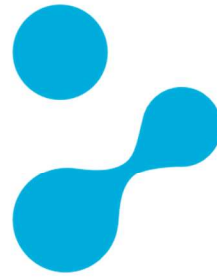


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## **Logistics cost risk management**

Managing freight costs and supply chain disruptions in a technology industry company

DEGREE PROGRAMME IN LOGISTICS  
2025

## ABSTRACT

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Managing freight costs and supply chain disruptions in a technology industry company  
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The aim of this thesis is to develop and improve logistics cost risk management in the management of freight costs and supply chain disruptions. The work focuses on how logistics costs can be managed and predicted in a changing operating environment.

The research focuses on the target organization's project logistics team, which is responsible for managing international freight transport and supply chain disruptions. The aim is to create practical measures that help the organization improve its logistics operations, manage costs and prepare for potential disruptions.

The thesis has been carried out as a qualitative study using participatory observation as a data collection method. The observation has been carried out as part of the team's daily activities in Espoo between November 2024 and April 2025.

In addition to developing operations, the work emphasizes observation and the importance of risk management as part of logistics cost management. The work also reviews proactive measures and various risk assessment models and the utilization of the present in supply chains.

Logistics cost risk management has been widely studied, particularly in the context of supply chain management and project logistics. Key areas of study include risk identification, assessment, and prevention-based strategies.

The thesis examines in more detail two risk management tools, failure mode and effects analysis (FMEA) and supply chain risk management (SCRM). These tools are used to conduct empirical research on the thesis.

**Keywords:** Logistics costs, risk management, freight costs, supply chain disruptions

## PREFACE

I would like to thank the host organization for the opportunity to carry out this thesis in a practical and expert environment. I would also like to express my warmest thanks to my family and friends for their continuous support and encouragement during my studies.

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# 1 INTRODUCTION

## 1.1 Topic selection and research problem

The aim of this thesis is to develop and improve risk management of logistics costs, especially in terms of freight costs and supply chain disruption management. The work focuses on investigating how logistics costs can be managed and predicted in a changing operating environment.

The research is focused on the project logistics team of the target organization, which is responsible for international freight and supply chain disruption management. The aim is to create practical measures that help the organization develop its logistics operations, control costs and prepare for potential disruptions.

The thesis is carried out as qualitative research using participatory observation as a data collection method. The observation has been carried out as part of the team's daily activities in Espoo, Finland, between November 2024 and April 2025. The work is carried out in collaboration with the target organization, which is a pioneer in sustainable development technologies and comprehensive solutions in rock crushing, mineral processing and metal refining. The target organization operates in several different markets and improves the efficiency of its customers energy and water use and reduces environmental risks.

The purpose of the thesis is to investigate how the target organization's logistics costs can be managed and predicted effectively, especially considering freight cost fluctuations and supply chain disruptions. The work focuses on the company's project logistics team, which consists of approximately ten members, and is responsible for managing international freight and supply chain disruptions. The aim of the work is to create practical tools that help

organizations improve their logistics operations and prepare for potential disruptions, which can improve financial performance and customer satisfaction. Research question is: How can logistics costs, freight costs and supply chain disruptions be managed and anticipated in a changing operating environment in a technology project logistics team?

## 1.2 The need and purpose of the thesis

The aim of this thesis is to develop practical ways to manage risks related to logistics costs. The goal is to improve the organization's ability to anticipate and manage freight cost fluctuations and supply chain disruptions. This supports both the organization's financial performance and customer satisfaction.

The work is based on practical observations of the team's daily activities. The observations are used to map how logistics cost risk management is currently implemented in practice. The result of the thesis is an operating model that supports risk management and helps optimize logistics costs by identifying areas requiring development.

The purpose of the thesis is to provide the target organization with concrete tools and development proposals for identifying, assessing and managing logistics related risks. The goal is to clarify logistics processes and strengthen proactive risk management in project logistics.

## 1.3 Thesis scope and limited areas

This thesis focuses on the management of risks related to logistics costs, especially freight costs and supply chain disruptions, which are key factors in the target organization's project logistics. The scope of the work is to only address logistics related risks. Business risks such as financial, market or personnel risks, are not examined.

The work emphasizes qualitative analysis and a practical perspective on identifying and managing risks. Quantitative modeling or detailed risk calculation methods are not included. The main focus is on how risks are managed in practice and how they could be better anticipated and managed by developing operational processes.

The research is limited to the organization's project logistics team and does not cover the broader logistics network. The scope includes only the activities related to international freight operations and the management of supply chain disruptions.

#### 1.4 Research method and approach

This thesis is carried out as a qualitative study, using observation as the data collection method. The observation focuses on the daily activities of a project logistics team in order to gain a practical understanding of the risks related to logistics costs and their current management.

This work uses participatory observation, which is carried out as part of the target organization's project logistics team in addition to work duties. The observation was carried out in Espoo between November 2024 and April 2025. Daily participation in logistics operations as a team member has enabled continuous and practical observation in a real operating environment.

To document the observations, notes have been taken on various situations, practices and possible areas for development for both the author and colleagues. The observations have been supplemented with material collected from email communications, Excel files and discussions.

After projects are completed, a lessons learned discussion is organized with the team, in which the challenges, successes and development suggestions for future projects are reviewed. This discussion provides valuable additional information for the thesis and complements the understanding of risk

management practices created through the observation. The research follows a case study approach, analyzing specific practices, processes, and responses within an organization. The results are examined using theoretical frameworks such as failure mode and effects analysis (FMEA) and supply chain risk management (SCRM).

The goal is to identify recurring challenges and risk factors in current processes and to produce practical recommendations that support risk management and improve the organization's ability to respond to changes in freight costs and supply chain disruptions.

### 1.5 Related studies and background literature

Logistics cost risk management has been widely studied, particularly in the context of supply chain management and project logistics. Key areas of study include risk identification, assessment, and prevention based strategies. Research shows that managing freight cost variability and supply chain disruptions can significantly improve a company's financial performance and customer satisfaction.

Based on the literature, risk management in the logistics and transportation sector is central to protecting global supply chains and ensuring the smooth flow of goods across continents. The logistics sector enables over US dollars 4.3 trillion worth of trade and contributes significantly to global GDP, but it is also vulnerable to a variety of risks, including natural disasters, cyber threats, geopolitical tensions, and market changes. Therefore, strengthening the resilience of supply chains and developing risk management practices are crucial to maintaining global economic stability. (McKinnon, 2024)

Logistics risk management consists of a broad set of measures aimed at identifying, assessing and mitigating potential disruptions. Effective strategies emphasize not only reaction to events but also anticipation and preventive preparedness. (McKinnon, 2024)

This thesis utilizes background literature and previous research results to develop practical recommendations to strengthen the risk management processes of the target organization. Proactive measures, structured risk analyses and continuous preparedness aim to improve business continuity, optimize logistics costs and manage the organization's operations in case of unexpected disruptions.

## 1.6 Framework and risk management models

The theoretical framework of the thesis is based on key models of logistics cost and supply chain risk management, which provide tools for identifying, assessing and managing risks in the context of the technology industry. In this study, two key risk management models are examined: FMEA (Failure mode and effect analysis) and SCRM (Supply chain risk management). These models are used to interpret and analyze observations collected from the daily activities of the target organization's project logistics team. The models guide the analysis by helping to identify where risks occur, how they manifest in practice, and how the organization is currently responding to them. The aim is to apply theory to practice through qualitative observation, and the work does not include quantitative risk modeling or interviews.

## 2 LOGISTICS COSTS AND RISK MANAGEMENT

### 2.1 Logistics cost structure and challenges

Logistics costs consist of several different components, such as transportation, storage, handling, packaging and administration costs. These are considered part of a larger whole that covers all the financial costs related to a company's logistics operations, including warehouse maintenance, insurance and customer service. In the technology sector, logistics costs are particularly affected by international supply chains, variable delivery times and high market instability. Transportation costs alone can account for up to half of a company's total logistics costs, due to operational requirements and terminal maintenance costs. (IOSCM, 2021)

The challenge is to effectively manage these costs in situations where freight rates fluctuate or external disruptions affect the supply chain. A poorly managed logistics system can lead to rapidly escalating costs, which is why effective planning and proactive cost management are crucial. Managing freight and logistics costs requires a risk aware approach and thoughtful decisions throughout the delivery process. (IOSCM, 2021)

### 2.2 Basic principles of risk management in logistics

Logistics risk management is a key part of supply chain management, and its goal is to anticipate and minimize the impact of disruptions and costs on a company's operations. Risk management is a systematic process that consists of several stages: identifying risks, analyzing them, planning and implementing measures, and continuous monitoring. Risks can be related to, for example, fluctuations in freight costs, delivery delays, weather conditions, geopolitical tensions, or supplier performance. (Logistiikanmaailma, 2024)

Based on the analysis, the company can choose appropriate management measures. These can include eliminating risks, minimizing their impact, transferring risks through insurance, for example, or accepting and retaining risks as part of the operations. Continuous monitoring of risk management is an essential part of the process, as the operating environment can change rapidly and require rapid response. Risk analysis is particularly important when there are changes in the company's operations or when the operating environment is uncertain. (Logistiikanmaailma, 2024)



Figure 1. Risk management model (Logistiikanmaailma, 2024)

### 2.3 Analyzing logistics cost risks in an unstable environment

Identifying and assessing risks related to logistics costs begins with a thorough analysis of the supply chain structure. In a global and changing operating environment, risk sources are increasingly interconnected and can be caused by both internal and external factors. Key risks include transportation delays, changes in freight costs, changes in legislation or regulations, and uncertainties related to suppliers. The year 2024 has shown how geopolitical events, inflationary pressures and trade policy uncertainty can significantly impact logistics cost structures. For example, the threat of a US East Coast port strike,

although temporarily suspended, remains a potential disruption until a final agreement is reached. At the same time, changes in US leadership and upcoming tariff policy have led to a short term increase in import volumes as companies try to bring forward deliveries to avoid future cost increases. This phenomenon has led to rising freight rates and increased warehousing and transportation costs, which directly affect companies logistics costs. (Kavas, 2024)

In addition, inflation, partly caused by potential new tariffs, could raise the cost of imported goods, which in turn affects consumer prices and demand. Recent industry analyzes suggest that higher tariffs could cost U.S. consumers an additional \$46 billion to \$78 billion annually, particularly in sectors such as apparel, furniture, and toys. Such downstream effects ultimately reduce demand for logistics services and challenge the predictability of trade. (Kavas, 2024)

## 3 RISK MANAGEMENT METHODS

### 3.1 Proactive measures and risk assessment models

Proactive measures are an essential part of logistics cost risk management. They aim to identify and address risks before they have a chance to impact a company's operations or cause financial losses. In the technology sector, where supply chains are complex and sensitive to disruptions, a proactive approach is particularly important. (Logistiikanmaailma, 2024)

FMEA is a model that identifies potential failures in the supply chain and assesses their impact, such as transportation disruptions or increased freight costs. It helps prioritize risks based on severity and probability and develop preventive measures. The model is particularly useful in logistics cost management, as it allows for a detailed examination of risks and practical measures to reduce costs. FMEA provides a structured approach to identifying root causes of failure, assessing their severity and likelihood, and developing effective prevention strategies. (University of Cambridge's Institute , 2025)

SCRM is a comprehensive model that looks at risks across different parts of the supply chain, such as subcontractor risk and supply chain disruptions. It helps identify and develop strategies to improve supply chain flexibility and resilience. The model is particularly useful in managing unforeseen changes that can impact logistics costs and supply chain smoothness. (Jonker & McGrath, 2023)

One of the key advantages of supply chain risk management (SCRM) is enhanced resilience. By proactively identifying risks and planning responses, companies can maintain operational continuity and better serve their customers, even amid disruptions. Additionally, effective SCRM practices can help reduce costs by minimizing inefficiencies in inventory and logistics processes. (Jonker & McGrath, 2023)

### 3.2 Risk management strategies in general

Risk management strategies are operational models and decision-making models that aim to manage risks identified in logistics processes. The purpose of the strategies is to protect the company's operations and reduce the likelihood of risk related events occurring or significant cost impacts. In the technology sector, where delivery reliability and cost effectiveness are key competitive factors, the design and implementation of risk management strategies are critical success factors.

### 3.3 Case example of best practices in risk management

Effective risk management requires its integration into the company's strategic planning and decision making. A good example of best practice is the strategic risk management model used by the LEGO Group, described in *Enterprise Risk Management: Case Studies and Best Practices* (Fraser, Simkins, & Narvaez, 2015). LEGO adopted the model in 2006 as part of the organization's strategic risk management development effort. The company utilized a four-step approach that integrated risk management into business strategy execution and long term planning.

The LEGO Group's strategic risk management model is based on a four phase approach, where risk management is integrated into the strategic planning and decision making of the business. The first phase utilized traditional enterprise risk management (ERM), which focused on managing financial, operational and hazard risks. Later, a systematic approach to strategic risks was also added. (Fraser, Simkins, & Narvaez, 2015)

The second phase introduced Monte Carlo simulations to understand fluctuations in financial performance and the factors behind these fluctuations. The simulations were integrated into the budgeting and reporting processes, enabling better forecasting and decision-making support. (Fraser, Simkins, & Narvaez, 2015)

The third phase developed active risk and opportunity planning (AROP), where each new business project goes through a systematic assessment process before a final decision is made. This process includes identifying risks and opportunities together with different stakeholders, assessing impacts using consistent scales, and clearly defining responsibilities and actions. (Fraser, Simkins, & Narvaez, 2015)

The fourth phase focused on preparing for uncertainty. This includes assessing the flexibility and sustainability of strategic plans through scenario analyses, which allow the organization to test the effectiveness of its strategies in different possible future situations. (Fraser, Simkins, & Narvaez, 2015)

The LEGO Group's risk management model is an excellent example of how risk management can be a strategic tool and a source of added value. A similar approach can be applied to technology companies that face significant cost risks and disruptions in logistics and supply chains. (Fraser, Simkins, & Narvaez, 2015)

The LEGO Group's risk management model also emphasizes stakeholder engagement, both internally and externally. Risk management is not seen as simply avoiding risks, but rather as enabling bolder and more informed business decisions, faster and more controlled than competitors. As in the book (Fraser, Simkins, & Narvaez, 2015) emphasize, effective risk management enables organizational growth and value creation, just as racing cars need the best brakes and steering to go faster, not slower. (Fraser, Simkins, & Narvaez, 2015)

## 4 PRACTICAL MEASURES TO MANAGE LOGISTICS COST RISKS

### 4.1 Risk management process and practical implementation

In the risk management process, it is important to consider the transport of particularly risky products. For example, glass, measuring instruments, frozen food, fruit, precious metals and valuables require careful transport, considering temperature requirements, among other things. This highlights the need for careful risk analysis already in connection with tender documents and contract negotiations, so that logistics cost risks can be managed effectively. (Logistiikanmaailma, 2024)

### 4.2 Measures and tools for forecasting logistics costs

The transport of particularly risky products, such as hazardous materials and perishable goods, requires special measures to ensure product quality and safety throughout the supply chain. Such transports can cause additional costs if not managed properly. Continuous temperature monitoring is essential for the transport of refrigerated products and other risky products. Temperature monitoring systems, such as data loggers, can record and monitor the temperature throughout the transport, allowing for rapid response to potential disruptions. In addition, GPS tracking optimizes transport routes and enables response if the transport deviates from the planned route. (Logistiikanmaailma, 2024).

Forecasting is based on real time data collection and analysis. IoT devices can collect information such as temperature, humidity and air pressure, which affect product quality. Advanced alarm systems are activated when transport conditions deviate from defined limits and notify the transport organization. This enables rapid response, such as changing the route or cancelling the transport. (Logistiikanmaailma, 2024)

Predictive cost models consider not only transportation costs, but also specific risks. This helps to prepare for cost changes and improve budgeting. In addition, risk management considers employee risks, such as key employee absences, and product traceability. (Logistiikanmaailma, 2024)

#### 4.3 Supply chain disruption management and preparation

Supply chain disruption management includes consideration of personnel risks as mentioned above, such as the potential illness or absence of key employees. Many companies do not have backup arrangements, which can make managing supply chain disruptions more difficult. In addition, product traceability and potential recalls are key factors in minimizing disruptions and managing logistics costs. (Logistiikanmaailma, 2024)

It is important for an organization to plan and document backup arrangements, especially for critical roles such as logistics managers, warehouse workers, and transportation coordinators. This preparedness reduces the likelihood of risks materializing and helps keep the supply chain running as smoothly as possible in the event of disruption. (Logistiikanmaailma, 2024)

#### 4.4 Contract strategies and negotiations in risk management

Contract strategies and negotiations are key components of risk management, as they help prevent and manage supply chain disruptions and logistics-related risks. Well drafted contracts not only define the rights and obligations of the parties, but also act as a safety net that protects the company from potential risks, such as delivery delays, price increases, or other unforeseen problems in the supply chain.

Contracts play a key role in supply chain risk management, especially when it comes to addressing the responsibilities and obligations between suppliers and logistics providers. The obligation to perform the contract is one of the fundamental principles associated with agency contracts and is different from

the obligation to perform other obligations. The supplier or logistics service provider is responsible for complying with the terms of the contract and performing its duties with care, unless otherwise agreed. (Glass, 2012)

In logistics in particular, the obligation of suppliers and transport companies to follow their customers instructions and to carry out the task as agreed. For example, if the goods deviate from specifications, such as in terms of weight or description, the transport company has an obligation to deliver the goods without defects and to ensure their correct quantity and quality. However, if the deviation can be attributed to reasons other than an error in its own operations, such as storage errors, the transport company is not liable for negligence unless other circumstances arise. (Glass, 2012)

Risk management is essential in negotiations, and it can be achieved when the parties go through all possible risks and their impacts. Key negotiation points include, for example, risk sharing and allocation, flexibility in contract terms, and plans for disruptions. (Glass, 2012)

Contract strategies and negotiations are a key part of risk management in logistics. Contracts create a safety net that protects supply chain actors from potential disruptions, price fluctuations and other risks. It is important to consider risk sharing, flexibility and contingency planning in negotiations so that contracts can function effectively even in unexpected situations. (Glass, 2012)

## 5 EMPIRICAL RESEARCH: OBSERVATIONS AND ANALYSIS

### 5.1 Observations of logistics risk factors

The empirical part of this thesis is based on qualitative observation within the project logistics team of the target organization. The aim was to identify real-world logistics cost risks and disruptions that affect daily operations and require active decision-making. Observations were conducted over a defined period and focused on international freight, transport coordination, and supply chain disturbances. Several recurring and exceptional risk factors were identified during the observation period. These included delays in sea freight, customs clearance issues, sudden freight rate changes, and supplier side delays. Each case provides insight into different dimensions of logistics risk from financial impact to customer satisfaction and operational continuity. To evaluate and understand these risks more systematically, two established models were applied FMEA and SCRM.

The following subchapters present three individual observation cases, each analyzed through the lenses of FMEA and SCRM frameworks. The goal is to draw lessons and identify improvement areas that support more resilient and cost effective logistics operations within the organization.

### 5.2 Case analyses of logistics risks

#### 5.2.1 Case 1: Vessel delay and rerouting to truck transport

Observation period: March 2025, Espoo, Finland

The following case is based on practical observation conducted in March 2025 in Espoo, Finland, during a real time logistics process.

The original freight plan was based on sea transport, with the ship scheduled to arrive in Helsinki on 17 March. Shortly after this, a new announcement was

received, according to which the estimated arrival time was first moved to 25 March and later postponed again. The shipping company announced that the next departure from Antwerp would not take place until 2 April, with an estimated arrival in Helsinki on 6 April. At this point, the sea route was no longer a realistic option for implementing the urgent delivery.

The situation created pressure, as the customer was no longer satisfied and expected the delivery as soon as possible. As an alternative, the possibility of unloading the containers in Antwerp and transporting them by truck to Finland was investigated. Although this option was more expensive, it was justified in terms of the overall schedule and customer satisfaction.

The containers were ultimately released for unloading, and the first trucks departed the following day. All shipments arrived in Finland by the end of week 14. In retrospect, it became clear that the ship would have been delayed even further, and the decision to switch to road transport proved to be the right one.

Table 1. FMEA Analysis, Case 1

Process step	Potential failure mode	Potential cause	Potential effect	S	O	D	RPN	Recommended action
International freight planning	Continuous delay in ship arrival	Shipping company reschedules, port congestion, limited departures	Delivery delays, customer dissatisfaction, increased transport costs	9	6	3	162	Implement real-time tracking systems, establish backup transport plans (e.g., truck from interim ports), create decision models for urgent rerouting
Delivery fulfillment	Inflexibility in transport plan	Over-reliance on sea freight schedule, no dynamic risk response model	Missed deadlines, reputational damage, internal operational pressure	8	5	4	160	Include flexibility clauses in freight planning, regular risk assessments of freight partners and ports, simulate alternative delivery routes
Customer communication	Lack of proactive communication	Delayed reaction to schedule change, unclear ETA updates	Increased customer pressure, uncertainty, dissatisfaction	7	4	4	112	Establish communication protocol for freight delays, proactive ETA updates, include customer in escalation scenarios

RPN > 100 → Further monitoring and analysis required  
RPN > 150 → Risk management measures recommended  
RPN > 200 → Immediate action required

S = Severity  
Scale of 1-10 → 10 = very severe impact  
O = Occurrence  
Scale of 1-10 → 10 = occurs often  
D = Detection  
Scale of 1-10 → 10 = very difficult to detect in

Based on the FMEA analysis, the risks were particularly related to the inflexibility of the original transport plan and delays, which caused customer dissatisfaction and potential breach of contract. The FMEA identified the most critical

steps as insufficient preparation for ocean freight delays, an incomplete contingency plan for alternative modes of transport, and delays in risk communication to the customer.

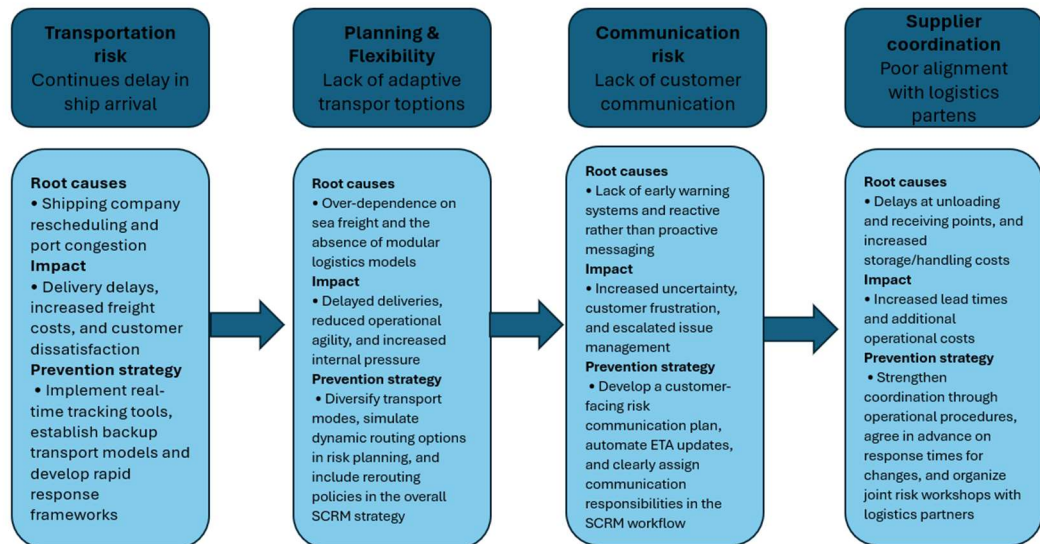


Figure 2. SCRM Analysis, Case 1

The SCRM analysis examined the root causes of the situation and provided recommendations for the future. It was identified that the risks were due to the high dependence on maritime transport and the delays in responding to the changing situation. Key preventive measures included diversifying transport modes and preparing contingency plans for risk scenarios, building proactive communication processes with customers, and developing an early warning system to respond to logistical changes.

### 5.2.2 Case 2: Customs clearance delay

Observation period: 6. November 2024, Espoo, Finland

A sample for research purposes was arriving from South Africa. The sample shipment was sent via DHL Express, and we were responsible for handling import customs clearance. Target organization has several authorized forwarders, as shipments arrive from all over the world. In this case, the forwarder used is familiar and the cooperation has worked flawlessly.

The forwarder notified of the arrival of the shipment and requested forwarding instructions and any documents that may affect customs clearance. The notification emphasized that Finnish customs require a sufficiently accurate description of the goods and a clearly stated trade name. This information is essential for successful customs clearance.

After receiving the notification, information emerged that there was missing the required HS code (harmonized system code) for the goods in the shipment. Since this code is mandatory for customs clearance, The information had to be obtained from a designated person. However, it took several days to obtain the information, which delayed the customs clearance process.

The shipment had a free storage period of three calendar days from arrival, after which storage fees would be charged. Since it took three days to obtain the HS code, customs clearance was delayed, and company incurred one day storage costs.

Table 2. FMEA Analysis, Case 2

Process step	Potential failure mode	Potential cause	Potential effect	S	O	D	RPN	Recommended action
Receive arrival notification	Notification not processed promptly	Notification overlooked or not prioritized	Delay in starting customs clearance	6	3	3	54	Implement a procedure to prioritize and promptly process arrival notifications
Check shipment details	Missing HS code for goods	Lack of available HS code information internally	Delay in customs clearance, risk of storage charges	7	5	4	140	Maintain an internal database of HS codes for common goods and pre-verify codes before shipment
Request additional information	Slow internal response for required documents (HS code)	No assigned responsible person or unclear process	Prolonged customs process, storage fees incurred	6	4	5	120	Assign a responsible person/team for customs documentation requests with defined response times
Submit customs clearance instructions	Incomplete or incorrect instructions submitted	Missing details due to time pressure or incomplete information	Customs clearance delay or rejection	6	3	4	72	Develop a checklist for required customs documents and information before submission
Manage free storage time	Free storage time exceeded	Customs clearance delay due to missing documents	Additional storage costs	5	5	2	50	Set up an alert system to monitor storage time limits and escalate pending actions early

RPN > 100 → Further monitoring and analysis required

RPN > 150 → Risk management measures

RPN > 200 → Immediate action required

S = Severity  
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According to the FMEA analysis, the risks in the customs clearance process were particularly related to the fact that critical product information (HS code) was not available in a timely manner. As a result, customs clearance was delayed, which led to additional costs and disruptions in the logistics chain. The FMEA identified the most critical steps as the lack of necessary information at the time of ordering, delays in internal information acquisition, and exceeding the free storage period.

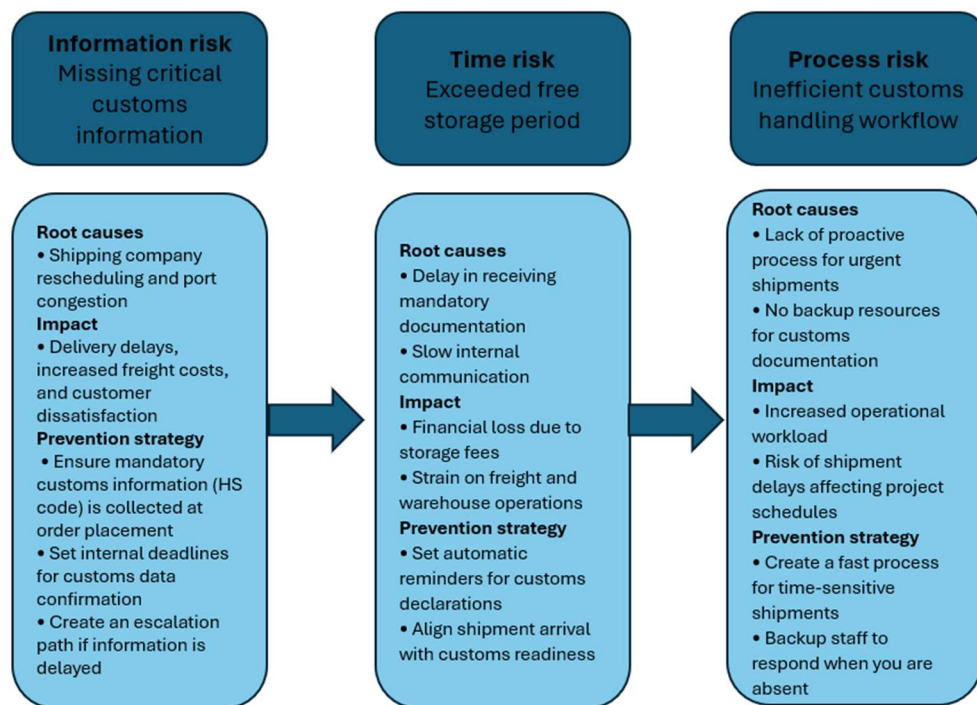


Figure 3. SCRM Analysis, Case 2

The SCRM analysis examined the root causes and preventive measures of the event more broadly. It has been identified that the risks were due to poor information management, poor monitoring of schedules, and deficiencies in internal and external communication. Key recommended preventive measures were ensuring the information required for customs clearance already at the ordering stage, designating internal deadlines and responsible persons for the customs clearance process, and implementing proactive reminders and monitoring tools.

### 5.2.3 Case 3: Supplier delay

Observation period: 17. April 2025- 25.4.2025, Espoo, Finland

This case describes a situation observed in April 2025 involving a delivery delay caused by the supplier's production issues and poor communication.

The original plan was for three trucks to be loaded at the supplier's location in Turkey on Friday, March 18th and then transported to the customer in Finland. The trucks had been booked in advance and loading bays had been secured. However, when the trucks arrived at the site, the supplier was only able to load two of them due to production delays caused by the third shipment.

The supplier's communication regarding production and delivery schedules was generally poor, which added to the uncertainty of the operation. A member of our project team has had to travel to Turkey several times to personally monitor the supplier's operations and ensure progress.

The cancellation of the third truck caused direct costs and delivery delays. The transport company stated that cancelling the third truck after it had already arrived at the loading bay would result in a cancellation fee. In addition, two of the loaded trucks experienced further delays at customs and were only able to continue their journey the following Monday. The project team agreed with the transporter to invoice the cancellation and waiting time charges separately to maintain transparency in cost allocation.

Furthermore, it became clear that real time reporting of estimated time of arrival (ETA) was essential. There was a situation where the project team had to inform the customer late at night that one of the deliveries would be unloaded the following morning, which almost led to a postponement to the next business day. Although the transport company performed exceptionally well in terms of delivery speed, the lack of proactive supply chain information from the supplier side created significant risks.

Table 3. FMEA Analysis, Case 3

Process step	Potential failure mode	Potential cause	Potential effect	S	O	D	RPN	Recommended action
Supplier Production	Production delay causing incomplete shipment (third truck not loaded)	Supplier's production delays, poor forecasting	Delay in shipment, customer dissatisfaction, cancellation costs	8	7	4	224	Improve supplier production scheduling and forecasting. Monitor progress closely.
Supplier communication	Poor communication from the supplier regarding delays	Lack of communication, no proactive updates	Increased uncertainty, project team member travel, customer frustration	9	5	5	225	Establish clear communication protocols and real-time updates from the supplier.
Transport scheduling	Cancellation of the third truck after arrival	Late notification of delay, poor planning	Cancellation fee, increased logistical costs	7	6	6	252	Negotiate clear cancellation terms with suppliers and transporters.
Customs preparations	Customs delays for two loaded trucks	Documentation issues, poor preparation	Delayed delivery to customer, potential project delays	8	6	5	240	Ensure better customs preparation, verify documentation in advance.
Customer communication	Late communication of ETA to customer	Lack of real-time reporting from supplier	Customer disappointment, potential scheduling issues	9	5	4	180	Implement real-time ETA reporting system, ensure timely notifications to the customer

RPN > 100 → Further monitoring and analysis required

RPN > 150 → Risk management measures recommended

RPN > 200 → Immediate action required

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D = Detection  
Scale of 1-10 → 10 = very difficult to detect in advance

In summary, the FMEA analysis revealed several risk points in the supply chain, resulting from challenges in production, communication, transportation, and customs preparation. To mitigate these risks, improvements in proactive communication, production and transportation predictability, and document management are recommended. Such measures will improve supply chain predictability, cost efficiency, and customer satisfaction.

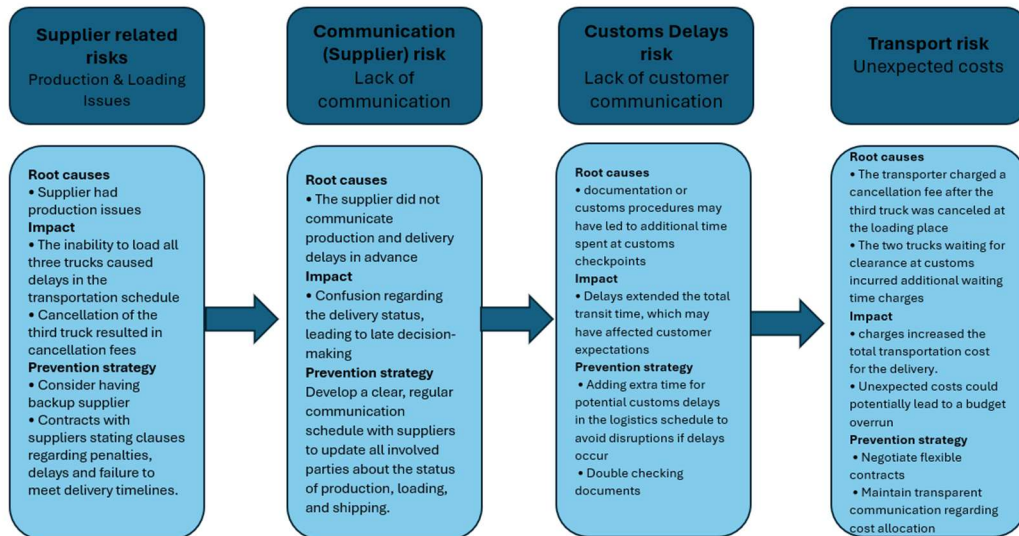


Figure 4. SCRM Analysis, Case 3

The analysis of this case from an SCRM perspective shows that supply chain risks are mainly caused by supplier production and communication problems. By improving proactive communication, clear processes and real time monitoring, risks can be managed more effectively, and supply chain performance can be improved.

## 6 CONCLUSIONS AND REFLECTION

This thesis examined logistics cost risks using three practical observation cases. Each case was analyzed according to the FMEA and SCRM frameworks to identify risk factors, root causes and preventive measures. The aim of the work was to improve the risk management of the target organization's project logistics operations.

Based on the study, the most significant risks in logistics processes were related to deficiencies in internal communication and information management. The FMEA analysis showed that, for example, the absence or delay of HS codes required for customs clearance led to chain reactions of process delays, additional costs and disruptions in the entire logistics chain.

Another key observation was the inflexibility of transportation plans. In the event of unexpected changes, such as vessel delays, the lack of contingency plans led to reactive decision making, increased costs and even the risk of breaching customer contracts. The FMEA analysis highlighted that unpreparedness for delays significantly increased operational vulnerability.

The third most significant risk factor for supply chain disruptions was supplier production and communication issues. The SCRM framework showed that proactive risk management requires strong and systematic supplier communication, real time monitoring, and clear escalation processes for managing problem situations.

In all cases, improving proactive communication, increasing visibility and strengthening contingency planning emerged as critical development areas. There should be clear processes between both internal and external stakeholders to ensure that relevant information is transferred smoothly, and that decision making is enabled in rapidly changing circumstances. Empirical research also showed that while individual risk factors varied, their underlying root causes were largely systemic and related to process management

deficiencies. This highlights the need for continuous risk monitoring, staff training and the systematic integration of structured risk management tools (such as FMEA and SCRM) into daily operations. In summary, it can be said that the research question has been answered both by identifying risks and by presenting practical solutions for their management and anticipation.

### 6.1 Development proposals

The study suggests that an organization's logistics risk management can be improved through a number of concrete measures. First, it must ensure that all necessary documentation, such as customs information and transport documents, is available in a timely manner at the beginning of the supply chain to avoid delays and additional costs.

Second, each logistics project should have ready contingency plans for potential disruptions, such as vessel delays or supply chain bottlenecks. It is a good idea to evaluate alternative modes of transport in advance.

In addition, communication with suppliers and logistics partners should be improved by using more systematic approaches and monitoring production and deliveries. Risk assessment should continue throughout the logistics process so that monitoring key risk factors allows for early identification of problems and rapid initiation of corrective measures.

With these development measures, the organization can strengthen the resilience of its logistics processes, manage costs more effectively, and provide its customers with an even higher quality service.

## REFERENCES

- Fraser, J., Simkins, B., & Narvaez, K. (2015). Implementing enterprise risk management: Case studies and best practices. In Hoboken, & B. J. In Hoboken, & B. J. John R. S. Fraser (Ed.), *Implementing enterprise risk management: Case studies and best practices* (2 ed., pp. 93-106). New Jersey: Wiley.
- Glass, D. A. (2012). Freight forwarding and multimodal transport contracts (Latest edition.). In *Freight forwarding and multimodal transport contracts (Latest edition.)* (pp. 81-94). Oxfordshire, England: Routledge, c2012. Abingdon, Oxon: 2012. Retrieved from <https://doi.org/10.4324/9781315878140>
- IOSCM. (2021, November 8th). *Factors Driving Down The Financial Cost Of Logistics*. Retrieved April 12, 2025, from Institute of supply chain management: <https://www.ioscm.com/blog/factors-driving-down-the-financial-cost-of-logistics/>
- Jonker, A., & McGrath, A. (2023, December 2). *Supply chain risk management*. Retrieved 2025, from IBM: <https://www.ibm.com/think/topics/supply-chain-risk-management>
- Logistiikanmaailma. (2024, June 27). *Riskienhallinta*. Retrieved 2025, from Logistiikanmaailma: <https://www.logistiikanmaailma.fi/sopimukset/riskienhallinta/>
- Logistiikanmaailma. (16. June 2024). *Toimitusketjun riskienhallinta*. Retrieved 2025 from <https://www.logistiikanmaailma.fi/logistiikka/logistiikka-ja-toimitusketju/toimitusketjun-riskienhallinta/>
- McKinnon, I. (2024, August 26). *What Is Risk Management In Logistics And Transport?* Retrieved 2025, from CHAS: <https://www.chas.co.uk/blog/risk-management-logistics-transport/>
- University of Cambridges Institute. (2025). *FMEA (Failure Modes and Effects Analysis)*. Retrieved 2025, from University of Cambridge: <https://www.ifm.eng.cam.ac.uk/research/dmg/tools-and-techniques/fmea-failure-modes-and-effects-analysis/>
- Kavas, S. (2024, November 12). *More than shipping*. Retrieved 2025, from <https://www.morethanshipping.com/5-biggest-risks-in-international-logistics-and-supply-chain/>