RISK MANGEMENT IN PROJECT CARGO LOGISTICS

Project report submitted to the School of Maritime Management, Indian Maritime University in partial fulfilment for the requirements for the award of degree of

MASTER OF BUSINESS ADMINISTRATION

In

PORT AND SHIPPING MANAGEMENT

Submitted by

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Certificate

This is to certify that the project report titled " RISK MANGEMENT IN PROJECT CARGO LOGISTICS " is a Bonafide work done VISAKH S D (Reg.No: - 2303304037) in partial fulfilment of the requirement for the award of the degree of Master of Business Administration in Indian Maritime University, Chennai.

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DECLARATION

I, **VISAKH S D Reg. No.2303304037** student of **School of Maritime Management, Indian Maritime University**, pursuing **MBA in Port and shipping Management** hereby declare that this submission of this project report titled **"RISK MANGEMENT IN PROJECT CARGO LOGISTICS"** - has been prepared by me towards the partial fulfilment of the Master of Business Administration in International Transportation and Logistics Management under the supervision of **Dr. Emil Mathew** Assistant Professor SMM, Indian Maritime University, Chennai Campus. I also declare that this project report is my original work and has not been copied from any other report previously submitted for the award of any degree, fellowship or other in the similar title.

Place: Chennai Date: 06/05/2025

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Chapter 1: Introduction

1.1 Background of the Study

- **Project cargo logistics and its importance in global trade.**

  Project cargo refers to the movement of large, heavy, high-value or complex loads either internationally or domestically, from multiple points of origin or one point of origin. It is a highly specific and complex form of logistics as it requires detailed planning to ensure that the shipment runs within strict parameters (timeline, budget and safety). Project cargo is regarded as one of the most complex forms of logistics because one must contend with the pressures of strict delivery schedules, tight delivery dates and safety regulations. Due to the nature of the oversized cargo, project cargo is often moved in a multimodal method- land, sea or air. Additional requirements can dictate the need for route surveys, police escorts or additional logistical arrangements beyond the normal daily considerations.

- **Project cargo and the difference between regular cargo.**

Project cargo has many differences from standard cargo, the most obvious being size. Project cargo is often oversize cargo, which may also include heavyweight cargo. As mentioned, project cargo includes items such as big industrial machinery, components of power plants, and large parcels of construction materials that exceed often over, dimensional (size and weight) limits of typical shipments, thus special transport is required, i.e., heavy-lift vessels, multi-axle trailers, modular transporters, etc. At the same time, project cargo tends to represent high-value commodities, this maybe one primary reason planning & execution need to be precise to avoid financial and operational failures/risks. Unlike standard cargo often transported via bulk or containerized shipments that have routine loading and transport methods used to load, package, and fasten products, project cargo shipments may require specialized handling, such as custom crating, heavy lifting, and route planning for oversized loads that require special handling. Project cargo also can have multi-modal logistics requirements, meaning that often minimize risk, the overall logistics may require land, sea, and air to reach remote destinations and place where

infrastructure may not permit road transport. Regulatory compliance is another differentiator that is important to understand, project cargo may involve municipal road permits and escort requirements outlined in the road permits defined at the start / route planning of project management. All of these reasons reflect that project cargo is an essential logistical process while being complex, risky, and time-sensitive in the environment of project management. As almost any element of the project cargo is disrupted or delayed, overtime can be billed or even force costs of the project to exceed original project estimate and lead reach or possibility for (and)financial penalties to occur. In summary, project cargo is potentially one of the most complex and challenging area of logistics because it requires expert planning & coordination despite the inherent risks.

- **Industries which use project cargo.**

  - Mining

    Project cargo is essential to the mining industry when large machinery, such as excavators, drillers, crushers, and conveyor systems, need to be transported over long distance, especially to remote areas under difficult loading/unloading conditions, where it needs to be treated with special care when handling and planning the logistics.

  - Oil and Gas

    Project cargo is critical in the oil and gas industry when drilling rigs have to be transported, along with pipelines and refinery components, and various offshore platform structures. Since it is a global industry, the logistics needs to consider maritime transport, heavy lifting and complex site deliverables.

- Building Construction

Massive projects that involve infrastructure and building construction need to ship large, oversized components used for construction. This can include structural elements such as steel beams, precast concrete sections, bridge sections, and rental equipment for construction active sites. Logistics planning also requires delivering the goods at the right time to the project site even when maneuvering through a busy urban market, and or a remote rural location.

- Power Plants & Renewable Energy

Energy also utilizes project cargo to transport large heavy pieces of equipment such as turbines, generators, transformers, and wind turbine sections (blades, nacelles, towers etc). Renewable energy projects may be similar to traditional energy arrangements but these projects can also involve complex arrangement of multimodal transport scenarios to deliver goods to difficult and remote locations for installation.

- Petrochemical Fields

Petrochemical plants cover all activities related to the chemical and petrochemical fields that use oversized objects such as reactors, heat exchangers, storage tanks, and distillation columns

- Military and Defense

Defense logistics frequently involve moving armoured vehicles, aircraft, weapon systems, and communication equipment. These shipments require high security, compliance with government regulations, and strategic planning for transport across international borders.

- Aerospace

The aerospace industry relies on project cargo for transporting aircraft components, satellites, rocket parts, and assembly equipment. Given the size and sensitivity of these items, transportation often involves specialized

handling, custom crating, and precise coordination to meet production and launch schedules.

❖ **Prominent logistics providers which specialize in project cargo.**

Many companies in the global logistics industry are known leaders in the industry because of its innovative solutions, reach, and capabilities. In this internal study, we will provide overviews of five of the leading project logistics companies, including details of their operations, strengths, and strategic outlook.

➢ Hellmann Worldwide Logistics

Global Overview: Hellmann Worldwide Logistics is known for its total freight forwarding and supply chain coverage around the globe. Operations in Project Logistics: The company has a strong global reach, with project logistics capabilities that provide solutions for project cargo logistics.
Strengths: In this industry, Hellmann has extensive experience to develop unique logistics solutions to handle complex shipments efficiently.
Strategies & Outlook: Hellmann is moving into the emerging markets, which should scale operations depending on geography, and ensure long-term sustainability with its moving logistics trends.

➢ Kuehne + Nagel International AG

Global Overview: Kuehne + Nagel is one of the largest logistics providers with an integrated supply chain offering, and has a strong international presence. Operations in Project Logistics: The company has extensive experience in transporting heavy equipment and complex project cargo.

Strengths: The company's demonstrated industry knowledge about complex logistics projects and its vast network of logistics service providers globally are valuable assets in achieving movement on a large scale.

Strategies & Outlook: The company is spending heavily on digitalization efforts to improve operational experiences for its customers through technology.

- C.H. Robinson Worldwide Inc.

Global Overview: C.H. Robinson, a logistics technology leader, works on optimization of supply chains and strives to provide real-time visibility.
Operations in Project Logistics: C.H. Robinson utilizes its global network of locations and variety of sectors to manage complex supply chains. Strengths: The company has a vast technology platform that allows project cargo to be managed and moved in a seamless and efficient manner, that corresponds to the lowest possible cost.
Strategies & Outlook: By utilizing new digital products and tools, C.H. Robinson's focus is on optimizing logistics solutions, while growing customer engagement and experience.

- DB Schenker

Global Overview: DB Schenker has a strong composite of land, air, and ocean freight and is a strong player in the project logistics sector.

Operations in Project Logistics: DB Schenker is capable of providing integrated/combination solutions to a wide array of charitable, sophisticated and large-scale industrial projects around the world.

Strengths: DB Schenker has a strong ability to integrate logistics solutions with advanced customer service that give it a strong competitive advantage in large complex projects..

Strategies & Outlook: DB Schenker has expanded the sector project logistics offerings by establishing strong and coherent partnerships. The company is continuing to expand its overall service offerings and improve the project logistics sector.

- Kerry Logistics

Worldwide Overview: With strength in Asia, Kerry Logistics is a major player for complex logistics services in various sectors.

Operations in Project Logistics: The company has an established regional footprint which allows for the movement of project cargo across the major markets it operates in.

Strengths: In particular, it has specialised in providing logistics solutions for complex and larger scale projects.

Strategies & Outlook: By concentrating on market growth in the Asia-Pacific region, Kerry Logistics takes full advantage of regional opportunities, whilst increasing its global footprint

1.2 Importance of Risk Management in Project Cargo Logistics

❖ **Risks in project cargo operations**

As you ship project cargo, you should be cognizant of potential risks. Risks such as physical damage to cargo in transit, unforeseen delays, and increased costs associated with rerouting or demurrage can all affect your supply chain, bottom line, and company reputation. Many project cargo shipping companies provide special insurance policies designed for high-value and out-of-gauge cargo, but for more risk control, consider defining acceptable rerouting methods in your pre-planning. Project cargo is often large, heavy, or irregularly shaped and requires specialized-loading equipment specifically aimed at the shipment. During peak demand seasons or in remote locations, you may have limited options for required equipment like rigging and multi-lift, flat-rack containers, and heavy-lift vessels. Some ports, roads and rail lines are not designed for project cargo and may cause delays or disrupt overall timelines.

Some of the common types of risk in project cargo logistics are-

- Technical risk, from a technical perspective, relates to the ability or feasibility of being able to physically transport a cargo. There is a need to consider the selection of vehicles, loading technologies, the routes, cargo specifications including dimensions, weight, and safety considerations. Of course, human error and accidents that may occur during the mode of transit add to the technical risk. •

- On the other hand, economic risk can include factors such as banking operations, funding accessibility for new technologies, market viability for transportation conditions, labor costs, infrastructure costs, and pricing for transportation. These factors will impact not only how much the project will cost but also how project cargo is shipped and options for route selection, specifically to improve efficiency.

- Social risk relates to the nature of how the public and regulatory authorities perceive or view oversized and heavy cargo transportation movements. The depth of disturbance (e.g., road closures), accessibility to labor and/or forces (e.g., Community perceptions of public acceptance of oversized, overweight or over-dimensional operations) can either facilitate or hinder a project. The depth of public tolerance of road use and access to skilled labor is important in the overall equation of transportation.

- Political risk relates to how government policies and regulations establish protocols for project cargo logistics such as permitting, customs, infrastructure tariffs, the consistence of policies across government institutions, or the overall economic development priorities of the country. The political stability and transit agreements would also have an effect on the process of appropriately moving oversized and heavyweight cargo cross-border and in an effective manner.

❖ **Risk management in project cargo operations**

To properly manage project cargo logistics, the fundamentals of proper (project cargo) planning, execution and communication between the primary stakeholders must all be carefully undertaken. Project cargo often entails large, heavy, and irregular shaped cargo which requires the use of specialized handling equipment and often multi modal transport to ensure the safekeeping of product for delivery.

- Pre-Shipment Planning and Site Assessment

  As part of a comprehensive risk management plan, a pre-shipment assessment and location survey is paramount to the management of project cargo shipments. When evaluating at road conditions, bridge load limits, ports and the capacity of loading facilities at the origin, transit and destination locations, you will be able to determine potential risks such as low-clearance roadway etc. Furthermore, you must get the necessary permits from the authorities, ensure that you have the correct framework for transport and stakeholder cooperation, to minimize delays, particularly for international shipping where "Customs Clearance" is often required.

- Choosing the Right Logistics Partner

  Moving project cargo is not straight forward. So it is imperative that you engage an experienced shipping partner that specializes in oversized and specialized shipments. A reputable logistics carrier should have experience in managing multimodal transport and access to specialized equipment, such as boom cranes, heavy lift cranes and multi-axle trailers. They should have established relationships with ports and members of the regulatory bodies. Engagement with a company that specializes in risk management could reduce risks associated with transit interruptions and ensure their project deadlines are met.

- Ensuring Effective Communication

  It is important for all stakeholders in the project cargo logistics process—including shippers, carriers, port authorities, and regulators—to coordinate regularly to avoid unnecessary risks. Regular meetings can allow stakeholders to clearly establish their roles and responsibilities and resolve issues before they affect project deadlines. Real-time cargo tracking systems can also facilitate coordination between firm/stakeholders and proactively identify delays or issues before they create obstacles in effective decision-making and timelines.

- Using Technology to Mitigate Risks

Advanced technologies such as GPS tracking, IoT sensors, and digital project management tools can provide further respectability and supervision to farm productivity organisation. IoT sensors can monitor cargo conditions such as temperature and vibration, essential for sensitive equipment requiring special handling conditions. Digital simulation techniques, much like digital twins, can provide logistics crews a recent method to test routes of travel, assess infrastructure capability, and render work in relation to project/process flows even before moving any physical cargo. Investing in digital solutions will allow you to manage permits, customs documentation, or compliance records much more easily, thus supporting decision-making that can result in a more efficient shipping process, ultimately reducing the possibility of administrative delays.

- Loss Prevention and Insurance Protection

The value of project cargo and the attendance long lead times to replace it create must-have priorities for loss prevention as part of risk management mitigation. Weather and cargo handling are considered traditional risks, but it is possible to incur unforeseen logistics difficulties mid-transit. Specialized teams assess and monitor transportation downtime and respond to threats in the probable instance of a deal between both parties, and transportation downtime does occur. While insurance offers financial protection against detriment or loss to cargo, it is only one component of risk management. Proactive planning, loss prevention, and expert awareness during the logistics and transportation process, help ensure project timelines and investments are protected as effectively as possible.

1.3 Research Problem Statement

❖ Gaps and Challenges in Project Cargo Logistics

• Uncertain operational risks: Cargo-handling failures, equipment malfunctions, and poor route planning are leading causes of unanticipated delays and interference.

• Countries' regulations: National and international regulations that need to be adhered to are becoming increasingly complex and result in an additional compliance burden and a potential delay in effective project delivery.

• Financial risks: Varying freight rates, inadequate insurance coverage, and liability risks mean stakeholders are burdened with financial risk.

• Environmental and geopolitical risks: Major threats to the smooth and effective transportation of cargo arise from extreme weather events surrounding geopolitical instability and other supply disruptions.

• Lack of standardized frameworks for risk mitigation: Industry stakeholders demonstrate significantly different approaches to assessing the risk from supply chains which results in varying methods for dealing with risk.

❖ Key Issues Faced by Industry Stakeholders

- Shippers: High transport costs related to unexpected risks, lack of visibility into risk factors, and challenges with cargo insurance.

• Freight Forwarders: Difficulty predicting in transit risk and minimizing exposure, documentation challenges, and contractual liability issues.

• Port Operators: Congestion related issues, risk of damage to cargo resulting from improper handling, risks related to security.

• Insurance & Risk Analysts: Problems associated with being certain of their risk exposure, particularly when considering appropriate pricing of insurance policies.

Given the high stakes associated with project cargo logistics, we need a more structured process for identifying risks, assessing risks, and mitigating risks. The limited research on risk management for project cargo has left professionals in this industry without recognized best practices.

This study aims to bridge this gap by:

- Find the key risks associated with project cargo logistics.
- Investigate current risk management practices used by practitioners.
- Suggest a risk management framework that strives for efficiency and efficacy.

By understanding these aspects, the research will provide invaluable information for logistics service providers, port authorities, and policymakers to improve risk resilience and operational efficiency relating to project cargo mobilization.

1.4 Research objectives

- **Identify Key Risks in Project Cargo Logistics**

- Examine the major operational, financial, regulatory, and environmental risks affecting project cargo transportation.
- Assess how these risks impact different stakeholders, including shippers, freight forwarders, port operators, and insurers.

- **Analyze Risk Assessment and Mitigation Strategies**

- Investigate the current risk assessment frameworks used by logistics professionals.
- Evaluate the effectiveness of different risk mitigation strategies implemented in project cargo operations.

- **Examine the Role of Technology in Risk Management**

- Explore the impact of digital tracking systems, AI-based risk analysis, blockchain documentation, and automation on mitigating risks in project cargo.
- Assess industry adoption levels and challenges in implementing technological solutions.

- **Study Case Examples of Risk Management in Project Cargo**

- Analyze real-world case studies where risk management strategies were successfully or unsuccessfully applied.
- Identify lessons learned and best practices from past project cargo movements.

1.5 Scope of the Study

This study examines risk management measures in project cargo logistics in the geographic region of Southern India, including major ports and logistics hubs, such as Chennai Port, Krishnapatnam Port, Cochin Port, and Ennore Port. The area is an essential locality with significant project cargo movement, especially in the energy, infrastructure, and heavy machinery sectors..

❖ **Limitations of the Study**

- Data Access: Some firms may be unwilling to share sensitive operational data or risk management reports, which may limit the analysis.

- Case-Studies Reliant: The results will be reliant on a limited number of case studies from industry professionals based on what is available and their willingness to disclose information.

- Geographical Limitation: Although the results will be specific to Southern India, the results may not be fully generalizable to other areas due to potential differences in local regulations, infrastructure, and risk profiles.

- Technology specific: The study will be mainly focused on the technologies available and adopted in Southern India and may not provide a snapshot of the advances in risk management facing companies around the world.

1.6 Methodology Overview

❖ This study will employ a qualitative research methodology to explore the risk management practices in project cargo logistics. Given the complexity and uncertainty associated with the risks faced, qualitative data will provide the required insights into the beliefs, practices and experiences of industry professionals.

❖ **Research Approach**

- **Qualitative Research:** The study will rely on interviews, case studies, and industry reports to explore the risk management landscape.
- **Descriptive and Exploratory:** It will describe current practices, identify challenges, and explore effective mitigation strategies.

❖ **Data Collection Methods**

➢ **Primary Data:**

- **Expert Interviews:** Semi-structured interviews will be conducted with key stakeholders, including project cargo managers, freight forwarders, port operators, and insurance professionals.
- **Case Studies:** Real-world cases of project cargo movements will be examined to analyze how risks were identified, assessed, and managed.

➢ **Secondary Data:**

- Industry reports, white papers, and publications from organizations such as **BIMCO, ICHCA, and FIATA**.
- Government reports, port authority data, and published case studies.
- Academic journal articles related to project cargo logistics and risk management.

❖ **Sampling Strategy**

- **Purposive Sampling:** Industry experts with direct experience in managing project cargo operations in **Southern India** will be selected.

- A sample size of **4-5 interviews** will be targeted to ensure a diverse range of perspectives.

1.7 Conclusion

Project cargo logistics is a key player in the global supply chains of today. Project cargo often includes unconventional factors globally, such as high value, weight, size and complexity issues. Project cargo logistics has also been discussed recently in the literature as being the envy of traditional freight forwarders, as it provides many operational opportunities with its inherent risks. Obstacles and challenges exist in many forms, including operational, financial, environmental, and regulatory risks. In general, risk management is integral to any project cargo operation, as it helps reduce operational disruptions, lost opportunity costs, and other potential financial losses.

The purpose of this study is to examine the host and scope of risks associated with project cargo logistics and the perceived effectiveness of current risk management strategies. This study will utilize primary and secondary data to investigate industry practices and ultimately strengthen risk management systems that might lead to improved efficiencies and operational success.

This study aims to review risk mitigation best practices and the contextual conditions for stakeholders in project cargo logistics. Ultimately, we hope to support more resilient and efficient logistics services in our turbulent world.

Chapter 2 :Literature review

2.1 HEAVYWEIGHT AND OVERSIZED CARGO TRANSPORTATION RISK MANAGEMENT

Ramūnas Palšaitis1, Artūras Petraška2

The movement of heavyweight and oversized freight poses distinctive challenges in the international logistics and supply chain environment. Owing to the size, weight, and complexity of such freight, the industry requires specialized handling procedures, infrastructure, and a coherent approach to risk management. Following Palšaitis and Petraška (2012), effective transport of heavy and oversized loads rests significantly on risk assessment and management measures, not only improving safety and operational efficiency but also the more informed infrastructure planning and lowering reconstruction costs. Risk here tends to be construed as the likelihood of negative occurrences that can detrimentally affect economic or operational performance of transport activities.

The authors categorize the risks associated with heavyweight and oversized cargo transportation into four broad groups. Technical risks involve vehicle suitability, loading technology, route constraints, and the inherent danger due to cargo dimensions and weight. Economic risks relate to external financial conditions, including banking policies, funding availability, and competitive pressures, all of which influence the viability of transportation projects. Social risks involve public opinion, availability of the workforce, and community acceptance—elements that may influence both regulatory clearance and the hassle-free conduct of transport. Political risks emanate from government regulations, financial policies, and infrastructure investment plans, which have direct bearing on route planning and the viability of transport.

The process of dealing with these risks normally starts with the identification of the risks, which is then modeled and assessed using statistical techniques. This is supplemented by in-depth data collection on road conditions, historical accident data, and cargo movement patterns. Mitigation measures are then applied, including movement restrictions, insurance policies, and route optimization. Of particular importance is the use of Geographic Information Systems (GIS) in risk management. GIS applications combine spatial data to evaluate traffic movement, accident-prone locations, and route viability and, thus, enable logistics planners to determine and implement safer and more efficient transportation routes**.**

2.2 VESSEL SELECTION PROSPECTS AND SUITABILITY ASSESSMENT FOR OVERSIZED CARGO TRANSPORTATION

Malaksiano M.O. ,Melnyk O.M.- Odessa National Maritime University

The transport of heavy-lift cargo, also referred to as project cargo, is critical to international infrastructure, energy, and industrial growth. With its compounded complexity, selection of the proper vessel is important to avoid compromising safety, economic value, and operational efficiency at sea. Malaksiano and Melnyk (2020) stress that ship choice is a multi-faceted process driven by technological, operational, and financial considerations. Industrial machinery, turbines, and pre-assembled buildings are usually oversized cargoes and fall under Out-of-Gauge (OOG) cargo, heavy-lift cargo, and project cargo categories. Though specialized heavy-lift ships are desirable because of their sophisticated handling, economic limitations and ship availability result in the employment of general-purpose ships such as bulk carriers and container ships for the carriage of such cargo.

Technology factors such as hull strength, deck area, onboard cargo-handling gear, and ship stability are key considerations in ship suitability. Non-specialized ships need to be modified or supplemented with external means to cope with the stress due to heavy cargo, and proper stowage and securing. Economically, ship performance is measured in terms of the Time Charter Equivalent (TCE) that compares freight income with operational expenses over voyage length. It has been seen through research that employing non-specialized ships on return voyages can improve profitability by reducing ballast trips and maximizing cost-benefit ratios. These ships tend to have lower daily operating expenses than heavy-lift vessels, with potential for higher economic returns in good market conditions.

Safety continues to be a top priority, demanding adherence to standards such as proper lashing, weight distribution, and International Maritime Organization (IMO) guidelines. Port facilities and regulatory limits also impact routing and operational planning. Advanced cargo handling systems, digital optimization of stowage plans, and hybrid vessels that are capable of efficiently hauling bulk and project cargo need future research. This dynamic field requires fully integrated strategies that optimize technology, economics, and safety in ship selection.

2.3 Safety of Oversize Cargo in Ports and in the Sea Transport

M. Chmieliński Polish Naval Academy, Gdynia, Poland

The movement of oversize cargo—including heavy machines, industrial buildings, wind turbines, and power plant machinery—is a burgeoning and important industry in international maritime logistics. This cargo, which is larger and heavier than the usual dimensional and weight limits, is a formidable challenge in port and sea transportation operations. Although there is no one accepted definition, oversize cargo is typically described as freight that exceeds standard transport dimensions in length, width, height, or weight (Chmieliński, 2017). The handling of such cargo requires exact coordination, specialized lifting and securing gear, and strict compliance with international safety standards.

The most important challenges are structural constraints at ports, insufficient lifting capacity, vessel compatibility, and the requirement for time-critical operations. Galor & Galor (2017) emphasize that most ports have insufficient infrastructure, and Pałucha & Chmieliński (2016) specify safety hazards such as cargo instability, especially during harsh sea conditions. Risk management practices emphasize the right weight distribution, floating crane or semi-submersible vessel usage, and sophisticated securing methods such as tailor-made lashing and hydraulic bracing systems. Inadequate securing or handling may result in vessel imbalance, delays, or even maritime incidents.

Regulations for safety, like the SOLAS Convention and the IMO's Code of Safe Practice for Cargo Stowage and Securing (CSS Code), offer uniform guidelines to facilitate safe stowage and handling. Moreover, local port authorities are essential in approving the movement of cargo and coordinating logistics through the provision of tug services and routing planning. Technological advancements have increased safety by means of automation, hydraulic skidding systems, and semi-submersible vessels, which enable loading of cargo with minimal mechanical intervention. In general, the safety of oversize cargo depends on a holistic approach that includes regulatory compliance, high technology, and highly coordinated port and sea operations.

2.4 The study of project cargo logistics operation: a general overview

Oktaviani Turbaningsih

Project cargo logistics is a niche area of transport logistics that entails the transportation of oversized, heavy, and expensive cargo, mainly utilized in the construction of infrastructures, power, and industries. In comparison to regular containerized or bulk cargo, project cargo demands unique planning and operations because of its non-standard dimension and weight (Pache, 2019). The rapid investment in emerging sectors such as renewable energy and modular construction has attracted more academicians and industrialists in this sector.

Project cargo operations entail intricate challenges, especially in stowage, handling, routing, and risk management. Melnyk et al. (2020) highlight the need for integrated logistics planning with cost control, technical safety, and route optimization of transport. One of the biggest challenges is the absence of standardized procedures for OoG cargo handling, which raises operational complexity and costs (Song, 2021). Due to the size and nature of such cargo, a multimodal transportation method—consisting of maritime, rail, and road—is typically required. Modes of transport are Lift-on/Lift-off (Lo-Lo), Roll-on/Roll-off (Ro-Ro), and Float-on/Float-off, and are determined by cost, delivery time, and safety (Hanssen et al., 2012; Melnyk et al., 2020).

Port infrastructure is of utmost importance when it comes to the logistics of project cargo. Heavy-lift operations require specialized equipment, storage facilities, and berthing capability (Notteboom et al., 2021). Insufficient facilities in a port may lead to delays and increased costs (Denktaş Şakar et al., 2018). Project cargo logistics also have high costs associated with them due to capital outlays, specialized equipment, permits, and road infrastructure limitations (Wijnolst & Wergeland, 2009; VTPI, 2017).

Risk management is essential with the high likelihood of technical, operational, and environmental interruptions (He & Han, 2022). Simulation models are used more and more to maximize logistics through cost, safety, and delivery schedule balancing. There is limited academic work on standardizing methods. Future studies should be conducted on predictive modeling for renewable energy logistics, enhancing port infrastructure, and the adoption of digital technologies to increase cargo visibility and operational efficiency.

2.5 The Transport of Oversized Cargoes from the Perspective of Sustainable Transport Infrastructure in Cities

Jan Petru, Vladislav Krivda

Transportation of oversized cargo poses several challenges, especially in European road networks that are not typically built to accommodate such heavy and oversized loads. Roundabouts, narrow roads, and traffic-calming infrastructure make the transportation of oversized vehicles challenging, while the absence of harmonized regulations across borders increases the difficulty of route planning and execution. While the European Best Practice Guidelines for Abnormal Road Transport (2006) encourage the creation of dedicated transport corridors, their adoption is patchy. Finland stands out for having well-documented and organized rules, with strict standards for road dimensions and clearance heights to take abnormal loads into account. To resolve routing problems, scientists have aimed to develop dedicated backbone routes aided by GPS tracking and video monitoring, which identify bottlenecks and measure real-time transport conditions.

Simulation software like AutoTURN is also employed to forecast vehicle behavior and improve route design. Heavy-duty transport vehicles are classified into six classes according to the cargo and chassis features, and computer programs such as AutoTURN and easyTrack have a vital role in simulating their movements. Such simulations also affect required infrastructure modifications, e.g., designing roundabouts differently or relocating traffic signals. Empirical research by nations such as Slovakia, Poland, Germany, and Austria have enriched the research area by utilizing technologies such as GPS, drones, and laser scanning to acquire data on road constraints and vehicle dynamics. The data-driven research is crucial to enhancing safety and efficiency in oversized cargo logistics.

2.6 Assessment of Potential Negative Impact of the System of Factors on the Ship's Operational Condition During Transportation of Oversized and Heavy Cargoes

Svitlana Onyshchenko, Olexandr Shibaev, Oleksiy Melnyk

The article *Assessment of Potential Negative Impact of the System of Factors on the Ship's Operational Condition During Transportation of Oversized and Heavy Cargoes* by Onyshchenko et al. provides an extensive overview of risks related to maritime shipping of oversized and heavy cargo (OHC), emphasizing risk assessment, cargo securing methods, and probabilistic modeling. Maritime shipping of OHC is subject to great risks such as human mistake, technical malfunctioning, and environmental factors. Schneider et al. (1999) and Eliopoulou et al. (2016) statistically evaluate maritime accidents, whereas Bužanić Primorac and Parunov (2016) study trends in incidents by vessel type. Route-based risk models by Kim et al. (2011), Mou et al. (2015), and Ramin et al. (2020) highlight the need for sophisticated methodologies in high-risk and high-traffic waters.

Carriage of OHC presents special difficulties because of its non-uniform size and weight, and special securing methods are called for. As much as the CSS Code (1991) prescribes the best approach, implementation deficits persist. Melnyk and Malaksiano (2020) note challenges in utilizing non-specialized ships for such cargo, including issues of stability and safety. Onyshchenko and Melnyk (2020) and Girtler (2013) utilize Markov modelling to assess a ship's operating condition and accident hazards. Human factors, as observed by Soner et al. (2018), remain a dominant cause of risk. Consequently, several probabilistic and simulation-based models have been built. Petersen et al. (2011) and Onyshchenko et al. (2015, 2016) apply regression analysis for factor correlation, whereas Peel and Good (2011) and Onyshchenko and Melnyk (2020) employ hidden Markov models to evaluate vessel behavior and stability. These instruments enable better risk forecasting and safety control in the carriage of oversized loads.

2.7 Value Creation in Project Cargo Logistics: A Delphi Study

Gül DENKTAŞ ŞAKAR, Esra YILDIRIM, Ezgi MANSUROĞLU

The research onValue Creation in Project Cargo Logistics: A Delphi Study by Denktaş Şakar et al. investigates value creation in project cargo logistics, with a special emphasis on Turkey. It classifies logistics as a key driver in value creation where value is defined as the equilibrium of customer benefits and sacrifices. Citing Vargo et al. (2008) and Porter's (1985) Value Chain, the paper highlights integrating logistics into the overall supply chain for competitive success. The key studies, such as Baudin (2004), Wang et al. (2004), and Mentzer et al. (2001), note that logistics service providers create value by being efficient, providing high-quality services, reducing costs, being responsive, and optimizing lead times.

The special challenges in project cargo logistics arise from handling oversized, heavy, or high-value cargo that requires specialized equipment and risk management. The UK P\\&I Club (2014) and Sarı (2016) underscore regulatory compliance and the required permits, but Aamuvuori (2014) addresses regional infrastructure and legal limitations. In Turkey, the absence of standard procedure and limited academic attention further complicate the practice.

The research identifies major value creation enablers including partner choice and efficiency in operations. Andersson et al. (2011) and Fagerholt et al. (2013) emphasize proper experience of partners and proper communication. Multimodal transport planning and risk management are also important for success in operations, as pointed out by Branch (2009) and Guzman and Norgaard (2000).

Value creation outcomes are enhanced operational efficiency, effective services, and technology uptake. Despite these, there exist challenges such as poor infrastructure, ambiguous regulations, and lack of qualified professionals. These are the restrictions that hinder the development of Turkey's competitive project cargo logistics industry.

2.8 HEAVY LIFT ITEMS AND PROJECT CARGOES

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The carriage of project cargo and heavy lift entails the transport of extremely heavy, high-value, or huge items critical to industries such as energy, construction, and infrastructure. Some examples include windmills, generators, and equipment for the oil and gas sector, typically delivered in special encasing boxes or in dissembled form to be reassembled later. As demand for these carriages accelerates with increasing industrial and energy projects, careful handling and high-risk management are imperative.

Contractual and legal aspects dominate project cargo logistics. Two main regimes of liability are utilized: Knock-for-Knock contracts under which each party takes responsibility for its own equipment and staff, and the Hague/Hague-Visby Rules requiring carriers to ensure the seaworthiness of a vessel and correct handling of cargo. In order to facilitate standardization, BIMCO has developed special heavy lift forms such as HEAVYCON 2007 for deck cargo and HEAVYLIFTVOY for cargo carried above and below deck.

Effective management of risk is paramount considering the delicacy and high value of such shipments. The process starts with comprehensive pre-planning, such as Safety Management System (SMS) checks and joint planning with cargo superintendents and surveyors. While stowing the cargo, there has to be sufficient lifting and lashing points, and securing calculations might need to involve professional contractors. Weather and stability risk considerations have to be included in voyage planning. These considerations have to be in accordance with IMO's safety codes, particularly for deck cargo.

Real-life examples of case studies demonstrate typical mishaps. Poor weather resulted in deck-stowed cargo loss amounting to $2 million in one instance. Another was an $850,000 damage attributed to probable misuse or stowage. Such examples emphasize careful planning, weather surveys, competent surveyors, and proper securing methods to avert expensive failure.

Chapter 3: Research Methodology

3.1 Research Design

This study does not test a hypothesis; it will identify the causal factors, any related strategies, and participants' perceptions of risk associated with project cargo logistics operations. This study is therefore relying on inductive reasoning. In the case of inductive reasoning, a participant's case and experiences will lead to overarching conclusions. This type of research design allows a researcher flexibility in assessing logistics processes which are inherently uncertain, involve many stakeholders, and have inherently varied regulatory frameworks.

This research is based on a qualitative and exploratory design that focuses on understanding and managing risk assume the nature of risk management 'in-use' in real-life practice and in real-time process for project cargo logistics. The qualitative approach allows a unique exploration of practitioner in-depth understandings, reflections and in-process, and complexity of decision making and action. Project cargo movements are unique, do-in-teign, usually non repetitive, high cost, and context specific so qualitative research is well suited opportunities to disclose significant underlying patterns of risk and risk mitigation.

3.2 Data Collection Methods

- **Primary Data**

  Primary data was collected in the form of interviews. The interviews were conducted both in-person and virtually. Each lasted between 25–45 minutes and was recorded, transcribed, and manually reviewed. The use of semi-structured questions allowed flexibility in responses while ensuring consistency in theme exploration.

- **Secondary data**

  Secondary data, including 10 detailed case studies, were selected based on their relevance to key sectors like mining, energy, manufacturing, aerospace, and defense. These sources provided contextual validation for the findings drawn from interviews.

  The study utilizes both primary and secondary data sources. Primary data was gathered through semi-structured interviews with professionals working in different capacities within project cargo logistics, including operations, chartering, documentation, and field execution. A total of four interviews were conducted.

  Secondary data included published case studies from reputed logistics companies such as Airland Logistics and CEVA Logistics, industry reports, company whitepapers, and publicly available documentation from the Project Cargo Network (PCN).

3.3 Sampling Strategy

Effort was made to ensure the sample represented a cross-section of the supply chain—from operational execution (loading and transit) to strategic chartering and planning. This helped capture risk from multiple angles. The sample size was determined by both the depth of available insights and access to professionals during the study period. Additional perspectives were gathered through informal industry discussions and follow-up clarifications.

Purposive sampling was employed to select participants based on their direct involvement with project cargo operations. This non-probability sampling method was appropriate due to the niche expertise required to provide meaningful insights on risk management in this logistics segment. The sample included:

- A senior loading and operations expert (Capt. Shivakumar)
- A chartering executive (Niranjan Borade)
- A field operations trainee (Mr. Anas)
- A documentation professional (Ms. Ima Nelson)

These participants were selected to reflect diverse functions across the project cargo supply chain.

3.4 Data Analysis Technique

The use of descriptive interpretation allowed the researcher to focus on real-world narratives, rather than coding text through software. Instead of frequency-based analysis, thematic occurrence and relevance were prioritized. Emergent themes were continuously compared with existing literature to ensure coherence and relevance. Cross-case comparison was performed manually by mapping responses against industry best practices and risks encountered in the 10 global case studies.

Thematic analysis was used to interpret the interview data. Each transcript was read carefully, and recurring patterns or themes were identified manually. Codes were assigned based on categories such as planning risks, operational failures, regulatory delays, equipment failures, documentation gaps, and coordination challenges. These themes were then mapped against real-world case studies to identify consistencies and contrasts across local and global contexts.

The 10 case studies—6 from Airland Logistics, 3 from PCN, and 1 from CEVA—served as triangulation points to reinforce or challenge the interview findings.

3.5 Ethical Considerations

Recordings and transcripts were stored securely and used only for analysis. The identities of companies and individuals were anonymized wherever necessary. Ethical approval was informally obtained through direct consent, and participation was entirely voluntary. This ensured compliance with general ethical research guidelines adopted by most academic institutions.

All research participants were informed of the purpose of the study. Interviews were conducted with their consent, and no personal or sensitive information was disclosed in the final report. Participants were informed that their responses would be used strictly for academic purposes. Ethical practices followed include voluntary participation, anonymity, and accurate representation of viewpoints.

3.6 Limitations of the Methodology

Another limitation was the manual nature of data analysis, which, while rich in context, may be subject to researcher interpretation bias. In future studies, coding tools like NVivo or Atlas.ti may help improve objectivity. Additionally, expanding the number of interviews and including more geographic regions can enhance generalizability.
While the study attempts to provide rich insights into risk management practices, several limitations exist:

- The number of interviews (4) is limited due to accessibility constraints.
- Data from private logistics companies was partially restricted due to confidentiality.
- The majority of practical examples are regionally focused on Southern India and may not represent all global practices.
- The qualitative approach limits statistical generalizability but enhances depth of understanding.

Despite these limitations, the findings provide valuable directional insights and highlight important considerations for both academics and practitioners involved in project cargo logistics.

Chapter 4 :Data analysis and Interpretation

4.1 Interview Interpretation: Loading & Operations Expert

- **Professional Background and Scope of Expertise**

  The interviewee has rich experience in the field of heavy-lift and project cargo logistics. His function is mainly concerned with the movement of over-dimensional and high-value cargo, especially its loading, securing, inland transportation, and port handling. Having worked in both Indian and international logistics environments, he brings a technical and tactical insight into operational vulnerabilities and the practical application of risk management procedures.

- **Planning-Stage Risk Awareness**

  One of the most powerful themes emphasized by the expert is the intrinsic significance of route surveys. Route surveys are not only documentation but are critical practice in recognizing potential risk initiators: sharp bends, poor bridges, height limits, soggy road shoulders, and even overpass power lines.

  He related that in Brazil, as a result of an incomplete route analysis, a project cargo was aborted en route since the route could not accommodate the size and weight. This identifies that improper or insufficient pre-movement surveys may result in disaster operational and fiscal failure.

- **Infrastructure and Regulatory Delays**

  One of the most insightful cases was the relocation of a 600-ton transformer from Chennai Port to Chennai Refinery. Although the distance was minimal (about 15 km), the shipment took more than three months because of the time spent in obtaining permissions and adapting local infrastructure. Workarounds involved disassembling port gates, laying temporary filling over railway tracks, and negotiating city traffic rules. These problems highlighted the importance of inter-agency coordination (customs, RTO, police, and municipal authorities) and exposed the infrastructure readiness gap that introduces layers of uncertainty and cost.

❖ **Transit and Mode Transfer Risks**

The expert deems mode-change points the most risky segments of a project cargo move: factory-to-truck, truck-to-port, port-to-ship. All have lifting, maneuvering, and unsecured moments in transit. He stressed that puller breakdowns and coordination with escort vehicles are common points of pain. Redundancy planning—having spare pullers, standby mechanics, and direct real-time access to decision-makers—is critical to offset surprise breakdowns.

❖ **Environmental Hazards and Timing**

The monsoon period, particularly in Kerala, is considered a whole shutdown period for cargo transportation. The expert does not schedule any ODC movements between May–August unless unavoidable. He explained how a mix of waterlogged roads, low visibility, and soft ground results in very high accident probabilities. Instead of depending on third-party weather apps, his planning uses seasonal awareness, ground reports, and weather intelligence for short-term modifications. "If you don’t have real-time communication, everything breaks down."

He stressed that technology is only as effective as the people using it, and that human miscommunication—particularly during crane operations or vehicle turns—can be more dangerous than equipment failure.

❖ **Ground-Level Communication and Execution**

A highlight moment was the use of real-time field communication. Though the current logistics sector is filled with ERP and GPS instruments, the expert uses walkie-talkies, hand signals, and torch lights extensively. He explained:

"If you don't have real-time communication, everything breaks down."

He emphasized that technology is only as good as the individuals operating it, and that human miscommunication—especially during crane operations or turns of vehicles—can be more hazardous than equipment malfunction.

❖ **Technical Errors and Rapid Adjustments**

Despite extensive pre-planning, unexpected technical mismatches are frequent. In one situation, the slings and shackles for lifting were found incompatible with the cargo dimensions during an actual lift.

His team had to pause the operation, source different lifting gear, recalculate load-bearing formulas, and reinitiate after field approval. This showcases the need for engineering flexibility and on-site expertise, as digital plans often need manual adjustments.

❖ **Insurance, Compliance, and Risk Transfer**

The expert placed significant emphasis on documentation—not just as a bureaucratic requirement but as a risk-limiting and liability transfer mechanism. Insurance approval is conditional on the prior submission of:

- Lifting plans
- Cargo securing diagrams
- Route clearance letters
- Load distribution charts

If a claim is filed and insurers find inconsistency between the approved plan and actual execution, the claim may be denied. This positions documentation as a financial risk shield.

❖ **Modal Comparisons and Case-Based Insight**

- *Chennai Road Movement (3 Months)*: This case illustrated how dense urban traffic, narrow roads, and port-city integration issues delay road-based transport.
- *Hazira to Haldia by Barge (3 Weeks)*: Same transformer type delivered over a longer distance in one-fourth the time due to waterway efficiency and fewer regulatory obstacles.

This comparison highlights that modality selection is not only about cost but directly affects time, safety, and risk.

❖ **Limitations in Current Risk Technologies**

He mentioned using CAD software for visual layout plans but acknowledged that advanced simulation, AI-assisted risk modeling, or digital twins are rarely used in their logistics planning. Decision-making still largely depends on human experience, legacy SOPs, and reactive planning.

❖ **Conclusion**

This interview offers an invaluable, experience-driven look into the high-stakes and highly variable world of project cargo logistics. The insights affirm that planning precision, real-time adaptability, human communication, infrastructure coordination, and documentation discipline are cornerstones of effective risk mitigation. The value placed on old-school coordination and technical foresight over digital convenience suggests that future improvements should focus on blending human intelligence with evolving technology to close the gaps in operational risk management.

4.2 Interview with a Management Trainee (Total Movements)

Experience: 8 months

Core Role: Assists in planning, coordination, and execution of Over-Dimensional Cargo (ODC) movement, particularly involving metro rail coaches, tanks, windmills, and transformers.

❖ **Understanding Risk from an Execution-Level Perspective**

The interviewee brings a grassroots-level perspective, being actively involved in project execution. His insights highlight the unpredictable nature of in-transit risks, especially for ODC cargo. While planning tools and route surveys are used, actual conditions on the ground — road quality, driver decisions, and government regulations — often override pre-set plans.

❖ **Risk Identification and Transit Vulnerabilities**

Transit Stage as Highest Risk: The interviewee emphasized that most challenges occur during transit, not planning. Delays, accidents, weather changes, and driver route deviations cause major disruptions.

Driver Deviation Incident: A real example was cited where the driver carrying Bangalore Metro coaches deviated from the approved route. This not only caused a 2-day delay, but also required an entirely new road survey and plan, involving route changes across different states.

State-Wise Regulatory Inconsistencies: The deviation resulted in navigating through both Tamil Nadu and Karnataka, each with different RTO charges and informal commission practices. Karnataka charged ₹7,000 per truck while Tamil Nadu charged ₹4,000 — underscoring the lack of standardization in regional road taxes.

❖ **Operational Risks During Loading**

During a metro coach movement, the cargo was loaded incorrectly, deviating from designated space markings on the trailer. What was planned as a 2-day job stretched to one full week, demonstrating how even minor loading missteps can delay the entire logistics timeline.

❖ **Communication Gaps and Coordination Complexity**

Real-time communication was emphasized as essential. Coordination occurs between the mechanical team, road survey team, and on-road escort.

However, communication tools are minimal. While some companies use walkie-talkies or WhatsApp, here the reliance is mainly on email, which may not be sufficient for dynamic, real-time updates in high-risk scenarios.

❖ **Documentation Practices**

The interviewee listed several critical documents involved in project cargo execution, including:

- Origin certificate
- Engineer's certificate
- Road/RTO permission
- Packing list
- Invoice

These documents are necessary for both regulatory compliance and insurance claims.

❖ **Insurance and Incoterms Dependency**

Insurance coverage depends on the Incoterms of the contract. In the Bangalore Metro case, the shipper was responsible for insurance, limiting the involvement of the logistics team in direct risk handling via insurance.

❖ **Infrastructure & Regulatory Bottlenecks**

A clear concern was raised regarding the RTO system, which the interviewee termed a "bottleneck."

Issues include: non-standard charges, unpredictable fees, and additional informal costs.

He suggested that standardizing RTO processes across states would significantly reduce costs and delays, thus improving risk management at a systemic level.

❖ **Conclusion**

This interview highlights the on-ground, execution-level risks in project cargo — particularly those that emerge unexpectedly during transit. The perspective shows that human error, weak enforcement of planned routes, and poor regulatory standardization are among the most pressing issues. While documentation and insurance exist, their effectiveness depends on contract terms and pre-approved routes being strictly followed. The need for better driver coordination, use of real-time tools, and harmonized RTO procedures emerges as a clear recommendation from this discussion.

4.3 Interview Interpretation: Chartering Executive (Total Movements)

❖ **Background and Role**

The interviewee serves as a Chartering Executive at Total Movements and plays a pivotal role in the planning and arrangement of ocean transport for project cargo. His primary responsibilities include booking suitable vessels, negotiating terms with ship owners and brokers, reviewing technical compatibility between cargo and vessel gear, and coordinating stowage and documentation. Although he has under a year of experience in this position, the interviewee demonstrated a clear understanding of both operational and legal aspects of project cargo movement, particularly from the perspective of chartering and documentation.

❖ **Chartering-Stage Risk Factors**

The interviewee highlighted a unique category of risks—those that arise before cargo even moves—rooted in chartering decisions. These include:

• Vessel Suitability: Mismatch between the vessel's crane capacity or deck space and the actual cargo dimensions can halt loading or lead to unsafe conditions.

• Weather Constraints: Rainfall during loading operations, especially in coastal regions, causes hatch closures and repeated loading pauses, leading to delays and increased laytime penalties.

• Incorrect Cargo Behaviour Assessment: Failure to predict the centre of gravity or balance of cargo has led to accidents, such as swinging cranes that damaged adjacent cargo. This emphasizes the importance of engineering calculations and real-time responsiveness.

❖ **Operational Coordination and On-Site Adjustments**

While the interviewee's chartering role is not based at the site, he collaborates extensively with field teams including surveyors, lifting engineers, and operational planners. He described the role of:

• On-site Surveyors who are present to adjust lifting shackles, slings, and hooks based on cargo swing or misalignment.

• Coordination with Port Authorities and Terminal Teams to ensure cranes are

tested, hatch covers are operational, and berth access is managed.

This dynamic illustrates a distributed responsibility model, where chartering executives manage upstream planning and negotiation, while ground teams handle execution and emergency decision-making.

❖ **Use of Fixture Notes and Legal Frameworks**

One of the most technically detailed parts of the interview was the emphasis on the Fixture Note, a document that formalizes the contract between the cargo owner and the vessel operator. Key inclusions are:

• Incoterms (e.g., FOB, CFR) to define risk transfer.

• Loading Terms: Free In, Liner Out (FILO), or Free In/Free Out (FIFO) terms that define cost-sharing and operational responsibility.

• Transit Commitment: Agreed delivery timeline and liability clauses in case of delays.

The clarity of the fixture note serves as a risk transfer tool, distributing legal and financial exposure across parties depending on negotiated terms.

❖ **Technology and Real-Time Monitoring**

The interviewee uses online platforms like MarineTraffic and Netpas for vessel tracking and ETA prediction. However, he acknowledged that the adoption of advanced risk analytics or predictive planning tools is still limited. The current system relies heavily on vessel owner-generated stowage plans and the experience of ground teams.

Case-Based Examples of Risk Realization

1. *Transformers from Turkey to Persian Gulf*: Loading was repeatedly interrupted due to rainfall, requiring hatch closure and rescheduling. This caused idle vessel time, additional port charges, and client frustration.

2. *Crane from Nigeria to India*: Misjudgement of the centre of gravity during loading caused the crane to swing dangerously, damaging other cargo. Although handled, it indicated a failure in technical risk anticipation.

   These incidents highlight the sensitive nature of loading operations and how small errors can lead to cascading issues—financial, operational, and reputational.

❖ **Challenges in Execution**

• Port and Infrastructure Constraints: Ports with shallow drafts or inadequate berth facilities may limit the kind of vessels that can be called in.

• Budget-Route Mismatch: Clients often demand specific ports of discharge within tight budgets, making it difficult to match the ideal vessel.

• Limited Control Over Ground Execution: Though the interviewee coordinates all vessel-related aspects, loading and discharge operations are dependent on ground teams, over which chartering officers have indirect influence.

❖ **Communication and Coordination Tools**

The interview confirmed that communication is multi-platform, involving:

• Email and Skype for broker and owner negotiations.

• Microsoft Teams for internal coordination.

• Phone and WhatsApp for quick updates with ground operations.

While functional, the interviewee admitted that this system can sometimes delay updates or decision-making, especially during live loading events where real-time reaction is key.

❖ **Conclusion**

This interview provided an in-depth look at the strategic side of project cargo risk management from a chartering perspective. The role integrates contractual structuring, vessel selection, documentation, and upstream planning, which collectively determine how smoothly operations can proceed. The reliance on strong field support, vessel capability checks, and clear fixture documentation emerges as a core pillar of risk management strategy. However, the lack of advanced analytics tools, real-time collaboration systems, and full digital integration remains an area for improvement in the project logistics industry.

4.4 Interview Interpretation: Project Operations Executive (Total Movements)

❖ Background and Role

The interviewee has two years of experience in project cargo logistics and currently works in Project Operations at Total Movements. Her role primarily focuses on shipment execution and documentation. She brings a document-intensive and coordination-driven perspective to the understanding of risk management in project cargo.

❖ Types of Cargo and Risk Awareness

The interviewee typically handles breakbulk and flat rack cargo, both of which present unique loading, securing, and transit challenges. She identified the most common risks as:

• Improper handling leading to cargo damage

• Infrastructure-related bottlenecks (especially for ODC)

• Security concerns

• Weather disruptions

• Permit-related issues

She pointed out that loading, transit, and final delivery are the most sensitive stages, especially when using equipment such as cranes or self-propelled trailers (SPTs).

❖ Case-Based Risk Insight

She shared a specific case where improper cargo planning led to a missed vessel connection, highlighting how early-stage oversights in logistics planning can cause major downstream disruptions and financial penalties.

❖ **Risk Mitigation Strategies**

To mitigate such risks, the interviewee emphasized:

• Advance planning and coordination among all stakeholders (port, engineering, transport partners)

• Thorough route surveys, including evaluation of road width, bridge strength, and barging feasibility

• Maintaining alternative route options in case of last-minute issues

• Relying on engineering support and real-time consultation to solve mechanical challenges during loading

❖ **Role of Documentation**

As her profile is documentation-heavy, she highlighted the importance of:

• Load and lashing plans

• Customs clearance documents

• Road permits and route approvals

These are not only operational requirements but also prerequisites for insurance and liability protection.

❖ **Insurance as a Risk Tool**

She mentioned that insurance covers unforeseen losses during loading, unloading, and transit, and serves as a financial safeguard against cargo damage or delays. However, effectiveness depends on proper documentation and execution.

❖ **Communication and Tools**

The interviewee described communication as critical, particularly for meeting documentation timelines. The main tools used include email and Microsoft Teams, which help coordinate between internal teams and external stakeholders. However,

there’s limited use of real-time field communication tools like walkie-talkies or tracking apps.

❖ Gaps and Systemic Challenges

• One major gap identified was delay in obtaining government permits, especially for ODC routes.

• She also pointed out the need for early route surveys to identify and mitigate possible chokepoints.

❖ Suggestions and Best Practices

• Encourage more field-level engagement by logistics professionals to understand practical realities

• Conduct route surveys well in advance to avoid last-minute surprises and ensure stakeholder preparedness

❖ Conclusion

This interview offered a documentation and coordination-based view of project cargo logistics. The perspective confirms the importance of advance planning, permit clearance, documentation integrity, and stakeholder coordination. The insights further strengthen the argument that risk management is not just technical or operational but also deeply administrative and procedural in nature.

4.5 Case Study : Transportation of Rail Rolling Stock to Sierra Leone (Mining Sector)

❖ Background and Project Scope

Airland Logistics was assigned a major international logistics project involving the shipment of approximately 600 out-of-gauge rail wagons from manufacturing hubs in China to a remote mining site in Sierra Leone, West Africa. The project was time-critical, directly linked to the expansion and commissioning of a mining operation in the region. Given the size, volume, and complexity of the cargo, the project required detailed coordination across a long and fragmented global supply chain, covering ocean freight, barge operations, and inland delivery.

❖ Nature of Cargo and Transportation Plan

The cargo consisted of 600 rail wagons categorized as Out-of-Gauge (OOG) cargo, requiring non-standard handling throughout the journey. The primary modes of transport included ocean freight from China, barge operations near the West African coast, and final inland movement to the mining site in Sierra Leone. With limited infrastructure in the region, especially near the destination, Airland had to design a transport plan that addressed both physical and administrative bottlenecks.

❖ Key Risks Identified

Several critical risks were recognized early in the project. Port congestion was a major concern as West African ports often suffer from berth shortages and operational delays, risking demurrage costs and shipment backlog. The risk of cargo damage—specifically corrosion and mishandling during transshipment—was elevated due to the exposure to marine environments and repeated lifting. Additionally, delays in cargo delivery could halt mining progress and push back the entire project timeline. Finally, the underdeveloped port and customs infrastructure in Sierra Leone posed logistical and regulatory uncertainties.

❖ Risk Mitigation Strategies

To manage these risks, Airland adopted offshore barging as a strategic solution. By offloading cargo from the ocean vessel to barges offshore, the project avoided extended waiting times at congested ports. To counter environmental risks, each wagon was carefully packed using corrosion-resistant material and reinforced crates to withstand harsh handling. Project managers were stationed both in China and Sierra Leone to supervise cargo movement, discharge operations, and inland delivery. Furthermore, a real-time communication system was maintained between barge operators, port officials, and vessel crews to ensure seamless coordination throughout the project.

❖ Special Challenges and Operational Complexities

One of the biggest challenges was conducting barge unloading operations during unpredictable maritime weather, which increased the risk of cargo swing, misalignment, or accidents. Additionally, negotiating berth availability at underdeveloped ports required both diplomatic engagement and on-ground financial negotiations. Customs procedures in Sierra Leone were particularly cumbersome, making it essential to submit documentation proactively and engage local officials early in the process.

❖ Learnings and Risk Management Implications

This project highlights the importance of proactive infrastructure assessment and alternative unloading strategies in ports with limited capacity. Offshore unloading and berth reservation planning proved to be valuable tools in minimizing port-related delays. The deployment of experienced logistics personnel at both origin and destination increased operational control, improved local communication, and reduced response time during disruptions. The case also shows that special packaging for OOG cargo is a worthwhile investment to prevent losses due to environmental exposure and mishandling.

❖ **Connection to Study Themes**

The case directly supports the insights shared by the loading expert regarding the need for pre-planning and infrastructure compatibility assessment. It also reinforces the chartering executive's view that vessel-port alignment and legal arrangements must be finalized well in advance to avoid last-minute issues. Furthermore, the case validates the management trainee's emphasis on real-time communication as a key strategy to mitigate on-ground execution-level risks in remote or underdeveloped areas.

4.6 Case Study : Transportation of Heavy Equipment to Kuwait (Défense Sector)

❖ **Background and Project Scope**

During the Iraq War, Airland Logistics was assigned a critical mission to transport heavy construction machinery from Australia and Europe to military bases located in Kuwait and Iraq. These assets were urgently needed to support defence-related construction and infrastructure development. The operation occurred in an active war zone, introducing extreme logistical and security risks. The project was executed under a high-pressure environment where both time and safety were paramount.

❖ **Nature of Cargo and Transportation Plan**

The cargo consisted of large-scale construction equipment such as cranes, bulldozers, and excavators—essential machinery for building and maintaining defence outposts. Given the urgency and volatility of the region, a multimodal transport plan was adopted, involving ocean break-bulk vessels for large shipments and Antonov AN-124 aircraft charters for high-priority cargo. These movements were coordinated across borders under tight timeframes and high-risk conditions, requiring exceptional precision and control.

❖ **Key Risks Identified**

The foremost challenge was security—moving high-value equipment through war-torn areas presented risks of theft, sabotage, and even physical danger to personnel. Operational delays posed another serious risk, as any hold-up could impact time-sensitive defence infrastructure. Customs clearance in a militarized zone also created complexity, with rapidly changing protocols and layered security checks. Additionally, the availability of secure routes and suitable airports for landing large aircraft was highly limited.

❖ **Risk Mitigation Strategies**

To manage these layered risks, Airland Logistics adopted a multifaceted mitigation approach. Their staff were stationed at critical loading and unloading points to oversee cargo safety, monitor ground operations, and ensure protocol compliance. Antonov aircraft were utilized for faster, more secure delivery of critical cargo, thereby

reducing exposure to road-based security threats. Pre-clearance processes were initiated with military customs authorities to avoid any post-arrival detentions or disputes. For especially high-risk land routes, the company arranged armed escorts and convoy support to maintain cargo security throughout the final leg of delivery.

Special Challenges and Execution Hurdles

One of the major operational hurdles was securing landing slots and overflight permissions for Antonov aircraft, which required coordination with both military and civil aviation authorities. The team also had to rapidly revise plans based on sudden changes in the security landscape, including insurgent activity, curfews, and restricted zone alerts. These unpredictable elements necessitated an agile, constantly updated logistics plan backed by contingency options.

❖ **Learnings and Risk Management Implications**

This case underscores the critical role of having logistics personnel physically present at the point of execution, especially in hostile environments. The use of air charter services proved invaluable for reducing both transit time and security exposure. Moreover, early and thorough engagement with defense customs agencies enabled smoother processing and clearance. The project demonstrates that risk management in conflict zones must go beyond documentation and planning—it requires proactive field execution, real-time intelligence, and tactical flexibility.

❖ **Connection to Study Themes**

This real-world case aligns closely with the broader study themes. It echoes Capt. Shivakumar's emphasis on having contingency and backup planning at all stages of the operation. It also supports Ima Nelson's assertion that documentation readiness is essential to prevent costly delays. Finally, the operation illustrates the value of multimodal flexibility and situational adaptability—key factors discussed in the interviews with chartering executives.

4.7 Case Study : Urgent Mining Equipment Movement from Australia to Thailand

❖ **Background and Project Scope**

This logistics operation was initiated under emergency conditions when a mining plant in Thailand experienced an unplanned shutdown due to equipment failure. To minimize production downtime and financial losses, Airland Logistics was immediately tasked with transporting 130 tonnes of critical replacement parts—including SAG mill liners and processing components—from Australia to Thailand. The high-value cargo and time-sensitive nature of the shipment required expedited planning and flawless execution across multiple modes of transport.

❖ **Nature of Cargo and Transport Plan**

The cargo consisted of oversized and heavy industrial components vital for the functioning of the plant's grinding and processing units. The logistics plan included road transport to the departure airport in Australia, followed by dedicated air charter to Thailand, and final delivery to the plant site via road. Given the size and weight of the equipment, conventional cargo routes were not feasible, and special handling arrangements were needed at both airports.

❖ **Key Risks Identified**

The primary risk was the time-critical nature of the shipment—each day of delay would cost the mining company millions in lost production. Another significant risk was the potential for customs bottlenecks during clearance, especially with the cargo arriving by air and requiring immediate release. Additionally, handling oversized cargo at airports posed logistical challenges due to space and equipment limitations for loading and unloading.

❖ **Risk Mitigation Strategies**

To address these risks, the logistics team adopted a multimodal optimization strategy. The cargo was divided into smaller, more manageable lots to expedite airfreight handling and customs processing. Priority customs clearance was arranged in advance, with documentation submitted even before the cargo reached the destination. Additionally, live GPS and operations monitoring systems were used to track the

shipment 24/7 across all stages of the journey, allowing the team to respond to any emerging issues in real time.

❖ **Special Challenges and Execution Hurdles**

The project faced a number of operational hurdles, including limited airport capacity to handle oversized freight and the complexity of synchronizing road and air logistics with multiple teams working under strict timelines. Coordinating customs officials, air cargo handlers, and inland transport teams across two countries required meticulous planning and real-time responsiveness.

❖ **Learnings and Risk Management Implications**

This case underscores the value of cargo segmentation for faster handling and customs clearance during air freight operations. It also validates the importance of using real-time monitoring tools in fast-paced, high-risk logistics environments. Furthermore, pre-clearing documentation and initiating parallel workflows can significantly reduce delays in cross-border shipments. These strategies enabled Airland Logistics to avoid major disruptions and deliver critical equipment within the narrow operational window.

❖ **Connection to Study Themes**

This case study strongly reinforces insights from the field interviews, particularly Anas' observations on the high-risk nature of the transit phase. It also supports the emphasis placed by ground-level experts on the importance of advance coordination between different modes of transport. The project demonstrates how efficient execution under pressure depends on early planning, adaptive strategies, and seamless communication across stakeholders.

4.8 Case Study : Transportation of Ball Mill Shells from South Africa to Egypt (Mining Sector)

❖ **Background**

Airland Logistics was assigned to transport large-scale ball mill shells, critical equipment for a mining project, from **Johannesburg, South Africa** to **Egypt**. The equipment was oversized and heavy, making the operation extremely sensitive to both handling and route planning.

❖ **Nature of Cargo and Scope**

- Cargo Type: Ball mill shells
- Total Weight: 528 tonnes
- Transport Mode: Inland transport → Ocean breakbulk shipment → Port unloading

❖ **Key Risks Identified**

- Infrastructure Risk: Weak bridges, restricted roads, and limited port handling capabilities for oversized cargo.
- Coordination Risk: Managing the sequencing of heavy cargo arrivals and departures across different ports.
- Cargo Damage Risk: Risk of cracking or deformation if improperly handled.

❖ **Risk Mitigation Actions**

- **Ro**ute Approval: Detailed engineering route surveys were conducted, and approvals were secured from national and local authorities before movement.
- Specialized Equipment: Low bed trailers, modular hydraulic platforms, and multi-axle trailers were used for land transport.
- Pre-Consolidation: Cargo was consolidated and stored at the port prior to vessel arrival to minimize demurrage charges and loading delays.

❖ **Special Challenges Faced**

- Coordinating port operations between South Africa and Egypt, both having different regulations and clearance protocols.
- Synchronizing inland trucking with vessel arrival to avoid penalties.

❖ **Learnings and Implications for Risk Management**

- Pre-movement engineering surveys and authority approvals are non-negotiable for abnormal loads.
- Consolidation at loading points saves considerable vessel laytime and costs.
- Cargo-specific lifting and lashing plans must be customized, not generalized.

❖ **Connection to Main Study Themes**

- Validates Capt. Shivakumar's emphasis on detailed route surveys and infrastructure risk assessments.
- Relates to Ima Nelson's point on early documentation and coordination to streamline port operations.

4.9 Case Study : Factory Relocation from UAE to UK (Manufacturing Sector)

❖ Background and Project Scope

This high-priority logistics assignment involved the rapid dismantling and international relocation of six complex manufacturing machines from an industrial factory in the United Arab Emirates to the United Kingdom. The entire operation had to be completed within an extremely compressed window of just 72 hours. Airland Logistics was entrusted with full end-to-end responsibility for dismantling, packaging, shipment, and inland delivery. The project demanded seamless coordination and precision execution under time-critical conditions.

❖ Nature of Cargo and Transportation Strategy

The cargo consisted of high-precision industrial machinery, which was both heavy and fragile. The equipment was highly sensitive to vibration, humidity, and temperature variations, posing considerable risks during dismantling, packaging, and reassembly. The transport process included on-site dismantling in the UAE, secure crating and preparation for ocean freight, followed by inland transport in the United Kingdom to the client's new facility.

❖ Key Risks Identified

Several major risks emerged in this case. The foremost was the compressed timeline risk; all dismantling, crating, customs documentation, and shipment had to be completed within 72 hours. The second was machinery damage risk—delicate machine components were at high risk of being compromised during dismantling or transport. Finally, there was a customs risk, particularly at the UK end, where any delay in clearance could derail the strict project schedule.

❖ Risk Mitigation Strategies

To address these risks, Airland Logistics implemented several specialized solutions. First, a 24/7 operational cycle was established. Engineering and logistics teams worked in rotating shifts to ensure continuous progress and eliminate downtime. Second, customized packaging solutions were designed to protect fragile parts. These included

vacuum-sealed crates, vibration-dampening skates, and anti-vibration lashing systems. Third, customs clearance in the UK was pre-arranged through advance document filing and coordination with customs brokers, significantly reducing clearance time upon arrival.

❖ Special Challenges and Field Realities

The most notable challenge was coordinating across functional teams—engineers, packers, logistics supervisors, and customs agents—within a highly compressed schedule. Any lapse in coordination could have led to equipment damage or shipment delay. Additionally, maintaining the structural integrity of heavy, sensitive machinery required precise dismantling, skilled packing, and careful handling to prevent even micro-level damage that could impact future performance.

❖ Learnings and Risk Management Implications

This case highlights the importance of integrated planning between engineering and logistics teams for successful factory relocations. It reinforces the value of custom-built packaging and handling solutions for fragile industrial equipment. Most importantly, it demonstrates how parallel planning across dismantling, documentation, and transport workflows is crucial for time optimization in high-pressure logistics scenarios. This approach allowed Airland Logistics to meet the client's urgent timeline without compromising on cargo safety or compliance.

4.10 Case Study: Oil & Gas Equipment Movement from UK to Australia (Energy Sector)

❖ Background and Project Scope

Airland Logistics was commissioned to execute a high-priority logistics operation involving the transport of oil and gas exploration equipment from the United Kingdom to Western Australia on behalf of Condor Energy. The urgency of the project was driven by exploration deadlines, making timely delivery of the cargo absolutely critical. The success of the exploration project was directly dependent on the arrival and deployment of this heavy-duty field equipment, placing enormous pressure on the logistics timeline and execution precision.

❖ Nature of Cargo and Movement Plan

The cargo consisted of 95 tonnes of specialized oil and gas field equipment. Given the urgency and weight of the cargo, Airland Logistics opted for air charter using an Antonov 124 aircraft—a rare and highly specialized aircraft capable of carrying oversized and heavy cargo. The operation involved a direct airlift from the UK to Australia, followed by last-mile land transport to the exploration site. The reliance on air transport was specifically chosen to minimize transit time and reduce the risk of customs or port-related delays.

❖ Key Risks Identified

Several critical risks were identified in the planning phase. The foremost was the tight delivery timeline, with no room for delays given the client's exploration schedule. Oversize air transport introduced additional challenges, including limited global availability of Antonov aircraft and constraints related to airport handling capabilities for such heavy equipment. Another high-impact risk was quarantine and biosecurity compliance—Australia enforces some of the strictest import controls in the world, particularly for equipment entering from industrial sites abroad.

❖ Risk Mitigation Strategies

Airland Logistics addressed these challenges through a series of robust mitigation strategies. First, a direct Antonov 124 charter was secured early, ensuring minimal

transfer delays and optimized scheduling. Second, biosecurity compliance was proactively managed by thoroughly cleaning, inspecting, and certifying the equipment before loading, ensuring that it met Australian quarantine standards. This significantly expedited the customs clearance process upon arrival. Finally, the logistics team implemented real-time flight tracking and coordinated closely with receiving teams to ensure seamless unloading and dispatch from the arrival airport.

❖ **Special Challenges and Real-Time Solutions**

A key challenge was the limited global availability of Antonov 124 aircraft, which required advanced booking and backup options in case of schedule disruptions. Additionally, preparing the equipment for Australian quarantine standards involved meticulous inspection and documentation—any oversight could have led to costly on-arrival cleaning delays. The team also had to ensure tight synchronization between air and land logistics to avoid downtime upon cargo arrival.

❖ **Learnings and Risk Management Implications**

This case underlines how the use of specialized air charter can drastically reduce logistics lead time for critical project cargo. However, it also shows that planning must begin far ahead, especially when navigating global compliance challenges such as Australia's strict quarantine laws. Real-time monitoring and proactive cross-border coordination between origin and destination teams emerged as crucial success factors. Starting risk mitigation during cargo packing, rather than after dispatch, significantly enhances operational efficiency and regulatory compliance.

4.11 Case Study : Press Machine Transport – Portugal (3-Year Project)

Presented by: João and Romel, Project Cargo Network (PCN)

❖ **Background and Project Scope**

This case involved the highly complex relocation of a large, heavy press machine from Portugal, a project that spanned nearly three years from the initial inquiry to final delivery. The project's extended timeline, multiple stakeholders across European borders, and intricate technical demands made it a standout example of how structured risk management can enable successful execution in project cargo logistics. The press machine, while robust in function, was also structurally delicate, requiring extreme care in both lifting and transport operations.

❖ **Nature of Cargo and Stakeholder Involvement**

The cargo consisted of an extremely heavy and sensitive press machine that had to be moved through various European jurisdictions. The stakeholders included PCN (Project Cargo Network) partners, on-site engineers, surveyors, customs officers, and logistics coordinators in both Portugal and Belgium. Because the shipment timeline extended over several years, there were challenges associated with evolving legal, financial, and infrastructure conditions across the two countries.

❖ **Key Risks Identified**

Multiple layers of risk were involved in this project. The most significant was coordination and timeline risk; over a three-year period, there was an increased likelihood of resource discontinuity, regulatory amendments, or changes in customer expectations. Technical risks were also high, given the weight and fragility of the press machine, which demanded precise handling, lifting, and securing protocols. Furthermore, the lack of formal risk transparency in earlier phases meant that small missteps could easily escalate if left unmonitored.

❖ **Risk Mitigation Strategies**

To manage these risks effectively, the project team employed a formal risk assessment and scoring model. Initially, the project was rated at a risk level of 32 (on an internal risk scale), which was later successfully brought down to 4.5 through systematic

planning and control. Scenario-based planning played a major role; alternate transport routes and response plans were developed and vetted in advance. Collaboration between Belgium-based and Portugal-based teams ensured that permits, equipment needs, and transport documents were aligned with both countries' regulatory environments. Each piece of documentation—ranging from route surveys to stowage plans—was pre-verified to prevent discrepancies during transit or customs clearance.

❖ **Special Challenges and Field Realities**

A unique challenge was sourcing lifting equipment that complied with regulations in both Portugal and Belgium. Additionally, harmonizing technical documentation across different legal frameworks added complexity to the administrative process. Inflationary cost pressures and changing freight rates over the three-year period also required continuous adjustment to the financial scope of the project, demanding transparent client communication and cost control mechanisms.

❖ **Learnings and Risk Management Implications**

This project illustrates that quantifying risk provides a powerful foundation for visibility and control, allowing teams to proactively measure improvement and preparedness. It also highlights the fact that in long-term logistics projects, adaptability and precision in documentation matter more than speed. Most importantly, the case demonstrates the value of cross-border collaboration in reducing communication errors and improving the flexibility of execution. Overall, this case serves as a benchmark for combining technical precision, administrative accuracy, and international cooperation in the successful movement of complex project cargo.

4.12 Case Study : Dismantling and Export of Thermoelectric Plant – Panama to Honduras

Presented by: Rolando Alvarez, CEO, UpCargo Logistics

❖ Background and Project Scope

This case involved a complex $1.3 million project to dismantle and relocate a thermoelectric power plant from Panama to Honduras. The operation encompassed the movement of 163 individual cargo units totaling over 1,200 tonnes, each destined for three separate clients in Honduras. The project's complexity was driven by the variety of stakeholders, the multimodal nature of transport—including land, barge, and ocean freight—and the extensive documentation required for each cargo unit. The cross-border nature of the project further compounded the logistical and administrative challenges.

❖ Nature of Cargo and Movement Strategy

The cargo consisted of large-scale industrial components, including turbines, transformers, and engines, which had to be dismantled and categorized into 163 packages. These were then transported via road to the canal, loaded onto a barge, and eventually shipped by sea to Honduras. Each leg of the journey involved tight timelines and customs regulations unique to the transport segment and the receiving client.

❖ Key Risks Identified

Multiple risk categories emerged in this project. The most critical was coordination risk—each of the three clients had separate timelines, unloading preferences, and communication styles. This required the logistics team to manage multiple workflows simultaneously. Documentation errors also proved risky; a minor mismatch in truck license numbers led to customs halts, delaying the entire movement. Another risk came from the rigid timeline associated with the barge charter—any deviation meant delay penalties. Additionally, the route itself posed infrastructural risk, particularly at the Miraflores Locks of the Panama Canal, where cargo movement was dependent on water levels and lock availability.

❖ **Risk Mitigation Strategies**

To mitigate these risks, the team implemented several proactive strategies. Early route rehabilitation was conducted, involving structural checks and minor modifications to road segments and port access areas. Independent surveyors were deployed to physically verify vehicle identities and documentation during transit, ensuring that minor data mismatches did not snowball into larger bureaucratic issues. Buffer days were included in the master schedule to account for unforeseen delays without impacting the barge timeline. Moreover, client-specific coordination was handled with high precision—daily updates and parallel tracking systems were set up to cater to all three customers' needs without compromising operational flow.

❖ **Special Challenges and Execution Pressures**

Among the greatest challenges was the pressure from the clients, who were deeply involved in every stage of the move. The constant scrutiny meant that documentation and communication had to be flawless. Coordination between dismantling crews, port authorities, logistics teams, and clients across two countries required seamless integration. The barge transport through the Panama Canal added another layer of complexity, as cargo timing had to align with lock scheduling and water level management.

❖ **Learnings and Implications for Risk Management**

This case underscores a vital lesson: in large, multi-party operations, coordination itself becomes a major risk category. Even minor administrative delays or communication breakdowns can derail the timeline. The deployment of surveyors as real-time field validators proved instrumental in closing the gap between planned and actual movement. Finally, the project highlighted that route-based risks are not only infrastructural but also bureaucratic in nature—successful execution depends as much on cross-agency and cross-border cooperation as it does on engineering precision.

4.13 Case Study : Transport of Drier Drum Shells – China (Urban Infrastructure Obstruction)

❖ Background and Project Scope

This case involved the movement of two oversized drier drum shells from a manufacturing site in China to Qingdao Port. Each drum measured nearly 25 meters in length and over 4 meters in width, with a total weight of approximately 67 tonnes. While the operation was expected to follow a pre-surveyed and approved local highway route, a major challenge emerged mid-project when a new flyover was constructed along the transport path. This unplanned infrastructure change significantly altered the available clearance and introduced critical risks that had to be addressed immediately**.**

❖ Nature of Cargo and Route Details

The cargo consisted of industrial drying drum shells with dimensions of 24.9 meters in length, 4.15 meters in width, and 4.35 meters in height. The designated route involved road transport from the factory to Qingdao Port via public highways. Given the size of the cargo, 90 cm low-bed trailers were used to keep the elevation as low as possible and maintain safe height clearance under existing infrastructure.

❖ Key Risks Identified

The newly built flyover posed a serious height clearance risk, offering only 90 cm of vertical clearance between the cargo and the underside of the bridge. This left little margin for error or any shock absorption. There was also a regulatory risk, as clearance had to be approved by the flyover's site manager, who held the power to delay or reroute the shipment. Additionally, the narrow margin introduced potential transit risks, where even slight misalignment could cause cargo damage or create traffic hazards.

❖ Risk Mitigation Strategies

Several actions were taken to address these risks. First, 10 EXO-line low-bed trailers were deployed to reduce the overall height profile of the cargo. The project lead directly engaged the flyover's site manager and secured verbal clearance by explaining the transport plan and safety measures, avoiding a longer bureaucratic delay. A fresh route

survey was conducted using digital scanning to ensure that the height measurements were accurate and up-to-date. The entire movement was executed with the support of police escorts, rolling road closures, and tight coordination between the transport team, crane operators, and traffic authorities.

❖ **Special Challenges and Field Solutions**

The transport team faced difficulty because the local authorities had no predefined protocols for moving such oversized cargo along the newly altered road network. Since the flyover was constructed just weeks before the movement, existing route permits were nearly invalid. Additionally, due to public road usage, the transport had to be conducted at night, necessitating coordination with police for rerouting and safe passage. The project highlighted how infrastructure in rapidly developing cities can change faster than logistics plans can adapt.

❖ **Learnings and Risk Management Implications**

This case emphasizes the importance of combining engineering precision with local political and regulatory engagement. Direct communication with decision-makers, such as the site manager, was found to be more effective than going through slower, official channels. It also highlighted that transport plans in fast-developing urban areas must remain flexible and account for recent infrastructure developments. Ultimately, success depended on a proactive, relationship-driven approach to risk management and the use of precise route validation methods.

4.14 Case Study : Overland Transport of Boeing 777 Aircraft – Saudi Background and Project Scope

In support of Saudi Arabia's Vision 2030, CEVA Almajdouie Logistics—a joint venture between CEVA Logistics and Almajdouie Logistics—executed the transportation of three decommissioned Boeing 777-200ER aircraft from King Abdulaziz International Airport in Jeddah to the Riyadh Boulevard entertainment zone. The goal was to convert the aircraft into a public attraction as part of the "Boulevard Runway" during the Riyadh Season 2024. The journey covered 1,250 kilometers over a span of 14 days and involved moving massive components, including three fuselages (each about 70 meters long and 120 tons), six wings, and additional aircraft parts.

❖ **Key Risks Identified**

The operation encountered multiple logistical and operational risks. The primary concerns were infrastructure limitations, especially in navigating oversized cargo through urban and rural terrains without causing damage to roads or public structures. Regulatory and coordination challenges were also significant, requiring the temporary shutdown of over 120 power lines. Operational risks included the continuous supply of fuel for the long-distance convoy and ensuring public safety along the transport route. Furthermore, the project had to consider the public's engagement and curiosity, as such a high-profile move attracted widespread attention.

❖ **Risk Mitigation Strategies**

To address these challenges, CEVA Almajdouie deployed specialized transport equipment, including 78 axle lines of hydraulic trailers and 6x6 prime movers for the fuselages, as well as 15 extendable low-bed trailers for the wings. Comprehensive route planning was undertaken to avoid major highways, thereby minimizing infrastructure modification needs and reducing traffic impact. Extensive coordination with government bodies ensured smooth management of power line shutdowns, route clearances, and traffic control. Fuel logistics were handled by Aldrees Petroleum & Transport Services Company through mobile refueling units and extended fuel tanks on the prime movers. Additionally, community engagement efforts were made to keep the public informed and reduce disruptions, with most movements scheduled during low-traffic hours.

❖ **Special Challenges and Solutions**

The convoy faced unique challenges, including navigating large aircraft parts through city roads, requiring temporary road closures and rerouting. Standard fuel stations could not accommodate the size and needs of the convoy, making mobile fuel support necessary. The operation also required careful planning for public safety due to the intense interest and large crowds drawn to the spectacle.

❖ **Outcomes and Project Learnings**

The aircraft components were delivered successfully without any damage or incidents, demonstrating the company’s expertise in handling complex project cargo logistics. This operation not only aligned with Saudi Arabia's strategic goals but also showcased the country's ability to execute high-profile logistical tasks. Community response was largely positive, owing to proactive public engagement and clear communication.

❖ **Implications for Project Cargo Risk Management**

This case highlights several important risk management lessons for project cargo transportation. It emphasizes the need for integrated planning that includes detailed route surveys, equipment selection, and stakeholder coordination. The case also illustrates the value of operational flexibility and adaptive strategies, such as schedule shifts and alternate routing, to respond to emerging challenges. Stakeholder engagement, especially with public bodies and local communities, was pivotal in ensuring smooth execution. Finally, the project reinforces the need to evaluate and prepare for infrastructure limitations when managing oversized, high-profile cargo.

4.15 Comparative Analysis of Project Cargo Case Studies

Case Study	Sector	Key Risks	Mitigation Strategies	Unique Challenges
Rail Wagons to Sierra Leone	Mining	Port congestion, cargo damage	Barge unloading, Onsite teams, Special packaging	Remote region, port bottlenecks
Heavy Equipment to Kuwait	Defense	Security threats, delay, customs	Aircraft charter, onsite staff, customs pre-clearance	Conflict zone operation
Mining Equipment to Thailand	Mining	Urgency, customs clearance	Split cargo into airfreight lots, real-time tracking	Shutdown risk, time pressure
Ball Mills to Egypt	Mining	Infrastructure limitations	Route approvals, cargo consolidation	Oversized cargo, bridge loading
Factory Relocation UAE–UK	Manufacturing	Time compression, vibration risk	24/7 dismantling, custom crates	Precision equipment, speed
Oil Equipment to Australia	Energy	Oversize air freight, biosecurity	Antonov aircraft, regulatory liaison	Quarantine delays
Press Machine – Portugal	Industrial	Timeline planning, documentation	Risk scoring, scenario mapping	3-year planning cycle
Power Plant – Panama to Honduras	Energy	Multi-client delays, document errors	Surveyors, Buffer time, Route fixes	Route rehabilitation, barge lock
Drier Drums – China	Industrial	Low bridge clearance, permits	Low-bed trailers, personal approvals	Infrastructure gap, flyover
Boeing 777s – Saudi Arabia	Aerospace	Infrastructure, public safety	Hydraulic trailers, Power line coordination	Urban visibility, high-profile case

❖ **Description**

This table presents a comparative analysis of ten international project cargo case studies from various sectors including mining, defence, energy, aerospace, and industrial manufacturing. Each project encountered unique logistical and operational risks ranging from port congestion and infrastructure limitations to security threats and regulatory delays. The table highlights how tailored mitigation strategies such as chartering Antonov aircraft, deploying on-site engineering teams, or using specialized trailers were employed to overcome these obstacles. It also draws attention to unique contextual challenges—for instance, urban visibility issues in the Saudi Boeing 777 case, and port lock rehabilitation in the Panama–Honduras case. This analysis demonstrates the diversity of challenges in project cargo movement, while underscoring the universal need for planning, adaptability, and coordination across all sectors.

4.16 Similarities with the theme of the study

Theme	Case Examples	Key Insight
Route Planning & Surveys	Ball Mills, Drier Drums, Boeing 777s, Panama–Honduras	Route and infrastructure challenges are universal risks, especially with ODC cargo.
Documentation & Regulatory Risk	Portugal, Kuwait, Panama–Honduras, UAE–UK, Australia	Customs and permit delays can paralyze projects. Pre-clearance is essential.
Stakeholder Coordination	All 10 cases	Multi-party involvement creates communication gaps—coordination is central to mitigation.
Real-Time Flexibility	Thailand, Panama, Saudi Arabia, Portugal	Live tracking, buffer times, or scenario planning help reduce disruption.
Specialized Equipment Use	Egypt, Australia, China, Saudi Arabia	Heavy-lift transport gear is critical for oversized and sensitive cargo.
Multimodal Transport	Sierra Leone, Thailand, Panama, Australia	Blending ocean, road, and air modes helps meet time and infrastructure constraints.
Local Constraints & Workarounds	China, Saudi Arabia, Panama	Urban growth, power lines, and canal locks required adaptive local solutions.

❖ **Description**

This section analyzes how the selected case studies align with the central themes of the study, especially in the context of risk management for project cargo. Route planning and infrastructure assessment emerged as a common challenge across multiple cases such as the Ball Mills to Egypt, Drier Drums to China, and Boeing 777s in Saudi Arabia. Regulatory and documentation-related delays were another recurring theme, notably in the Kuwait, Portugal, and Australia cases, where customs and permit issues significantly affected project timelines. Stakeholder coordination was found to be a universal necessity in all ten cases, reflecting the importance of integrated communication and planning. The use of specialized equipment—like hydraulic trailers, low-bed carriers, and Antonov aircraft—proved critical in cases with high cargo sensitivity or dimensional constraints. Additionally, the integration of multimodal logistics was seen as a practical solution to overcome infrastructure gaps in challenging geographies. These findings closely mirror the issues identified in both literature and primary research.

4.17 Alignment Between Literature Review and Primary Research Findings

Theme from Literature Review	Validated by Study Findings
Importance of Route Surveys and Pre-Planning	Capt. Shivakumar emphasized route surveys as critical; case studies showed delays due to poor pre-planning; Project Operations Executive supported need for early surveys.
Technical Risks: Loading Equipment, Handling & Compatibility	Chartering Executive described incompatible slings and CG misjudgment; Management Trainee shared misloading incident; IMO and Palšaitis & Petraška highlighted loading risks.
Infrastructure and Regulatory Bottlenecks	RTO delays and complex permits reported by interviewees; Denktaş Şakar et al. discussed lack of unified legal frameworks.
Communication and Real-Time Coordination	Interviewees cited communication gaps and reliance on WhatsApp/email; Capt. Shivakumar highlighted walkie-talkies use; Literature stressed digital tool adoption.
Documentation and Insurance as Risk Transfer Tools	All interviews stressed documentation for compliance and insurance claims; literature discussed BIMCO standards and risk allocation.
Role of Technology and its Limitations	Limited tech use noted by interviewees; Onyshchenko et al. proposed advanced simulation and risk modeling tools.
Modal Choice and Its Impact on Risk and Timelines	Real-world modal comparisons (road vs. barge) demonstrated time and safety impact; literature discussed vessel suitability and modal economics.

❖ **Description**

This table provides a thematic synthesis between insights gathered from academic literature and empirical findings derived from field interviews and case studies. For instance, the importance of pre-shipment route surveys—frequently emphasized in scholarly works—was echoed by logistics professionals, including field experts like Capt. Shivakumar and project coordinators who experienced delays due to inadequate route assessments. Technical risks related to loading equipment and misalignment were discussed in both literature and interviews, with first-hand accounts from chartering and operational personnel. Similarly, regulatory hurdles, especially at the regional level (like RTO challenges), were validated by interviews and correlated with academic observations on fragmented regulatory frameworks. A noticeable gap in real-time communication and underutilization of advanced digital tools was also evident in both domains. Moreover, the discussions around modal choice—road vs. waterway, air vs. sea—highlight how transportation method directly impacts risk levels, transit timelines, and operational efficiency. This table confirms that the practical realities in project cargo logistics are closely intertwined with the theoretical constructs discussed in the literature.

Chapter 5: Findings, Suggestions and Conclusion

5.1 Findings

- **Awareness of Project Cargo Logistics**

  There was evident awareness among all the respondents regarding project cargo logistics and its importance in facilitating large-scale infrastructure and industrial projects. They were aware of the nature of project cargo, especially the intricacies involved in the movement of heavy, oversized, and high-value equipment that frequently demands customized logistical planning and execution.

- **Key Attributes in Project Cargo Handling**

  The interviews showed that route analysis, planning, and pre-dispatch inspections are all agreed to be necessary in project cargo operations. The respondents stressed that every cargo movement has to be tailored according to cargo size, terrain, and destination. Technical knowledge and foresight are essential in handling such operations effectively and safely, particularly when dealing with geographical or infrastructural limitations.

- **Role of Freight Forwarders**

  Freight forwarders were in unison considered pivotal in handling project cargo logistics. They were regarded by the respondents as facilitators who deal with documentation, customs clearance procedures, and the coordination of communications with stakeholders. Their role in avoiding risks and handling regulatory schemes is fundamental in making the movements of project cargoes seamless, on schedule, and conforming to national and international regulations.

- **Technology and Innovations**

  It was widely accepted that technology makes the handling of project cargo more efficient and reliable. GPS tracking, digital documentation systems, and real-time communication platforms were identified as best practices that facilitate more effective decision-making, enhance visibility of the cargo, and assist in preventing potential interruptions during transport.

- **Challenges Highlighted**

  Interviewees identified a number of common challenges facing project cargo logistics. Delayed regulation, inadequate multimodal infrastructure, and the intricacies of getting transport permits for oversized shipments were common themes. Port congestion and interagency coordination constraints further complicate matters, sometimes causing delay and extra costs for projects.

- **Best Practices Identified**

  A number of best practices emerged through the interviews. These include planning with clients in early stages, engagement of local authorities in route surveys and permits, and application of route simulation software. Allocation of special teams for supervision at key points of cargo movement were also recommended as an important strategy for facilitating timely and safe delivery.

- **Role of Cooperation**

  There was agreement regarding the significance of cooperation among all the stakeholders. The respondents agreed that effective project cargo operations' implementation relies on smooth coordination between the logistics suppliers, clients, governments, and port authorities. Cooperative effort enables minimization of delays, improvement in routes, and compliance with regulations, and finally, good project outcomes.

5.2 Suggestions

From the experiences learned from the interviewed professionals and an analysis of recent project cargo case studies, a few practical recommendations could be made to enhance the efficiency and trustworthiness of project cargo logistics in India. Firstly, there is a serious need for stronger public-private coordination, especially for regulatory approvals and transport permits. Implementing a single-window clearance system for project cargo would significantly reduce delays and red tape. This would speed up the transportation process and lower demurrage and detention costs.

Another key suggestion is to invest in multimodal infrastructure and dedicated project cargo corridors. Interviews indicated that the lack of connectivity between ports, roads, and inland destinations is a chokepoint. Increasing last-mile connectivity and enhancing port-side infrastructure—such as heavy-lift equipment and storage facilities—would minimize handling time and enhance service delivery.

Freight forwarders, who are crucial to this sector, need to be supported by training programs that improve their knowledge of project planning, documentation, and compliance. Industry and government can together establish certification programs in project logistics to bring about standard practice across the industry.

Moreover, the adoption of technology must be accelerated. Digital monitoring systems, automated reporting, and predictive analytics will enable logistics participants to make improved decisions, sidestep congestion, and provide increased customer transparency. Firms must also investigate utilizing digital twins and route simulation tools at the planning stage in order to optimize cargo movement. Lastly, risk management frameworks should be built into every stage of project cargo movement. Given the high value and complexity of such shipments, it is important to identify potential risks early and create contingency plans for weather disruptions, equipment failure, or geopolitical issues. Insurance coverage should be carefully reviewed and expanded to include multimodal risks.

Implementing these suggestions can help streamline operations, improve timelines, and make India a more competitive destination for large-scale logistics operations in the global project cargo market.

5.3 Conclusion

The research has discussed numerous aspects of project cargo logistics by integrating professional viewpoints, sector case studies, and field experience. By carrying out extensive interviews with professionals directly working in the field and evaluating major real-world cases, the research has indicated the major issues, best practices, and developing trends in oversized and high-value cargo handling.

It is clear that though India's project cargo sector possesses enormous potential with the country's infrastructure development and industrial growth, it still remains beset by operational limitations like regulatory timelines, inefficacious last-mile connectivity, and a lack of technical capabilities at some ports and hubs. Meanwhile, the study showed how seasoned freight forwarders, tailor-made handling approaches, and efficient coordination among stakeholders can neutralize these limitations and achieve effective transportation of difficult cargo.

The study shows that with more public-private partnership, greater investment in multimodal infrastructure, and adoption of advanced technology, project cargo logistics can become more efficient, robust, and competitive globally. Finally, this research adds to the increasing discussion of the importance of logistics innovation and strategic planning for addressing the special requirements of project cargo, and the importance of coordinating these efforts with national infrastructure objectives to further speed up India's position in international supply chains.

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