The Operational Risk Management Design of National Companies Export Shipments Delay

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ABSTRACT

The main problem with freight forwarding companies in Indonesia was the absence of a risk identification process and the lack of risk triggers implemented by XYZ company. Other problems were found there had been delays in delivery caused by ship delays, unavailability of ship space, container shortages, and also late production due to delays in receiving raw materials. The aim of the research is to design a risk management framework for XYZ company in Jakarta. The research used exploratory sequential design by implementing enterprise risk management. Risk identification was processed using Fishbone as the qualitative method and then analyzed by House of Risk as the quantitative method. The management of supply chain risks was developed using the SCOR model to assist in planning and managing delivery delays. The key finding is brainstorming with supply chain heads that will be used as the priority risk agents, namely, the 12 main ranking risk agents. Determining preventive actions based on a set of 16 specific actions serves as a guide for the House of Risk phase 2 model.

Keywords: aggregate risk potential, enterprise risk management, house of risk, risk agent, risk event

A. Introduction

Without effective risk management, supply chains are highly vulnerable to potential losses, including revenue reduction, customer attrition, and the loss of competitive advantage. (Khan et al., 2016; Mensah et al., 2017; Tan & Lee, 2022). Previous studies have emphasized that risk management is essential for minimizing organizational losses and ensuring business sustainability (Sumarna & Nabil, 2020). Increasing uncertainty in supply and demand, market globalization, shortened product life cycles, and rapid technological advancements have further intensified operational risks faced by organizations (Rao & Goldsby, 2009). Over the past several years, substantial disruptions across various industries, particularly within supply chain operations, have been driven by the global spread of the COVID-19 pandemic, creating numerous risks capable of adversely affecting corporate performance. Komaromi et al., (2022) reported that significant vessel delays caused by port congestion at major international ports disrupted supply chain activities worldwide. To mitigate such risks, previous research conducted at PT Agility International applied the House of Risk (HOR) methodology as a proactive approach to reducing potential disruptions throughout export operations (Andriyanto &

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Mustamin, 2020). The HOR methodology primarily focuses on the identification and management of operational risks. However, many organizations still lack a formal risk assessment framework and risk management system based on Enterprise Risk Management (ERM) and ISO 31000 standards (Maharani, 2018; Ricardianto et al., 2023). Furthermore, Saptodewo et al., (2020) found that during the COVID-19 pandemic, declining export demand directly affected employee productivity due to significant changes in working environments and operational regulations.

The COVID-19 pandemic has profoundly affected Indonesia's international trade activities and the global economy, resulting in business process inefficiencies within XYZ company's logistics operations, particularly in the form of shipment delays. These disruptions were driven by various government-imposed measures aimed at containing the spread of COVID-19, including lockdown policies, health protocols affecting cargo movement, fluctuations in supply and demand patterns, and global supply chain restructuring involving major economies such as China, Germany, and the United States. Consequently, export shipment processes experienced significant operational disturbances.

Based on operational data collected from XYZ company in 2021, shipment delays were primarily caused by vessel schedule disruptions, limited vessel space availability, container shortages, and production delays resulting from late deliveries of raw materials. Despite these challenges, the company has not conducted a comprehensive operational risk assessment nor established a systematic framework to address export shipment risks arising from pandemic-related disruptions. Therefore, risk identification and risk management initiatives are necessary to mitigate the potential risks associated with shipment delays. This study aims to develop a risk management framework using the Enterprise Risk Management (ERM) approach. The implementation of ERM is expected to support management in minimizing risks and enhancing organizational performance. Furthermore, this study is intended to assist management in implementing operational risk management practices based on SNI ISO 31000:2018 to ensure more effective and structured risk governance.

Risk can be defined as the possibility of loss, unexpected events, deviations from anticipated outcomes, or unfavorable conditions arising from uncertainty. According to Frosdick (as cited in Handayani, 2016), risk represents the probability of an event occurring that may result in losses within a particular period. Such risks cannot be ignored and must be managed carefully. Vaughan & Vaughan, (2013) further defined risk as a condition involving the possibility of adverse deviations from expected outcomes. Similarly, Vorst et al. (2018) emphasized that risk encompasses uncertainties that may either negatively affect organizational performance or lead to gains and losses resulting from managerial decisions. Operational risks may arise from inadequate internal processes, human error, system failures, or unforeseen external events (Supriyono, 2013).

Risk management is critical for reducing the magnitude of potential losses faced by organizations. Inadequate risk handling can threaten business continuity and organizational sustainability (Maharani, 2018). Risk mitigation involves preventive actions designed to eliminate or reduce the likelihood and impact of risk events. Qualitative risk analysis measures and evaluates risks by assessing both the probability of occurrence and the severity of their potential consequences (PMJ, 2008).

Enterprise Risk Management (ERM), as defined by CSOTC, (2020), Khan et al., (2016), and Ricardianto et al., (2023), is a comprehensive approach that integrates the design, implementation, evaluation, and continuous improvement of risk management across an organization. Risk management processes consist of systematic principles, standards, practices, and procedures that

facilitate risk communication, assessment, treatment, monitoring, review, documentation, and reporting. The application of ERM in managing shipment delay risks is essential because it enables organizations to assess risks within established tolerance limits and improve the quality of decision-making processes.

ISO 31000 states that the primary purpose of risk management is the creation and protection of organizational value while providing practical guidance for addressing various dimensions of risk (Hillson, 2023). The ISO 31000:2018 framework comprises principles, a framework structure, and risk management processes that collectively provide a foundation for effective, efficient, and consistent risk management practices (figure 1). The principles of ISO 31000 describe the characteristics of sound risk management, align risk management with organizational objectives, and providing guidance for achieving effective governance. The framework supports organizations in integrating risk management into all business activities. In this study, ISO 31000:2018 serves as the primary ERM standard for operational risk management related to export shipment delays, ensuring that risk mitigation decisions are implemented in a structured, systematic, and standardized manner.

At the beginning of March 2020, the COVID-19 pandemic generated significant negative impacts across all business sectors, including logistics. Export and import volumes declined as Indonesian industries integrated within global supply chains experienced lower international demand. According to Firdausy (2021), the tangible consequences of the pandemic included reduced export-import cargo volumes, prolonged customs clearance processes, and vessel docking disruptions. To overcome these challenges, improvements in infrastructure, product distribution systems, logistics service capabilities, regulatory frameworks, administrative processes, and information systems are required. Accordingly, this research examines risk management in freight transportation services by adopting the Enterprise Risk Management (ERM) approach in conjunction with Aggregate Risk Potential (ARP), the House of Risk (HOR) methodology, the Supply Chain Operations Reference (SCOR) model, and ISO 31000 standards. Risk identification focuses on both risk agents and risk events, which are analyzed using Pareto and Fishbone diagrams. The integration of these analytical tools within a single framework represents a novel contribution that has not been comprehensively addressed in previous studies.

B. Methods

This study employed a mixed-method approach, combining qualitative and quantitative descriptive research methods. The validity of the quantitative data was tested using SPSS Version 26, while the validity of the qualitative findings was assessed through data triangulation techniques. The analysis was subsequently extended through the development of the Aggregate Risk Potential (ARP) model. The research process began with field observations aimed at identifying operational risks within the export shipping process. Risk identification was supported through the application of Pareto Analysis and the Fishbone Diagram approach.

Furthermore, the Supply Chain Operations Reference (SCOR) Model was systematically applied across six core supply chain processes, namely Plan, Source, Make, Deliver, Return, and Enable, covering activities from suppliers to end customers. The SCOR framework served as the foundation for understanding supply chain operations, identifying relevant stakeholders, and evaluating supply chain performance. In addition, the Pareto Diagram was utilized to identify the critical 20% of operational risk sources contributing to shipment delays, enabling management to prioritize mitigation efforts effectively.

This study adopted the Enterprise Risk Management (ERM) framework based on

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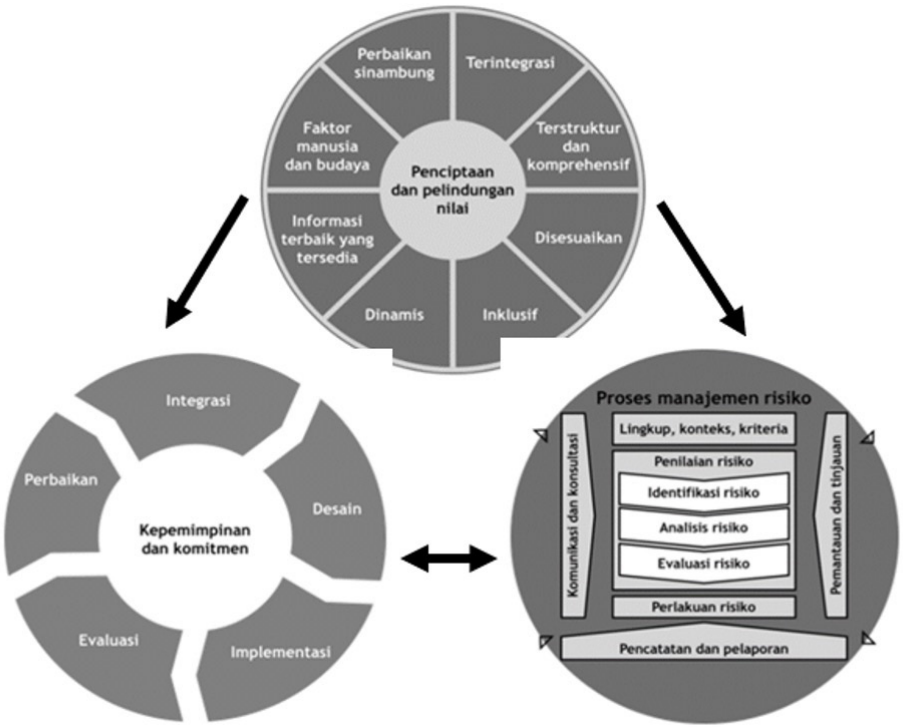

Source: adapted from ISO (2018)
Figure 1 Conceptual Overview of the ISO 31000:2018 Risk Management Model, Illustrating the Relationship between Principles, Framework, and Risk Management Processes

ISO 31000:2018 to ensure that risks could be systematically controlled and mitigated in support of organizational objectives. Quantitative data analysis was conducted using the House of Risk (HOR) methodology, which integrates the principles of Failure Modes and Effects Analysis (FMEA) and Quality Function Deployment (QFD) as developed by Pujawan & Geraldin, (2009). The integration of these methodologies facilitated the development of an operational risk control framework for export shipment activities at XYZ company and provided recommendations that may be applicable to other export-oriented organizations facing similar operational challenges.

The research methodology consisted of several stages. The qualitative phase focused on problem identification and context establishment through validity and reliability testing, data triangulation, and the identification of risk events and risk agents. The quantitative phase involved risk identification, analysis, evaluation, and mitigation. Risk analysis was performed to determine the severity of each risk event, the occurrence level of each risk agent, the relationship between risk events and risk agents, and the resulting Aggregate Risk Potential (ARP) scores. Subsequently, the study proceeded with risk evaluation, risk response development, establishment of the risk management foundation, data analysis, conclusion formulation, risk control planning, and final recommendations. The study involved a total of 41 employees representing five organizational functions: Supply Chain Management, Customer Service, OTIF (On Time In Full), Logistics, and Warehouse Operations. These respondents were engaged in five key business processes: business planning, order fulfillment, production, shipment execution, and return management. Their participation provided comprehensive insights into operational risks throughout the export supply chain process. The risk identification process was supported by a Fishbone Diagram,

which was used to systematically map the root causes of operational risks associated with export shipment delays.

C. Results and Discussion

1. Overview of Operational Risk Identification for Export Shipment Delays

Based on field observations and interviews conducted during the study, several operational risks associated with export shipment activities were identified. Using the 5M framework (Manpower, Method, Material, Machine, and Mother Nature), the Fishbone Diagram analysis revealed a total of 30 risk events and 43 risk agents contributing to operational disruptions. The identified risk agents and risk events were subsequently classified according to their respective risk owners to ensure a more accurate and effective risk mitigation strategy.

2. Analysis of Risk Agent Levels Related to Operational Shipment Delay Risk Events

Following the identification of risk agents and risk events, assessments of occurrence**,** severity**,** and correlation were conducted. The integration of risk events, risk agents, and correlation values generated the Aggregate Risk Potential (ARP) score, which combines the likelihood of risk occurrence and the associated impact to determine the priority level of each risk agent. The resulting ARP scores were ranked from the highest to the lowest priority. Through brainstorming sessions with the Supply Chain Head, 12 priority risk agents were selected from the 43 identified risk agents as requiring immediate management attention.

3. Analysis of the Risk Management Framework Design

After identifying the priority risk agents affecting export shipment operations at XYZ company, a structured risk management framework was developed. From the twelve priority risk agents identified, 16 preventive actions were proposed. However, based on feasibility, available resources, and organizational priorities, only 10 preventive actions were considered suitable for immediate implementation.

4. Analysis of Risk Control Measures

Following the prioritization of risk agents and the selection of immediate preventive actions, the next phase involved implementing control and monitoring mechanisms to manage potential risks proactively. Through continuous monitoring and control activities, the organization is expected to minimize operational disruptions and reduce potential financial and operational losses resulting from export shipment delays.

5. Risk Identification

a. Context Establishment

This study aims to analyze the risk management practices of XYZ company, with particular emphasis on supply chain operations. The Supply Chain Department plays a critical role in supporting order fulfillment, production planning, shipment execution, and inventory handling. Consequently, managing operational risks within this function is essential to maintaining business continuity and organizational performance. Therefore, this research focuses on identifying and mitigating operational risks that may adversely affect business operations.

b. Risk Identification Process

The risk identification process began with an analysis of risk events using the Fishbone Diagram approach. The SCOR (Supply Chain Operations Reference) model was then employed to map supply chain activities and simplify the classification of identified risk events across different operational stages. The SCOR framework consists of five primary processes Plan, Source, Make, Deliver, Return. These processes provide a structured framework for understanding supply chain operations and identifying potential sources of

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risk.

Risk identification was conducted using monthly operational reports, field observations, and expert interviews from each supply chain function. This approach ensured the validity and reliability of the findings. The House of Risk (HOR) methodology was used not only to identify risk events but also to determine the underlying risk agents that trigger such events. The Fishbone Diagram was subsequently utilized to map the relationship between identified risk events and their root causes. Since risk events arise because of risk agents, effective mitigation strategies must target the risk agents to reduce or eliminate potential operational disruptions.

6. Risk Agent Assessment

a. House of Risk (HOR)

To minimize risks arising from identified risk agents, the House of Risk (HOR) methodology was applied to determine which risk agents should be prioritized for mitigation. The HOR approach emphasizes preventive actions by identifying and prioritizing risk factors before adverse events occur. The method consists of two phases Risk Identification (HOR Phase 1) and Risk Mitigation Planning (HOR Phase 2).

1. HOR Phase 1: Risk Identification

The first stage involved mapping the Supply Chain Department's business processes and identifying risk agents and risk events requiring immediate attention. The ARP ranking was calculated based on three key variables Occurrence, Severity, and Interrelationship (Correlation). Respondents from the supply chain division evaluated the severity and occurrence of identified risks using a scoring scale ranging from 1 to 10. After data collection, validity and reliability testing were conducted to ensure the quality of the research instrument.

Validity and Reliability Testing

The validity test was performed using Pearson Correlation Analysis. Results showed that all variables related to risk events and risk agents across Customer Service, Logistics, OTIF, and Warehouse divisions had correlation values exceeding the critical threshold, indicating that all variables were valid. The correlation coefficients ranged between 0.652 and 0.974**.** Reliability testing using Cronbach's Alpha yielded coefficients greater than 0.70, confirming the reliability of the measurement instrument. The reliability coefficients ranged between 0.919 and 0.961, indicating a high degree of internal consistency. The relationship between risk agents and risk events was evaluated using the following correlation values.

The ARP calculation integrated risk event data, risk agent data, correlation values, and occurrence assessments to generate the HOR Phase 1 results. Risk agents were then ranked according to their ARP values. The Pareto Principle (80/20 rule) was subsequently applied to identify the most critical risks requiring immediate action. According to this principle, approximately 20% of risk sources contribute to 80% of potential organizational losses (figure 4).

The Pareto 80/20 analysis, also known as the Pareto Principle, was employed to identify priority risk agents that constitute the primary inputs for designing mitigation strategies (Tables 4 and 5). Given resource constraints, risk management initiatives cannot address all identified risk agents simultaneously. Therefore, risk treatment priorities were established based on a cost-benefit perspective, considering the resources required for mitigation and the magnitude of the potential impact associated with each risk agent. Based on Pareto analysis, the following twelve risk agents were prioritized for mitigation:

The application of the Pareto Principle suggests that a relatively small proportion of risk sources, approximately 20%, may contribute to nearly 80% of the potential adverse impacts experienced by an organization. Therefore, risk mitigation efforts can be optimized by concentrating

resources on addressing the most critical risk agents. Based on the cumulative Aggregate Risk Potential (ARP) values derived from the Pareto analysis, nine priority risk agents were initially identified: A6, A25, A13, A12, A14, A28, A4, A23, and A37. Nevertheless, expert judgment obtained through consultations with the Supply Chain Head indicated that the twelve highest-ranked risk agents should be prioritized, given their potential to hinder the achievement of the company's strategic and operational targets. These priority risk agents were subsequently evaluated through House of Risk (HOR) Phase 2 to establish the most appropriate and effective preventive actions.

2. Risk Mitigation Strategy Design

a. HOR Phase 2: Risk Mitigation

House of Risk (HOR) Phase 2 represents the second stage of the risk management process. This phase focuses on developing preventive actions aimed at mitigating the priority risk agents identified in HOR Phase 1. The process includes several key activities: formulating mitigation strategies, determining the correlation between preventive actions and risk agents, measuring the effectiveness and degree of difficulty of each proposed action, and ultimately establishing implementation priorities based on the Effectiveness-to-Difficulty (ETD) ratio. The ETD ratio enables organizations to identify mitigation initiatives that provide the highest impact relative to the effort required for implementation. Following the calculation of total effectiveness and the assessment of the degree of difficulty, each proposed mitigation strategy was evaluated and ranked according to its ETD value. This approach ensured that risk mitigation resources were allocated to actions capable of delivering the greatest reduction in risk exposure.

3. Risk Control

a. Selection of Preventive Actions

Not all proposed preventive actions can be implemented simultaneously. Factors such as implementation costs, time requirements, and organizational management policies significantly influence the feasibility of each initiative. Following discussions with the management of XYZ company, it was determined that only 10 of the 16 identified preventive actions were sufficiently feasible and beneficial for immediate implementation. The ten highest-priority preventive actions identified through the HOR Phase 2 analysis are presented below (Table 4):

Based on the risk identification process conducted at XYZ company, a total of 30 risk events associated with export shipment delays were identified. These consisted of nine risk events within the Customer Service function, four within the OTIF function, ten within the Logistics function, and seven within the Warehouse function. In addition, the study identified 43 risk agents as potential sources of operational disruption, comprising eleven risk agents in Customer Service, ten in OTIF,

Table 1 XYZ company's Supply Chain Activities Based on the SCOR Model

Process	Activity	Division	Code
Plan	Receive customer orders	Customer Service	C1
	Coordinate shipment planning with related parties		C2
Source	Procure raw materials	OTIF	C3
Make	Manage production schedules	OTIF	C4
	Issue Work Orders to production		C5
Delivery	Select transportation service providers	Logistic	C6
	Coordinate shipment plans with logistics providers		C7
Return	Process customer returns	Warehouse	C8
	Return raw materials to suppliers		C9

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Table 2 Correlation Scale

Scale	Remark
9	Strong relationship. The risk agent plays a significant role in causing the risk event
3	Moderate relationship, indicating a limited causal contribution
1	menunjukkan risk agent memiliki pengaruh yang kecil dalam Weak relationship, indicating minimal influence of the risk agent on the risk event.

seventeen in Logistics, and five in Warehouse operations.

Subsequently, the identified risks were evaluated through House of Risk (HOR) Phase 1 using the Aggregate Risk Potential (ARP) approach. The analysis resulted in the prioritization of twelve critical risk agents, namely A6, A25, A13, A12, A14, A28, A4, A23, A37, A15, A16, and A18. Among these, A6 (Human Error) emerged as the most significant risk agent, with an ARP value of 666 and a cumulative ARP contribution of 8.21%. Conversely, A18 (Delayed Arrival of Raw Materials) represented the lowest-ranked priority risk agent, recording an ARP value of 252 and a cumulative ARP contribution of 3.11%.

The development of the proposed risk management framework was subsequently undertaken through HOR Phase 2, which generated sixteen preventive actions designed to mitigate the identified priority risks. However, following a series of expert discussions and management evaluations conducted with the Supply Chain Head, only ten preventive actions were considered sufficiently feasible and strategically relevant for immediate implementation. Among the selected mitigation initiatives, PA4, which involves maintaining intensive coordination and communication with shipping lines regarding vessel schedules, special cargo handling requirements, vessel space allocation, and container availability, achieved the highest Effectiveness-to-Difficulty (ETD) score of 12,852. This result indicates that the action offers the greatest mitigation impact relative to the effort required for implementation. In

Table 3 Identification and Selection of Priority Risk Agents

Rank	Risk Code	Risk Agent	ARP	ARP Kumulatif
1	A6	Human Error	666	8,21%
2	A25	Vessel Schedule Changes	648	7,99%
3	A13	Cargo Defects	624	7,69%
4	A12	Reduced Employee Productivity Due to Work-from-Home Arrangements	594	7,32%
5	A14	Production Failure	432	5,33%
6	A28	Roll-Over / Shut-Out Vessel	396	4,88%
7	A4	Delayed Cargo Payment by Customers	360	4,44%
8	A23	Limited Vessel Allocation	324	4,00%
9	A37	Limited Container Stock at Depots	324	4,00%
10	A15	Unexpected Paper Machine Breakdown	288	3,55%
11	A16	Production Time Exceeding Forecast	288	3,55%
12	A18	Delayed Arrival of Raw Materials	252	3,11%

contrast, PA3, which focuses on enhancing employee competencies and professional capabilities to improve operational effectiveness and efficiency, recorded the lowest ETD score of 945 among the selected preventive actions.

The findings of this study are consistent with previous research by Sumarna and Nabil, (2020), Andriyanto and Mustamin, (2020), both of which highlighted the effectiveness of the House of Risk methodology in identifying risk events, determining risk agents, and developing mitigation strategies for logistics and transportation operations. Furthermore, the results support the studies conducted by Maharani, (2018), Siregar and Suparno, (2021), and Wisesa, (2023), Sahulata and Gumabo, (2023), Aliyasyah et al., (2023) dan Thuy et al., (2023) which emphasized the importance of proactive risk mitigation planning through the application of the House of Risk framework.

The present study also contributes to the broader body of knowledge on Supply Chain Risk Management (SCRM) by reinforcing previous findings regarding the strategic role of risk identification and mitigation in enhancing supply chain resilience (Hohenstein, 2022; Staniuk et al., 2022). From an Enterprise Risk Management (ERM) perspective, the results further validate the applicability of ISO 31000:2018 as a comprehensive risk management standard for operational environments, supporting conclusions drawn by previous researchers, including de Oliveira et al., 2017; Dumara, 2017; Evinia & Sitokdana, 2023; Sari & Harindahyani, 2019.

In addition, the integration of ISO 31000:2018 and the Supply Chain Operations Reference (SCOR) model within the proposed framework is consistent with prior studies that have demonstrated the effectiveness of combining risk management standards and process-based supply chain models to improve organizational risk governance and operational performance (Rachmadhani et al., 2023). The application of the SCOR framework in this study also aligns with previous research in supply chain management conducted by Delipinar & Kocaoglu, 2016; Khadijah et al., 2021; Pertiwi et al., 2023; Ricardianto et al., 2022; Subagyo et al., 2022; Zhou et al., 2011.

Similarly, the utilization of Pareto Analysis as a prioritization tool supports earlier studies emphasizing its effectiveness in concentrating organizational resources on the most critical sources of risk (Jum'a & Basheer, 2023; Karmaker et al., 2023; Rajesh, 2023). Moreover, the combined application of Aggregate Risk Potential (ARP), House of Risk (HOR), and the SCOR model corroborates the findings of Marlina & Hadiguna, 2023 as well as Pertiwi et al., 2023, who demonstrated the value of integrating multiple analytical tools to develop comprehensive supply chain risk management solutions.

This study primarily focuses on developing a practical and systematic risk management framework for XYZ company, with particular emphasis on export shipment operations, where operational risks are most visible and have the greatest potential impact on business performance. Through the implementation of an Enterprise Risk Management framework based on ISO 31000:2018, the organization is expected to strengthen its capability to identify, assess, mitigate, and monitor operational risks that may adversely affect export shipment performance.To ensure the effectiveness and sustainability of risk management implementation, continuous monitoring and control activities should be carried out by the respective functional managers and section heads. Regular evaluation of mitigation initiatives will enable management to assess the effectiveness of existing controls and

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Table 4 Preventive Action priority

Rank	PA Code	Preventive Action
1	PA4	Maintain intensive communication with shipping lines regarding vessel schedules, special cargo handling requirements, vessel space allocation, and container availability.
2	PA1	Implement and enforce Standard Operating Procedures (SOPs) throughout operational processes
3	PA5	Identify and develop alternative vendors and service providers
4	PA10	Inform customers at an early stage regarding potential cargo shortages
5	PA11	Conduct regular supplier performance evaluations
6	PA12	Follow up sales order forecasts well in advance of production cycles
7	PA2	Apply disciplinary measures for non-compliance with SOPs
8	PA7	Coordinate flexible container-type substitutions with relevant stakeholders
9	PA14	Verify the availability of all production resources and components before each production cycle.
10	PA3	Enhance employee competencies and professional skills to improve operational

continuously improve organizational resilience against operational disruptions, particularly those associated with export shipment delays.

Furthermore, XYZ company may consider establishing a dedicated Risk Management Unit within its formal organizational structure to provide centralized oversight, strengthen governance practices, and ensure consistent implementation of risk management policies across business functions. Finally, the preventive actions that were not selected for immediate implementation may serve as valuable references for future studies and continuous improvement initiatives aimed at optimizing the management of operational risks related to export shipment delays.

D. Conclusion

The findings of this study indicate that a total of 30 risk events and 43 risk agents were successfully identified within the export shipment process. These findings suggest that several operational risks remain insufficiently managed and require a more structured risk management approach. Effective risk treatment requires the prioritization of risk agents to determine which risk sources pose the greatest threat to organizational performance and therefore demand immediate attention. Based on the Pareto analysis, nine priority risk agents were identified as key contributors to potential organizational losses and should therefore be mitigated as a priority. However, following brainstorming sessions with the Supply Chain Head of XYZ company, it was concluded that the twelve highest-ranked risk agents require immediate and focused treatment due to their potential impact on the organization's ability to achieve its strategic and operational objectives. Consequently, a comprehensive risk management framework was developed based on the Aggregate Risk Potential (ARP) values calculated for these priority risk agents.

The study further revealed that, from the

twelve selected priority risk agents, a total of 16 preventive actions were identified through the House of Risk (HOR) Phase 2 analysis. Nevertheless, due to limitations related to implementation time, financial resources, and management considerations, only 10 preventive actions were deemed feasible for immediate execution within the organization. These selected preventive actions subsequently formed the basis for the proposed risk control and risk management framework. The results also demonstrate that risk control should be supported through continuous monitoring and oversight activities conducted by the heads of each operational function. Such monitoring is essential to ensure the effective implementation of mitigation measures and to optimize the organization's risk management performance in addressing export shipment delays, particularly during periods of significant operational disruption such as the COVID-19 pandemic. The implementation of risk management activities should therefore be aligned with the selected preventive actions and integrated into the proposed risk management framework.

Furthermore, the findings provide valuable managerial insights for XYZ company in strengthening its operational risk management practices related to export shipment delays. Operational risks that are not managed effectively may result in substantial financial losses, operational inefficiencies, and reduced business performance. Accordingly, the proposed risk management and risk control framework is expected to facilitate more effective and efficient allocation of organizational resources based on the company's risk profile while enhancing overall business performance and operational resilience. In conclusion, the integration of Enterprise Risk Management (ERM) based on ISO 31000:2018, the House of Risk (HOR) methodology, the Aggregate Risk Potential (ARP) approach, and the SCOR model provides a comprehensive framework for identifying, prioritizing, mitigating, and controlling operational risks associated with export shipment delays. The proposed framework offers a practical guideline for strengthening supply chain resilience, improving operational reliability, and supporting sustainable business performance in export-oriented organizations.

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