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BREAK BULK CARGO CHALLENGES FACED BY FREIGHT FORWARDERS AND CARRIERS

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Abstract: Break bulk cargo shipments involve transporting goods that must be loaded individually, often because they are oversized, heavy, or uniquely shaped. Freight forwarders and carriers handling break bulk cargo face distinct challenges that can impact operational efficiency and cost-effectiveness. This study examines key obstacles such as limited port infrastructure, the need for specialized equipment, complex handling and storage procedures, and the risks of cargo damage during loading and transit. Additionally, regulatory hurdles, customs documentation issues, and coordination difficulties between various service providers contribute to shipment delays and increased costs. Weather disruptions and geopolitical uncertainties further exacerbate operational risks. Through industry analysis and professional insights, the study highlights the urgent need for better planning, investment in modern handling technologies, and stronger collaboration between freight forwarders, carriers, and port authorities. The research also recommends adopting advanced tracking and risk management systems to enhance the reliability and safety of break bulk cargo operations. Understanding these challenges is crucial for improving service quality, reducing delays, and maintaining competitiveness in the break bulk shipping sector.

Keywords: Break Bulk Cargo, Freight Forwarders, Carriers, Shipping Challenges, Cargo Handling

I. INTRODUCTION

Break bulk cargo refers to products shipped in fragments, unlike bulk or containerized shipments. This form of shipping is essential for industries dealing with large, heavy, or irregularly shaped commodities, such as machinery, steel, automobiles, and construction materials. Break bulk shipping has been a crucial aspect of international trade for centuries, with goods being manually loaded and unloaded in various forms.

It has been used for ancient trade routes, the Industrial Revolution (18th-19th Century), and the rise of containerization in the 20th century. Despite the revolution, break bulk shipping remains used for oversized and irregular cargo. Today, heavy industries, infrastructure projects, and large freight that cannot be containerized still rely on break bulk shipment. The modern era has seen advancements in digital logistics and handling equipment making break bulk shipping more efficient.

Break bulk cargo is a type of transportation that involves moving items as individual components, such as machinery, steel coils, and automobiles, rather than in containers. This method is suitable for items like machinery, turbines, and construction equipment that cannot be containerized. Break bulk cargo is difficult to handle due to its various sizes and shapes, necessitating meticulous planning for storage space and cargo safety. It requires more labor and equipment, as it requires hand-loading and unloading, which can lead to longer port stays and increased handling time. It is ideal for heavy or oversized items like industrial machinery, turbines, and construction equipment, often classified as "project cargo."

However, break bulk cargo also comes with increased shipping and handling costs, higher port fees, and potential damage to cargo. Longer loading and unloading times are required due to the separate handling of each unit. Secure stowage and lashing are essential to prevent cargo shifting during transit. Break bulk cargo is ideal for smaller ports without infrastructure for container handling, as they can be loaded and unloaded using conventional cranes or onboard equipment. However, break bulk freight is more vulnerable to theft and damage compared to containerized shipments, and proper documentation, freight monitoring, and security measures can help reduce these risks.

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Break bulk cargo includes project cargo, heavy lift cargo, out-of-gauge cargo, non-containerized cargo, roll-on/roll-off cargo, bulk liquid cargo, and dry bulk cargo. Project cargo involves large, bulky products requiring special logistics and management. Heavy lift cargo involves heavy machinery and requires specialized handling. Non-containerized cargo includes large or unusually shaped items. Roll-on/roll-off cargo involves vehicles and equipment.

Break bulk cargo shipments are ideal for large and irregular items, offering cost-effectiveness, flexibility in shipping, reduced damage risk, access to limited infrastructure ports, and more effective handling of special cargo. These shipments are suitable for steel pipes, construction equipment, and large machinery, and can be transported through smaller or less developed ports.

Problem of the Study

Break bulk cargo, which requires individual loading, presents unique logistical, operational, and financial challenges for freight forwarders and carriers. These shipments vary in size, weight, shape, and handling requirements, making them more complex to plan, transport, and deliver efficiently. Issues include inadequate port infrastructure, inconsistent cargo handling practices, high risk of damage or loss, delays due to manual operations, limited specialized equipment availability, and coordination difficulties among stakeholders. Despite their critical role in sectors like construction, oil and gas, and heavy machinery, there is limited research on systemic challenges faced by logistics providers.

Need for the Study

The study aims to improve break bulk cargo handling efficiency by identifying bottlenecks, reducing cargo damage, theft, and pilferage, and enhancing cost-effectiveness by analysing freight rates, labour costs, and port handling charges. It also examines port infrastructure constraints and proposes solutions for timely deliveries. The study also explores the role of digitalization and automation in logistics, ensuring compliance with international regulations and safety standards, and providing insights for freight forwarders and carriers to adapt to market demands and customer satisfaction.

Objective of the Study

Primary Objective

- To understand the challenges faced by freight forwarders and carriers in handling break bulk cargo, including loading, unloading, and storage issues.

Secondary Objective

- To understand the regulatory and compliance issues affecting break bulk cargo movements across different regions and ports.
- To assess the infrastructure limitations at ports and terminals that affect the efficiency of break bulk cargo operations.
- To research the effects of supply chain interruptions, delays, and traffic on the movement of break bulk cargo. and overall logistics efficiency.

Scope of the Study

- It identifies operational issues like cargo handling, loading/unloading, storage, and transportation inefficiencies.
- It analyses cost-related challenges like freight rates, labour expenses, and port charges.
- It explores regulatory and compliance issues related to customs clearance, documentation, and safety standards.
- It evaluates infrastructure limitations at ports, terminals, and storage facilities.
- It investigates cargo security risks and suggests mitigation best practices.
- It examines technological advancements in digitalization and automation.
- It provides strategic recommendations for operational efficiency, cost reduction, and supply chain reliability.

II. LITERATURE REVIEW

- **Smith, J., Patel, S., & Garcia, M. (2023):** "Challenges in Break Bulk Cargo Logistics: Operational and Economic Perspectives"**.** The aim of this review is to offer a thorough examination of the challenges faced by freight forwarders and carriers in break bulk cargo shipments. The study identifies major logistical problems, including the requirement for experienced labour to ensure efficient loading and unloading, high operational costs related with manual labour and specialized equipment, and logistical complexity resulting from the variable shapes and sizes of break bulk goods. The impact of shifting fuel prices and international trade regulations on the effectiveness of break bulk transportation is also highlighted in the analysis.

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- **Lee, Wang, and Khan (2022):** "Break Bulk Cargo Transportation: Challenges and Technological Solutions". This review presents a detailed review of the issues freight forwarders and carriers face in break bulk cargo transportation. They examine issues such ineffective port infrastructure that causes delays, security threats brought on by cargo exposure while in transit, complicated regulations pertaining to international shipping compliance, and technical limitations that prevent automation in handling. In order to get beyond these obstacles and enhance break bulk logistics, the report highlights the importance of digitalization, risk management, and strategic planning.
- **Brown, R., & Wilson, T. (2021):** "Financial Strategies in Break Bulk Shipping: Costs, Risks, and Optimization"**.** They examine the financial effects of managing break bulk cargo, paying particular attention to the effects of changing freight rates, port fees, and insurance premiums. In addition to discussing how market volatility impacts profitability, the authors offer cost-cutting tactics include shipping route optimization, real-time cargo tracking investments, and using bulk contracts with suppliers to stabilize costs.
- **Johnson, M., & Cooper, L. (2020):** "Regulatory Frameworks in Break Bulk Logistics: Compliance and Challenges"**.** They examine how regulatory and policy frameworks influence break bulk logistics. Their study highlights the challenges posed by inconsistent customs regulations across different countries, delays caused by excessive documentation requirements, and the necessity of standardized international procedures to guarantee compliance while reducing bureaucratic inefficiencies.
- **Martinez, P., & Gomez, H. (2019):** "Sustainable Break Bulk Shipping: Environmental Challenges and Solutions". They explores the effects of break bulk shipment on the environment, paying special attention to carbon emissions and fuel use. The authors discuss how the adoption of eco-friendly port operations, cleaner fuel alternatives, and sustainable cargo handling practices can reduce the environmental footprint of break bulk logistics. They also highlight legislative efforts and regulatory pressures that promote the use of environmentally friendly shipping methods.
- **Davis, N., & Thompson, E. (2018):** "Workforce Management in Break Bulk Logistics: Safety, Training, and Efficiency". They focus on labour-related concerns when transporting broken bulk material. Their study highlights how crucial personnel training is to improving operational effectiveness and safety. The study finds shortage of competent workers might result in more accidents, delays, and cargo damage. It implies that the productivity of break bulk shipping operations can be greatly increased by funding safety precautions and employee training initiatives.

III. RESEARCH METHODOLOGY

Research methodology is the methodical approach used in a research study to collect, analyze, and interpret data in a structured and scientific manner. It entails establishing the research problem, developing hypotheses, picking a good research design, and figuring out how best to gather and analyze data. Selecting a sample strategy, guaranteeing the authenticity and reliability of the data, and resolving ethical issues like informed permission and confidentiality are further components of the process. A clearly established research technique guarantees the study's objectivity, reliability, and reproducibility. It assists researchers in solving difficult problems, coming to well-informed conclusions, and adding significant information to their disciplines. Methodologies may be qualitative, quantitative, or a mix of the two, depending on the type of study. For any research project to be successful and produce accurate data, a solid technique is essential.

3.1 Research Design

Descriptive Research Design

Descriptive research design is a systematic method for collecting, analyzing, and presenting information about a specific phenomenon, group, or situation. It aims to provide a thorough understanding of a subject by answering questions like "what," "who," "where," "when," and "how." It is commonly used in social sciences, business, healthcare, and market research to investigate habits, trends, and traits.

3.2 Sampling Techniques

Purposive Sampling

Purposive sampling is a non-probability sampling technique where researchers deliberately choose participants based on predetermined standards like experience, knowledge, or study relevance.

Sample Area

Freight forwarding & carrier companies, Chennai.

Sample Size

200 samples each from freight forwarding & carrier companies.

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3.3 Method of Data Collection

Primary Data

Primary data is information that has been collected directly from the source for a specific purpose.. It is obtained using techniques like surveys, interviews, experiments, and firsthand observations. Since original data is gathered directly from the source, it is typically accurate, current, and pertinent to the goals of the researcher. However, because acquiring primary data necessitates enough preparation, resources, and effort, it can be expensive and time-consuming. Primary data offers insightful information, but there are drawbacks to take into account, including biased responses, trouble reaching a large sample, and high expenses. Primary data is frequently used by organizations, researchers, and businesses to make well-informed decisions.

Secondary Data

Secondary data is information that has already been collected and published by others. Research papers, periodicals, corporate records, government reports, and internet databases are some of the sources from which it is gathered. When primary data collecting is impractical or unneeded, secondary data is frequently employed since it saves money and time. Its precision is dependent on the validity of the original source, though, and it might not always be tailored to the researcher's requirements. Companies frequently use secondary data for market research, such as examining historical sales data to forecast future demand or relying on public reports to analyze industry trends. Before using secondary data to inform decisions, researchers should confirm its validity and applicability, even though it can be helpful for comprehending broad trends and historical Insights.

3.4 Questionnaire Design

In this questionnaire, I have used the personal details of the employees who working in freight forwarding and carrier companies and their perceptions towards challenges in managing break bulk cargo. The first part involves five questions like Age, Gender, Qualification, Job Position, Experience. The second part involves agreement statements on challenges.

3.5 Limitations Of Study

- Period of study was restricted to three months.
- Since the logistics and shipping company has less no. of employees, it is difficult to collect the required samples.

IV. STATISTICAL TOOL

a) Descriptive Statistics

Freight Forwarders

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Operational & Coordination Challenges	200	5	22	10.15	2.755
Infrastructure & Handling	200	5	21	12.88	2.916
Documentation & Compliance	200	7	25	12.66	2.912
Cost, Insurance, Risk	200	6	22	13.64	2.981
Valid N (listwise)	200				

Inference

The study reveals that operational and coordination challenges have the lowest mean score of 10.15, while cost, insurance, and risk have the highest. Infrastructure & handling and documentation & compliance have similar mean values of 12.88 and 12.66, indicating moderate variability.

Carriers

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Operational & Cargo Handling	200	5	17	8.94	2.252
Port Infrastructure & Equipments	200	5	18	10.74	3.251
Safety, Security & Documentation	200	5	22	10.22	2.836
Financial & Commercial Issues	200	6	20	10.50	3.504

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Valid N (listwise)	200				

Inference

The study reveals that port infrastructure and equipment have the highest mean score (10.74), followed by Operational and cargo handling (8.94). Financial and commercial issues, safety, security, and documentation have the lowest mean values (10.22 and 10.50), with a moderately distributed response from carriers.

b) Regression Analysis

Freight Forwarders

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.578[a]	.334	.324	2.398

a. Predictors: (Constant), Cost, Insurance & Risk, Operations & Coordination, Documentation & Compliance

b. Dependent Variable: Infrastructure & Handling

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	564.950	3	188.317	32.753	.000[b]
	Residual	1126.925	196	5.750		
	Total	1691.875	199			

a. Dependent Variable: Infrastructure & Handling

b. Predictors: (Constant), Cost, Insurance & Risk, Operations & Coordination, Documentation & Compliance

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	3.633	.985		3.688	.000
	Operations & Coordination	.131	.067	.124	1.955	.052
	Documentation & Compliance	.400	.067	.400	6.009	.000
	Cost, Insurance & Risk	.208	.062	.213	3.379	.001

a. Dependent Variable: Infrastructure & Handling

Inference

The regression analysis reveals that the model explains 33.4% of the variance in Infrastructure & Handling, with cost, operations & coordination, insurance & risk, and documentation & compliance as significant predictors. The model's standard error is 2.398, indicating moderate prediction accuracy.

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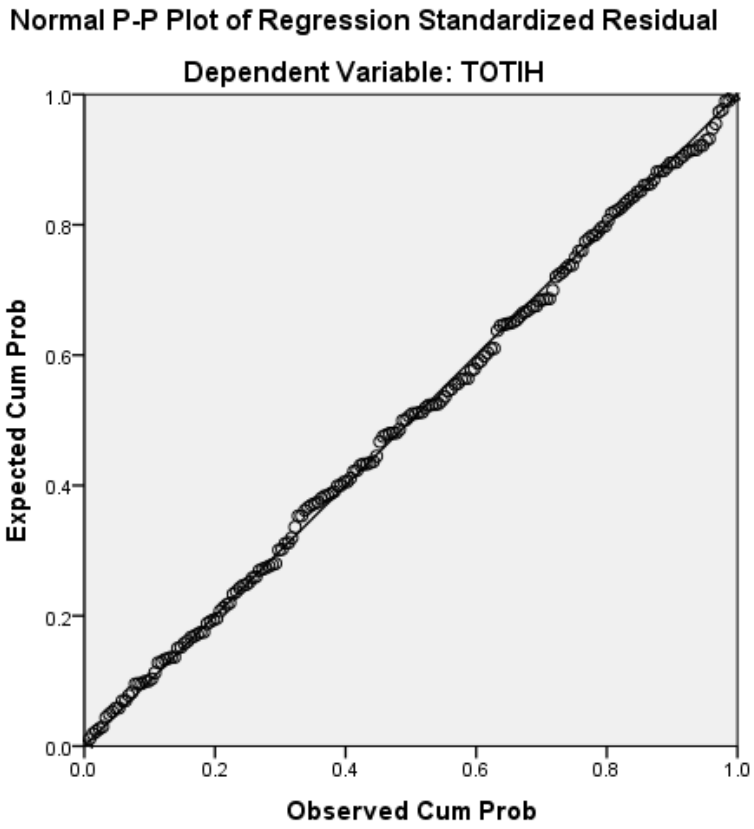

Carriers

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.668[a]	.446	.437	2.439

a. Predictors: (Constant), Operational & Cargo Handling, Financial & Commercial Issues, Safety, Security, Documentation

b. Dependent Variable: Port Infrastructure & Equipments

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	937.272	3	312.424	52.532	.000[b]
	Residual	1165.683	196	5.947		
	Total	2102.955	199			

a. Dependent Variable: Port Infrastructure & Equipments

b. Predictors: (Constant), Operational & Cargo Handling, Financial & Commercial Issues, Safety, Security, Documentation

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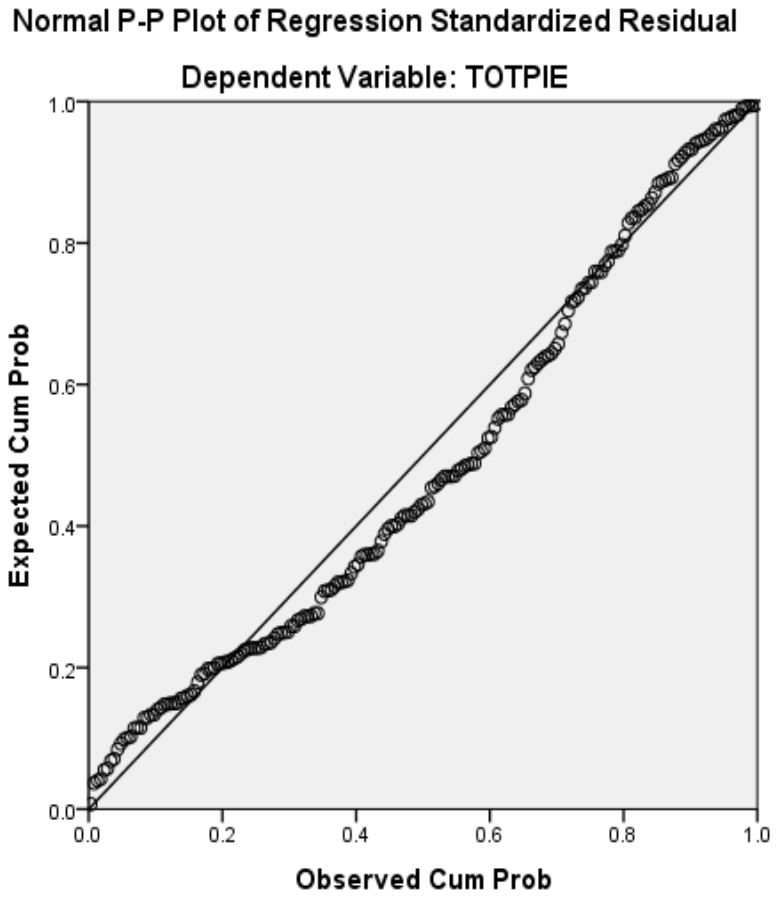
Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.196	.835		1.433	.153
	Safety, Security, Documentation	.302	.076	.264	3.985	.000
	Financial & Commercial Issues	.362	.057	.390	6.316	.000
	Operational & Cargo Handling	.297	.084	.206	3.530	.001

a. Dependent Variable: Port Infrastructure & Equipments

Inference

The regression model predicts Port Infrastructure & Equipments, explaining 44.6% of the dependent variable's variance. It is statistically significant and relies heavily on three predictors: Operational & Cargo Handling, Safety, Security, Documentation, and Financial & Commercial Issues, with the latter having the greatest impact.



c) Anova

Freight Forwarders

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ANOVA

Infrastructure & Handling

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	359.670	15	23.978	3.312	.000
Within Groups	1332.205	184	7.240		
Total	1691.875	199			

Inference

The test statistic for the ANOVA is F-value = 3.312. It contrasts the variation within the groups with the variation between them. 0.000 is the significance (Sig.) p-value. It is less than 0.05, which indicates that the outcome is statistically significant.

Carriers

ANOVA

Port Infrastructure & Equipments

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	364.615	12	30.385	3.269	.000
Within Groups	1738.340	187	9.296		
Total	2102.955	199			

Inference

The F-value or variance between groups divided by variance within groups, is 3.269. 0.000 is the significance (Sig.) p-value. It is less than 0.05, which indicates that the outcome is statistically significant.

V. SUGGESTIONS

To improve cargo handling efficiency and reduce damage, train employees in break bulk handling techniques. Coordinate with stakeholders, conduct cargo surveys, and create comprehensive stowage and lifting plans. Invest in cutting-edge handling tools and work early with stevedores and port authorities to secure berthing slots. Implement cargo insurance and risk management procedures to protect against financial losses. Implement digital tools for improved visibility and operational control. Maximize vessel space usage, lower freight costs, and streamline logistics coordination for large and oversized cargo. Monitor weather forecasts and make backup plans for goods. Improve cargo paperwork for easier customs clearance and reduce extra costs. Encourage flexible scheduling agreements with clients and carriers to account for potential delays and reduce costs.

VI. CONCLUSION

Carriers and freight forwarders have many difficulties when handling break bulk cargo. Break bulk cargo, in contrast to containerized shipments, necessitates specific handling, tailored storage options, and close coordination throughout the whole transit process. While carriers deal with operational inefficiencies, restricted vessel space optimization, and greater personnel expenses, freight forwarders must manage complicated paperwork, a variety of cargo dimensions, increased damage risks, and port congestion. Complexity is further increased by uneven port infrastructure and disparate national regulatory requirements. Strong planning, the purchase of qualified personnel and equipment, cooperation from all parties involved, and the use of technology to enhance risk management, coordination, and tracking are all necessary to overcome these obstacles. Maintaining service quality and customer happiness as well as the overall cost-effectiveness and competitiveness of logistics operations depend on the appropriate management of break bulk cargo.

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