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Improvement of LCL consolidation and FCL by focusing on CHA procedures

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Abstract: The efficiency of cargo handling plays a pivotal role in global trade, particularly in optimizing Less-than-Container Load (LCL) and Full Container Load (FCL) operations. This study explores the enhancement of LCL consolidation and FCL shipping by streamlining Customs House Agent (CHA) procedures. By identifying bottlenecks in documentation, inspection, and clearance processes managed by CHAs, the research proposes procedural reforms and digital integration to reduce delays and costs. Emphasis is placed on improved coordination between stakeholders, adoption of automated systems, and adherence to compliance protocols. The findings suggest that focused improvements in CHA operations can significantly boost the effectiveness of container utilization, reduce lead times, and enhance overall supply chain performance.

I.INTRODUCTION

LCL (Less than Container Load) consolidation and FCL (Full Container Load) are key methods of cargo handling in international shipping, particularly at Container Freight Stations (CFS). In LCL consolidation, cargo from multiple shippers is combined into one container, while FCL involves a single shipper using an entire container. The role of a Customs House Agent (CHA) is vital in ensuring smooth operations at the CFS. For LCL shipments, CHAs manage documentation for each consignee, coordinate cargo segregation, and oversee customs clearance for consolidated cargo. In FCL, the CHA ensures that the single consignee's cargo is properly documented, sealed, and customs-cleared without delays. CHAs play a critical role in liaising with customs officials, arranging cargo inspections, and ensuring compliance with import-export regulations. Their efficiency directly affects the turnaround time at the CFS, making them indispensable to the seamless movement of both LCL and FCL cargo through international supply chains.

This study aims to examine the existing CHA procedures within the LCL consolidation and FCL process identify the root causes of inefficiencies, and propose practical enhancements. By focusing on CHA activities, the research seeks to improve the overall performance of LCL and FCL logistics, reduce clearance time, and enhance coordination among freight forwarders, customs officials, and other stakeholders. The goal is to streamline the process to meet the growing demands for timely, cost-effective, and reliable international cargo movement.

Statement of the Problem:

The process of LCL (Less than Container Load) consolidation is designed to offer a cost-effective and flexible solution for international cargo movement, especially for shippers with smaller volumes. However, the effectiveness of LCL shipments is significantly compromised by inefficiencies in Customs House Agent (CHA) procedures. These inefficiencies stem from issues such as manual documentation, lack of digital integration, procedural redundancies, and poor coordination between various stakeholders including freight forwarders, customs officials, and port authorities.

Such operational bottlenecks result in shipment delays, increased clearance times, higher costs, and a lack of transparency in the logistics chain. These challenges not only affect the overall service quality but also reduce customer satisfaction and hinder the competitiveness of logistics service providers.

Despite the critical role CHAs play in the clearance and consolidation process, there has been limited focus on analysing and optimizing their procedures to meet the evolving demands of modern logistics. Therefore, there is a pressing need to systematically examine the current CHA practices and implement improvements to enhance the efficiency and reliability of LCL consolidation.

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OBJECTIVES

Primary objectives:
To analyze the existing Customs House Agent (CHA) procedures involved in Less than Container Load (LCL) consolidation and to propose effective strategies for improving operational efficiency, reducing delays, and enhancing the overall performance of the LCL consolidation process.

Secondary Objective
Optimized Space Utilization – Maximize the efficiency of container space by consolidating LCL shipments or managing FCL loads to reduce empty container movement.
Cost Reduction – Lower shipping costs for customers through cargo consolidation, reducing per-unit transportation expenses
Supply Chain Efficiency – Improve logistics operations by ensuring smooth handling, storage, and transportation of consolidated cargo.
Minimization of Transit Time – Ensure timely consolidation and deconsolidation
to minimize delays and improve overall delivery schedules.
Cargo Safety and Security – Enhance security by reducing handling risks and implementing stringent cargo monitoring.
Regulatory Compliance – Ensure all customs and trade regulations are met for smooth international shipping.

II. REVIEW OF LITERATURE

Christopher (2016) highlighted that containerization (both FCL and LCL) has drastically reduced international shipping costs and improved global trade flows.
Christopher (2016) emphasized that containerization, encompassing both Full Container Load (FCL) and Less than Container Load (LCL), has significantly transformed global logistics by lowering shipping costs and streamlining cargo handling. Standardized containers enable efficient loading, unloading, and transfer between transport modes, reducing port congestion and turnaround times. This efficiency leads to cost savings for shippers and enhances supply chain reliability. As a result, businesses can expand internationally with reduced logistical barriers. Furthermore, containerization minimizes cargo damage and theft, further improving operational efficiency. Collectively, these advantages have facilitated increased global trade flows and supported the growth of international markets and commerce.

Notteboom and Rodrigue (2017) emphasized that LCL consolidation plays a crucial role in serving SMEs (small and medium enterprises) that cannot fill an entire container.
Notteboom and Rodrigue (2017) emphasized that Less-than-Container Load (LCL) consolidation is vital for small and medium-sized enterprises (SMEs) that cannot fill an entire container. LCL services allow multiple shippers to share container space, enabling SMEs to access international markets without bearing the full cost of a Full Container Load (FCL). This approach reduces shipping expenses, lowers inventory holding costs, and provides greater flexibility in shipment sizes and frequencies. By facilitating more manageable and cost-effective logistics solutions, LCL consolidation empowers SMEs to participate in global trade, enhancing their competitiveness and integration into international supply chains.

Sople (2018) discussed that FCL shipments offer greater control over cargo handling, reducing the risk of damage compared to LCL shipments.
Sople (2018) highlighted that Full Container Load (FCL) shipments offer greater control over cargo handling, thereby reducing the risk of damage compared to Less than Container Load (LCL) shipments. In FCL shipping, a single shipper utilizes the entire container, which is sealed at the origin and remains unopened until it reaches its destination. This exclusivity minimizes handling, as the container does not require consolidation or deconsolidation with other shipments, reducing the chances of cargo being mishandled or damaged during transit. Conversely, LCL shipments involve multiple shippers sharing container space, necessitating additional handling during the consolidation and deconsolidation processes, which increases the risk of damage due to more frequent movement and potential stacking of incompatible goods. Therefore, FCL shipments provide enhanced security and protection for goods, making them a preferred choice for shippers concerned about cargo integrity

Rushton et al. (2017) observed that LCL services enable logistics providers to optimize container space, leading to better asset utilization.
Rushton et al. (2017) observed that Less-than-Container Load (LCL) services enable logistics providers to optimize container space, leading to better asset utilization. By consolidating shipments from multiple shippers into a single container, LCL maximizes the use of available space, reducing the number of partially filled containers in transit.

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This approach not only lowers transportation costs but also minimizes environmental impact by decreasing the total number of shipments required. Efficient space utilization through LCL allows logistics providers to improve operational efficiency, offer flexible shipping options to clients, and enhance overall supply chain performance. Consequently, LCL services play a crucial role in achieving cost-effective and sustainable logistics operations

Hummels (2018) suggested that improved consolidation strategies for LCL can significantly reduce per-unit transportation costs for exporters.

Hummels (2018) suggested that improved consolidation strategies for Less-than-Container Load (LCL) shipments can significantly reduce per-unit transportation costs for exporters. By efficiently grouping smaller shipments from multiple exporters into a single container, logistics providers can maximize container space utilization, leading to economies of scale. This approach minimizes the number of partially filled containers, reducing the total number of shipments and associated handling costs. Consequently, exporters benefit from lower transportation expenses per unit, making international trade more accessible, especially for small and medium-sized enterprises. Additionally, optimized consolidation enhances supply chain efficiency and reliability, further supporting exporters in competitive global markets.

III. RESEARCH METHODOLOGY

Research design

In the CFS operations, a mixed-methods research approach is often adopted, integrating both quantitative and qualitative data. This methodology facilitates a comprehensive understanding of operational efficiency, customer satisfaction and process optimization. Quantitative data might encompass metrics such as cargo throughput, turnaround times, and equipment utilization rates. Qualitative data could be derived from stakeholder interviews and observational studies, providing insights into operational challenges and opportunities for improvement.

Container Freight Stations (CFSs) are critical nodes in international supply chains, facilitating the handling of Less-than-Container Load (LCL) and Full Container Load This research is designed to systematically study and compare the operational processes, efficiency factors, and challenges related to LCL consolidation and FCL handling in a CFS environment.

Research Gap

While existing literature comprehensively addresses the broader operational dynamics of LCL (Less than Container Load) consolidation and FCL (Full Container Load) logistics at a global and national level, there remains a significant gap in understanding how these concepts are specifically applied and optimized within individual container freight stations like Triway. Most studies focus on general logistics trends, technological advancements, and supply chain efficiency; however, very few provide granular, facility-level insights into how container freight stations manage the operational challenges between LCL and FCL cargo, particularly in an Indian context.

There is limited research examining how mid-sized CFS operators like Triway utilize digitalization, warehouse infrastructure, and cargo tracking systems to improve LCL consolidation processes while balancing the faster throughput needs of FCL cargo. Additionally, while global studies highlight the importance of sustainability and cargo security, there is insufficient data on how Triway adapts these trends in real-world practices, particularly regarding customer satisfaction, operational cost reduction, and cargo dwell time improvement. Furthermore, the impact of evolving trade patterns, such as the rise of e-commerce and multi-origin cargo shipments, on Triway's LCL and FCL service models has not been explored in depth.

Thus, the study seeks to bridge this research gap by analyzing Triway's strategies, operational challenges, technological adoption, and customer-driven innovations specific to LCL consolidation and FCL handling. This focused examination will contribute to a more practical understanding of how container freight stations can optimize performance in a competitive logistics environment.

Research Objectives

- To understand the operational workflow of LCL and FCL handling at a container freight station.
- To identify challenges and bottlenecks in LCL consolidation and FCL operations.
- To evaluate the efficiency, cost implications, and space utilization of LCL and FCL processes.
- To suggest operational improvements and best practices for CFS management.

Research Approach

The study will adopt a **Mixed-Methods Approach**, incorporating both qualitative and quantitative techniques:

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a) Qualitative Approach

- **Purpose:** To gain deep insights into operational practices, personnel experiences, and system workflows.
- **Methods:** Interviews, focus groups, direct observations.
- **Outcome:** Identification of operational challenges, procedural gaps, and subjective assessments of efficiency.

b) Quantitative Approach

- **Purpose:** To objectively measure performance indicators and validate findings statistically.
- **Methods:** Surveys, operational data analysis, time-motion studies.
- **Outcome:** Statistical comparisons between LCL and FCL performance (e.g., turnaround time, cost per unit, space utilization).

Research Design Framework

This study will use a **Descriptive-Exploratory Research Design**:

- **Descriptive:** To document existing practices in LCL and FCL operations.
- **Exploratory:** To discover areas of inefficiency and opportunities for process improvement.

The research will combine field studies at the CFS, interviews with key staff, analysis of operational data, and comparison with industry best practices.

Sample Size

An estimated sample size for effective and focused data collection:

- **Interviews:** 15–20 employees (divided between LCL and FCL departments).
- **Survey Questionnaires:** 40–50 operational staff including loaders, supervisors, and warehouse coordinators.

Data Collection Methods

a) Primary Data Collection

- **Structured Interviews:** Target groups include operational managers, customs officers, warehouse supervisors, and logistics coordinators. Key questions will focus on: Standard operating procedures for LCL and FCL
- Cargo handling challenges
- Infrastructure adequacy
- Staff and labor management
- **Direct Observation:** Systematic observation of: Receiving, storage, consolidation, and stuffing processes for LCL
- Receiving, storage, and dispatch processes for FCL
- Equipment usage (e.g., forklifts, cranes)
- Cargo documentation flow
- **Surveys:** Short questionnaires distributed among staff and customers to gather feedback on: Turnaround times
- Damage rates
- Satisfaction with handling processes

b) Secondary Data Collection

- Operational performance reports from the CFS.
- Industry reports and benchmarking data for container freight operations.
- Academic articles and logistics industry white papers.

Sampling Strategy

- **Purposive Sampling:** Only individuals with direct involvement in cargo handling (both LCL and FCL) will be selected.
  Sample Size:
- 15–20 employees for interviews
- 50 survey respondents including operational staff, drivers, and freight agents

Limitation of study

The study of Container Freight Stations (CFS) focusing on LCL (Less than Container Load) consolidation and FCL (Full Container Load) operations, while insightful, is subject to several limitations. Firstly, the scope may be geographically

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restricted, limiting the generalizability of findings to other regions with different logistical, infrastructural, or regulatory conditions. The reliance on survey data from a limited number of respondents can introduce biases or fail to capture the full diversity of operational practices across the industry. Additionally, the study may not fully account for dynamic external factors such as global trade disruptions, seasonal fluctuations, or economic shifts that significantly impact container freight operations. The complexity of international supply chains also means that many variable such as customs procedures, carrier reliability, and port efficiency may not be comprehensively addressed. Technological advancements in logistics and varying levels of digital adoption among CFSs can further skew the analysis. Furthermore, operational challenges such as container availability, labor constraints, and warehouse space limitations may be underrepresented. Lastly, the study may focus more on quantitative data, lacking deeper qualitative insights into stakeholder experiences or systemic inefficiencies. These limitations suggest that while the findings are valuable, they should be interpreted with caution and supported by broader, more detailed research.

IV. FINDINGS AND SUGGESTION

1.Complex Documentation Requirements

LCL shipments involve multiple consignees whose goods are grouped together into a single container. CHAs handling LCL cargo must process separate Bills of Entry for each consignee. This complexity increases the documentation workload and often leads to discrepancies if not carefully managed.
Key Observations:

- Multiple documents need to be filed with customs authorities for a single consolidated container.
- Risk of mismatch in cargo and documentation due to varying declarations.
- Higher incidence of customs queries and holds.

2.Coordination with Multiple Stakeholders

CHAs must coordinate with freight forwarders, shipping lines, and CFS staff to ensure all consolidated goods are correctly manifested and declared.
Key Observations:

- Delays often occur due to lack of timely information from freight forwarders.
- Manual errors in Cargo Arrival Notices (CANs) and Delivery Orders (DOs) affect clearance time.

3.Cargo Segregation and Inspection

At CFS, deconsolidation takes place for LCL cargo. CHAs must be present for customs examination and cargo identification.
Key Observations:

- Physical inspection and cargo segregation are time-consuming due to volume.
- Warehouse congestion at CFS during peak periods increases delays.

4. Handling Charges and Operational Delays

LCL shipments tend to incur higher handling charges due to storage, handling, and deconsolidation activities, which CHAs must manage and reconcile with clients.
Key Observations:

- Handling costs are shared among consignees but often disputed.
- Delays in clearance impact demurrage and warehousing charges.

5.Streamlined Documentation

FCL shipments involve a single consignee and usually a single Bill of Entry or Shipping Bill. CHAs find the FCL process relatively straightforward compared to LCL.
Key Observations:

- Less complexity in documentation and filing.
- Faster clearance times and minimal coordination with other consignees.

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6.Sealed Container Examination

FCL containers are usually sealed at the origin and inspected only if flagged by customs. CHAs coordinate container movement to CFS or port directly, depending on customs notification.
Key Observations:

- If not flagged, containers may not be opened, speeding up clearance.
- If examination is required, CHAs must ensure unsealing and resealing protocols are strictly followed.

7.Efficient Clearance through Direct Port Delivery (DPD)

Many FCL containers qualify for Direct Port Delivery, bypassing the need for CFS, though CHAs are still involved in customs filing.

Key Observations:

- CHAs have less physical involvement in DPD cargo but must ensure pre-arrival clearance is accurate.
- Misdeclaration or late filings result in rerouting the container to CFS, leading to cost and time penalties.

Systemic and Operational Issues Identified

1.Limited Digital Integration
Despite the availability of ICEGATE (Indian Customs EDI gateway), many CFSs and CHA operations still depend on manual workflows.
Key Observations:

- Manual entries at CFS lead to document duplication.
- Lack of system interconnectivity delays cargo release updates.

CHA Overload and Staffing Constraints
High-volume ports often experience a shortage of experienced CHAs, especially for LCL cargo which requires more effort per consignment.
Key Observations:

- Short staffing results in procedural errors or missed deadlines.
- CHA delays directly affect importer/exporter delivery schedules.

3.Variation in CFS Efficiency
Not all CFSs maintain the same infrastructure or procedural rigor. The performance of CFS impacts CHA's ability to process shipments timely.
Key Observations:

- CFSs with automated tracking systems allow CHAs to process documents and cargo faster.
- Inadequate handling equipment or storage leads to backlogs.

V. CONCLUSION

In conclusion, the study of LCL consolidation and FCL operations, with a specific focus on CHA (Customs House Agent) procedures at Container Freight Stations (CFS), underscores the critical role CHAs play in the seamless movement of cargo through India's complex logistics ecosystem. Whether handling consolidated LCL shipments involving multiple consignors or managing full-container FCL loads, CHAs are central to ensuring compliance with customs regulations, timely processing of documentation, and effective coordination between various stakeholders.

The operational differences between LCL and FCL such as the intricate segregation of multiple consignments in LCL versus the single-source nature of FCL highlight the necessity for CHAs to be highly adaptable, detail-oriented, and process-driven. At CFSs, which act as vital nodes in the cargo flow chain, CHAs facilitate customs clearance, inspections, duty payments, and the final dispatch or receipt of goods. The study reveals that despite the increased digitization and process reforms introduced under initiatives like "Turant Customs" and "Faceless Assessment," challenges persist in documentation accuracy, coordination delays, and cargo mismanagement, especially in LCL handling. It is clear that improving CHA practices at CFSs through better training, greater digital adoption, and clearer regulatory communication can significantly enhance overall logistics efficiency.

Moreover, the findings emphasize that CHAs not only perform a regulatory role but also serve as logistical enablers, ensuring trade flows remain uninterrupted despite procedural or infrastructural constraints.

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As global trade continues to grow and diversify, the relevance of efficient LCL consolidation and FCL management through capable CHA intervention becomes even more pronounced. Therefore, strengthening CHA procedures and infrastructure support at Container Freight Stations is not just a matter of operational necessity it is a strategic imperative for enhancing the competitiveness of India's import-export logistics and aligning with global trade standards.

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