Evaluating Clearance Delays and their Impact on Supply Chain Efficiency: A Study on Chattogram Port

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ABSTRACT

This study investigates the clearance delays at Chattogram Port and their implications for supply chain efficiency in Bangladesh, adopting a qualitative research approach supported by case study evidence. As the country's principal maritime gateway, Chattogram Port handles over 90% of containerized trade, yet clearance inefficiencies undermine both cost competitiveness and operational reliability. Primary data was collected through structured surveys with 10 respondents, including customs officials, C&F agents, and importers, to capture stakeholder experiences and perceptions regarding clearance processes. Thematic analysis revealed four dominant issues: manual documentation (cited by 80% of respondents), understaffing at customs and port authorities (70%), inadequate terminal infrastructure such as shortage of scanners and equipment (60%), and inefficient customs procedures including excessive physical inspections (50%). Respondents emphasized that these problems collectively prolong clearance times, disrupt production schedules, raise logistics costs, and reduce supply chain reliability—particularly for time-sensitive sectors like garments and pharmaceuticals. To enrich the qualitative findings, secondary evidence from the Time Release Study (TRS) 2022 was integrated as a case reference, which reported an Average Release Time (ART) of 11 days 6 hours. Stakeholder insights confirmed that these delays significantly disrupt lead times, increase logistics costs, and reduce reliability across industries such as garments and pharmaceuticals. The findings also reveal the effectiveness of Pre-Arrival Processing (PAP), which reduced clearance duration by an average of 43%. The study highlights the potential benefits of digitization, Pre-Arrival Processing (PAP), workforce capacity building, and infrastructure investment to mitigate these bottlenecks. By combining qualitative insights with case-based secondary data, the research underscores that clearance delays at Chattogram Port are not isolated technical problems but systemic challenges rooted in processes, institutions, and capacity gaps. The study concludes that coordinated investment in infrastructure, digital customs, workforce training, and PAP adoption is essential. These reforms will cut delays, boost supply chain performance, and strengthen Bangladesh's global trade competitiveness.

Keywords: Time Release Study (TRS) 2022, Average Release Time (ART), Pre-Arrival Processing (PAP), Supply Chain Operations Reference (SCOR) Framework

INTRODUCTION

Over the past ten years, Bangladesh, a fast-rising country with a population of over 170 million, has seen exceptional economic progress, primarily due to its booming industrial sector and export-oriented economy. Over 90% of the nation's transactions are carried out via maritime routes, making international trade the foundation of this expansion (UNCTAD, 2021). Because of this, ports are essential to sustaining the nation's commercial competitiveness and facilitating the efficient flow of products. Over 90% of Bangladesh's containerized cargo is handled at Chattogram Port, formerly known as Chittagong Port, which is the main marine gateway (Chittagong Port Authority, 2022). As a result, the national economy is directly impacted by this port's operational performance, which has an impact on supply chain dependability, import efficiency, and export competitiveness.

Despite its strategic significance, Chattogram Port faces persistent challenges that hinder its operational efficiency. Congestion, vessel delays, and procedural bottlenecks have long plagued the port, resulting in prolonged turnaround times and increased costs for both importers and exporters. Vessels often wait several days or even weeks before berthing due to limited handling capacity, infrastructural inadequacies, bureaucratic hurdles, and labor-related inefficiencies. These challenges have intensified as trade volumes continue to rise, exceeding the port's current capacity. Consequently, clearance delays not only inflate logistics costs and disrupt production schedules but also weaken Bangladesh's position in global trade competitiveness. In contrast, regional ports such as Singapore and Colombo record average cargo release times of less than 24 hours, whereas the average release time at Chattogram Port exceeds 11 days (NBR & WCO, 2022), highlighting a significant performance gap.

The delays experienced at Chattogram Port have broader implications for Bangladesh's supply chain efficiency. According to the Time Release Study (TRS) 2022, the port's average release time is 11 days, 6 hours, and 23 minutes, while for critical sectors such as pharmaceuticals it exceeds 14 days. Such inefficiencies disrupt production timelines, increase storage and transportation costs, and undermine the reliability of logistics operations. These issues are particularly detrimental to export-oriented industries such as the ready-made garments (RMG) sector, which contributes more than 80 percent of the country's total export earnings. Delays in cargo clearance not only affect the timeliness of shipments but also reduce the overall responsiveness of the supply chain, leading to missed deadlines and financial losses across multiple industries.

Although previous research has acknowledged the operational and procedural inefficiencies at Chattogram Port, there remains a scarcity of systematic studies that quantify the effects of clearance delays on end-to-end supply chain performance. Most existing studies tend to identify the causes of delays but rarely examine how these delays influence key performance indicators such as lead times, logistics costs, and reliability. Furthermore, few studies have applied structured analytical frameworks, such as the Supply Chain Operations Reference (SCOR) model, to evaluate the relationship between clearance inefficiencies and supply chain outcomes. This gap limits the ability of policymakers and port authorities to formulate targeted strategies for improving performance and reducing trade-related bottlenecks.

This study seeks to address this gap by analyzing the impact of clearance delays at Chattogram Port on Bangladesh's overall supply chain efficiency. Through a qualitative approach that incorporates stakeholder perspectives and case study evidence, the research identifies the operational, infrastructural, and procedural factors contributing to clearance delays and examines their effects on key supply chain performance dimensions. The findings are expected to provide valuable insights into how inefficiencies at the port level propagate through the broader logistics network, affecting national trade performance and competitiveness. In doing so, the study also highlights potential policy interventions and global best practices that could enhance port performance, reduce clearance times, and strengthen the resilience of Bangladesh's supply chains in an increasingly competitive global marketplace.

LITERATURE REVIEW

Global Perspective on Port Efficiency and Clearance Delays: Over 90% of global trade is facilitated by ports,
which are essential components of global supply chains (UNCTAD, 2021). Improving lead times, cutting logistical costs, and raising a country's competitiveness in global trade all depend on effective port operations. However, ports around the world deal with issues including traffic, manual procedures, and poor infrastructure, which cause supply chains to be disrupted and cargo clearance to be delayed (Koray et al., 2025; Notteboom, 2006).

Congestion and Delays: A widespread problem that impacts both industrialized and developing nations is port congestion. According to studies, delays in cargo clearance have a detrimental effect on supply chain efficiency by raising lead times, logistical costs, and inventory holding expenses (Meersman et al., 2012). For instance, during the COVID-19 pandemic, delays at the US Port of Los Angeles caused major disruptions in international supply chains, underscoring the significance of effective port operations (World Bank, 2022). In a similar vein, congestion at India's Port of Mumbai has been connected to higher shipping costs and lower export competitiveness (Ghate, P. S. 2025).

Automation and Technology: Automation and the use of information technology (IT) have been found to be important ways to increase port efficiency. To expedite cargo clearance procedures and cut down on delays, ports like Singapore and Colombo have installed cutting-edge IT systems, such as electronic data interchange (EDI) and real-time tracking (Gonçalves, M., & Teixeira, L. 2025). For example, the Port of Singapore's integrated IT system reduces clearance delays by 30% by enabling importers to electronically submit documentation (Tsou, M. C. 2025). Leading ports are also implementing cutting-edge technologies like blockchain and artificial intelligence (AI) to improve security, efficiency, and transparency in cargo handling and risk management (Lu et al., 2016).

Port Efficiency and Supply Chain Performance

The success of the supply chain is directly impacted by port efficiency, especially when it comes to lead times, costs, and dependability. According to Koray et al. (2025) and Notteboom (2006), effective ports can help businesses achieve delivery dates and preserve a competitive edge by lowering the time and cost of cargo movement. Effect on Lead Times: Production timetables may be thrown off and stockouts may result from delays in cargo clearance at ports. For instance, it has been demonstrated that the apparel industry, which depends on just-in-time delivery to fulfill export deadlines, suffers when raw material clearance at Chattogram Port is delayed (Islam et al., 2021). According to a study by Rahman and Hossain (2020), delays at Chattogram Port lengthened lead times by 15–20%, which caused exporters to lose sales and experience production delays. Impact on Costs: Demurrage, storage, and transportation expenses are among the logistical costs that are raised by ineffective port operations. These extra expenses are frequently transferred to customers, making exports less competitive in international marketplaces (World Bank, 2022). For example, inefficiencies at Chattogram Port raised logistical costs by 20–25%, making Bangladeshi exports less competitive in global markets, according to a study by Ahmed and Mahmud (2019). Impact on Reliability: Businesses find it challenging to efficiently plan and carry out their operations when supply chains are less reliable due to port inefficiencies. This is especially troublesome for sectors like the pharmaceutical and perishable goods industries that depend on timely deliveries (Meersman et al., 2012).

For example, delays in the clearance of pharmaceutical raw materials at Chattogram Port have been linked to shortages of essential medicines in Bangladesh (Karim, S. M. N. 2024; Kabir and Helal, 2021). Similarly, delays in the clearance of perishable goods, such as fruits and vegetables, have resulted in significant losses for exporters and importers, further highlighting the need for efficient port operations (Du Plessis, F et al., 2023 Chowdhury et al., 2020). Challenges at Chattogram Port Chattogram Port, the principal seaport of Bangladesh, faces significant challenges that contribute to clearance delays and supply chain inefficiencies. These challenges include manual processes, understaffing, inadequate infrastructure, and inefficient customs procedures (Sukanta et al., 2020; NBR and WCO, 2022).

Manual Processes: Heavy reliance on manual documentation and cargo handling processes is a major bottleneck at Chattogram Port. According to the Time Release Study (TRS) 2022, importers and customs brokers consume 75% of the total release time due to delays in document submission and payment processing (NBR and WCO, 2022). A study by Rahman and Siddique (2019) found that manual processes at Chattogram Port increased clearance times by 30-40%, compared to ports with automated systems.

Understaffing: Customs and port authorities at Chattogram Port are operating with 50% of the approved workforce, leading to delays in cargo assessment and examination (NBR and WCO, 2022). This understaffing has been exacerbated by a lack of investment in training and capacity building for port workers (Ahmed and Mahmud, 2019).

Inadequate Infrastructure: The port's infrastructure is insufficient to handle the growing volume of cargo, resulting in congestion and delays. For example, the shortage of container scanners and gantry cranes has been identified as a key factor contributing to delays in cargo clearance (Karim, S. M. N. 2024; Kabir and Helal, 2021). A study by Chowdhury et al. (2020) found that the lack of modern equipment at Chattogram Port increased vessel turnaround times by 20 25%. Inefficient Customs Procedures: Customs clearance processes at Chattogram Port are often slow and bureaucratic, with a high percentage of physical examinations (15%) due to inadequate risk profiling (NBR and WCO, 2022). A study by Islam and Rahman (2020) found that inefficiencies in customs procedures increased clearance times by 10-15%, leading to higher costs for importers and exporters.

Global Best Practices for Port Efficiency

Several ports around the world have implemented best practices to improve efficiency and reduce clearance delays. These practices include automation, pre-arrival processing (PAP), and public-private partnerships (PPPs). These strategies have proven effective in reducing clearance times, enhancing operational efficiency, and improving supply chain performance.

Automation: Ports such as Singapore and Colombo have implemented advanced IT systems, including electronic data interchange (EDI) and real-time tracking, to streamline cargo clearance processes and reduce delays (Alavi-Borazjani et al., 2025; Zhang et al., 2015). For example, the Port of Singapore uses an integrated IT system that allows importers to submit documentation electronically, reducing clearance times by 30% (Tsou, M. C. 2025). Emerging technologies, such as blockchain and artificial intelligence (AI), are also being adopted by leading ports to enhance transparency, security, and efficiency in cargo handling and risk management (Lu et al., 2016).

Pre-Arrival Processing (PAP): PAP allows importers to submit documentation and pay duties before the arrival of goods, reducing clearance times. For example, the implementation of PAP at Chattogram Port has reduced clearance times by 57% for importers using the system (NBR and WCO, 2022). A study by Lu et al. (2016) found that PAP reduced clearance times by 40-50% at the Port of Shanghai. This approach not only reduces delays but also enhances predictability and reliability in supply chain operations.

Public-Private Partnerships (PPPs): PPPs have been used to modernize port infrastructure and improve operational efficiency. For example, the Port of Colombo in Sri Lanka has successfully used PPPs to expand its container handling capacity and reduce congestion (UNCTAD, 2021). A study by Bashar and Amin (2022) found that PPPs increased the efficiency of port operations by 20-30% in developing countries. By leveraging private sector expertise and investment, PPPs can address infrastructure gaps and improve service delivery at ports.

Challenges in Implementing Best Practices: While these best practices have proven effective, their implementation in developing countries like Bangladesh faces several challenges. These include limited funding, lack of technical expertise, and resistance to change (Ahmed and Mahmud, 2019). For example, the adoption of automation and PAP at Chattogram Port has been hindered by bureaucratic inefficiencies and a lack of coordination among stakeholders (Karim, S. M. N. 2024; Kabir and Helal, 2021). Addressing these

challenges requires strong political will, stakeholder collaboration, and sustained investment in capacity building.

Theoretical Discussion

Supply Chain Management Theory

Supply Chain Management (SCM) emphasizes the integration of activities from suppliers to end customers to ensure smooth flow of goods, information, and finance. Any inefficiency at one node disrupts the entire chain. Clearance delays at Chattogram Port extend lead times, raise inventory costs, and reduce the ability of firms to meet export deadlines, thereby weakening competitiveness.

Trade Facilitation Concept

According to the World Trade Organization (WTO) and UNCTAD, trade facilitation involves simplifying, modernizing, and harmonizing export and import processes to reduce time and cost. Efficient customs clearance is central to this idea. However, Chattogram Port's reliance on manual documentation, multiple physical inspections, and bureaucratic bottlenecks contradicts trade facilitation principles, creating high costs and uncertainty for supply chain actors.

Institutional Theory

Institutional theory emphasizes that organizational practices are shaped by formal rules, bureaucratic norms, and institutional structures. Clearance delays at Chattogram Port are often linked to bureaucratic inefficiencies, limited coordination among customs, port authorities, and other agencies, and resistance to automation. Institutional reforms and stakeholder collaboration are therefore necessary to improve efficiency.

Research Methodology

Research Design The present study adopts a qualitative research design as its core methodological approach. The rationale for choosing this design is to capture stakeholder perceptions, operational realities, and systemic challenges underlying clearance delays at Chattogram Port factors that cannot be fully understood through numerical indicators alone. Unlike a purely quantitative design, which would limit the analysis to statistical measures of clearance time, the qualitative approach allows for the exploration of themes, patterns, and institutional bottlenecks as experienced by those directly engaged in port operations. To generate primary evidence, the study relies on structured surveys with 10 respondents, including customs officials, C&F agents, and importers. The survey instrument was designed to elicit detailed insights into recurring clearance challenges, such as manual documentation, staffing adequacy, infrastructural capacity, and customs procedures. These responses form the foundation of the qualitative dataset, which is later examined through thematic analysis to identify dominant issues and their implications for supply chain efficiency. The thematic analysis of the qualitative survey data was integrated with the SCOR framework In addition to primary survey findings, the research incorporates case study evidence to strengthen and contextualize the analysis. Two types of case study inputs are considered. The Time Release Study (TRS) 2022, conducted by the NBR and WCO, provides secondary quantitative figures such as Average Release Time (ART), stakeholder-wise time distribution, and the impact of Pre-Arrival Processing (PAP). Furthermore, global best practices case studies such as the Port of Singapore and the Port of Colombo are reviewed to demonstrate how automation, digitization, risk-based customs clearance, and public-private partnerships (PPPs) have successfully reduced congestion and improved clearance efficiency. These international benchmarks serve as comparative case studies, offering practical reform pathways for enhancing the performance of Chattogram Port.

Data Collection

In this study, data were collected through primary qualitative surveys, allowing direct insights into respondents' views and experiences. To strengthen the analysis, these findings were further supported by secondary case

study evidence. The combination of both sources not only enriches the context of the research but also enhances the reliability and credibility of its conclusions.

Qualitative Data

The survey design was intended to capture stakeholder experiences, perceptions, and recommendations, thereby providing insight into the qualitative dimensions of clearance delays. All responses were recorded, coded, and later analyzed using thematic analysis to identify recurring patterns and categories of inefficiency. The specifics of the survey are outlined below:

- Respondents: 10 stakeholders including C&F agents, customs officials, and importers.
- Instrument: Structured survey questionnaires containing 5 key questions.
- Focus: Stakeholders were asked about their experiences with manual documentation, staffing levels, infrastructure adequacy, customs procedures, and other recurring bottlenecks in clearance.
- Nature of Data: Responses were descriptive in nature, highlighting common operational difficulties and suggested reforms.

The survey questionnaire consisted of five core questions, focusing on:

- The challenges faced due to manual documentation in clearance.
- The effect of understaffing at customs and port authorities.
- Infrastructure-related limitations.
- Inefficiencies in customs procedures and their impact.
- Other recurring problems or bottlenecks encountered during clearance.

Data Analysis

The study employed an integrated analytical approach, combining thematic exploration with a structured supply chain framework to derive meaningful insights from the qualitative and case study data. The analysis process consisted of the following key stages:

Thematic Analysis of Survey Responses

The primary qualitative data obtained through structured surveys were examined using thematic analysis. This involved identifying, analyzing, and reporting patterns (themes) within the data. Key themes such as manual documentation processes, staffing constraints, infrastructural limitations, and procedural inefficiencies were coded and categorized to understand the root causes of clearance delays from the perspective of practicing stakeholders.

Analytical Integration with the SCOR Framework

The emergent themes from the survey data were systematically evaluated using the Supply Chain Operations Reference (SCOR) model as an analytical lens. This integration allowed for a structured assessment of how the identified operational challenges impact key supply chain performance dimensions:

- Reliability: Consistency and predictability of clearance processes
- Responsiveness: Speed and agility in cargo release
- Costs: Financial implications of delays and inefficiencies
- Asset Utilization: Efficiency of port infrastructure and resource use

Case Study Analysis

Quantitative data from the Time Release Study (TRS) 2022 were analyzed as supporting case evidence. Key metrics including Average Release Time (ART), clearance time distribution across process stages, and

PreArrival Processing (PAP) effectiveness were interpreted to validate and contextualize the themes emerging from the primary survey data.

Comparative Analysis of Global Best Practices

Case studies of international ports, including Singapore and Colombo, were analyzed to identify transferable strategies for improving port efficiency. The focus was on understanding how automation, digitalization, and public-private partnerships have been successfully implemented in comparable contexts to address challenges similar to those faced at Chattogram Port.

This multi-layered analytical strategy ensured that the findings were grounded in local realities while being informed by global benchmarks and theoretical frameworks.
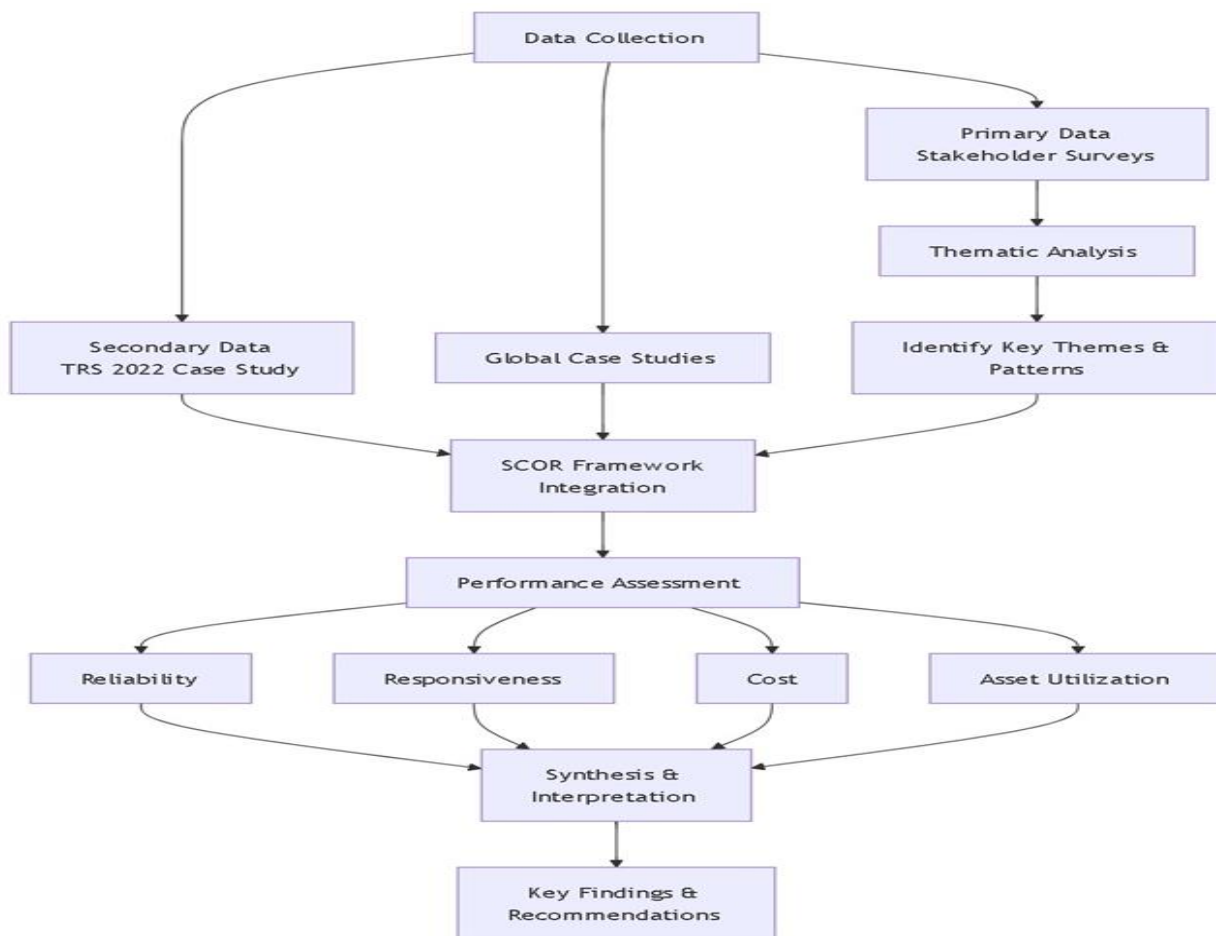
Figure 1: Data Analysis Process Flow

Findings and Analysis

Thematic Analysis of Primary Data

The primary qualitative data, gathered through structured surveys with 10 stakeholders, was subjected to thematic analysis, revealing four dominant themes as summarized given below. The complete set of anonymized survey responses is provided in Appendices.

Manual Processes:

One of the main reasons for clearance delays, according to 80% of respondents, is manual documentation and physical file handling. "Each shipment requires physical submission of 12-15 documents, and a single error means redoing the entire process, adding 2-3 days to the clearing time".

Understaffing: Insufficient staff at customs and port officials was cited by 70% of participants as a major obstacle. "Our crew is processing 50% more containers than the sanctioned strength allows, leading to inevitable delays in cargo examination and release," a port official stated.

Inadequate Infrastructure: A lack of contemporary equipment was mentioned by 60% of respondents. "The lack of specialist scanners for heavy equipment means we wait 3-4 days for a physical inspection appointment, thus harming our project timeframes," a capital machinery importer clarified.

Inefficient Customs Procedures: 50% of stakeholders highlighted procedural inefficiencies. A frequent theme was the high rate of physical inspections and the lack of a robust risk management system. A C&F Agent explained, "High percentage of physical examinations without proper risk assessment causes unnecessary delays," noting that this often adds 1-2 extra days even for compliant shipments.

The key findings are summarized in Table 2, showing main challenges, their frequency, stakeholder quotes, and impact on the clearance process.

Table 2: Thematic Analysis of Stakeholder Survey Responses

Theme	Frequency	Representative Stakeholder Quotations	Key Implications
Manual Processes	80%	"Each shipment requires physical submission of 1215 documents. A single error means restarting the entire process." – Customs Broker	Increases processing time; High error rate
Understaffing	70%	"Our team handles 50% more containers than sanctioned strength allows." – Port Official	Causes bottlenecks in cargo examination and release
Inadequate Infrastructure	60%	"The lack of specialized scanners means we wait 3-4 days for physical inspection slots." – Importer	Limits handling capacity; Increases dwell time for specialized cargo
Inefficient Customs Procedures	50%	"High percentage of physical examinations without proper risk assessment causes unnecessary delays."- C&F Agent	Increases clearance uncertainty; Affects supply chain reliability

Analysis of Clearance Time Distribution and PAP Impact Using TRS 2022 Case Data

Commodity-wise Clearance Time and PAP Impact

The TRS 2022 data was analyzed as a supporting case study to validate the clearance delays identified in the stakeholder surveys. This section presents a consolidated analysis of the Average Release Time (ART) across major commodity groups and evaluates the significant time reduction achieved through Pre-Arrival Processing (PAP), as summarized in the tables below.

Table 3: Average Release Time (ART) by Commodity and PAP impact

Commodity	ART without PAP (Days: Hours: Min)	Key Challenges	ART with PAP (Days: Hours: Min)	Reduction Achieved in ART
Pharmaceuticals	14:05:49	High rate of physical inspections and delays in testing/certification (aligned with 'Inefficient Procedures' theme)	08:05:49	45%
Garments Raw Materials	09:23:34	Manual documentation delays and payment processing issues (aligned with 'Manual Processes' theme).	05:12:34	43%
Capital Machinery	12:01:14	Inadequate infrastructure for handling and inspecting large items (aligned with 'Inadequate Infrastructure' theme).	07:01:14	42%
Food Items	11:22:57	Limited cold storage facilities and procedural bottlenecks (aligned with 'Inadequate Infrastructure' and 'Inefficient Customs Procedures' themes).	06:02:57	44%

This table compares clearance efficiency at Chattogram Port, highlighting major delays across commodities and time savings from Pre-Arrival Processing (PAP). Pharmaceuticals have the longest Average Release Time (over 14 days) due to inspections, while garments raw materials are shortest (9 days) but still face manual delays. PAP cuts clearance times by 42–45%, saving 4–6 days per shipment, with pharmaceuticals benefiting most (6 days saved). The data confirms stakeholder survey findings, linking operational challenges to actual performance and proving PAP's role in improving port efficiency.
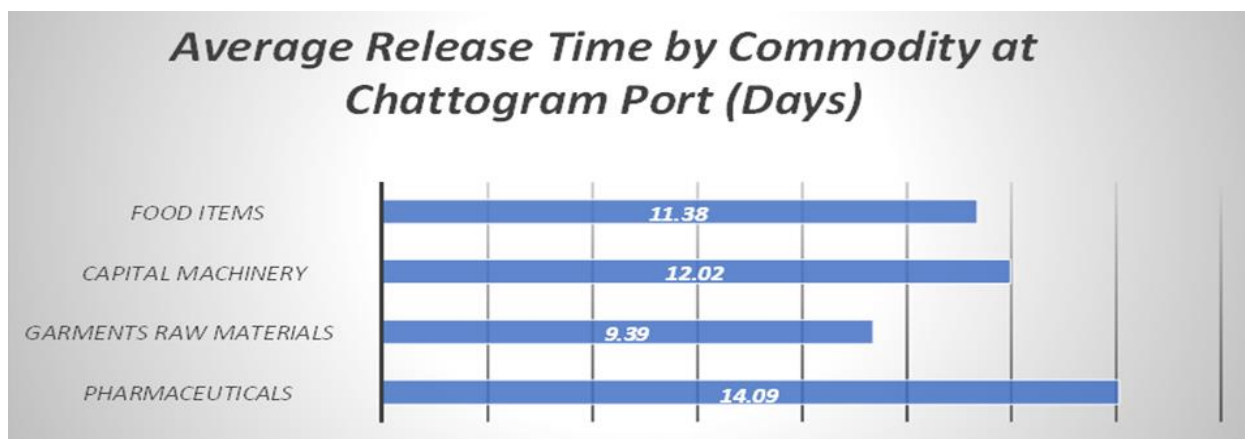
**Figure 2:** Average Release Time (ART) by Commodity at Chattogram Port
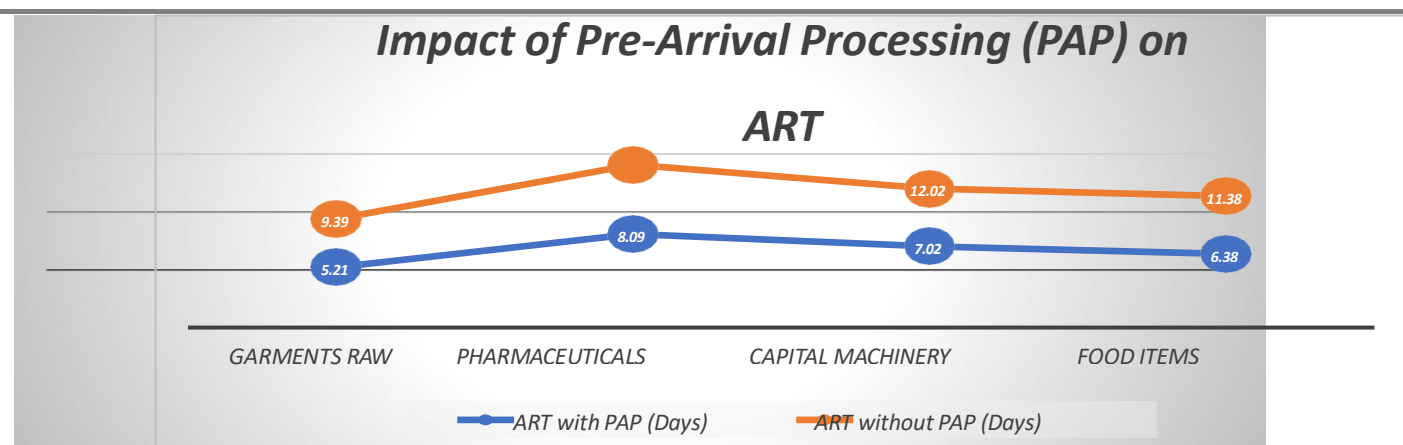
Figure 3: Impact of PAP on Clearance Times

Time Allocation Across Clearance Stages

The TRS 2022 data shows importers and brokers consume 75% of clearance time, primarily for manual documentation and payments, validating the survey's main bottleneck. In contrast, Customs (8%) and other agencies (2%) have minimal shares, proving core delays occur before official checks. This highlights that the primary inefficiency lies not with authorities, but with pre-submission processes, underscoring the urgent need for front-end digitization to reduce these manual dependencies.

Table 4: Time Allocation across Clearance Stages

Clearance Stages	Percentage of Total Release Time	Key Activities
Importers and Customs Brokers	75%	Document submission, payment processing, coordination with customs and port authorities.
Port Operations	14%	Cargo handling, shed management, equipment operation.
Customs Verification	8%	Document verification, risk assessment, physical inspections.
Other Government Agencies (OGAs)	2%	Testing and certification of goods.
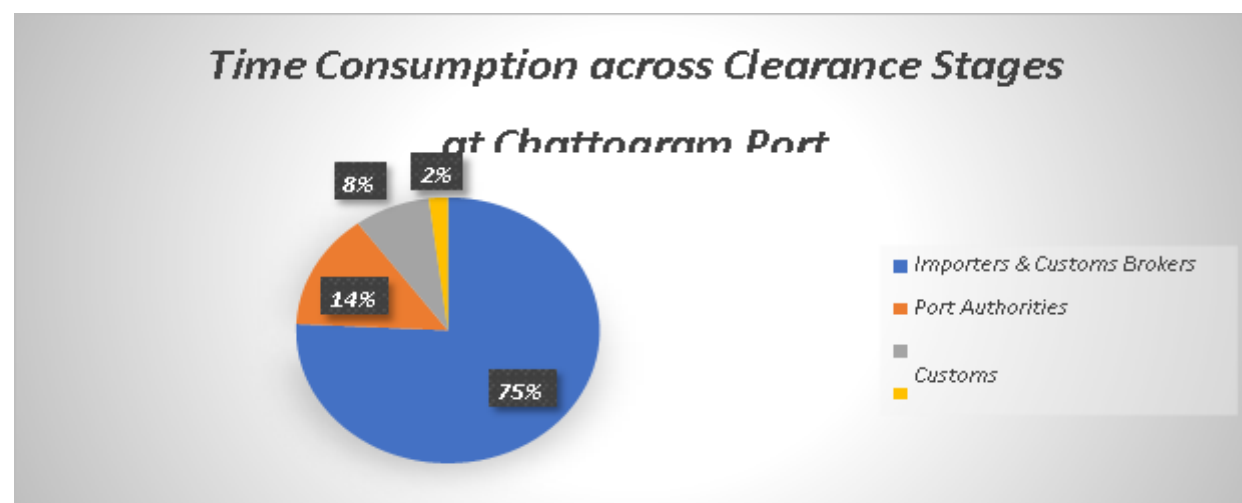
Figure 4: Clearance Stage-wise Time Consumption

Integrated Analysis through the SCOR Framework

The identified themes from the qualitative survey and TRS case data were systematically evaluated using the SCOR model to assess their impact on supply chain performance, creating a direct alignment between stakeholder experiences and theoretical framework.

Reliability Impact

Qualitative Evidence: Survey respondents consistently reported unpredictable clearance times, with 80% citing manual processes causing 2-3 days variation per shipment.

SCOR Alignment:

- Unreliable lead times affecting delivery performance metrics

- Inconsistent processing times disrupting supply chain planning

- High variability in clearance durations (9-14 days across commodities)

Direct Correlation: The 'Manual Processes' and 'Inefficient Customs Procedures' themes directly impact SCOR's reliability dimension, making supply chain planning highly uncertain.

Responsiveness Impact

Qualitative Evidence: 70% of stakeholders highlighted understaffing-related delays, while importers reported 3-4 day waits for physical inspections due to equipment shortages.

SCOR Alignment:

- Extended response times (11+ days ART vs global 1-2 days)

- Slow reaction to market demands and customer requirements

- Delayed order fulfillment cycles

Direct Correlation: 'Understaffing' and 'Inadequate Infrastructure' themes directly reduce supply chain responsiveness, preventing quick adaptation to market changes.

Costs Impact

Qualitative Evidence: Stakeholders reported significant cost escalations through demurrage charges, storage fees, and manual processing overheads.

SCOR Alignment:

Total logistics costs increased by 20-25% (Ahmed and Mahmud, 2019)

- Higher inventory carrying costs due to extended dwell times
- Increased operational costs from manual documentation

Direct Correlation: All four thematic challenges contribute to increased supply chain costs, validating stakeholder cost concerns through SCOR's cost metrics.

Asset Utilization Impact

Qualitative Evidence: 60% of respondents cited poor equipment utilization, with specialized scanners operating beyond capacity and infrastructure constraints limiting throughput.

SCOR Alignment:

- Suboptimal utilization of port infrastructure and equipment

- Congestion reducing asset efficiency

- Inadequate handling capacity for growing cargo volumes

Direct Correlation: The 'Inadequate Infrastructure' theme directly correlates with poor asset utilization metrics in the SCOR framework.

Integrated SCOR-Performance Dashboard

The alignment reveals that Chattogram Port's clearance delays create a cascading effect across all SCOR performance attributes:

- **Reliability** compromised by manual processes and procedural inefficiencies

- **Responsiveness** hampered by understaffing and infrastructure gaps

- **Costs** escalated across all supply chain activities

- **Assets** underutilized due to operational bottlenecks

This integrated analysis demonstrates that qualitative stakeholder experiences quantitatively translate into measurable SCOR performance deficiencies, providing a comprehensive framework for targeted interventions and performance improvement strategies.

The SCOR framework has effectively validated stakeholder perspectives while providing a structured approach to quantifying the impact of clearance delays on overall supply chain performance.

**Comparative Benchmarking with Global Case Studies**

A comparison with global best practices highlights the performance gap and potential solutions for Chattogram Port.

- The **Port of Singapore**, with its fully digitalized and automated processes, achieves an ART of under 24 hours. This contrasts sharply with Chattogram's manual systems, underscoring the potential impact of addressing the 'Manual Processes' theme.

- The **Port of Colombo** has successfully used Public-Private Partnerships (PPPs) to expand capacity and improve efficiency, offering a model to address the 'Inadequate Infrastructure' challenges identified at Chattogram Port.

Table 5: Port Performance Comparison

Port	ART (Days)	Key Features
Chattogram Port	11.26	Manual processes, Understaffing, Inadequate infrastructure, Inefficient custom procedures.

| Port of Singapore | 1-2 | Advanced automation, Digital pre-arrival processing (PAP). |
| Port of Colombo | 3-4 | Public-private partnerships (PPPs), Integrated IT systems, Real time cargo monitoring. |

Figure 5: Comparison of ART at Chattogram Port with Global Benchmarks
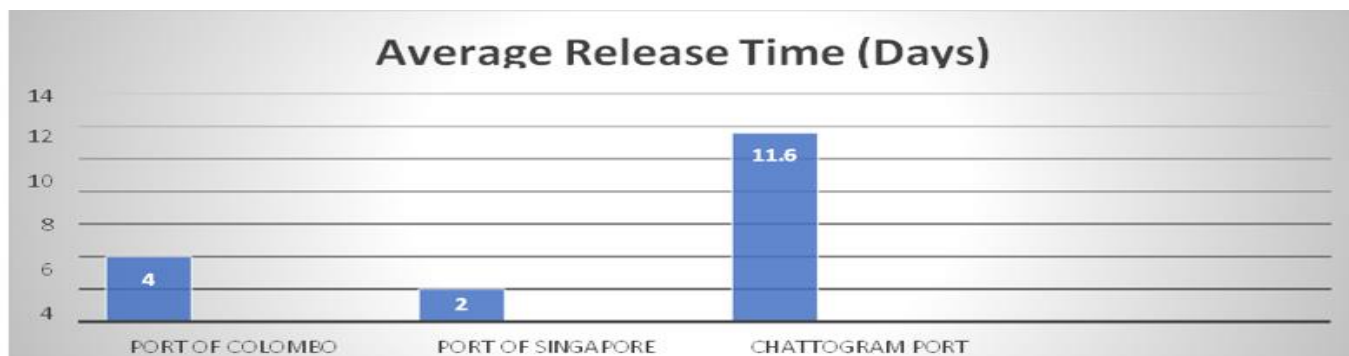
Note: Chattogram Port's ART (11:06:23) is significantly higher than the Port of Singapore (1-2 days) and the Port of Colombo (3-4 days).

The comparison highlights the significant gap between Chattogram Port's performance and global benchmarks, underscoring the need for process improvements and infrastructure upgrades.

DISCUSSION AND SUMMARY OF FINDINGS

Interpretation of Findings: A Reflective Synthesis

This research reveals that clearance delays at Chattogram Port are more complex than they initially appear. The connection between the qualitative data and case study's data experiences tells a compelling story.

The 75%-time consumption by importers and brokers - a key finding from the TRS data - directly confirms what stakeholders described in surveys. When 80% of respondents identified manual documentation as the main problem, they were explaining why this 75% figure exists. Customs brokers' detailed accounts of "submitting 12-15 physical documents per shipment" and "restarting the entire process for single errors" give human context to these numbers.

The 43% reduction through PAP demonstrates the potential that stakeholders themselves recognized. The survey showed that procedural inefficiencies weren't just about speed but about predictability - a concern raised by 50% of respondents. The extreme delays in pharmaceuticals (14+ days) exemplify this, where qualitative responses described how testing bottlenecks created uncertainties that numbers alone couldn't capture.

The integration of both data types reveals a vicious cycle. Manual processes cause delays that overwhelm understaffed teams (reported by 70%) and strain inadequate infrastructure (noted by 60%), leading to more inspections and paperwork. The qualitative stories transform statistics into actionable insights, showing not just what is happening but why it matters to real businesses.

Critical Analysis of Findings in Relation to Existing Literature

This results both support and contradict previous research. Ahmed and Mahmud's (2019) estimates of a 20–25% rise in logistics costs are consistent with my research, which shows that infrastructure constraints are not the primary reason for this. Instead, it draws attention to the fact that inefficiencies in the private sector's submission and documentation procedures constitute a significant—and hitherto overlooked—factor in the overall delay.

Due to thorough testing and inspections, which validate stakeholder allegations of protracted certification processes, pharmaceuticals experience the largest delays (14+ days). My qualitative data, however, highlights a neglected aspect: a series of delays that compound rather than merely increase the overall clearance time are caused by a lack of collaboration between several regulatory organizations.

According to UNCTAD (2021) reports, Chattogram's performance disparity is even more pronounced when compared to global benchmarks. My research indicates that Chattogram's changes have been piecemeal, which explains why PAP shows impressive results (43% reduction) but is still underutilized, whereas Singapore and Colombo gained their efficiency through systematic modernization.

Scholarly Reflection on Research Methodology and Validity

There were advantages and disadvantages to conducting this study when port reforms were in progress. I was able to gather real-time effectiveness data because the date corresponded with PAP implementation, but stakeholders were cautious in their reactions. I used triangulation using survey data, the TRS case study, and international benchmarks to guarantee validity. It was a conscious choice to concentrate on ten stakeholders, giving depth precedence over breadth. In hindsight, adding shipping line officials would have given more insight into the effects of vessel operations. Nonetheless, the coherence between my qualitative themes and the quantitative data from TRS indicates that the main conclusions are sound. When stakeholders brought up recent advancements, the limitations of using TRS 2022 data became clear. Real-time tracking, as opposed to retrospective analysis, would be advantageous for future studies. Nevertheless, even with small modifications, the patterns found are probably still present.

Personal Reflection and Theoretical Contribution

The gap between the goals of policy and the realities on the ground caught my attention throughout this investigation. The success of PAP shows that there is technology for efficiency benefits, but institutional inertia, talent gaps, and misaligned incentives are invisible impediments to adoption.

By showing how organizational practices in developing economies are influenced by capacity limits and informal norms in addition to formal regulations, this work advances institutional theory. The discovery that just 8% of time is spent on customs verification contradicts popular belief and implies that reform initiatives have been misguided.

A new method for port studies that captures the operational impact of inefficiencies as well as the human experience is provided by the merging of qualitative narratives with SCOR measurements. Other logistics hubs in underdeveloped nations could benefit from this methodological advancement.

Generalization and Practical Implications

While focused on Chattogram, my findings likely apply to other ports in similar contexts. The centrality of documentation processes and fragmented coordination appear to be universal challenges in developing economies, though their specific manifestations may vary.

The dramatic effectiveness of PAP suggests a strategic insight: digitizing front-end processes may yield greater returns than infrastructure investments in the short term. This doesn't diminish the need for infrastructure development but suggests a sequencing strategy digital transformation first, followed by physical capacity expansion.

For policymakers, my research indicates that process reengineering may be more urgent than capital investment. The 75%-time allocation to importer/broker activities represents low-hanging fruit that could be addressed through relatively inexpensive digital solutions.

This research has transformed my understanding of supply chain efficiency—from viewing it as a technical challenge to recognizing it as a complex socio-technical system where human factors, institutional arrangements, and technology interact in ways that require holistic solutions rather than silver bullets.

CONCLUSION AND RECOMMENDATIONS

This study set out to investigate clearance delays at Chattogram Port and their impact on supply chain efficiency through a qualitative-dominant, case-study-supported approach. The research reveals several critical findings that collectively paint a comprehensive picture of the port's operational challenges. Manual documentation processes emerged as the fundamental bottleneck, with 80% of stakeholders identifying this as the core challenge, a fact corroborated by TRS data showing 75% of clearance time is consumed by importer and broker activities. This issue is exacerbated by severe understaffing, reported by 70% of respondents, and inadequate infrastructure, noted by 60%, which together create a vicious cycle of inefficiency. The study also found significant commodity-specific variations, where pharmaceuticals experience the longest delays of over 14 days due to testing requirements, while garments raw materials show relatively faster clearance despite documentation challenges. Conversely, Pre-Arrival Processing (PAP) demonstrates remarkable effectiveness by reducing clearance times by 43% on average, offering a proven pathway for improvement.

Theoretical and Practical Implications

This research makes several significant contributions to the supply chain management literature. It successfully adapts the SCOR framework to port efficiency analysis in developing economies, demonstrating its applicability beyond traditional manufacturing contexts. Furthermore, the study offers a methodological innovation by integrating qualitative stakeholder perspectives with quantitative case data, thereby providing a robust template for future port efficiency studies. Theoretically, it extends institutional theory by revealing how organizational practices within these economies are shaped not only by formal rules but also by pervasive informal capacity constraints.

Practical Implications:

The findings offer immediate and actionable insights for policymakers and port authorities. Given that 75% of time is allocated to importer and broker activities, the clear short-term priority should be to focus on process digitization rather than infrastructure investment. The proven effectiveness of the Port Activity Program (PAP) establishes a solid business case for rolling out such digital systems to all commodity groups. Furthermore, the identified commodity-specific delay patterns enable targeted and high-impact interventions, particularly for critical sectors like pharmaceuticals and capital machinery.

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