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Article

Unclaimed and Abandoned Cargo Management in Maritime Logistics: Challenges Faced by Freight Forwarders and Future Perspectives

Jenarthanan. M[1], D. Rajasekar[2]*

[1,2]AMET Business School, AMET University, Chennai – 603112, Tamil Nadu, India.
*Corresponding Author: prof.rajasekard@gmail.com

Abstract: Logistics and freight forwarding are essential components of international trade, ensuring the smooth transport of goods in the global supply chain. Freight forwarders are the middlemen between the exporters, importers, shipping lines, customs authorities, terminal operators, and other logistics service providers, who play a vital role in transportation coordination, documentation, customs clearance, cargo consolidating and supply chain management services. However, the rise in the amount of international freight traffic has led to some challenges in operations, including the pile-up of unclaimed and abandoned goods for ports and logistics service providers. This type of cargo consumes resources at the port, extends cargo dwell time, causes congestion, poses financial, legal/regulatory obligations and impacts stakeholders. The main objective of the present review is to explore the issues of unclaimed and abandoned cargo with specific reference to Chennai Port and forwarders. The current state-of-the-art research in the field of freight forwarding activities, port logistics, customs clearance, cargo management, multimodal transport, technological innovations, and regulation was summarized. The review pinpoints key drivers for the abandonment of goods, such as insolvency of importers, documentation irregularities, customs clearance delays, commercial disagreements, excessive demurrage and detention charges, regulatory adjustments, disruption of the supply chain and lack of coordination among stakeholders. Moreover, the study analyzes the operational, financial, legal, technological, environmental and communication related challenges which are faced by freight forwarders in handling such cargo. The results indicate that while there has been a lot of research on freight forwarding services, port efficiency, logistics competitiveness and supply chain management, very few studies have concentrated specifically on the role and issues of freight forwarders in dealing with unclaimed and abandoned cargo in a port environment, specifically for India. The review points to the necessity for better collaboration between stakeholders, digital integration, efficient customs procedures, upgrading infrastructure, cargo disposal processes, and sustainable logistics practices to address these challenges. Resolve these issues will help to reduce port congestion, logistics cost, efficiency of cargo clearance and increase the resilience and sustainability of maritime logistics operations, especially at Chennai Port.

Keywords: Freight Forwarders; Unclaimed Cargo; Abandoned Cargo; Port Logistics; Chennai Port; Customs Clearance; Supply Chain Management; Maritime Logistics

1. Introduction

Logistics is an essential part of today's economies, and is a vital component of both domestic and global supply chains (Arvis et al., 2007). In order to maintain global trade, economic growth and industrial development, the efficient transportation of goods from producers to consumers is crucial. The logistics industry has grown to be a very inter-dependent system that includes modes of transportation, warehousing, inventory management, customs clearance, documentation and distribution. Despite the tremendous strides made over the past few years, the Indian logistics sector still has to contend with a host of challenges—both infrastructural and regulatory—in comparison to other developed countries like the United States, China and various European countries.

The freight forwarder is one of the main intermediaries in the international transport and logistics network, and is responsible for moving goods from exporters to importers. They serve as logistics coordinators, connecting shippers, consignees, shipping lines, road and rail transport companies, airlines and customs officials and others involved in

international trade. Freight forwarders can also be Non-Vessel Operating Common Carriers (NVOCCs), who provide transportation of goods in containers under their own bills of lading, and/or Customs House Agents (CHAs) providing customs brokerage and cargo clearance services, depending on the level of their operation and they have regulatory authorizations (David, 2013). Their expertise helps to make the international shipments efficient and helps to plan, coordinate and execute them in an efficient manner while ensuring compliance of the national and international trade regulations.

A freight forwarder's main job is to process and oversee shipping paperwork, such as bills of lading, airway bills, commercial invoices, packing lists, certificates of origin, customs paperwork and other regulatory paperwork that's necessary for moving cargo overseas (Murphy & Daley, 2001). Freight forwarders also handle cargo consolidation, logistics, multimodal transport, shipment planning, insurance, and warehousing, which ensures safe, on-time and cost-effective delivery of goods. Digital technologies have revolutionized the freight forwarding industry, improving both efficiency and visibility in shipments and customer service by implementing electronic documentation systems, logistics management software, and automated customs processing.

Global freight forwarding refers to the transportation of goods by ship, air, road, rail and multimodal means, coordinated from a global perspective. Of these, maritime transport has the largest share of international transport of goods and is more cost effective, and air freight is more favored for perishable goods, time sensitive and high value goods. The global logistics market is growing rapidly due to the growing demand for freight forwarding services with the expansion of global manufacturing, international trade and e-commerce. At the same time, advancements in technology, like realtime shipment tracking, business intelligence systems, blockchain applications, artificial intelligence, and data analytics have revolutionized freight forwarding by delivering greater transparency, efficiency, and decision-making capabilities.

In spite of these technological advances, freight forwarding industry still faces a number of challenges while operating (Kim, 2005). International cargo transport has been profoundly impacted by a variety of events, including port congestion, volatility in freight charges, increased fuel expenses, geopolitical tensions, trade restrictions, customs delays, regulatory adjustments, and events globally like the COVID-19 pandemic. One of these problems has become a serious issue for ports, customs officials, terminal operators, shipping lines and freight forwarders: unclaimed and abandoned cargo. The delay in consignees collecting the cargo, or the inability to collect due to financial insolvency of importers, inconsistencies with documentation, customs dispute, changes to trade policies, quality dispute, high demurrage and detention fees, and failure to collect all cargo can cause cargo to be unclaimed or left behind. This load takes up precious space, causes congestion in the port, adds to the cost of operations, slows down cargo handling, poses legal and financial burden on all parties involved.

This is especially relevant in key ports like Chennai Port, which is one of India's major ports to receive significant amounts of containers (Saran, 2014). With the constant rise in cargo volumes, the management of unclaimed and abandoned cargo has become crucial for the smooth functioning of the ports, reducing the congestion of storage areas and providing uninterrupted operations in the supply chain. The freight forwarders are essential in helping to solve these problems by ensuring that importers and exporters, customs authorities, shipping lines, terminal operators and other logistic service providers can work together efficiently. They still do experience significant challenges when operating such loads, however, in terms of operating, financial, legal and documentation issues.

Thus, the present review seeks to critically examine the problems being faced by freight forwarders in dealing with unclaimed and abandoned cargo with specific reference to Chennai port. The review draws on the literature to bring together what is known about the causes, implications for operations, legal and regulatory aspects, financial aspects and stakeholders' responsibilities regarding unclaimed and abandoned cargo. In addition, it summarizes the state of the art, uncovers gaps in existing research and suggests some directions and policies for the betterment of the cargo management, port efficiency and the overall performance of freight forwarding industry.

2. Role of Freight Forwarders in Port Logistics

A freight forwarder acts as a middleman between the shippers, consignees, shipping lines, customs authorities, port operators, transportation companies and other parties of the logistics chain, and therefore plays a vital role in smoothing the process of international trade. Their main duty is to provide timely, efficient, and cost-effective transportation of goods from the source to the destination, following the national and international trade law. Freight forwarders play a crucial role in the seamless functioning of ports and the broader efficiency of global supply chains by streamlining various logistics processes (Arvis et al., 2007).

A major function of freight forwarders is to organize and coordinate the movement of goods efficiently and effectively, whether by sea, air, road, rail or a combination of these modes (multimodal transport) (Gujar, 2006). To identify the best shipping route, they consider the shipping schedule, transit time, freight price, what the cargo is and what the customer wants. Freight forwarders are vital in coordinating with shipping lines, terminal operators and land transport companies to facilitate the efficient movement of goods between various points in the supply chain, reducing delays and disruptions during transit.

Another key operation freight forwarders perform is documentation management (Murphy & Daley, 2001). A large number of commercial documents and regulations must be prepared, verified and submitted in order to facilitate international cargo transport, such as bills of lading, airway bills, commercial invoices, packing lists, certificates of origin, insurance certificates, customs declarations, import or export permits. Proper documentation is crucial for customs clearance, cargo release, and regulatory requirements. Miscommunication or mistake in documentation can lead to shipment delays, financial penalties, detention of cargo or legal issues. Therefore, freight forwarders are an integral part to the role of ensuring that accuracy in documentation and adherence to international trade requirements are upheld.

One of the most specialized of freight forwarders' services is customs clearance (Appels & Struye de Swielande, 1998). Freight Forwarders are licensed to act on behalf of importers/exporters in many countries as Customs House Agents (CHAs) or customs brokers in customs clearance and customs declaration. They facilitate communication with customs officials regarding declaration, duty and tax calculations, necessary approvals and perform cargo inspection as needed. They possess an understanding of customs procedures, tariff classifications, import/export policies, and documentation requirements, which can help reduce clearance delays and facilitate the movement of goods through ports.

Another important function of freight forwarders is cargo consolidation and deconsolidation, which optimizes transport operations and decreases logistics expenses (David, 2013). Consolidation services combine various small-scale shipments from different exporters into one shipment, thus allowing customers to enjoy reduced freight charges and the best utilization of containers. When freight forwarders arrive at their destination, they arrange for the deconsolidation and distribution of the freight to the respective consignees. These services optimise cargo handling efficiency, maximize container capacity utilization, and help small and medium-sized enterprises to reduce the transportation cost associated with international trade.

A key element of freight forwarding services is warehousing and inventory management (Tamizhjyothi, 2016). Freight forwarders set up a temporary storage area for export and import cargo prior to customs clearance or shipping onward. Today's logistics companies also provide value-added services like labelling of the goods, packing, palletisation, quality checking, inventory management, cross-docking, and order fulfillment. Effective warehouse operations help ensure a smooth and continuous flow of goods, minimize storage expenses, and improve customer satisfaction.

Freight forwarders must provide risk management because of the uncertainties involved in international freight transport (Nishimura et al., 2009). Accidents, theft, natural disasters, documentation errors, customs inspections, geopolitical conflicts or supply chain disruptions can all pose a risk to cargo shipments. The freight forwarder helps clients minimize these risks by managing cargo insurance, tracking shipments, having contingency plans, and complying with international safety and security standards. They are proactive and reduce financial losses and increase supply chain resilience.

Digital technologies have been a game-changer for freight forwarding services (Notteboom et al., 2006). To boost efficiency and service quality, modern freight forwarders are using integrated logistics management systems, electronic data interchange (EDI) systems, transportation management systems (TMS), warehouse management systems (WMS), real-time cargo tracking systems, automated customs clearing services, cloud-based document management systems, and data analytics. The use of emerging technologies like blockchain, AI, Internet of Things (IoT), and predictive analytics is also improving transparency, traceability, and decision-making in the logistics network.

Freight forwarders are key players in the port environment where they coordinate between shipping lines, customs officials, terminal operators, container freight stations, inland transport companies and cargo owners. They are able to coordinate their activities effectively for having the vessel in time, handling of the cargo efficiently, clearance of customs and evacuation of cargo from the port premises without any interruptions. This coordination

helps to lower vessel turnaround times, alleviate congestion at ports, and maximise the utilization of terminal capacity and enhance the efficiency of maritime logistics operations (Nishimura et al., 2009).

Freight forwarders face a host of operational, financial, legal and regulatory issues, but perhaps none so many as dealing with unclaimed and abandoned goods (Kim, 2005). This cargo tends to lead to long storage periods, higher demurrage and detention fees, customs delays, paper work hassles, shortage of containers, and congested ports. These issues can impact not just the economic success and efficiency of freight forwarding businesses, but also the overall performance of ports and the stability of the supply chain. Hence, the role of freight forwarders in port logistics gives good insights to study the complexities involved in the management of unclaimed and abandoned cargo, especially in the case of major port cities like Chennai Port.

3. Causes of Unclaimed and Abandoned Cargo

The rise in global trade and the transport of cargo in containers has greatly contributed to the increased efficiency of international trade. It has also resulted in an increasing amount of unclaimed and abandoned cargo at seaports across the globe. Unclaimed cargo goods left at ports or under customs control because the consignee has not picked them up within the required time, and abandoned cargo goods that are intentionally handed over to the public by the owner or importer for various reasons such as financial, legal or commercial reasons. When this occurs in ports, it wastes precious storage area, congests terminals, delays cargo clearance, and adds financial and administrative costs for freight forwarders, shipping lines, terminal operators and customs officials. Financial insolvency or bankruptcy of importers/consignees is one of the most frequent reasons of unclaimed and abandoned cargo (Yeo, 2016). The importer might not have funds to pay customs duties, freight charges, storage charges, demurrage and detention charges needed to release the goods due to economic slowdown, business closure, liquidity restrictions or sudden market changes. In such cases the consignee might choose to tamper with the shipment and therefore allow prolonged storage within the port premises and incur additional logistic costs for the stakeholders.

Another major contributing factor to cargo abandonment is documentation discrepancies (Arvis et al., 2007). The bill of lading, the commercial invoice, packing list, certificate of origin, import permit and customs declaration are just some of the commercial and regulatory documents that are necessary for international shipping. Customs clearance and cargo release can be delayed due to errors or inconsistencies in data, missing documents or falsified documents. Documentation problems frequently lead to disputes between exporters, importers, customs and freight forwarders, sometimes causing cargo to be unclaimed for long periods of time. The accumulation of unclaimed cargo is also due to customs regulations and delays. The clearance process can be extended due to customs inspections, disputes over the valuation of goods, tariff classification issues, regulatory compliance requirements and delays in getting import approvals. In certain instances cargo may be held until all regulatory requirements are met. Cargo may be abandoned under customs regulations if the importer does not correct these problems within the time limit. Another primary cause of cargo abandonment is high demurrage, detention and storage charges (Kim, 2005). When shipping lines, terminal operators and port authorities determine that cargo has extended past the free storage time in port terminals, the companies strike the shipper with hefty monetary fines. The longer that the storage period continues to be paid, the more it can be more expensive to clear the cargo than its worth of business, and importers may not be able to claim the cargo in that case. This means that importers might rather lose the cargo as opposed to suffering further monetary losses.

Oftentimes commercial disagreements between the buyer and the seller cause goods to be lost (Bonoma & Johnston, 1978). These issues can occur when there are differences in product quality, quantity, price, contractual agreement, delivery schedules, and payment terms. The importer reserves the right not to accept deliveries if they do not meet with contractual requirements or do not pass the quality tests. Disagreements about letters of credit, insurance claims, or contracts for international trade can further delay cargo acceptance and cause the port to store goods for a longer period of time. Government policies and international trade laws also affect cargo abandonment (Gujar, 2006). Rapid changes in import duties, tariff arrangements, licensing conditions, quarantine or environmental or product certification rules can make some products commercially unviable or not legally compliant. Other restrictions, such as trade sanctions, embargoes, and restrictions on particular commodities, can also be imposed that could further stall clearance of cargoes, potentially leading to extended storage or abandonment.

In recent years, unclaimed cargo has grown in importance as a result of the disruptions of the global supply chain (Nishimura et al., 2009). The COVID-19 pandemic, geopolitical conflicts, labour strikes, port congestion, container shortages and shipping schedule disruption have led to serious delays in cargo transportation through global trade lanes. The disruptions have made logistics more expensive, longer, and caused uncertainty for importers, which in some instances has resulted in forfeiting of cargo because of shifting market conditions or financial concerns. Lack

of communication and collaboration between supply chain participants may also be a factor in goods being abandoned. Failure to ship shipping documents in time, lack of communication between exporter and importer, freight forwarder, customs broker, shipping line, terminal operator and failure to notify of cargo arrival can also cause customs clearance and cargo delivery delays. Poor coordination can lead to unnecessary delays in storage and higher operational expenses.

Additional challenges are found when transporting hazardous, perishable or special goods. Perishable items can become worthless due to delayed customs clearance, or long storage; hazardous items must be handled in accordance with safety and environmental laws. If importers are unwilling or unable to fulfill these regulatory duties or associated costs, this cargo could be abandoned, and port authorities may have concerns regarding environmental and public safety. The lack of technological capabilities and digital integration, among logistics partners, can worsen the cargo management issues even more (Notteboom et al., 2006). While many ports have digitized their documentation systems, variations in digital infrastructure, lack of interoperability and manual documentation can slow cargo processing and increase the risk of documentation errors. Lack of investment in advanced technologies like blockchain, AI, and real-time cargo tracking could diminish visibility in supply chains, making it harder to identify shipments in danger of unclaimed or abandoned cargoes.

In general, the rate of unclaimed and abandoned cargo can be affected by a mixture of financial, operational, legal and regulatory, commercial and technological issues (Kim, 2005). Often these factors occur together to build up complex issues, which impact freight forwarders, shipping lines, customs, terminal operators and port administrations. Recognising these root causes is key to designing effective solutions to reduce cargo abandonment, improve cargo clearance efficiency and reduce port congestion and optimise the performance of maritime logistics systems, especially at key ports like Chennai Port.

4. Challenges Faced by Freight Forwarders

Freight forwarders serve as critical intermediaries in international trade by coordinating cargo movement between exporters, importers, shipping lines, customs authorities, terminal operators, and inland transport providers (Murphy & Daley, 2001). Their responsibilities extend beyond transportation management to include documentation, customs clearance, cargo consolidation, warehousing, regulatory compliance, and customer service. However, the increasing complexity of global supply chains, evolving trade regulations, technological advancements, and the growing incidence of unclaimed and abandoned cargo have significantly increased the challenges faced by freight forwarders. These challenges influence operational efficiency, financial performance, service quality, and the overall effectiveness of port logistics. The detailed challenged are summarized in table 1.

Table 1. Major Challenges Faced by Freight Forwarders in Handling Unclaimed and Abandoned Cargo (Takele and Jaleta, 2023; Ohagwu, 2024; Kumar, 2026)

Challenge Category	Specific Challenges	Impact on Freight Forwarders
Operational Challenges	Port congestion due to accumulated unclaimed cargo; shortage of storage space; delays in cargo handling; increased container dwell time; inefficient terminal operations	Delayed cargo delivery, reduced operational efficiency, disruption of supply chain activities, and increased workload.
Financial Challenges	Escalating demurrage, detention, storage, and container handling charges; unpaid freight charges; increasing fuel and transportation costs	Increased operational expenses, reduced profit margins, cash flow constraints, and financial losses.
Legal and Regulatory Challenges	Compliance with customs regulations, port authority rules, international trade policies, cargo ownership disputes, and disposal procedures	Legal liabilities, penalties, prolonged cargo detention, documentation disputes, and increased administrative burden.

Documentation Challenges	Errors in Bills of Lading, commercial invoices, packing lists, certificates of origin, customs declarations, and missing shipping documents	Customs clearance delays, shipment rejection, cargo detention, additional documentation costs, and customer dissatisfaction.
Customs Clearance Challenges	Delays in customs inspections, tariff classification disputes, valuation issues, import licensing requirements, and regulatory approvals	Extended cargo clearance time, increased storage charges, delayed delivery schedules, and higher logistics costs.
Technological Challenges	Limited adoption of digital logistics systems; poor integration among Port Community Systems (PCS), Customs EDI, and freight management software; cybersecurity risks	Reduced shipment visibility, duplication of work, inefficient information sharing, and operational delays.
Communication Challenges	Poor coordination among importers, exporters, shipping lines, customs authorities, terminal operators, and transport providers	Miscommunication, delayed decision-making, cargo mismanagement, customer complaints, and increased cargo abandonment.
Customer Service Challenges	Managing customer expectations, shipment tracking requests, cargo claims, dispute resolution, and service reliability	Reduced customer confidence, reputational damage, customer attrition, and increased claim settlements.
Risk Management Challenges	Cargo theft, damage, loss, insurance claims, natural disasters, geopolitical conflicts, labor strikes, and supply chain disruptions	Increased insurance costs, shipment delays, financial risks, and business uncertainty.
Environmental Challenges	Handling hazardous and perishable cargo, disposal of abandoned goods, environmental compliance, and waste management regulations	Environmental risks, regulatory penalties, public health concerns, and increased disposal costs.
Infrastructure Challenges	Limited warehouse capacity, inadequate container yards, aging port infrastructure, insufficient transport connectivity, and equipment shortages	Port congestion, slower cargo movement, inefficient logistics operations, and increased turnaround time.
Challenges Specific to Chennai Port	High container traffic, congestion, prolonged cargo dwell time, documentation delays, customs bottlenecks, increasing unclaimed cargo, and limited storage capacity	Reduced port productivity, higher logistics costs, increased demurrage, operational inefficiencies, and greater pressure on freight forwarders to coordinate cargo clearance efficiently.

5. Operational Challenges

Port Congestion is one of the biggest operational issues faced by freight forwarders due to the piling up of unclaimed and abandoned cargo (Kim, 2005). Staging of goods outside the port terminal, for storage, takes up precious ground space, decreases terminal capacity and hinders the cargo handling process. If there is an increase in congestion, the time required for loading/offloading cargo, the vessel turnaround time, inefficient use of port facilities, and reduced productivity along the logistics chain will increase. This requires freight forwarders to continually liaise with shipping lines, terminal operators, transport companies, and customs officials to minimise the disruption in operations and ensure timely deliveries of goods. One of the other critical issues is coordination of multimodal transport with seamless cooperation of multiple stakeholders. When one part of the transportation system is delayed, it impacts the entire transportation system, which can include rescheduling shipments, extended transit times, and added operational costs.

Coordination of several service providers is even more difficult during the peak of cargo volumes or when the supply chain is disturbed.

6. Financial Challenges

One of the greatest worries for freight forwarders is the financial loss from unclaimed and abandoned goods (Yeo, 2016). Shipping lines, terminal operators and port authorities also charge for demurrage, detention, storage and container handling, which increases as cargo is stored for longer. The charges are usually due from the cargo owner, but freight forwarders often face cases where importers refuse or cannot pay an outstanding bill. This can cause freight forwarding businesses to face these challenges, such as delayed revenue recovery, higher administrative costs, and financial losses from mismanaged cargo claims. Complex freight rate fluctuations, volatile fuel prices, exchange rate fluctuations and high running costs also impact the profitability of freight forwarding companies. Random delays in the global shipping systems may also lead to higher freight costs and less reliability in service, forcing freight forwarders to find alternative transportation options in short timeframes.

7. Legal and Regulatory Challenges

Freight forwarders work in a very well-regulated area, with customs laws, international maritime conventions, trade treaties and port regulations that regulate their activities (Appels & Struye de Swielande, 1998). Customs policies, regulations, import-export regulations, tariffs, environmental laws, and security policies are subject to frequent changes, requiring ongoing monitoring and compliance. Non-compliance with these regulations may lead to the cargo detention, monetary fines, legal proceedings or suspension of operational licenses. The issues of cargo ownership, liability, disposal, and customs enforcement are very complex and can present in handling unclaimed and abandoned cargo. In cases where the ownership of the shipments may be disputed, the exporter and importer, shipping lines and insurance companies, may find it difficult to determine who is at fault for storage charges, the disposal of goods and for financial damages. Freight forwarders need to ensure that they have extensive documentation and adhere to all the statutory requirements in order to minimise legal risks.

8. Documentation and Customs Clearance Challenges

Good documentation is essential to the successful movement of international cargo (Murphy & Daley, 2001). The freight forwarder prepares and checks commercial invoices, bills of lading, packing lists, certificates of origin, customs declarations, import permits, insurance documents and other regulatory paperwork. The documentation may be incorrect or inconsistent which may lead to longer time for cargo to be stored in port terminals, more inspections and delays in customs clearance. Clearance can become more complex if the items being shipped include restricted items or hazardous materials or if the items are in compliance with several regulations. Logistics delays are caused not only by the additional costs involved in waiting for customs clearance but also by the congestion in ports and warehouses.Logistics delays are not just due to the extra costs associated with customs clearance but also because of the congestion in ports and warehouses that leads to the accumulation of goods without being claimed.

9. Technological Challenges

Electronic documents, automated customs clearance, shipment tracking systems and logistics management systems have revolutionized logistics processes with digital transformation (Notteboom et al., 2006). Despite the numerous advantages of advanced technologies, many freight forwarding companies, especially small and medium-sized ones, still struggle with their implementation because of high implementation costs, lack of technical skills, and restricted digital infrastructure. Another obstacle is the interoperability of the different digital platforms of shipping lines, customs authorities, port operators and freight forwarders. There can be some lack of interoperability between systems, which can lead to double documentation, information delay and lack of visibility in the supply chain. Moreover, as freight forwarding firms become more reliant on digital technologies, they face threats of data breaches, ransomware attacks, and unauthorized access to vital business data.

10. Customer Relationship and Communication Challenges

To ensure efficient cargo movement, it is crucial to have good communication between the different entities involved, such as exporters and importers, shipping lines, customs authorities, transport operators, and terminal managers (Kutschker, 1985). Customs delays, shipment disputes, and cargo abandonments can occur due to miscommunication, paperwork delays, shipping information errors, or poor customer coordination. Despite external events not under the freight forwarder's control, the freight forwarder should be in a position to give regular updates on the shipment, solve operational problems quickly and keep the customer satisfied. Freight forwarders are further

challenged to maintain service quality and keep increasing their services as customer demands grow for quicker deliveries, visibility of shipments, transparency on pricing and a more responsive customer service.

11. Environmental and Sustainability Challenges

Freight forwarders are faced with more responsibilities due to the increasing importance of sustainable logistics and environmental protection. The logistics sector is facing a green revolution as environmental regulations around the world strive to curb greenhouse gas emissions, boost energy efficiency, and foster sustainable transport options.The logistics industry is undergoing a green revolution, with international regulations pushing for more environmentally responsible practices in its operations. Handling and control of abandoned hazardous materials, disposal of environmentally sensitive materials and adherence to waste management laws and regulations are critical concerns in the marine environment, especially at sea ports where various types of imported goods are handled.

12. Challenges Specific to Chennai Port

The Chennai Port is one of the key container handling ports in India with significant cargo volumes and it is an important gateway for international trade (Saran, 2014). As the volume of cargo increases, and is now transported in containers, freight forwarders within the port ecosystem are faced with significant challenges arising from the periodic congestion of the port, the time delay in documentation, complex customs clearance procedures coupled with the build-up of unclaimed and abandoned cargo. Other problems include high storage occupancy, rising demurrage and detention fees, limited capacity of the yard, coordination among various regulatory agencies and delays in cargo disposal procedures. To solve these problems, all stakeholders in freight transportation logistics, such as freight forwarders, customs authorities, port management, shipping lines, terminal operators and policy makers, must closely cooperate to enhance the efficiency of cargo clearance and strengthen the supply chain's ability to withstand shocks. In general, freight forwarders have to deal with several issues, including operational, financial, legal, technological, environmental and customer related challenges. Effective handling of these challenges is crucial for efficient cargo transportation, mitigating port congestion, lowering logistics costs and boosting the competitiveness of the maritime logistics industry. The importance of developing integrated digital systems, improving regulatory coordination, fostering collaboration among stakeholders, and creating effective cargo disposal mechanisms will be critical to minimising the number and impact of unclaimed and abandoned cargo, especially at strategically significant ports, like Chennai Port.

13. Review of Previous Studies

A summary of the available previous studies in relation to the topics of freight forwarding, port logistics, customs operation, multimodal transportation, shipping alliances, logistics competitiveness and cargo management is presented in Table 2. The table summarizes the key findings and implications of some of the major contributions of previous research, along with the study focus, in order to highlight the specific focus and findings of each researcher. The review shows that there is extensive research on the topic of freight forwarding services, port efficiency, customs, and logistics management, but not much has been done on the subject of unclaimed and abandoned cargo and especially in the context of Chennai Port. The present review is based on this research gap.

Table 2. Summary of Previous Studies Related to Freight Forwarding, Port Logistics, and Cargo Management

Author(s)	Year	Focus of the Study	Major Findings	Research Implications
Apples and Swielande	1998	Role of customs administration	Customs authorities primarily focus on revenue collection; inadequate training of officials creates operational challenges.	Highlights the importance of efficient customs administration in facilitating trade.
Murphy et al.; Daley et al.	2001	Freight forwarding services	Freight forwarders act as international trade specialists offering a wide range of logistics services. Selection depends on service quality, reliability, and expertise.	Demonstrates the strategic importance of freight forwarders in global supply chains.

Bonoma and Johnston	1978	Industrial buyer–seller relationships	Negotiation plays a central role in industrial purchasing and long-term business relationships.	Effective negotiation enhances freight forwarding and logistics operations.
Kim	2005	Port operational delays	Additional customs inspections and cargo verification significantly increase cargo clearance time and logistics costs.	Efficient customs procedures are essential for reducing port congestion.
Girish Gujar	2006	Multimodal transportation in India	Legislative barriers, policy shortcomings, and infrastructure limitations constrain multimodal logistics development.	Calls for policy reforms and infrastructure modernization.
Notteboom	2006	Port operational efficiency	Outdated technology, inefficient IT systems, and inadequate equipment reduce port productivity.	Emphasizes digitalization and technological upgrades in ports.
Sanjai	2006	Indian logistics industry	Technology, infrastructure development, and supportive government policies reduce logistics costs and improve competitiveness.	Logistics modernization is critical for sustainable freight forwarding.
Jean François Arvis et al.	2007	Global freight forwarding	Freight forwarding companies connect global markets by coordinating international cargo movement.	Reinforces the importance of freight forwarders in international trade facilitation.
Sreedevi	2008	Indian shipping and ports	Port inefficiencies arise mainly from labour issues and cargo overstuffing.	Improving labour productivity can enhance port performance.
Nishimura et al.	2009	Vessel scheduling and port traffic	Delays in vessel arrivals and departures adversely affect inbound and outbound cargo movement.	Efficient vessel scheduling improves port logistics performance.
David	2013	Freight forwarding industry	Freight forwarders differ from customs brokers and Non-Vessel Operating Common Carriers (NVOCCs) in terms of responsibilities and operational scope.	Clarifies the distinct functions of logistics intermediaries.
Saran	2014	Indian port development	Examined cargo volumes, port capacity, and container traffic growth across major and minor Indian ports.	Increasing cargo volumes necessitate infrastructure expansion.
Kutschker	1985	Buyer–seller negotiations	Successful business relationships depend on effective negotiation between trading partners.	Supports the importance of negotiation in logistics service management.
Heejung Yeo	2016	Shipping company finance	High leverage and liquidity influence the financial sustainability of shipping companies.	Financial stability is essential for long-term maritime operations.
Baumol	2016	Contestable market theory	Markets remain competitive when entry and exit barriers are minimal.	Applicable to understanding competition

				in logistics and freight forwarding industries.
Soo Yong Shin and Myong Sop Pak	2016	Purchasing negotiation in freight forwarding	Analytical Hierarchy Process (AHP) identified negotiation capability as a critical success factor for freight forwarders.	Strategic purchasing improves freight forwarding competitiveness.
Viet Linh Dang and Gi Tae Yeo	2017	Seaport competitiveness	Strategic planning and competitive positioning are essential for enhancing seaport performance.	Supports long-term planning for sustainable port development.
Haralambides and Veenstra	2000	Shipping alliances	Shipping alliances expand geographical coverage and improve operational efficiency without price fixing.	Cooperation among carriers enhances global shipping networks.

From the literature reviewed, it is clear that freight forwarders are of great importance in the facilitation of international trade in the areas of cargo coordination, documentation, customs clearance and multimodal transportation. The efficient infrastructure of the ports, technological development, customs modernization, strategic planning, and involvement of stakeholders have been highlighted as the main factors to enhance logistics performance in previous studies. Others have pointed out that port congestion, poor infrastructure, regulatory issues, delays in documentation and labour-related problems have all continued to inhibit the smooth flow of goods. While a lot of research works have been conducted on freight forwarding, port operations, shipping alliances, and logistics management, relatively less work has been done on unclaimed and abandoned cargo and the issues faced by freight forwarders in managing such cargo, especially at Chennai Port. Overall, the backlog reflects the importance of a holistic approach to the assessment of causes, impacts, and management strategies of unclaimed and abandoned cargo, with the aim of improving the effectiveness of ports and making maritime logistics systems more resilient.

International trade and global supply chain management is highly dependent on the freight forwarding industry and, therefore, it has been the subject of much research attention. Murphy et al. and Daley et al. (2001) showed in early studies that freight forwarders are experts in international trade and provide a variety of logistics services such as transportation coordination, cargo consolidation, documentation, customs clearance and supply chain management. Their research also highlighted that service quality, operational reliability, industry expertise and cost competitiveness are key factors that affect the choice of freight forwarding companies. Likewise, Arvis et al. (2007) defined freight forwarding companies as the necessary middlemen that link producers and consumers in various parts of the world and help transport the goods from and to other countries with ease.

A number of researchers have paid attention to the distinction between freight forwarder and other logistics service providers (LSPs) operational role. David (2013) stated that the freight forwarders are far different from Customs Brokers or Non-Vessel Operating Common Carriers (NVOCCs) with respect to their duties and functions. Customs brokers mainly facilitate customs clearance and regulatory compliance, NVOCCs provide their own transport documentation and container services, and freight forwarders coordinate the entire logistics process by combining transportation, documentation, warehousing and customs services. The difference emphasizes the importance of freight forwarders in the context of supply chain management today.

Port operations studies have repeatedly shown that port infrastructure and port operational inefficiencies are significant constraints on logistics performance. Saran (2014) conducted a study on the performance of major and minor ports in India and observed that there has been significant growth in container traffic, which further highlighted the need to continuously develop the infrastructure to scale with the increased traffic. Nishimura et al. (2009) noted that delays in ships' arrival and departure have a significant impact on both the inbound and the outbound flow of goods resulting in a decrease in port productivity and higher logistics expense. Similarly, Kim (2005) found that cargo clearance delays stem from the high number of customs inspections and physical checks of the goods, which leads to higher port congestion and operating costs. Technological development is also shown to be an important factor in port efficiency. Notteboom (2006) pointed out that ports lose a lot of operational efficiency due to the use of outdated technology, inefficient IT systems and a lack of cargo handling equipment. Similarly, Girish Gujar (2006) studied the growth of multimodal transportation in India and found that there are certain legislative restrictions, policy gaps and lack of infrastructure facilities which are still the big hindrances to integrated freight transportation.

In addition, the functions of customs administration have been much discussed in the logistics literature. Apples and Swielande (1998) found that the main responsibility of the customs authorities is to collect revenue, and the lack of training of customs officials may lead to delays and inefficiencies in customs operations. In the same context, Tamizhjyothi (2016) identified labour related problems and over-stuffing of cargo as the major factors hindering the port efficiency in India. The study recommended that the improvements of workforce productivity and optimizing cargo handling operations could significantly boost shipping sector overall performance.

The strategic and economic competitiveness of freight forwarding and port logistics has been discussed. Baumol (2016) coined the term contestable markets, which states that industries are competitive if barriers to entry/exit are relatively low. In the context of freight forwarding, the idea implies that competition pushes for innovation in services, better use of resources, and tailored solutions for customers. Likewise, Viet Linh Dang and Gi Tae Yeo (2017) highlighted that strategic planning and competitive positioning are important to enhance the performance of seaports within the current dynamic and competitive world of global logistics.

Negotiation recently has been identified as a significant part of freight forwarding operations as well. In this study, Soo Yong Shin and Myong Sop Pak (2016) used the Analytical Hierarchy Process (AHP) to determine the critical success factors affecting the purchasing negotiations of freight forwarders in Korea. They found that successful negotiation techniques have a significant positive impact on operational efficiency, supplier relations and business competitiveness. Previous research by Dobler et al. (1984), Bonoma and Johnston (1978), and Kutschker (1985) also highlighted that negotiation is an essential ingredient in establishing a long-term relationship with buyers and sellers and is an important consideration when making a purchasing decision in an industrial context.

There has also been significant research work on the financial sustainability of the maritime transport industry. The relationship between liquidity and financial leverage of shipping enterprises was analyzed by Heejung Yeo (2016) and it was found that high financial leverage companies need to have the ability to financial management in order to establish long-term stability in operation. The study also emphasized the need for the right mix of liquidity and debt to facilitate a sustainable shipping business.

Collaborative approaches being used to increase operational efficiency among shipping companies have also been investigated. According to Haralambides and Veenstra (2000), shipping alliances help carriers to increase their geographical reach, optimise their vessel utilisation, and create more efficient service networks, without actually having to enter into any freight rate agreements. Strategic cooperation improves service reliability and boosts the competitiveness of global shipping network.

While freight forwarding services, customs procedures, port efficiency, multimodal transportation, technological advancements, shipping alliances and logistics competitiveness have been comprehensively studied, only a handful of studies have focused on the problems of unclaimed and abandoned cargo, especially through the lens of freight forwarders. Previous research has mainly considered port authorities, customs administration and shipping companies; however, in the case of freight forwarders, the challenges they face are operational, financial, legal, documentation and coordination based on these and have not been sufficiently investigated. Moreover, there is very little empirical data that can be specifically used with reference to Chennai Port, one of India's busiest maritime gateways. Hence, the need to review extensively the causes, effects, and management strategies of unclaimed and abandoned cargo to address this research gap and offer concrete recommendations on ways to enhance freight forwarding operations and port logistics efficiency.

Research Gap

From the literature research, it can be seen that there is a lot of research that has been carried out regarding freight forwarding, port logistics, customs administration, multimodal transportation, supply chain management, and seaport competitiveness. The previously mentioned studies are mainly about the operational function of freight forwarders, the determinants for choosing logistics service providers, development of port infrastructure, customs clearance process, technology development, and strategies to enhance logistics efficiency. Further, a few scholars have studied topics related to port congestion, vessel scheduling, multimodal transport integration, shipping alliances and digital technologies for improving maritime logistics performance.

While all these contributions are important, little attention has been paid to unclaimed and abandoned cargo, especially from the viewpoint of freight forwarders. Previous research has largely focused on the functions of port authorities, customs administrations, shipping lines, and terminal operators, while the difficulties faced by freight forwarders in the areas of operation, finance, law, documentation and coordination have been somewhat under-

researched. In addition, there are no detailed investigations that analyse the trade-offs between the regulatory requirements, customer expectations and operation efficiency of freight forwarders in abandoned cargo handling.

The other significant drawback that has been noticed in the literature is the lack of research work specifically on the Indian ports, especially at Chennai Port, one of the major ports in India for handling containers. While some studies have already assessed the performance and logistics infrastructure of the ports in India, few studies have attempted to explore the causes, consequences and solutions to unclaimed and abandoned cargo in the Chennai Port. There are also few findings available in the existing literature with respect to the coordination of stakeholders, the use of digital cargo management systems, policy measures, and best practices to reduce the rate of cargo abandonment and boost port efficiency.

Hence, this present review will focus on these gaps by systematically summarizing the existing literature on the problems encountered by freight forwarders when dealing with unclaimed and abandoned cargo with special reference to Chennai Port. The review covers aspects of operations, finance, law, technology and regulation and contains both gaps in knowledge and potential solutions that could lead to improved cargo management, increased collaboration with stakeholders and increased efficiency and sustainability of the port logistics operations.

Future Directions

In view of the rising complexity of global supply chains and the ongoing enhancement of international trade, new solutions are needed to tackle the problem of unclaimed and abandoned goods. Future steps need to involve the design of integrated logistics systems to improve cooperation between freight forwarders, port authorities, customs authorities, shipping companies, terminal companies, importers and exporters. More coordination between these stakeholders will help to clear cargo in a timely fashion, prevent operational congestion, and remove cargo from port facilities.

Digital transformation is seen as a key enabler of the freight forwarding and port logistics value chain. The adoption of advanced technologies such as electronic documentation, Port Community Systems (PCS), Electronic Data Interchange (EDI), blockchain technology, artificial intelligence (AI), Internet of Things (IoT), big data analytics, cloud-based logistics platforms, and real-time cargo tracking systems can significantly enhance supply chain visibility, improve documentation accuracy, accelerate customs clearance, and support informed decision-making. The technologies also can help identify cargo at risk of becoming unclaimed or abandoned at an early stage, which can allow stakeholders to take timely corrective actions.

Going forward, policies need to focus on modernizing customs processes and regulations to improve the management and disposal of unclaimed and abandoned cargo. The shortened documentation process, customs cohesion, risk-based inspection systems and clear cargo disposal will help to shorten cargo dwell times and enhance the efficiency of port operations. Furthermore, adopting consistent practices and digital approval systems will help to streamline cargo handling and improve compliance with regulations.

The other key areas include infrastructure development, which is crucial for improving cargo management. Increasing capacity of the container yard, upgrading cargo handling machinery, building special storage space for abandoned cargo, and enhancing multimodal transport connectivity will help ease the congestion at the port and enhance the throughput of cargo. Smart port investment in infrastructure and automation technologies can further enhance operational efficiency and aid sustainable port development.

Capacity development and professional training are also crucial in improving the performance of freight forwarding operations. Freight forwarders and other logistics professionals will have their technical skills strengthened through continuous training on international trade regulations, customs procedures, digital logistics systems, risk management and emerging technologies. Improved human resources competency will help to make better decisions, provide improved customer service and facilitate improved cargo handling practices.

Future cargo management should also have environmental sustainability embedded in their plans. The implementation of environmentally friendly disposal methods for abandoned cargo, the implementation of good hazardous waste management practices, and the implementation of sustainable logistics practices can reduce environmental damage and meet national and international environmental regulations. Changing to energy-efficient transportation and sustainable port operations will further contribute to the longterm resilience of maritime logistics.

Researchers can benefit from conduct of future investigations into empirical analyses of the operational, financial, legal and technological issues of freight forwarders in dealing with unclaimed and abandoned cargo in various ports and geographical areas. The comparative analysis of the major ports of India with the leading

international ports may be helpful in understanding the best practices and management strategies. Moreover, a study comparing the feasibility of the use of new technologies, participatory models among stakeholders and policy interventions in cargo abandonment reduction will make a significant contribution to the evolution of the freight forwarding and maritime logistics literature.

In conclusion, the issue of unclaimed and abandoned cargo is complex and can only be solved through a collaborative and multidisciplinary effort, combining technological advances, policy adjustments, infrastructure upgrades, stakeholder involvement, and sustainable logistics practices. Each of the future directions will not only boost the operational efficiency of freight forwarders but also port productivity, supply chain resiliency and sustainable growth of the maritime logistics industry, particularly at major container ports like Chennai Port.

14. Conclusion

Freight forwarders are key players in the facilitation of international trade, where they arrange transportation, documentation, customs clearance and supply chain activities for exporters and importers along with other logistics entities. But, unclaimed and abandoned goods have become a frequent problem, resulting in serious operational, financial, legal and regulatory issues for freight forwarding firms and port logistics systems. Financial difficulties of importers, documents, customs and delays, trade disputes, regulations and lack of coordination among stakeholders are among various reasons for cargo build-up at ports. It is noted that the effective control of unclaimed and abandoned cargo necessitates a holistic approach based on technological innovation, infrastructure development, regulatory changes and good collaboration between all stakeholders. Implementing better cargo clearance procedures, improving digital integration, upgrading storage and disposal facilities, and creating effective coordination systems are all crucial to tackling the challenges of cargo and enhancing port efficiency within the context of Chennai Port. While existing research has made important contributions to the understanding of freight forwarding and port logistics, less attention has been paid to the unique problems faced by freight forwarders when dealing with unclaimed and abandoned cargo. Hence, this review will give the insights of the origin, effects and possible solutions of cargo abandonment. Solving these challenges will help freight forwarders to be more resilient, better productivity in ports, lower logistics costs, and support the sustainable development of the India's maritime logistics industry.

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