYANMAR

Hnin Wai Lwin* and Sumate Permwonguswa**
Assumption University of Thailand

ABSTRACT

This study focused on the supply chain risk management process by identifying and evaluating of current and potential supply chain risk as well as developing of appropriate measures to response the identified risks and build supply chain resilience. Its purpose is to reinforce the supply chain risk management of humanitarian organizations in Myanmar under the current complex operating environment. The qualitative method was employed by conducting interviews with three different humanitarian organizations. In the interview, 5 steps of supply chain risk management and mitigation processes have been applied. Moreover, supply chain mapping and risk matrix (ABC analysis) tools have been used to explore and assess the supply chain risks. As the result, the research findings can be applied in improving of the supply chain risk management systems of other organizations by reflecting to the current context.

Keywords: *Disaster, Humanitarian supply chain, Risk matrix, Supply chain risk management*

บทคัดย่อ

การศึกษานี้มุ่งเน้นที่กระบวนการบริหารความเสี่ยงในโซ่อุปทาน โดยการระบุและประเมินความเสี่ยงในโซ่อุปทานในปัจจุบันและที่อาจเกิดขึ้น ตลอดจนการพัฒนามาตรการที่เหมาะสมเพื่อตอบสนองต่อความเสี่ยงที่ระบุ และสร้างความยืดหยุ่นของโซ่อุปทาน โดยมีวัตถุประสงค์ เพื่อเสริมสร้างการจัดการความเสี่ยงในโซ่อุปทานขององค์กรด้านมนุษยธรรมในเมียนมาร์ภายใต้สภาพแวดล้อมการดำเนินงานที่ซับซ้อนในปัจจุบัน การศึกษานี้ใช้วิธีวิจัยเชิงคุณภาพ โดยการสัมภาษณ์องค์กรด้านมนุษยธรรม 3 องค์กรที่แตกต่างกัน ในการสัมภาษณ์ 5 ขั้นตอนของการบริหารความเสี่ยงในโซ่อุปทานและกระบวนการบรรเทาได้ถูกนำมาใช้ นอกจากนี้ เครื่องมือการทำแผนที่โซ่อุปทานและตารางความเสี่ยง (การวิเคราะห์ ABC) ยังถูกนำมาใช้เพื่อสำรวจและประเมินความเสี่ยงของโซ่อุปทาน ทั้งนี้ผลการวิจัยสามารถนำไปใช้ในการปรับปรุงระบบบริหารความเสี่ยงด้านโซ่อุปทานขององค์กรอื่น ๆ ได้ โดยสะท้อนบริบทในปัจจุบัน

คำสำคัญ: ภัยพิบัติ โซ่อุปทานด้านมนุษยธรรม ตารางความเสี่ยง การจัดการความเสี่ยงในโซ่อุปทาน

Received September 15, 2024; Revised September 30, 2024; Accepted October 2, 2024

* Ms. Hnin Wai Lwin is an MSc Supply Chain Management student at the Martin de Tours School of Management and Economics, Assumption University. Email: hninwailwingreat@gmail.com

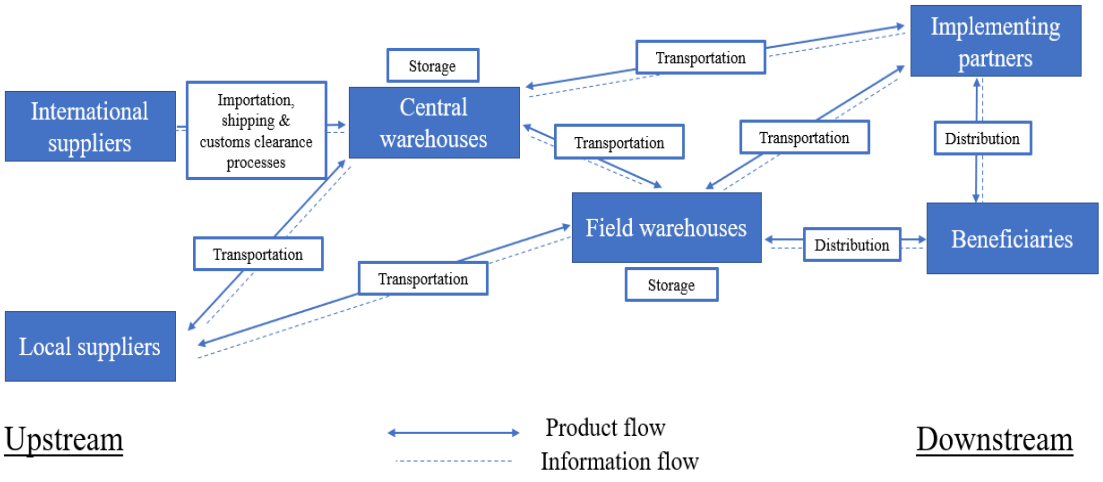
** Dr. Sumate Permwonguswa is the chairperson of the Department of Digital Business Management at Assumption University.

INTRODUCTION

In Myanmar, disaster-prone political conflict country, supply chain operations of humanitarian organizations are being encountered multifaceted challenges. These challenges adversely impact the effective delivery of humanitarian aid. The complex interplay of natural disaster and political instability exacerbate the supply chain risks, hindering the timely acquisition, storage, transportation, and distribution of essential relief supplies. Moreover, the uncertainties impact on the supply chain activities like importation, warehouse and transport management. The difficulties incurred by these uncertainties adversely impact not only on supply chain activities but also its cost and time. Since the coup in February 2021, the approval process of Tax Exemption Certificates (TECs) or import permits necessary for humanitarian cargo importation has become increasingly challenging. Delays in the import process have become prevalent, especially for medical supplies. Moreover, bureaucratic impediments and access restrictions imposed additional hinderances on transport and storage functions. In associated with political instability, economic situation in the country is downsizing and many issues related to banking, inflation, market instability, fuel shortage are being encountering.

As uncertainties are accelerating under in-country volatile situation these years, supply chain disruption is likely to happen. Therefore, the risks in the whole supply chain system must be monitored and the role of supply chain risk management becomes a crucial part. Hence, throughout the supply chain flow, the existing and potential supply chain risks are needed to be explored and assessed for further developing of appropriate measures, responding them immediately and building resilience to diminish the disruption. The objectives of the study are to identify and analyze the supply chain risks of humanitarian organization and to explore the most appropriate techniques for further implementation and reinforce the organizational supply chain risk management system. During the study, the researcher applied qualitative method by interviewing with three logistics or supply chain professionals from different organizations. During the interview, the researcher follows the risk management process throughout their humanitarian supply chain flow as shown in the Figure 1.

Figure 1: Humanitarian Logistics and Supply Chain Flow



LITERATURE REVIEW

Humanitarian supply chain is an interconnected system that manages the integration and coordination of many diverse actors with the core objective is to deliver physical aids or services to affected population effectively and efficiently (Heaslip, Mangan, & Lalwani, 2010)**.** These chains involve numerous stages and participants, each encountering different risks. Thus, their effectiveness hinges on robust risk management. This highlights the importance of risk identification and management techniques. The goal of risk management is to identify, assess, and develop strategies to mitigate risks (Fan, Lin, & Sheu, 2008).

Supply Chain Risk Management Process

Supply Chain Risk Management (SCRM) is becoming increasingly vital, emphasizing the identification, assessment, analysis, and mitigation of vulnerabilities and risks within the supply chain. Implementing SCRM poses significant challenges due to the interconnected nature of individual risks, actions taken to mitigate one risk can often inadvertently exacerbate another. In managing of supply chain risk, proactive approach is required. Then, five steps are stated in Supply chain risk management framework, and these are 1. Risk identification, 2. Risk assessment and evaluation, 3. Selection of appropriate risk management, 4. Implementation of supply chain risk management strategy and 5. Mitigation of supply chain risks.

1. Risk identification

In the risk identification of SCRM, supply chain mapping serves as a critical tool, offering a visual representation of the supply chain and enabling the identification of potential risk sources. A study by Oloruntoba and Gray (2006) emphasized that visual mapping aids in identifying critical supply chain elements and vulnerabilities in humanitarian contexts.

2. Risk Assessment and Evaluation

The risk matrix is an essential tool based on their likelihood and impacts in risk assessment process, thereby facilitating prioritization and informed decision-making. The identified risks are mapped within a matrix by assessing of their likelihood and impacts. Then, these are classified using ABC analysis or Pareto analysis (Norrman & Jansson, 2004). Then, the risks are then classified into High (A, immediate and strong mitigation strategies are needed), Medium (B, careful monitoring and contingency planning are needed) and Low (C, only basic risk management practices are needed) risks for further determination of their risk degree, levels and actions required as showed in Figure 2. In determination of the risk degree, the consequences and likelihood are measured in the Table 1 and Table 2.

Table 1: Risk Probabilities (Likelihood)

Description of probability	Interpretation
No	Will never occur
Minor	Unlikely to occur
Medium	About an even chance of occurring
High	Likely to occur
Very high	It is certain to occur

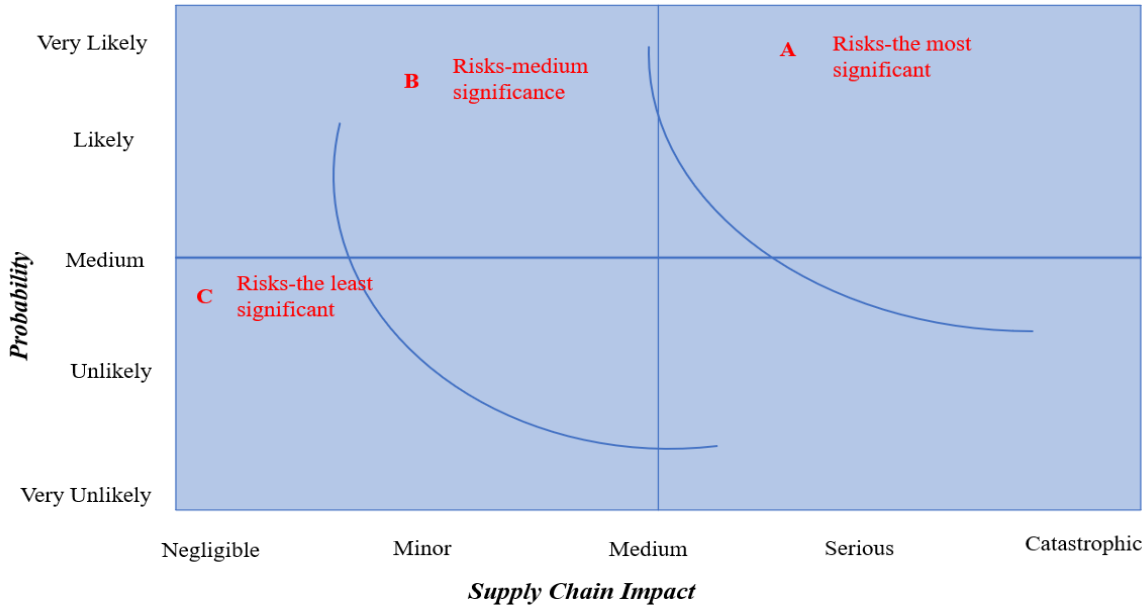
Source: Norrman and Jansson (2004)

Table 2: Range of Consequences (Impact)

	Consequences	Description
Category 1	Negligible	An insignificant effect on the working of the supply chain.
Category 2	Minor	Causing some inconvenience with minor disruptions, delays and increased costs to some parts of the chain, but with most functions unaffected.
Category 3	Medium	Causing some disruptions to parts of the supply chain, but with the main functions continuing to meet requirements.
Category 4	Serious	Major disruptions to the essential operations of the supply chain, causing serious delays and a high cost of recovery.
Category 5	Catastrophic	Causing complete and irrecoverable failure of the supply chain and possibly whole.

Source: Norrman and Jansson (2004)

Figure 2: Risks Matrix (ABC analysis)



Source: Norrman and Jansson (2004)

The integration of the supply chain mapping with risk matrix helps in risk management process however, it has some limitations like accurate mapping which is difficult to obtain, especially in chaotic disaster environments.

3. Risk Management Strategy Selection

Effective risk management involves exploring and implementing suitable mitigation measures based on risk assessment (Tummala & Schoenherr, 2011). Key strategies include enhancing supplier relationships, diversifying the supplier base, strategic stock positioning, leveraging

technology, and fostering collaboration. Diversifying suppliers reduces dependency and disruptions (Choi, Beresford, Pettit , & Fahd, 2010), while prepositioning relief items and maintaining strategic stock boosts readiness (Kunz & Reiner, 2012).

Technology, like satellite communications and drones, enhances logistics and information sharing, cutting response times and costs (Delmonteil & Rancourt, 2017). Collaborative activities, such as information sharing and joint investments, build trust and improve satisfaction and performance (Nyaga, Whipple, & Lynch, 2010).

4. Implementation of Supply Chain Risk Management Strategy

Freedman (2003) emphasizes that simplifying complexity is crucial for effective strategy implementation. To manage supply chain complexity, flexibility is key. Other factors include organizational learning, information systems, and performance metrics. Organizational learning aids in risk identification and evaluation through inquiry, analysis, feedback, and communication. Information systems are vital, as they provide necessary data throughout the risk management process (Bowersox & Daugherty, 1995; Edwards, Peters, & Sharman, 2001).

5. Mitigation of Supply Chain Risks

Effective risk mitigation requires anticipating potential unexpected losses. Case studies reveal that robust contingency plans and strong local supplier relationships help humanitarian organizations better handle disruptions (Balcik & Beamon, 2008) . These plans, which should be adaptable and informed by past experiences, improve preparedness (Talluri, Kull, Yildiz, & Yoon, 2013; Ho, Zheng, Yildiz, & Talluri, 2015). Additionally, Saglam, Çankaya, and Sezen (2021) found that enhancing supply chain resilience and responsiveness positively impacts performance.

RESEARCH METHODOLOGY

In humanitarian operations and supply chain management studies, Behl and Dutta (2018) suggested the inclusion of qualitative research method. This method is designed to achieve a deep and comprehensive understanding of the issues through textual interpretation and interviews (Creswell, 2007). This study involved collecting primary data through interviews with experienced supply chain or logistics professionals. To minimize bias, individuals from three different humanitarian organizations were selected to represent various aspects of supply chain operations. The profiles of these interviewees are detailed in Table 3.

Table 3: Profiles of Interviewees

Position	Logistics Officer	Senior Supply Chain Associate	Logistics Coordinator
Years of Experiences	11 years	9 years	7 years
Date of Interview	25 June 2024	29 June 2024	3 July 2024

Before the process, the researcher prepared a set of open-ended questions to ensure focused and insightful discussions, aligning with the supply chain risk management process. The questions used are listed below:

1. What types of supply chain risks are being encountered, and what are their sources? Please describe them.
2. Please specify the likelihood of these risks and explain them.
3. Please specify the impacts or consequences of these risks and explain them.
4. What precautionary or mitigation measures for these risks? Please also mention about practices to strengthen or maintain supply chain resilience?
5. How is the supply chain risk management program is implemented, monitored, and modified? Please describe them.

In the qualitative method, a hybrid approach with secondary data analysis was used to complement the limited insights from primary data. The researcher reviewed annual reports and situational updates from published sources (Thesis Writing: Data collection & Lab experiment, 2024) to provide a broader context and support the primary data.

FINDINGS AND RESULTS

Risk identification

After the interview, the researcher found that a total of 25 categorized risks during risk identification process. These are funding, disaster, supply, demand, security, political, physical, operational, reputational, policy/regulation, resources, transport, macro, partnership, information, network, storage, criminal, delay, financial, organizational, competitive, communication, technology, and safety risks.

Among these, the security risk, transport risk, storage risk and delay risk, supply risk and resources risks are major risks due to the bureaucratic impediments, import constraints, economic and political instabilities as well as have interconnected each other. Additionally, the researcher observed that key issues of environmental, political and economic factors are severely impacted on the current humanitarian supply chain.

Risk Assessment and Evaluation

To analyze and prioritize these identified risks, the interviewees were asked to assess the level of risk associated with the events identified. This involved rating the probability and impact of these risks based on their historical occurrences and the magnitude of their consequences. Regarding the probabilities, there are five degrees of ratings, ranging from the lowest rating of "very unlikely" for "no occurrence in the past and no chance to occur" to the highest rating of "very likely" for events that regularly happen, as mentioned in Table 4.

Table 4: Range of Probabilities

Description of probability	Interpretation
Very Unlikely	No occurrence in the past and will never occur
Unlikely	1 or 2 in the past
Medium	1 or 2 times per year
Likely	1 or 2 times per quarter
Very Likely	Regularly or certain to happen, e.g.: like monthly

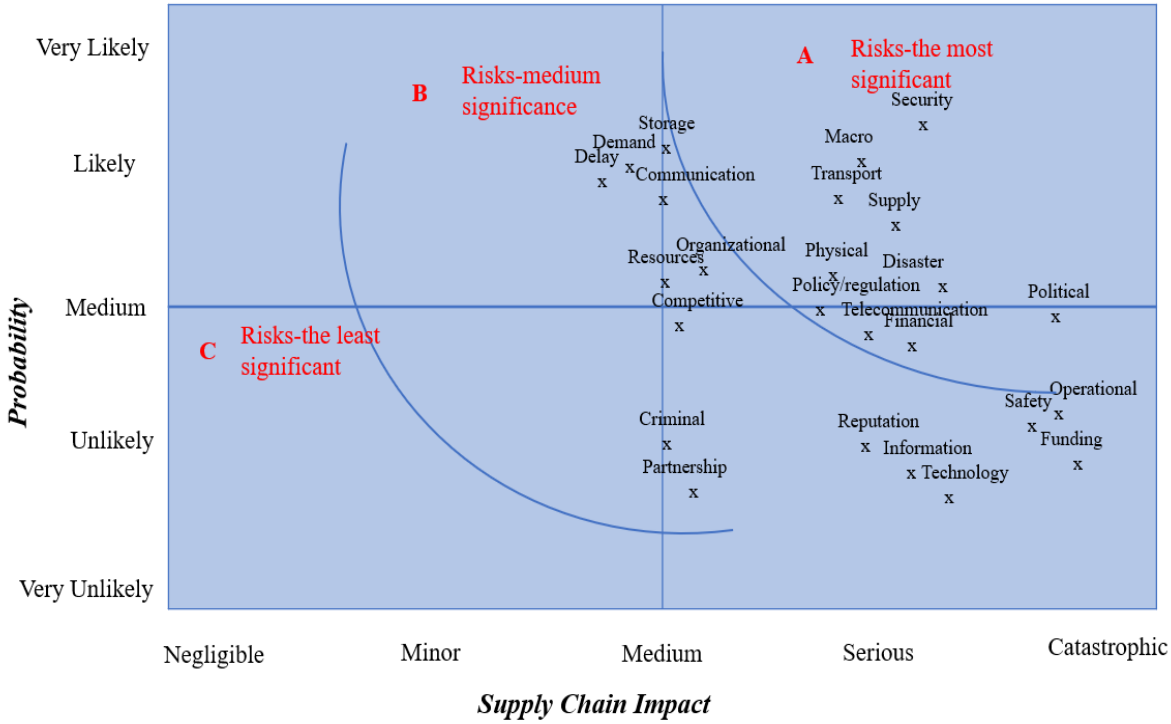
Related to the consequences, a similar rating system is applied, ranging from the lowest rating of "negligible" for no effect on supply chain operations to the highest rating of "catastrophic" for irrecoverable failure of the supply chain or organization, based on the magnitude of its consequences as shown in Table 5.

Table 5: Range of Consequences on Supply Chain

Consequences	Description
Negligible	An insignificant or no effect on the supply chain operation.
Minor	Causing some inconvenience with minor disruptions, delays and increased costs to some parts of the chain, but with most functions unaffected.
Medium	Causing some disruption to parts of the supply chain, but with the main functions continuing to meet requirements.
Serious	Major disruptions to the essential operations of the supply chain, causing serious delays and a high cost of recovery.
Catastrophic	Causing complete and irrecoverable failure of the supply chain or organization and can induce the whole stopping of operation in the country. Reputational damage.

Based on the interviewees' knowledge, perspectives, and extensive experiences in the humanitarian logistics industry, the identified risks had been categorized and positioned within the risk matrix, as depicted in Figure 3.

Figure 3: Humanitarian Supply Chain Risk Matrix



After evaluating the current and potential risks within the humanitarian supply chain system using ABC analysis, it is evident in Figure 3 that all identified risks fall within Zones A and B. In which, it was determined that 10 out of 25 risks (40% of the total) fall within Zone A, while 15 out of 25 risks (60% of the total) are categorized in Zone B. No risks were classified in Zone C, indicating that nearly half of the identified risks require immediate action and thorough monitoring. Despite some risks having low probabilities, Pareto analysis suggests they could cause significant disruptions. Risks such as funding, operations, reputation, safety, information, technology, partnerships, and criminal threats, while unlikely, could have severe consequences. Immediate action and careful monitoring are essential.

Risk evaluation revealed varying likelihoods and impacts even within the same type of risk. For instance, information security risks have a low probability of cyber-attacks but severe impacts, while restricted information flow has a higher likelihood but moderate impact. Similarly, warehouse congestion is likely with a moderate impact, whereas cargo loss from natural disasters is less likely but severe. Mitigation efforts should be tailored to each specific risk, prioritizing high-likelihood risks and developing contingency plans for those with severe potential impacts.

Risk Treatment (Responding to Supply Chain Risks and Building resilience)

In the treatment of the supply chain risk, there are different techniques to respond the emerging risks. These are outlined as follows.

1. Avoid or accept,
2. Reduce (probability and/or consequences),
3. Transfer the risk,
4. Make contingency plan,
5. Adapt to it,
6. Oppose a change,
7. Move to another environment.

In responding of risks in humanitarian supply chain of the current context, most of the above techniques are applied either separately or combinedly. The environment of the supply chain is quite complicated in Myanmar, and it is at high chance of exposing to multiple shocks. Therefore, the supply chain capacities are needed to strengthen for having more resistance and quick recovery when any operational disruptions occur. In building of supply chain resilience, there are three following pillars as stated in Figure 4.

Figure 4: Three Pillars of Supply Chain Resilience

In terms of redundancy, the risks can be reduced by having multiple suppliers, keeping of buffer stock and having backup systems to allow the operation's continuity in case of any disruptions. Related to flexibility, standardization of process and collaboration bring extensive benefits in the current context of supply chain. Under the corporate culture, the organization can quickly be recovered by risk aware working environment through continuous information among employees, their empowerment, and commitments.

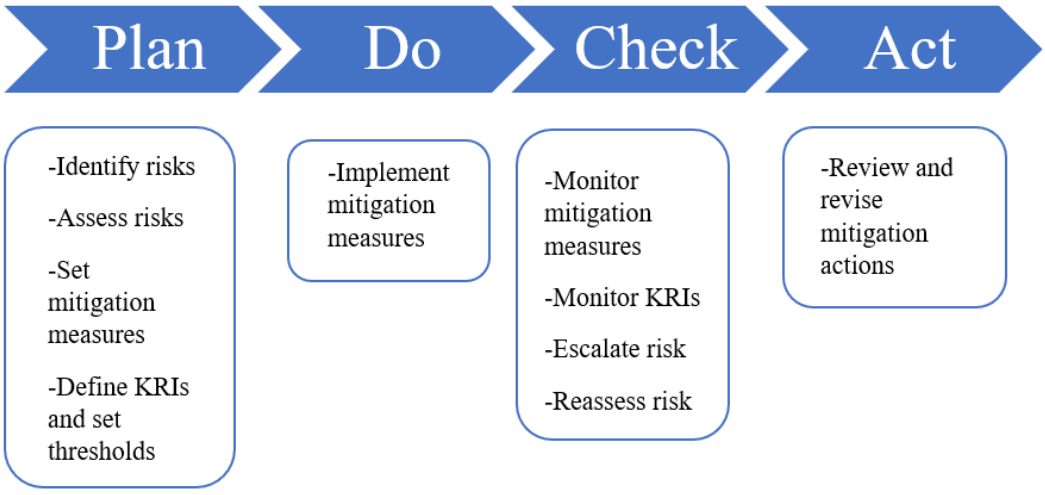
During the interviews, several risk mitigation activities have been developed with the purpose of reducing the impact or/and livelihood, transferring and adapting to the risks as well as developing contingency plan. The researcher found several mitigation measures including strengthening of supplier relationships, diversifying of suppliers, prepositioning of stock, developing of contingency plan, empowering staff, establishing strong coordination and information systems.

Apart from this, the researcher understands that local partners' involvement enhances the sustainability of humanitarian supply chain. They have deep knowledge of local environment and strong existing network. Additionally, the researcher realized that destocking, or maintaining minimal stock levels, is practiced to minimize storage risks during political crises, in contrast to stockpiling. On the other hand, the leverage of technology can improve the early warning and monitoring systems of supply chain, but it is limited in humanitarian supply chain where there is funding constraint. Hence, the balancing of the cost of managing risk with anticipated benefits is important for effective and efficient risk management process.

Implementation of Supply Chain Risks Management (SCRM) Program

In implementing the risk management process, the researcher found the Plan-Do-Check-Act (PDCA) model essential as shown in Figure 5. It supports early planning, active learning, and continuous improvement. In the Supply Chain Risk Management (SCRM) process, risks are registered, prioritized, and assigned to first-level risk owners (procurement, logistics, warehousing) for monitoring and mitigation.

Figure 5: Overall Risk Management Activities



These risk owners establish key risk indicators (KRIs) and risk thresholds with 3 levels (Green, Amber and Red zones), with oversight from the head of the Supply Chain unit (second-level risk owner), ensuring ongoing monitoring.

Monitoring and Modification of SCRM Program

In the Supply Chain Risk Management program, the risk owners are monitoring the KRIs and mitigation measures throughout the cycle. It enables them to be conscious on the risk environment to take corrective actions in timely manner and escalate to the next level of management if needed. The escalation process is followed by the indicator of emerging risk is shifted into another level of threshold. Additionally, the overall risks should be reviewed annually during the work plan to align with organizational goals. This involves assessing current KRIs, developing new ones if needed, and identifying corrective actions if existing controls are ineffective. Effective monitoring requires quarterly risk reporting, which highlights key risks and internal controls for management decisions or escalation.

CONCLUSIONS AND RECOMMENDATIONS

In conclusion, the researcher has effectively addressed supply chain risks and mitigation measures to support the humanitarian supply chain system by reflecting to the current country situation. The study revealed that applying supply chain mapping helps identify both existing and potential risks, preventing them from being overlooked (Tatham & Pettit, 2010). The risk matrix tool was validated as useful for decision-making, resource mobilization, and developing prioritized mitigation measures through ABC analysis (Wassenhove, 2006). The research found that maintaining strong supplier relationships and sourcing from multiple suppliers are crucial for preventing disruptions. Collaboration, information sharing, and prepositioning buffer stocks are key strategies in a volatile environment. However, risks such as cargo destruction or loss due to complex situations need continuous monitoring, balancing upcoming risks with benefits.

The research provides clear procedures for integrating supply chain risk management into each phase of the Plan-Do-Check-Act (PDCA) model. This approach helps reinforce the risk management process, supports a risk-aware culture, and facilitates regular reviews of Key Risk Indicators (KRIs) and corrective actions by the management team. Lastly, the research faced some limitations due to a small sample size and poor data transparency in a complex country situation. Data privacy issues also restricted access to confidential organizational figures, leaving the study reliant on interviewee perspectives. The researcher recommends using precise data for risk assessment in the future to enhance reliability. Conducting supply chain risk assessments for specific areas to have more insightful risk analysis and collaborating with cross-functional departments could improve situational analysis and risk management effectiveness.

REFERENCES

Balcik, B., & Beamon, B. (2008). Facility location in humanitarian relief. *International Journal of Logistics Research and Applications, 11(2)*, 101-121. https://doi.org/10.1080/13675560701561789.

Behl, A., & Dutta, P. (2019). Humanitarian supply chain management: a thematic literature review and future directions of research. *Annals of Operations Research, 283(1)*, 1001-1044. https://doi.org/10.1007/s10479-018-2806-2.

Bowersox, D., & Daugherty, P. (1995). Logistics Paradigms: The Impact of Information Technology. *Journal of Business Logistics, 16(1)*, 65-80.

Choi, A. K.-Y., Beresford, A. K., Pettit , S., & Fahd, B. (2010). Humanitarian aid distribution in East Africa: a study in supply chain volatility and fragility. *Supply Chain Forum: An International Journal, 11(3)*, 20-31. https://doi.org/10.1080/16258312.2010.11517237.

Creswell, J. W. (2007). *Qualitative Inquiry & Research Design: Choosing Among Five Approaches: International Student Edition.* California: Sage Publications.

Delmonteil, F.-X., & Rancourt, M.-È. (2017). The role of satellite technologies in relief logistics. *Journal of Humanitarian Logistics and Supply Chain Management, 7(1)*, 57-78. https://doi.org/10.1108/JHLSCM-07-2016-0031.

Edwards, P., Peters, M., & Sharman, G. (2001). The Effectiveness of Information Systems in Supporting the Extended Supply Chain. *Journal of Business Logistics, 22(1)*, 1-27. https://doi.org/10.1002/j.2158-1592.2001.tb00157.x.

Fan, M., Lin, N.-P., & Sheu, C. (2008). Choosing a project risk-handling strategy: An analytical model. *International Journal of Production Economics, 112(2)*, 700-713. https://doi.org/10.1016/j.ijpe.2007.06.006.

Freedman, M. (2003). The Genius is in the implmentation. *Journal of Business Strategy, 24(2)*, 26-31. https://doi.org/10.1108/02756660310508164.

Heaslip, G., Mangan, J., & Lalwani, C. (2010). *Modelling a Humanitarian Supply Chain using the Structured Analysis and Design Technique (SADT).* United Kingdom: University of Hull Logistics Institute (UHLI).

Ho, W., Zheng, T., Yildiz, H., & Talluri, S. (2015). Supply chain risk management: a literature review. *International Journal of Production Research, 53(16)*, 5031-5069. https://doi.org/10.1080/00207543.2015.1030467.

Kunz, N., & Reiner, G. (2012). Meta-analysis of humanitarian logistics research. *Journal of Humanitarian Logistics and Supply Chain Management, 2(2)*, 116-147. https://doi.org/10.1108/20426741211260723.

Norrman, A., & Jansson, U. (2004). Ericsson's proactive supply chain risk management approach after a serious sub-supplier accident. *International Journal of Physical Distribution and Logistics Managment, 34(5)*, 437. https://doi.org/10.1108/09600030410545463.

Nyaga, G. N., Whipple, J., & Lynch, D. F. (2010). Examining supply chain relationships: Do buyer and supplier perspectives on collaborative relationships differ? *Journal of Operations Management, 28(2)*, 101-114. https://doi.org/10.1016/j.jom.2009.07.005.

Oloruntoba, R., & Gray, R. (2006). Humanitarian aid: An agile supply chain? *Supply Chain Management: An International Journal, 11(2)*, 115-120. https://doi.org/10.1108/13598540610652492.

Saglam, Y. C., Çankaya, S. Y., & Sezen, B. (2021). Proactive risk mitigation strategies and supply chain risk management performance: an empirical analysis for manufacturing firms in Turkey. *Journal of Manufacturing Technology Management, 32(6)*, 1224-1244, DOI:10.1108/JMTM-08-2019-0299.

Talluri, S., Kull, T., Yildiz, H., & Yoon, J. (2013). Assessing the efficiency of risk mitigation strategies in supply chains. *Journal of Business Logistics, 34(4)*, 253-268. https://doi.org/10.1111/jbl.12025.

Tatham, P., & Pettit, S. (2010). Transforming humanitarian logistics: The journey to supply network management. *International Journal of Physical Distribution & Logistics Management, 40(8)*, 609-622. https://doi.org/10.1108/09600031011079283.

Thesis Writing: Data collection & Lab experiment. (2024, June 15). Retrieved from Thesis Writing: https://www.thesiswriting.in/data-collection/

Tummala, R., & Schoenherr, T. (2011). Assessing and managing risks using the Supply Chain Risk Management Process (SCRMP). *Supply Chain Management An International Journal, 16(6)*, 474-483. https://doi.org/10.1108/13598541111171165.

Wassenhove, L. V. (2006). Humanitarian aid logistics: Supply chain management in high gear. *Journal of the Operational Research Society, 57(5)*, 475-489. https://doi.org/10.1057/palgrave.jors.2602125.