Assessment of the Impact of Tanzania Electronic Single Window System on Cargo Congestion in Tanzaniaa Case of Dar Es Salaam Port

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Abstract:

This study assessed the impact of the Tanzania Electronic Single Window System (TeSWS) on cargo congestion at Dar es Salaam Port. The specific objectives were to examine the influence of the system on average cargo clearance time, assess its impact on the annual volume of cargo handled, and determine its effect on vessel dwell time. A mixed-methods approach was adopted, combining quantitative analysis of clearance times, throughput, and vessel dwell time with qualitative insights from interviews with customs officers, port officials, and logistics providers. Findings showed that TeSWS has reduced average cargo clearance time from more than a week under the former system to about three days. This was achieved by streamlining documentation and integrating multiple agencies, though ICT challenges and limited user training continued to cause delays. Likewise, the system improved cargo throughput by enabling faster clearance and better coordination among stakeholders, leading to steady growth in annual cargo volumes, though constrained by inadequate infrastructure and partial private sector adoption. Furthermore, vessel dwell time decreased as clearance and release processes accelerated; however, dwell times remained higher than international best practice due to congestion and weak evacuation systems. In general, TeSWS has substantially reduced cargo congestion. The study recommends include sustained investment in ICT infrastructure, continuous stakeholder training and sensitization, upgrading of port facilities, and establishment of robust monitoring frameworks to ensure long-term sustainability and competitiveness of Dar es Salaam Port in regional and global trade.

Keywords: Tanzania Electronic Single Window System (TeSWS), Cargo Congestion- Cargo Clearance Time, Cargo Throughput, Trade Facilitation

1.1 Introduction:

Many countries have adopted Single Window Systems (SWs) to simplify foreign trade by unifying regulatory documentation into a single electronic entry point, improving efficiency in imports and exports. While global evidence shows that SWs reduce clearance times, increase cargo throughput, and streamline trade processes, their implementation faces challenges such as high costs, technical issues, and stakeholder resistance. At Dar es Salaam Port, cargo clearance was historically slow due to manual procedures and later TANCIS, which improved customs

operations but lacked inter-agency integration. To address these inefficiencies, Tanzania introduced the Tanzania Electronic Single Window System (TeSWS), integrating multiple agencies into one digital platform. Early evidence suggests TeSWS reduces clearance delays, vessel dwell time, and congestion while enhancing transparency and coordination. However, challenges such as infrastructure limitations, technical hitches, and partial adoption still constrain its full impact. This study fills a gap by empirically assessing TeSWS's effectiveness in improving operational performance at Dar es Salaam Port, offering policy and practical recommendations for sustainable port efficiency and competitiveness.

1.2 Statement of the Problem

Dar es Salaam Port, which handles over 90% of Tanzania's import and export cargo, has long faced challenges such as congestion, long vessel dwell times, and delays in cargo clearance, leading to higher logistics costs and reduced trade competitiveness. To address these issues, the government, through the Tanzania Ports Authority (TPA) and Tanzania Revenue Authority (TRA), introduced the Tanzania Electronic Single Window System (TeSWS), a centralized electronic platform for all trade-related documentation. Evidence from global ports shows that such systems reduce clearance times and improve efficiency, and in Tanzania, TeSWS has already minimized duplication of processes, shortened clearance times, reduced vessel dwell times, and increased cargo throughput from 17.0 million tons in 2021 to 27.7 million tons in 2024. The system has also enhanced transparency, reduced corruption, and improved data management. However, challenges such as technical malfunctions, inadequate training, and infrastructure gaps limit its full effectiveness. This study, therefore, aims to examine the impact of TeSWS on cargo congestion at Dar es Salaam Port, focusing on its effects on clearance time, cargo volume, and vessel dwell time to provide evidence on its role in enhancing port efficiency and trade competitiveness

The study was guided by following specific objectives

To examine the influence of Tanzania electronic Single Window System on average cargo clearance time at Dar es Salaam Port.

To assess the impact of the Tanzania electronic Single Window System on the volume of cargo handled per year at Dar es Salaam Port

To determine the effect of the Tanzania electronic Single Window system on vessel dwell time at Dar es Salaam port

2.1 Literature Review
2.2 Port Performance Theory

Port Performance Theory focuses on the efficiency and effectiveness of port operations, emphasizing multiple factors that influence overall port productivity, such as cargo handling processes, vessel turnaround time, berth occupancy rates, storage and yard management, and coordination among various port stakeholders including customs officials, shipping agents, and terminal operators. The theory posits that when these operational aspects are optimized, ports experience smoother cargo flow, reduced congestion, lower operational costs, and increased throughput. Efficient port performance also enhances competitiveness, attracts more shipping lines, and ensures timely delivery of goods, which is particularly critical for ports that serve as major gateways for regional trade (Wagner, 2018).

2.3 Technology Adoption Theory (TAM)

The Technology Adoption Model (TAM) explains how individuals and organizations adopt and use new technologies. The model emphasizes two main factors: perceived usefulness (the degree to which a person believes that using a technology will improve their job performance) and perceived ease of use (the degree to which a person believes that using the technology will be free of effort). TAM suggests that successful technology adoption depends on users' willingness to accept the system, their confidence in using it, and the extent to which the technology aligns with existing work processes. The theory has been

widely applied to understand the adoption of electronic systems in organizations, highlighting how training, user support, and organizational culture influence the effective use of technology. (Melts, 2020)

2.2 Empirical literature review

Warioba(2019) Impact of ICT on Port Management in East Africa, This research investigated the role of ICT systems in port operations using descriptive research and interviews with key port stakeholders. Warioba found that the adoption of digital systems improved coordination, communication, and documentation efficiency. The study concluded that ICT-based platforms, including TESWS, effectively reduce congestion and streamline cargo handling in East African ports.

Chacha(2019), Impact of ICT on Cargo Clearance in Dar es Salaam Port.Chacha used a mixed-methods approach, including interviews with port staff and analysis of cargo data, to assess the impact of ICT systems on port efficiency. The study found that implementing digital solutions, including TESWS, reduced cargo clearance time, minimized vessel dwell time, and improved the volume of cargo handled daily. The conclusion emphasized that ICT adoption is a critical factor in managing congestion and enhancing port performance.

Rodrigue(2020) Port Performance and Efficiency in Global Shipping. This study examined port efficiency and operational performance in major global ports. Using a comparative case study methodology, the researchers analyzed factors such as vessel turnaround time, berth occupancy, cargo handling, and coordination among stakeholders. The study found that ports implementing advanced management systems and technology experienced significantly reduced vessel dwell time, faster cargo processing, and improved throughput. The authors concluded that integrating electronic platforms and optimizing port operations are critical to reducing congestion and improving global port performance.

UNCTAD (2021) Trade Facilitation and Port Efficiency in Developing Countries

UNCTAD conducted a documentary review and analysis of port operations in developing countries across Africa and Asia. The study focused on trade facilitation initiatives, including Single Window Systems. It revealed that countries that adopted electronic documentation systems experienced a reduction in cargo clearance delays and improved coordination among port stakeholders. The study concluded that implementing such systems contributes directly to enhancing operational efficiency and reducing congestion in busy ports.

Massawe (2021) Evaluation of Port Congestion Management Strategies. Massawe used observation and secondary data analysis from port authority reports to evaluate strategies for reducing congestion at ports. The study found that digital platforms like TeSWS streamlined cargo processing, improved stakeholder coordination, and reduced operational bottlenecks. The conclusion emphasized the importance of technology adoption in achieving efficient cargo handling and managing congestion.

Ngowi(2018),Adoption of E-Systems in Tanzanian Ports. Ngowi conducted a study using survey questionnaires and secondary data to examine user adoption of electronic systems in Tanzanian ports. The findings showed that training, user support, and stakeholder acceptance were crucial for the effectiveness of systems like TeSWS. The study concluded that proper adoption and user competence directly impact the success of TeSWS in reducing cargo clearance delays and congestion.

Hamisi and Kileo (2024) conducted a study on the impact of automated customs clearance systems, focusing on TANCIS and the Tanzania Electronic Single Window System (TeSWS), in improving the efficiency of Dar es Salaam Port. The research applied a quantitative methodology, using surveys distributed to port officials, customs officers, and clearing agents, supported by secondary performance data from the port authority. The study concluded that automation through TeSWS

reduced the average cargo clearance time from more than a week to just a few days, minimized congestion, and improved transparency in the clearance process. This study is highly relevant because it provides direct empirical evidence that TeSWS addressed the key challenges of delays and congestion that your research focuses on.
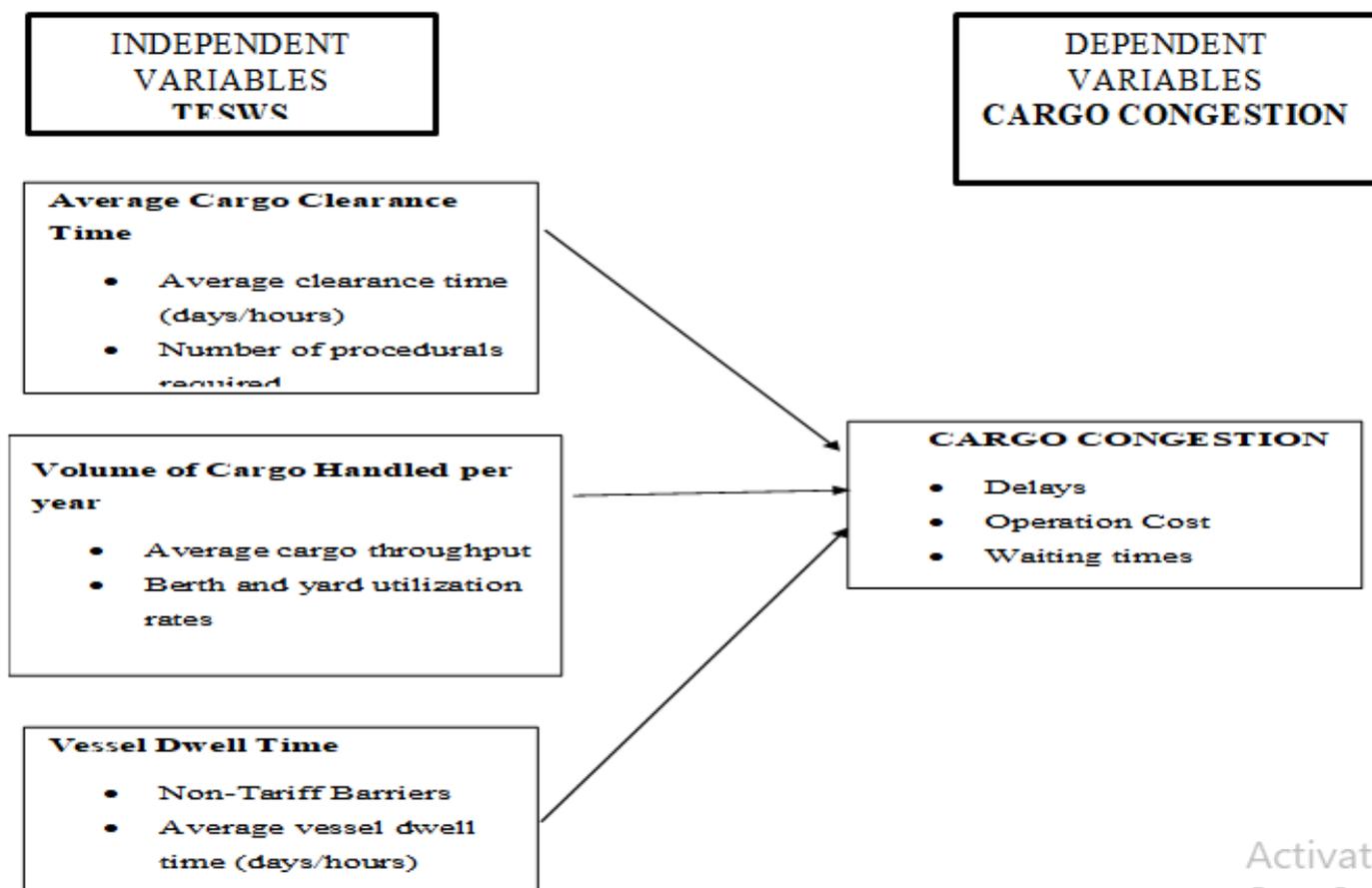
2.3 Research Gap

Despite extensive research on port efficiency and ICT adoption, significant gaps remain regarding the Tanzania Electronic Single Window System (TeSWS) at Dar es Salaam Port. Most existing studies emphasize general benefits of electronic systems or rely on secondary data, with limited focus on TeSWS's direct impact on cargo congestion, clearance time, and vessel dwell time. Little attention has been given to stakeholders' perceptions and acceptance of the system, or to contextual challenges such as infrastructure constraints, bureaucratic practices, and varying technological readiness among users. Furthermore, existing research often highlights short-term improvements without assessing the long-term sustainability of TeSWS amid growing trade volumes and evolving regulations. The socio-economic implications, particularly how TeSWS contributes to trade facilitation, regional integration, and Tanzania's competitiveness in East and Central Africa, also remain underexplored. This study addresses these gaps by empirically evaluating TeSWS's effectiveness in improving operational efficiency, reducing congestion, and enhancing port performance at Dar es Salaam Port, while providing insights to guide policy and future reforms.

2.4 Conceptual Framework

The conceptual framework serves as a foundational structure for any research study, providing a clear representation of the key concepts, variables, and their relationships within the scope of the investigation. According to Miles and Huberman (2018), it can be presented either graphically or narratively, outlining the main elements that the research intends to explore.

Source: Researcher 2025

3. Research methodology:

This study used a mixed-methods approach to assess the impact of Tanzania Electronic Single Window System (TeSWS) in cargo congestion at Dar es Salaam Port. Quantitative data measured cargo clearance time, vessel dwell time, and cargo volumes, while qualitative data was collected through the interviews with port officials, customs officers, and logistics providers. A case study design focused on Dar es Salaam Port, with purposive sampling selecting 30 respondents. Data were collected through interviews and document reviews, then analyzed using thematic techniques and Excel. This approach provided a clear understanding of TeSWS's effectiveness in reducing cargo delays and improving port efficiency.

$$\text{Sample size (n)} = \frac{N}{1+N(e)^2}$$

$$(n) = \frac{60}{1+60(0.1)^2}$$

$$n = 30$$

4. Findings and discussion impact of TeSWS on cargo congestion at Dar es Salaam Port

4.1 Tanzania electronic Single Window System on average cargo clearance time at Dar es Salaam Port.

The findings indicate that between 2018 and 2020, cargo clearance at Dar es Salaam Port was handled mainly through TANCIS, which offered partial automation but lacked full integration with all port agencies, leading to long clearance times of 8–10 days, congestion, and delays. With the introduction of the fully integrated Tanzania Electronic Single Window System (TeSWS) in 2021, clearance times dropped significantly to 5–7 days and further to just 3 days by 2024. By centralizing all import, export, and transit procedures into a single electronic platform, TeSWS improved coordination, reduced congestion, and accelerated cargo movement, clearly highlighting its substantial positive impact on port efficiency and trade facilitation compared to the earlier TANCIS system. By providing a centralized platform accessible to customs officials, shipping agents, freight forwarders, and port operators, TeSWS ensures that all parties have real-time access to necessary documentation and status updates

Table 4.1: Cargo Clearance Performance Before and After Tanzania electronic Single Window Implementation at Dar es Salaam Port (2018–2024)

Year	Cargo Throughput (Million Tons)	Container Traffic (TEUs)	Average Cargo Clearance Time (Days)	
2018	15,693,019	710,2020	10	
2019	16,138,286	726,841	8-9	
2020	15,905,454	720,866	8	
2021	17,025,452	759,902	5-7	
2022	20,020,669	885,478	7	
2023	22,676,664	982,807	3-5	
2024	27,745,210	1,230,832	3	

Source: TPA Statistical Bulletin, 2024

4.2 The Tanzania electronic Single Window System on the volume of cargo handled per year at Dar es Salaam Port

Regarding the from 2018 to 2020, Dar es Salaam Port depended on TANCIS for cargo processing, which, despite enabling some electronic submissions, lacked full integration across stakeholders and relied on partial automation. This limited system resulted in modest growth, with cargo throughput rising slightly from 15.69 million tons to 15.91 million tons and container traffic from 710,202 TEUs to 720,866 TEUs, while challenges such as duplicated procedures, manual verification, and coordination gaps caused congestion and long dwell times. Following the introduction of the fully integrated Tanzania Electronic Single Window System (TeSWS) in 2021, port performance improved significantly, with throughput increasing from 17.03 million tons in 2021 to

27.75 million tons in 2024, and container traffic from 759,902 TEUs to 1,230,832 TEUs. By centralizing all trade-related processes on a single electronic platform, TeSWS streamlined operations, enhanced coordination, reduced delays, and expanded port capacity, clearly demonstrating its stronger positive impact compared to the earlier TANCIS system.

Moreover, the system positively influences container traffic by streamlining customs clearance and inspection procedures. Faster processing of containers allows ships to dock, unload, and depart on schedule, reducing vessel dwell time and improving overall berth utilization. Consequently, shipping lines are more likely to favor Dar es Salaam Port

Table 4.2 **Dar es Salaam Port cargo handled per year, with statistics up to 2024**

Year	Cargo Throughput (Million Tons)	Container Traffic (TEUs)
2018	15,693,019	710,2020
2019	16,138,286	726,841
2020	15,905,454	720,866
2021	17,025,452	759,902
2022	20,020,669	885,478
2023	22,676,664	982,807
2024	27,745,210	1,230,832

Source: TPA Annual Report, 2024

4.3 The effect of the TeSWS on vessel dwell time at Dar es Salaam port

The study further found that From 2018 to 2020, vessel dwell times at Dar es Salaam Port averaged 10–12 days due to manual documentation, poor information sharing, and duplication of procedures among port agencies, with TANCIS only streamlining customs processes and failing to integrate other trade stakeholders. This led to congestion, long berth waiting times, and high operational costs. Following the introduction of the Tanzania Electronic Single Window System (TeSWS) in 2021, vessel dwell times steadily declined from 8 days in 2021 to 4 days in 2024 reflecting improved coordination, real- time communication, and streamlined documentation across customs, port authorities, and other

stakeholders. TeSWS has thus accelerated cargo clearance, reduced congestion, lowered shipping costs, and enhanced the efficiency and reliability of Dar es Salaam Port as a key trade hub for Tanzania and the East African region.

Reducing vessel dwell time has broader economic implications, as faster turnaround increases the port's capacity to handle more ships, reduces demurrage and storage costs for shipping lines and importers/exporters, and enhances Tanzania's competitiveness in regional maritime trade.

Table 4.6: **The Average vessel dwell time at Dar es alaam Port.**

Year	Average Vessel Dwell Time (Days)	Average Cargo Clearance (Days)
2018	12	10
2019	11	8-9
2020	10	8
2021	8	5-7
2022	6-7	7
2023	5	3-5
2024	4	3

Source: Source: TPA Statistical Bulletin, 2024

Discussion:

The analysis of Dar es Salaam Port operations from 2018 to 2024 reveals a clear and significant impact of the Tanzania Electronic Single Window System (TeSWS) on cargo clearance, throughput, and vessel dwell times. Prior to the full implementation of TeSWS in 2021, the port relied on TANCIS, which, although it automated some customs procedures, lacked integration across all port stakeholders. This partial system resulted in long cargo clearance times of 8–10 days, modest cargo throughput growth from 15.69 to 15.91 million tons, and container traffic increases from 710,202 to 720,866 TEUs. Vessel dwell times were also high, averaging 10–12 days, due to manual documentation, duplicated processes, and poor coordination among customs, port authorities, shipping lines, and inspection agencies. Consequently, congestion persisted, operational efficiency was low, and trade costs remained elevated.

Following the introduction of the fully integrated TeSWS in 2021, the port experienced substantial improvements across all operational metrics. Average cargo clearance times dropped to just 3 days by 2024, reflecting the system's ability to centralize and streamline import, export, and transit procedures. Cargo throughput increased markedly from 17.03 million tons in 2021 to 27.75 million tons in 2024, while container traffic rose from 759,902 to 1,230,832 TEUs. Similarly, vessel dwell times decreased steadily from 8 days in 2021 to 4

days in 2024, demonstrating more efficient coordination, real-time communication, and reduced administrative bottlenecks.

Collectively, these observations indicate that TeSWS has had a transformative effect on Dar es Salaam Port operations. By fully integrating all trade-related agencies into a single electronic platform, the system has not only accelerated cargo clearance and minimized congestion but

also expanded port capacity, enhanced throughput, and lowered shipping costs. Moreover, TeSWS has improved stakeholder coordination, transparency, and the reliability of port operations, positioning Dar es Salaam as a competitive regional trade hub. These findings underscore the importance of comprehensive digital trade facilitation systems in enhancing port efficiency and supporting broader economic growth

Conclusion:

The findings of this study indicated that The Tanzania Electronic Single Window System (TeSWS) had a significant positive impact on Cargo Congestion at Dar es Salaam Port. The analysis of cargo clearance times shows a remarkable reduction from an average of 8–10 days prior to the system's implementation to 3 days by 2024, highlighting the effectiveness of digitalized processes in streamlining documentation, minimizing inter- agency delays, and improving overall trade facilitation. The study also demonstrates that the TeSWS has positively influenced the volume of cargo handled per year, with throughput increasing from 20.02 million tonnes in 2022 to an estimated 27.75 million tonnes in 2024. This growth reflects the port's enhanced capacity to manage higher cargo volumes efficiently, attributable to optimized procedures, improved coordination among regulatory agencies, and the adoption of modern technology.

Recommendations

Continuous System Upgrades and Technological Enhancement

The TeSWS should be regularly upgraded to incorporate new functionalities, integrate with other digital trade facilitation platforms, and improve system speed and reliability. Regular updates will help accommodate increasing cargo volumes and complex trade requirements, ensuring that delays caused by technical issues are minimized. Advanced analytics and automation features could also be incorporated to predict congestion patterns and optimize resource allocation.

Capacity Building and Training for Stakeholders

Effective utilization of the TeSWS depends heavily on the knowledge and skills of all stakeholders, including customs officers, port operators, freight forwarders, shipping agents, and importers/exporters. Structured training programs and refresher courses should be conducted regularly to ensure stakeholders are proficient in using the system. This will reduce human errors, enhance compliance, and improve overall efficiency in cargo clearance processes.

Strengthening Public-Private Partnerships (PPP)

Collaboration between government agencies, port authorities, and private sector logistics operators is essential for smooth TeSWS operations. Joint planning and communication frameworks can ensure that all parties share accurate and timely information. Partnerships can also help in addressing operational challenges, optimizing workflow, and improving service delivery to cargo owners.

Infrastructure Development and Modernization

While the TeSWS improves digital processing, physical infrastructure is equally critical. Investments should be made to expand storage facilities, container yards, and berthing spaces. Additionally, modern cargo handling equipment should be introduced to speed up loading/unloading operations. Integrating TeSWS functionalities with real-time monitoring of infrastructure resources can further enhance port efficiency.

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