

# Analysis of Business Uncertainty in the Reefer Container Sector in the VUCA Era of Industry 4.0. Case Study

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**ABSTRACT:** This study examines the phenomenon of uncertainty in the reefer container business within the VUCA era (Volatility, Uncertainty, Complexity, Ambiguity), focusing on a domestic route case study of PT.XXX. The background of this research lies in the demand for fresh product delivery, which faces uncertainties in market conditions. The objective of the study is to identify the factors of uncertainty, classify their impacts based on relevant divisions, and provide mitigation solutions. The research methodology employed is a qualitative case study, involving observations, questionnaires, and documentation. The findings reveal that uncertainties stem from government policies, delays in vessel schedules, and fluctuations in operational costs such as fuel prices and freight tariffs. The study concludes that cross-division collaboration and improved mitigation strategies are crucial to maintaining business stability. It is recommended to enhance employee training, strengthen technology integration, and establish strategic partnerships with logistics partners to minimize the impact of uncertainties.

## 1 INTRODUCTION

The need for shipping fresh food products is a trend today [1], [2], according to speed up access to shipments with large capacities [3], refrigerated containers are needed that can keep product shipments fresh, this is based on the problem that products can be easily stale, damaged or contaminated if sent within a few days without using refrigerated containers.

PT.XXX started operating in Medan in 2016, engaged in shipping services according to a distribution activity from one place to another to facilitate consumers and has delivered to all parts of Indonesia [4], in this case PT.XXX is one of the logistics service providers that has several types of services, ranging from Reefer Container, Isotank Container, Forwarding, and Thermobox Truck.

PT XXX in this case has 4 branch offices, namely Medan, Jakarta, Surabaya and Makassar, providing

reefer container rental services, for shipments from the origin factory to the destination warehouse (Door to Door) shipments are made for routes throughout Indonesia, then renting reefer containers to be used as cold storage which is rented per period in accordance with the agreement with the customer,

This research was conducted directly at PT.XXX to explain the understanding of the reefer container rental business [5] and the phenomenon of uncertainty that occurs in running this business, this research is focused on shipping activities from Jakarta to outside Jakarta (throughout Indonesia), Ideally a company wants there to always be an increase in reefer container shipments but after observations made at PT.XXX obtained reefer container shipping data starting in 2022, 2023, and November 2024 on the Jakarta - Out route of PT.XXX as follows.

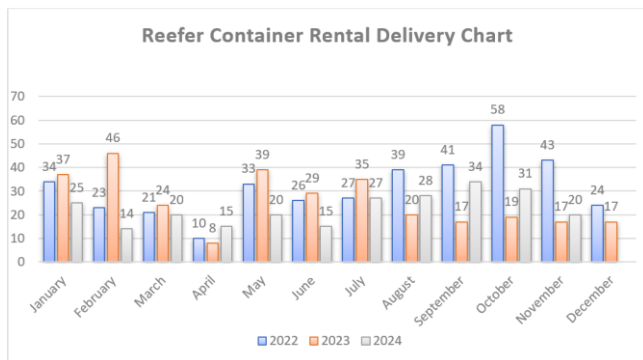


Figure 1. Fluctuation of Jakarta-Out Reefer Container Delivery Rate

Based on the graph, 2024 is the year with the lowest shipment volume, compared to previous years. The decline that occurred was due to the reduction in people's purchasing power, and due to the 2024 political year.

When viewed in the 2024 graph in January to February there was a decrease due to the election which made the delivery stop for a moment, while in March there was an increase in shipments due to the Eid religious holiday which made shipping demand increase.

However, the decline did not last long, because starting in July there was an increase again due to the Indonesian independence day held at IKN (Capital City of the Archipelago) in Balikpapan, so that many shipments headed to Balikpapan, the chart anomaly occurred because there was one customer, but made many shipments, each shipment of 3 reefer containers and it was done for 2 consecutive weeks which caused a significant increase, this continued until October 2024 due to the grand opening event of the branch in Balikpapan.

Running a reefer container business has a great opportunity but also has risks that must be considered [6], because based on one example of PT. Porman Kitchen Storefront's shipments are insured by the insurance institution (PT. Lippo General Insurance Tbk, 2024) with chicken meat commodities from Jakarta to Balikpapan with a value of Rp 250. 000,000 per container with a temperature setting of -20 ° C. It is known that the price of one reefer container unit ranges from 100 million to 450 million, then if in the delivery of 1 20 feet container can load 15 tonnes, then the accumulation of 1 kg of chicken meat at a price of Rp 40,000 then in one shipment the value of the cargo reaches Rp 600,000,000 each shipment requires insurance.

The value of the cargo does not match the actual, because if the greater the value of the goods, the greater the premium fee that must be paid, this is usually notified to the sender and has been agreed before the shipment is made.

Then, in running the reefer container [7], [8] business directly, it is known that many obstacles occur at the time of stuffing, because every shipment is based on the ship's schedule, so if there is a delay in the ship's berth, the shipping cost will increase, and this will cause losses in the shipment [9]. This loss is due to the cost of plugging or generators to supply electricity for reefer containers.

One of the shipments of PT So Good Manufacture on the Jakarta Makassar route, the delivery was delayed for 2 days, due to engine damage to the Meratus Sorong MS160N ship, so that after stuffing on 16 November 2024 it could only board the ship on 18 November 2024 so that PT.XXX suffered a loss of plugging costs for 6 shifts which were calculated to be worth approximately Rp. 2,100,000 because the container must always be kept at temperature.

This phenomenon of uncertainty cannot be predicted, in the current vuca era, vuca stands for volatility, uncertainty, complexity, and ambiguity, which means conditions of uncertainty that can occur at any time [10], [11]. This phenomenon is difficult to avoid requiring PT.XXX to take mitigation steps quickly and responsively [12].

Based on this, deeper observation is needed to find out the phenomena of uncertainty in the reefer container business which can include technological developments, changes in food industry trends, economic conditions, ship berthing schedules, force majeure, internal ship conditions (port equipment and ship engines) and weather. So that it is expected to provide an overview for someone who will start a reefer container business or reefer container business actors to better understand the phenomena that occur and can reduce losses in every shipment.

## 2 LITERATURE REVIEW

### 2.1 Reefer Container Shipping Business Theory in the Industry 4.0 Era

Shipping using Reefer Container [8], [13] was first cetuskon by Malcolm McLean, a business owner of a company engaged in land transport using a truck called 'Mc Lean Trucking Company'. Malcolm's business began to expand towards intermodal shipping from land shipping to sea shipping by buying the Pan Atlantic Steamship Company shipping company which caused him to be called the 'father of containers' because of his innovation in shipping using containers starting in 1956 through a trip from New Jersey to Puerto Rico which became the beginning of Sea Lan Service Inc.

Then in the 1950s to 1960s Malcolm McLean [14] made many shipping innovations in order to achieve shipping efficiency, then when making a voyage Malcolm McLean needed a container that could store food ingredients, then made engineering modifications by running electricity and setting the temperature in the container so that food and medicine could stay fresh and safe for a long time, then a refrigeration container was made.

### 2.2 Theory of VUCA (Volatility, Uncertainty, Complexity and Ambiguity)

VUCA [9], [15], [16] is a condition that can occur massive changes due to several factors that can be predicted or that are difficult to predict the direction of change, these circumstances are VUCA (Volatility, Uncertainty, Complexity, and Ambiguity). The term VUCA was put forward by Warren Bennis and Burt Nanus around 1987 based on leadership theory.

Technology that has regenerated to become more sophisticated makes the acceleration in the industrial revolution 4.0 look very massive, humans are increasingly easy to communicate and exchange information using digital media connected by the internet from smart devices. This development triggers complexity and the absence of a definite direction related to changes in digitalisation (ambiguity) accompanied by other sectors that affect one of them business and economy which are closely related. The business sector is currently very influential with the current trend, the current trend created by a generation and accepted by the audience can be a new thing and get great exposure, so that it can immediately increase marketing.

### 2.3 Theory of VUCA (Volatility, Uncertainty, Complexity and Ambiguity)

The individual competence of PT.XXX employees to face VUCA requires individuals who are ready to work according to (Prayesti Tyas, 2022) Brady's theory in his book there are aspects of a person who states that someone is ready to work, namely the existence of responsibility, flexibility, adaptive, skills, self-view, and self-security.

In this case (Prayesti Tyas, 2022) explains that employees need to be embedded with responsibility or responsibility to complete all tasks properly, flexibility, which means that a person has an adaptive nature that is easy to adjust to his environment, has skills or skills which means that a person who is ready to work with the abilities he has and feels able to complete every job well. Furthermore, self-view is the level of self-confidence of a person who consciously has the ability, confidence and acceptance within himself.

The last is health and safety, which means that a person can manage and maintain personal hygiene, be agile in using safety properties [17], and be physically and mentally healthy. With this, problem-solving skills will naturally emerge and increase self-confidence, honest personality, in everyone.

### 2.4 Supply Chain Integration

The individual competence of PT.XXX employees to face VUCA requires individuals who are ready to work according to Brady's theory in his book there are aspects of a person who states that someone is ready to work, namely the existence of responsibility, flexibility, adaptive, skills, self-view, and self-security.

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solving skills will naturally emerge and increase self-confidence, honest personality, in everyone.

### 2.5 Theory of Refrigerated

Refrigerated Container is a type of container that has closed ventilation with a chilling system that plays a role in maintaining temperature conditions in the container room [20], [21]. Reefer Container has several specific parts as follows:

1. Cooling Unit (Reefer Unit)  
The refrigeration unit can be a mechanical or thermal refrigeration system, and is also equipped with compressors, condensers, evaporators, and temperature control devices, and the refrigeration unit part is the main component in the reefer container.
2. Compressor  
The compressor is the original part of the refrigeration unit whose job is to compress and flow refrigerant in the system, the compressor also helps in the cooling process using moving refrigerant from the evaporator to the condenser.
3. Condenser  
The condenser is the original part of the refrigeration unit that cools the refrigerant that has been compressed. generally, this condenser is on the outside of the container and can use air or water as a cooling medium.
4. Evaporator  
Evaporator is a component contained in the container and is tasked with absorbing heat from the air in the container so that the temperature can be controlled. Refrigerant evaporates in the evaporator and absorbs heat from the environment.
5. Temperature Control and Regulatory System  
The temperature control system makes the reefer container have settings to adjust the temperature requirements according to the commodity to be transported.
6. Thermal Insulation  
Reefer containers are equipped with excellent thermal insulation materials that reduce heat transfer between the interior and exterior of the container. This insulation is crucial for maintaining a stable and efficient temperature.
7. Ventilation  
The ventilation system ensures even air circulation and temperature distribution inside the reefer container. This prevents unwanted cold or hot spots from forming or defrosting.
8. Water Disposal System  
Poly reefer containers are equipped with a system to remove water that forms because of condensation, preventing the build-up of water that can damage goods.
9. Door and Lock System  
Reefer container doors are designed to ensure airtightness and temperature tightness. The lock system is also important to keep the items inside the container safe.
10. External Control Panel  
An external control panel allows technicians to set the temperature as well as monitor the status of the refrigeration unit from outside the container. It is often equipped with temperature and operational status indicators.
11. Alarm and Monitoring System

Some reefer containers are equipped with an alarm as well as monitoring system to alert you if there is a case of sitting on the temperature or refrigeration unit.

### 2.6 Barriers in the Reefer Container Shipping Process

Shipping reefer containers there are several risks that must be considered, so that each shipment must be carried out carefully [22], as for some of the risks that can occur, namely:

1. Poor communication between stakeholders or parties involved in the process of sending reefer containers.
2. Humid environmental conditions affect the performance of reefer containers.
3. Damage to the reefer container's electricity which causes the reefer container's electrical power to decrease or die completely
4. Damage to the container machine during stuffing due to not doing SOP PTI (Pre-Trip Inspection) before the container is used.
5. Error in setting the container temperature
6. Miscommunication occurs so that the container ventilation that should be closed becomes open.

## 3 METHODOLOGY

The method in this research is a qualitative case study conducted at PT.XXX located in Sunter, North Jakarta in the period January 2025 to November 2025, while the framework in this study is as follows.

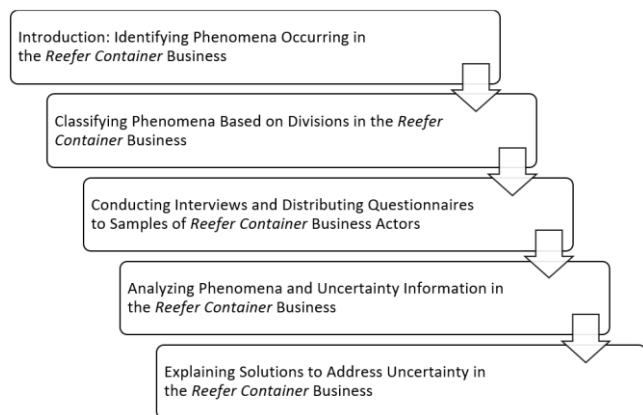


Figure 2. The Framework of Study

The following are the stages of research implementation:

#### 1. Pre-research Stages

At this pre-research stage, the researcher determines the characteristics of the informants who will fill out the questionnaire, in this process the researcher conducts research according to the research background and prepares a research proposal and questionnaire guidelines.

#### 2. Field Work Stages

At this stage the researcher began to make observations and questionnaires, namely:

- Classifying informants, namely senior sales, operations, and customer service who already have 7 to 10 years of experience in the field of shipping reefer containers.

- Researchers sent questionnaires to 6 random companies engaged in the reefer container shipping business.
- Researchers conducted an analysis of the questionnaires that had been made.

#### 3. Data Analysis Stages

Based on the results of questionnaires, observations and company document studies, researchers deeply analyse each information obtained and relate it.

##### 3.1 Data Collection Methods

Data collection techniques carried out by researchers during the research process in qualitative methods are carried out in three ways, namely:

##### 1. Observation

Observation or observation carried out by this researcher was carried out in a massive manner, the researcher made direct observations at the location of the PT.XXX company because the researcher was an employee at PT.XXX so that the researcher could understand more deeply about all the events that occurred.

##### 2. Questionnaire Filling

The questionnaire made in this study is the result of actual identification carried out by researchers while working in the reefer container business field which is assisted by the supervisor in improving the writing structure, the questionnaire contains questions and statements related to the phenomena of uncertainty in the reefer container shipping business services.

##### 3. Documentation

This documentation is carried out using media in the form of company documents in the form of: epolish, invoices, minutes, road letters, drawings, photographs, and recordings that can be accurate evidence in conducting research to focus more on research problems [23].

## 4 RESULTS AND DISCUSSION

Based on the data obtained in this study, the results obtained in this study are as follows:

#### 4.1 Uncertainty Phenomena Affecting Reefer Container Business Stability

To find out the phenomena of uncertainty that occur in the reefer container business at PT.XXX, research is carried out by direct observation in the field, then conducting questionnaires to 18 participants consisting of 6 different companies, from 3 different divisions.

Starting from the marketing or sales division of 6 people, then the customer service division of 6 people, and the operational division of 6 people, all participants are seniors in their division in the field of reefer containers who have been running the reefer business for more than 7 years.

With this questionnaire he provided a lot of his knowledge and experience in the reefer container business, besides that, documentation of the problems that occurred, and evidence that strengthened the research.

The evidence is invoices, photos, and company data that will complement this research. Besides that, research was also carried out on the stuffing, monitoring and dooring processes on each shipment during January 2024 to November 2024.

#### 4.2 *Existence of Shipping Agent as Owner of SOC Reefer Container*

Shipping agent is the first company to provide rental services for multi-mode reefer container transportation, shipping reefer containers between islands can only be done by sea or using ships, shipping agents are here to make it easier for customers to meet the needs of shipping products out of Java Island.

Shipping agents have a professional workforce in their fields specifically for shipping reefer containers, shipping agent companies will arrange all the necessary needs such as supporting documents such as insurance, quarantine, SI (Shipping Instruction) documents, DO (Delivery Order Get In and Get Out), and shipping agents make it easier for customers to send products without having to go through long and complex bureaucracy.

#### 4.3 *Uncertainty Phenomena in the Era of VUCA (Volatility, Uncertainty, Complexity, and Ambiguity)*

The VUCA era according to (Rani Afkarina et al., 2023) is a condition that can occur massive changes due to several factors that can be predicted or that are difficult to predict the direction of change, these circumstances are VUCA (Volatility, Uncertainty, Complexity, and Ambiguity).

Based on the journal (Soraya et al., 2022) the term VUCA was put forward by Warren Bennis and Burt Nanus around 1987 based on leadership theory. Technology that has regenerated to become more sophisticated makes the acceleration in the industrial revolution 4.0 look very massive, humans are increasingly easy to communicate and exchange information using digital media connected by the internet from smart devices.

This development triggers complexity and the absence of a definite direction related to changes in digitalisation (ambiguity) accompanied by other sectors that affect one of them business and economy which are closely related (Prof. Imron Arifin, 2019). is a condition of uncertainty that makes instability in the reefer container business, this includes:

1. Influence of Indonesia's Economic Development on Reefer Container business
2. Competition in the Reefer Container Business
3. Analysis of the State of Market Demand in Reefer Container Shipping
4. Influence of Government Policy with the Sustainability of Reefer Container Business
5. The influence of shipping companies on the Reefer Container business
6. The Influence of Shipping Companies on the Reefer Container Business
7. Sustaining Reefer Container Business in the VUCA Era of Industrial Revolution 4.0
8. Integration Complexity in the Reefer Container Shipping Business.

## 5 CONCLUSIONS

Based on the results of the research that has been conducted, several conclusion points are obtained that support the research objectives, The phenomenon of uncertainty in the reefer container business includes various aspects that mutually affect the stability of the company's operations and strategies. External factors such as fluctuations in the national economy, seasonal changes, rising operational costs, and logistical challenges due to natural disasters and the global climate create complex dynamics. In addition, inter-company competition and technology-driven changes in consumer trends reinforce the need for business adaptation. Internally, marketing divisions face challenges in responding to market fluctuations and competitor strategies, while service divisions need to improve communication, document management, and technology implementation. Operations divisions face risks from equipment breakdowns, bad weather, and schedule delays. By understanding and managing these uncertainties holistically, companies can improve competitiveness and ensure business sustainability.

In terms of internal policies and co-operation with external parties, companies can adopt a cross-subsidisation strategy to reduce operating costs and offer more competitive prices. Strong relationships with shipping partners and trucking vendors need to be built to ensure efficiency in the shipping process. In addition, co-operation with relevant authorities is important to facilitate document management and quarantine processes. For divisional development and increased customer focus, companies can involve the sales team in developing customer relationships, so as to add value to the service. Providing regular schedule updates to customers can also maintain transparency and build trust. Finally, providing customised solutions for customers with specific needs in reefer container shipping will increase customer satisfaction and loyalty. By understanding and implementing the above solutions, companies can effectively manage uncertainty, maintain the stability of the reefer container business, and increase customer satisfaction.

Factors affecting the shipping and logistics industry include seasonal changes, government policies, competition among shipping companies, logistics bottlenecks, and changing consumer trends. Severe weather changes can disrupt the delivery of goods, while government policies, such as rising fuel costs and port fees, increase the burden of operating costs. Fierce competition between shipping companies with their own fleets and shipping agents that rent reefer containers leads to differences in shipping prices. Logistical obstacles such as natural disasters can cause delays in shipments, and changes in consumer trends, such as increased demand for instant food, affect the types of goods shipped. All these factors influence each other, impacting the cost, volume, and delivery time of goods.

The shipping strategy we implement focuses on adapting to ship berthing schedules to optimize time and cost efficiency. We ensure that the stuffing time is aligned with the ship's berthing schedule, to avoid additional costs such as plugging fees, which can be incurred if the ship is late. Once the ship is docked, we prepare transportation to transport the containers to

the stuffing location and ensure the loading and unloading process is done on time. With this approach, we strive to reduce operational costs and improve shipping efficiency.

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