Risk Management in Logistics: A Case Study at State Mining Corporation Limited (SMCL), Phuntshothang

Deki Yangzom[1], Kunzang Chodon[2], Kusum Samal[3], Ugyen Lhamo[4], Cheki Yangdon[5], and Wangmo[6]

[1-6]*Department of Humanities and Management, Jigme Namgyel Engineering College Royal University of Bhutan*
[*]*Corresponding author: wangmo.jnec@rub.edu.bt*

Published: February 2025

Abstract

Logistics risk management is essential for ensuring the efficient functioning of organizations, particularly in industries such as mining where the transportation of goods is critical. This study focuses on State Mining Corporations Limited (SMCL) in Bhutan, examining the organization's logistics risks and evaluating the effectiveness of its current risk management practices. Through surveys and data analysis, the study identifies potential vulnerabilities, assesses the impact of these risks, and proposes effective mitigation strategies. Key findings include the identification and categorization of logistics risks, evaluation of risk management practices, and the involvement of relevant stakeholders. The study underscores the importance of taking proactive measures in logistics risk management and highlights the need for continuous improvement in risk mitigation strategies. By implementing these recommendations, the company can enhance its ability to identify and categorize logistics risks, implement proactive measures to mitigate transportation equipment breakdowns and develop contingency plans for weather-related disruptions.

Keywords— risk, risk management, logistics, transportation risk, geographical risk

1 Introduction

Logistics is a process linking the activities of product manufacturing from suppliers to customers (the Journal of Logistics Management, n.d.). It defines logistics as the process of planning, implementing, and controlling the efficient, effective flow and storage of goods, services, and related information from point of origin to point of consumption to conform to customer requirements. Logistics risk management involves the identification, assessment, and mitigation of risks that can impact the flow of goods, materials, and information throughout the supply chain (Kindness, 2012). In the mining industry, where operations are often geographically dispersed and reliant on large-scale transportation networks, subject to environmental and regulatory constraints, effective logistics

risk management is crucial (Kindness, 2012). Mining is the process of extracting useful materials from the earth. Some examples of mined substances include coal, gold, or iron ore, and mining is necessary to obtain most materials that cannot be grown through agriculture. processes or feasibly created artificially in a laboratory or factory (Trkman & McCormack, 2009). Numerous day-to-day life materials are the products of mining and demand for the same is increasing. If we were to recycle all the freely available metals and minerals in the world today, we would only meet a small percentage of the total mineral and metal requirements of society. The mining industry is critical to modern society because it provides raw materials for our daily life. Mining underpins practically every area of modern life, from the construction of buildings and infrastructure to the creation of electronics and renewable energy technology (pamapersada.com,2023). According to Evolutionary and Revolutionary Technologies for Mining (2002), mined materials are needed to construct roads and hospitals, build automobiles and houses, make computers and satellites, generate electricity, and provide the many other goods and services that consumers enjoy. In addition, mining is economically important to producing regions and countries. The State Mining Corporation Limited in Bhutan plays a significant role in the country's mineral extraction sector, contributing to economic growth and sustainable development. The companys operations involve the extraction, processing, and transportation of various minerals, including coal, limestone, and dolomite. As a state-owned entity, the company faces unique challenges in managing logistics risks, including the need to balance commercial imperatives with environmental protection and community engagement.

The transportation of minerals from mining sites to customers is a critical aspect of the companys operations. This process involves the movement of large quantities of materials over long distances. The efficient and timely delivery of these minerals is essential for meeting customer requirements and maximizing revenue generation. However, the logistics operations of SMCL are exposed to numerous hazards that can disturb the mobility of goods and impact the overall supply chain. These hazards can arise from various sources, including natural disasters, equipment failures, labor strikes, regulatory changes, and geopolitical issues. The occurrence of any of these risks can lead to delays, increased costs, damaged reputations, and even the suspension of operations. Therefore, it is crucial for SMCL to proactively identify, assess, and mitigate these risks to ensure the smooth functioning of its logistics operations.

By examining SMCL's approach to logistics risk management, this study aims to identify the key risks faced by the company and examine its current risk mitigation strategies. By understanding the specific challenges faced by SMCL and the effectiveness of its risk management practices, valuable insights can be gained for augmenting the performance in the supply chain and fostering resilience. This paper also seeks to contribute practices in logistics risk management within the mining industry.

Ultimately, by enhancing logistics risk management in the mining sector, particularly in the context of a state-owned entity like SMCL, this study can help improve industry standards, promote responsible mining practices, and support the economic development of Bhutan while safeguarding environmental integrity. Additionally, the findings and recommendations of this study can serve as a valuable reference for other mining companies facing similar logistical challenges.

2 Literature Review

The location of logistics facilities significantly affects not only the activities of urban goods movement but also the urban environment as these facilities represent major originators and receivers of freight (Thompson, 2016). Recently, the phenomenon of logistics sprawl, i.e.; the relocation of logistics facilities away from inner urban areas to suburban areas has received an increasing level of attention from both academics and policymakers. In this paper, a literature review of the various impacts of logistics sprawl is provided with a detailed taxonomy of the impacts. It has been

observed that logistics sprawl contributed to changes in the geography of urban freight, increasing trucks traveled distance and consequent emissions and impacting the continuing of logistics employment (Aljohani, 2016). While these studies highlight the challenges associated with logistics sprawl, further empirical research is needed to assess long-term sustainability and mitigation strategies.

Logistics management is known or its complexity, dynamics, and uncertainty. The advent of rapid technology development, intense business competition and changing customer needs and requirements, have forced companies to reshape their business model and strategies (Sundram, 2015). Numerous new terms such as Global Supply Chain, Third Party Logistics, Green Logistics, E-Logistics and Reverse Logistics are becoming issues that have to be deal with by all companies, local multinational and global. Lately Reverse Logistics start to get attention by most of the firms. The purpose of this assignment is to review and identify clear definition of Reverse Logistics, comparison Reverse Logistics with Forward Logistics to have a better understanding and finally, the future direction of Reverse Logistics in gaining competitive advantages (Rajagopal, 2015). However, existing studies often lack industry-specific case analysis, which could provide deeper insights into practical applications and challenges. With the globalization of business operations, logistics systems are threatened by all kinds of uncertainties and disruptions. According to Chiu and Chan (2016), almost every month, serious accidents in transportation and natural disasters all around the world are reported in the media. As a result, an effective and efficient risk management scheme is of the topmost priority in the mind of all professionals in logistics management. This paper concisely explores risk management of logistics systems in several critical areas, namely disruption risk management, operational risk control, disaster and emergency management, and logistics service risk analysis (Choi, 2016). Despite these valuable contributions, there remains a gap in integrating predictive analysis and artificial intelligence into risk management frameworks, which could enhance proactive decision-making. This study highlighted the importance of determining the impact that an ineffective mode of transport has on a firms transportation model and costs. The study is to determine the logistics opportunity costs of using road transport within a mining firm. The road Freight Strategy for South Africa highlights the fact that South Africa's transportation costs are considerably higher than most other economies and that they need to be minimized (Havenga, 2016). As transport costs are directly linked to the oil price, it is a very vulnerable cost and could, therefore, continue to escalate (Simpson & De Bod, 2016). The prospect of additional tolling costs, as well as the possibility of the taxing of carbon emissions, would further ensure that the transport costs share of the total logistics spend will increase in the future. While this study provides a strong economic perspective, there is limited exploration of alternative transportation modes such as rail or multimodal logistics solutions that could mitigate cost pressures. Revenue management conception has been used for reference in the car rental industry to develop booking, pricing, and inventory strategies. To get a high degree of customer satisfaction and optimize vehicle fleet utilization, logistics managers in the car rental business approximately adopt three decision-making steps: namely, poor segmentation, strategic fleet planning, and tactical fleet planning (Yang & Jin, 2008). The optimization of resource deployment and cost reduction remains a core objective of logistics management. However, there is a lack of research on integrating digital transformation technologies, such as blockchain and real-time tracking, into car rental logistics, which could enhance operational efficiency. This sort of research is prospective and useful for future development of the car rental industry (Yang & Jin, 2008). While this review provides a solid foundation, it lacks an updated perspective on recent advancements, particularly in digitalization, automation, and sustainable TPL practices. Third-party logistics (TPL) has attracted considerable research attention in the recent past. Despite the growing body of literature on this topic, precious little effort has been devoted to synthesizing the overall state of the art of research on TPL. In this paper, an attempt is made to review the status of literature on TPL. A literature review scheme is presented. A total of 152 articles published between 1989 and 2006 in 33 reputable international journals are reviewed and classified into content- and methodology-related issues. Based on the review, suggestions for future research are likewise provided (Marasco, 2008). Supply chain risk management has

increasingly become a more popular research area recently. Various papers, with different focuses and approaches have been published since a few years ago. This paper aims to survey supply chain risk management (SCRM) literature. Papers published in relevant journals from 2000 to 2007 are analyzed and classified into five categories: conceptual, de- scriptive, empirical, exploratory cross-sectional, and exploratory longitudinal (Vanany & Pujawan, 2009). We also looked at the papers in terms of the types of risks, the unit of analysis, the industry sectors, and the risk management process or strategies addressed. The literature review will provide the basis for outlining future research opportunities in this field (Zailani, 2009). Dumisdara Dolomite mine is located at Pugli in Samtse covering an area of 100 acres. The topographic survey and geological investigation have been completed. Dumsidara dolomite contains an average content of MgO of 19.39%, which is a significant mineral resource. However, there is a need for further research into the logistics and supply chain implications of dolomite mining, particularly regarding transportation efficiency, environmental impact, and economic viability. In general, while the existing literature provides a strong foundation in logistics management, significant gaps remain, particularly concerning digital transformation, sustainability and risk mitigation strategies. Further research should explore these emerging areas to enhance both theoretical understanding and practical applications in logistics and supply chain management.

Recent research highlights the significant transformation occurring in logistics due to the digital age. Beyond critical aspects like facility location and transportation costs, the findings reveal a complex interplay of technological disruption, increased risks, and changing customer expectations. The growth of e-commerce, along with advancements in data analytics and automation, is reshaping supply chain dynamics, compelling companies to adopt more agile and resilient strategies. Additionally, the greater interconnectedness of global supply chains has heightened the potential for disruptions, making robust risk management frameworks essential. This era calls for a holistic approach to logistics, one that combines technological innovation, strategic planning, and a deep understanding of the evolving market landscape.

3 Methodology

3.1 Research Design

This study applies a descriptive research design with partially exploratory elements. The data collection methods include surveys and literature reviews to provide a detailed understanding of logistics risk management at State Mining Corporation Limited.

3.2 Sources of Data

Primary data is gathered using surveys administered to employees at SMCL, Phuntshothang, and Samdrup Jongkhar while Secondary data is sourced using Journals, books, websites, and organization reports.

3.3 Structure of questionnaire

This questionnaire comprises three sections: demographic information, Supply chain disruption and breakdowns, and strategies for overcoming the existing risks.

3.4 Sample size

The study focused on all employees at the Phuntshothang, SMCL coal mining company. This sample size may seem limited but it still provides valuable insights into the perceptions and experiences

of a portion of the workforce. Although the response rate was lower than anticipated, efforts were made to ensure that the collected data represents a diverse range of roles and perspectives within the organization. The insights gathered from the 44 respondents offer valuable quantitative data that can inform the analysis and discussion of logistic risks and management strategies at SMCL.

3.5 Analytical tools

In this research project, data collection was conducted through Google Forms, and subsequent analysis was conducted using Microsoft Excel.

4 Result

Based on the data analysis and interpretation, the following are the summarized findings of the study: The majority of respondents agree that the company effectively identifies potential breakdowns in transportation equipment as a logistics risk. There exists a high level of confidence in the company's ability to identify risks within the logistics process. Relevant stakeholders are consistently engaged in identifying and categorizing logistics risks, as well as participating in important decision-making processes. The company conducts comprehensive evaluations of potential logistics risks within its mining operations. Proactive planning for contingencies to mitigate the impact of weather-related disruptions on operations is effectively carried out. Fluctuations in fuel prices are duly recognized as potential logistics risks by the company. A majority believe that hedging fuel purchases effectively manage fuel price fluctuations. Strong belief is held by most respondents regarding the crucial importance of proactive steps in logistics risk management. Engaging external partners emerges as the most promising strategy for mitigating transportation equipment breakdowns and shaping a better logistics strategy.

5 Discussion

The survey data provides a comprehensive overview of SMCL's current logistics risk management practices. While the company demonstrates a strong understanding of potential risks, particularly those related to transportation and fuel price fluctuations, there are areas where further improvement is necessary.

5.1 Strengths in Risk Identification and Mitigation

SMCL has a commendable track record in identifying and mitigating key logistics risks. A significant majority of respondents believe the company effectively recognizes transportation issues and fuel price fluctuations. The involvement of relevant stakeholders in risk identification and categorization is also a positive aspect. The company's proactive approach to identifying emerging risks is noteworthy. This indicates a commitment to staying ahead of potential challenges and adapting to changing circumstances. Furthermore, the perceived effectiveness of strategies to mitigate transportation and weather-related risks suggests a robust risk management framework.

5.2 Areas for Improvement

While the company's risk identification capabilities are strong, there is room for improvement in the consistency and effectiveness of risk mitigation strategies. A notable proportion of respondents expressed uncertainty or disagreement regarding the effectiveness of strategies to mitigate transportation risks. This suggests a potential gap in the implementation or execution of these strategies.

The survey also highlights the need for more comprehensive risk assessments. Although the company evaluates potential logistics risks, there is a perception that certain risks may be overlooked or inadequately addressed. This could be due to a lack of standardized risk assessment methodologies or insufficient resources allocated to risk management activities.

6 Conclusion

In conclusion, the judicious management approaches to reduce logistic risk are deemed necessary to smoothly operate and sustain the profitability of the State Mining Corporation Limited (SMCL). This study has helped to understand the nature of logistics, encompassing the planning, implementation, and control of goods, services, and information flow from suppliers to customers. In an increasingly global business environment with complex supply chains, the need for comprehensive risk management strategies has become inevitable. At SMCL, logistical inefficiencies and safety risks, especially in remote operations like the coal mining activities in Phuntshothang, Bhutan, faced significant challenges. These inefficiencies often arise from poor road conditions, leading to delays, damaged goods, and disruptions in the supply chain, ultimately escalating costs and reducing productivity. The primary objective of this study is to analyze these vulnerabilities and propose effective risk mitigation strategies to address them. By systematically identifying and categorizing logistics risks, evaluating current risk management practices, and developing targeted mitigation strategies, SMCL can enhance its resilience and competitiveness. Collaboration with external partners and suppliers is vital to develop joint strategies for shared risk mitigation, ensuring a more robust and coordinated approach. Finally, successful management of logistics risks demands an adaptive approach, continuous improvement in risk management practices, and a strong emphasis on coordination, cooperation, and information sharing across the entire supply chain. Implementing these strategies will not only maintain operational efficiency and reduce costs but also ensure long-term sustainable development for SMCL.

Acknowledgment

Our warm gratitude goes to the company (State Mining Corporation Limited) for allowing us to research its logistics risk and mitigation processes. Despite their busy schedules, the employees spared their precious time to respond to our survey questions, which was helpful to our research. We would like to sincerely thank Ms. Wangmo, our advisor, for guiding us through the project. Her feedback was commendable in shaping our understanding of the task, and Mr. Gangaram Bhattarai, Lecturer for guiding us to design our paper in the conference format. Last but not least, we would like to thank all our classmates and friends for helping us complete our project.

References

[1] E. Andreea, "Risk analysis in transport and logistics," *Journal of Business and Public Administration*, vol. 8, no. 3, Dec. 2017. [Online]. Available: `https://www.researchgate.net/publication/322894048_Risk_analysis_in_transport_and_logistics`

[2] B. Bahli and S. Rivard, "The information technology outsourcing risk: a transaction cost and agency supply chain-based perspective," *Journal of Information Technology*, vol. 18, no. 3, pp. 211221, 2003. [Online]. Available: `https://doi.org/10.1080/0268396032000130214`

[3] M. Browne and J. Allen, "Logistics outsourcing," in *The Handbook of Logistics and Supply*

Chain Management, Emerald Group Publishing Limited, 2017. [Online]. Available: https://doi.org/10.1108/978008035930-016

[4] "Evolutionary and Revolutionary Technologies for Mining," National Academies Press, 2002. [Online]. Available: https://nap.nationalacademies.org

[5] L. V. Jaarsveld, J. G. Hyens, and P. J. Kilbourn, "Logistics Opportunity Costs: A Mining Case Study," May 2013. [Online]. Available: https://www.researchgate.net/publication/2069972969_Logistics_opportunity_costs_A_mining_case_study

[6] Logistics World, "What is Logistics," [Online]. Available: http://www.logisticsworld.com/logistics.htm

[7] H. R. Lourenço, "Logistics Management: An Opportunity for Metaheuristics," in *Metaheuristics Optimization via Memory and Evolution*, C. Rego and B. Alidaee, Eds., Kluwer Academic Publishers, 2005, pp. 329356. [Online]. Available: https://link.springer.com

[8] F. Nilsson and J. Waidringer, "Toward adaptive logistics management," in *Proceedings of the 38th Hawaii International Conference on System Science*, IEEE, 2005. [Online]. Available: https://www.computer.org/portal/web/csdl/doi/10.1109/HICSS.2005.629

[9] P. Rajagopal and V. P. Kaliani Sundram, "Future Directions of Reverse Logistics in Gaining Competitive Advantages: A Review of Literature," 2015. [Online]. Available: https://www.researchgate.net/publication/280321391_Future_Directions_of_Reverse_Logistics_in_Gaining_Competitive_Advantages_A_Review_of_Literature

[10] T. M. Choi, C. H. Chiu, and H. K. Chan, "Risk Management of Logistics Systems," 2016. [Online]. Available: https://www.sciencedirect.com/science/article/abs/pii

[11] P. Trkman and K. McCormack, "Supply chain risk in turbulent environments - A conceptual model for managing supply chain network risk," *International Journal of Production Economics*, vol. 119, no. 2, pp. 247258, 2009. [Online]. Available: https://www.sciencedirect.com/science/article/pii

[12] "Whats in your logistics risk management plan?" LinkedIn, Sep. 5, 2023. [Online]. Available: https://www.linkedin.com