

The Influence of Lean Management Practices on Port Logistics Performance in Tanzania: A Case of Dar es Salaam Port

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Abstract — This study examined the influence of lean management practices on port logistics performance in Tanzania, focusing on waste elimination, continuous improvement, and cycle time reduction. Guided by the Resource-Based View theory, which emphasizes internal resources and capabilities as drivers of efficiency, the research aimed to determine how lean practices enhance operational effectiveness and create value for port stakeholders. A quantitative research design was employed, targeting 1,454 port personnel. Stratified random sampling was used to select 314 respondents, including clearing and forwarding agents, shipping agents, and transporters, as these groups directly shape logistics efficiency at Dar es Salaam Port. Data were collected through structured questionnaires and analysed using descriptive statistics, correlation, and multiple regression. The findings revealed that cycle time reduction had the most significant effect on logistics performance, highlighting that optimizing cargo handling, vessel discharge, and clearance processes strongly improves efficiency. Waste elimination also showed a positive and significant effect, indicating that minimizing redundant processes and inefficiencies contributes meaningfully to operational gains. Similarly, continuous improvement practices—such as employee engagement, process refinement, and feedback-driven initiatives—were found to significantly enhance logistics performance. The study extends the Resource-Based View theory by demonstrating the relevance of lean practices in a developing country's port logistics context, emphasizing the importance of internal capabilities and process optimization. Practically, the research provides insights for port authorities and policymakers to adopt integrated lean strategies, strengthen digitalization, and promote employee involvement to improve efficiency. Future studies are recommended to examine additional lean dimensions and undertake comparative analyses across ports to improve generalizability.

Keywords — Lean Management, Port Logistics Performance, Waste Elimination, Cycle Time Reduction, Dar es Salaam Port

I. INTRODUCTION

Lean management focuses on minimizing waste and optimizing processes to deliver greater value to customers (Lee & Song, 2022). It is employed for port expansions, increasing demand, or efficiency optimization to meet global competition (Talley, 2019). Crises such as port congestion, Labor shortages, or environmental deregulations have been identified as major causes of port logistics underperformance (IMO, 2021; Sachish, 2020). One of the most promising solutions is the adoption of lean management practices (Bonamigo & Arcanjo, 2023). Common lean practices include Just-In-Time (JIT), predictive analytics, Internet of Things, Kaizen principles, robotics, and artificial intelligence, which aim to reduce dwell times, digitalize customs processes, and automate cargo handling (Diaz & Cruz, 2023). They also enhance real-time tracking, predictive maintenance, and integration of port community systems for seamless coordination among stakeholders (Talley, 2019).

Lean management enhances performance by reducing congestion, shortening waiting times, minimizing resource waste, and improving throughput efficiency (Talley, 2019). These practices optimize supply chains, reduce operational costs, ensure faster cargo turnover, and maintain competitiveness in global trade while aligning with sustainability goals (UNCTAD, 2020). However, challenges persist. UNCTAD (2020) notes that port underperformance is common during unexpected demand spikes or extreme weather, where over-reliance on automation leads to system failures and bottlenecks. Similarly, Rodrigue and Notteboom (2021) estimate that 63% of operational inefficiencies stem from poor communication and resistance to lean adoption.

Inadequate training and cultural resistance further exacerbate these challenges, leading to poor alignment of lean tools with traditional processes (Sachish, 2020). This mismatch results in overly complex digital systems

and underutilization of port capabilities. In Africa, lean practices are employed to modernize port infrastructure, reduce congestion, and improve efficiency in cargo handling (Panayides, 2021). These are supported by digitalization, training, capacity building, and multi-stakeholder collaboration involving customs, terminal operators, and transport companies (Ochieng, 2023). Their goal is to resolve chronic inefficiencies such as high dwell times and congestion, improving competitiveness and reducing delays, storage, and cost burdens (Mathuva, 2018).

However, implementation in Africa often fails due to misalignment with local conditions (Pels & Nijkamp, 2021). Research shows that many African ports lack adequate infrastructure and training, leading to incomplete lean applications, system breakdowns, and coordination failures (Pels & Nijkamp, 2021; Mathuva, 2018; Ochieng, 2023). Poor adoption further fuels corruption and bureaucratic inefficiencies, undermining port performance (Makwao, 2019; Obwago, 2018; Lee & Song, 2022). Yet, strategies such as capacity building, infrastructure development, PPPs, stakeholder engagement, and adaptation of digital tools have been introduced to improve logistics performance and maximize the benefits of lean practices (IMO, 2021).

In Tanzania, lean management practices are increasingly utilized to improve port efficiency and competitiveness (Rahman, 2018). The Tanzania Electronic Single Window System (TeSWS) was implemented to streamline clearance and reduce paperwork (Mlimbila & Ulingeta, 2020). Automated scanners expedite inspections, while lean tools such as value stream mapping help identify bottlenecks and waste in cargo handling (Ally & Mbamba, 2021). These measures also strengthen coordination among customs, shipping lines, and transport companies. By reducing costs and inefficiencies, Tanzania aims to attract global trade and align with international port standards (Zikomo, 2019).

However, challenges remain in Tanzania's implementation. Infrastructural inadequacies, poor integration of lean principles with local realities, and limited stakeholder involvement hinder effectiveness (Zikomo, 2019; Mlimbila & Ulingeta, 2020). Persistent corruption and bureaucratic inefficiencies weaken reforms (Rahman, 2018). Therefore, lean practices often fail to deliver their full potential in Tanzanian ports.

Theoretical perspectives such as the Resource-Based View Theory (Barney, 1991) and Lean Thinking Theory (Womack & Jones, 2016) provide frameworks for understanding the efficiency gains of lean practices. Yet, empirical studies reveal barriers: reliance on lean practices without infrastructure investments causes inefficiencies (Rahman, 2018; Zikomo, 2019); cultural resistance hinders adoption (Ally & Mbamba, 2021); and digital systems face limitations such as power outages or unreliable internet (Mathuva, 2018). While lean systems reduce redundancy, they can also create congestion during peak periods (Mathuva, 2018). Research emphasizes that leadership commitment, employee involvement, and supportive organizational cultures are critical for successful implementation (Chatzoglou & Chatzoudes, 2020).

The efficiency and effectiveness of logistics directly impact trade facilitation and regional economic growth (Marlow & Casaca, 2019). Dar es Salaam Port, a major Tanzanian gateway, continues to face congestion, delays, and high operational costs (Rahman, 2018). Such inefficiencies reduce competitiveness against regional ports. Lean management practices, which emphasize waste reduction, process optimization, and continuous improvement (Womack & Jones, 2016), present a potential solution. Although lean methods have proven effective in other industries, their application in developing country ports is still underexplored.

Previous studies, such as Womack and Jones (2016) and Liker (2014), emphasize tools like value stream mapping and just-in-time delivery to improve throughput and reduce lead times. Rodrigue and Notteboom (2021) argue that ports adopting lean strategies achieve notable gains in service quality and customer satisfaction. Case studies from Rotterdam and Los Angeles show successful lean adoption, with reductions in turnaround times and greater competitiveness (Notteboom & Winkelmans, 2021). However, research on lean management in African ports remains limited, especially in Tanzania. This presents an opportunity to examine how lean practices can be tailored to address Dar es Salaam Port's exclusive challenges.

Therefore, this study aims to examine the influence of lean management practices on logistics performance at Dar es Salaam Port. By identifying key improvement areas and proposing a tailored framework, the research seeks to strengthen port performance, efficiency, and competitiveness, while contributing to broader regional economic development.

II. LITERATURE REVIEW

Theoretical Review

Resource-Based View (RBV)

The Resource-Based View (RBV) provides a relevant theoretical lens for examining the influence of lean management practices on port logistics performance. RBV, developed by Barney (1991), emphasizes that organizations achieve sustainable competitive advantage by efficiently utilizing internal resources that are valuable, rare, inimitable, and non-substitutable (Bonamigo & Arcanjo, 2023). This theory views the port as an interconnected system and highlights the importance of optimizing internal resources to improve operational

performance and reduce waste (Lee & Song, 2022). In this regard, RBV aligns closely with lean management, which also seeks to enhance efficiency by leveraging existing capabilities rather than increasing resources (Taimoto, 2000).

The application of RBV to this study is evident in the way lean practices enable ports to maximize internal resources such as technology, staff skills, and operational systems to improve logistics performance (Womack & Jones, 2016). At Dar es Salaam Port, lean approaches create efficiencies without additional resource investments, which reflects RBV's principle of maximizing internal strengths. This theory further supports the development of tailored frameworks that align with unique port resources such as specialized equipment, trained personnel, and infrastructure, allowing lean practices to be implemented effectively (Marlow & Casaca, 2019). By aligning resource optimization with strategic goals like reducing lead times, cutting costs, and improving customer satisfaction, RBV reinforces the role of lean management in delivering superior performance outcomes (Liker, 2014).

RBV offers several strengths in relation to lean management and port logistics. It emphasizes resource optimization, particularly in contexts where resources are limited and must be strategically utilized, which directly corresponds to the goals of lean management (Lee & Song, 2022). This theoretical foundation enables the development of strategies that connect lean practices with performance outcomes such as efficiency, competitiveness, and customer satisfaction (Liker, 2014). Furthermore, RBV highlights the long-term sustainability of competitiveness when ports leverage their existing resources effectively, demonstrating its relevance to developing countries like Tanzania where infrastructure constraints are prevalent (Marlow & Casaca, 2019).

However, RBV also has limitations when applied to this study. It primarily focuses on internal resources while overlooking external environmental influences such as government regulations, trade dynamics, and shipping line requirements that also shape port logistics performance (Barsyte & Fennis, 2023). In addition, the theory assumes resource stability, yet ports operate in highly dynamic environments influenced by technological, economic, and geopolitical changes that demand continuous adaptation (Taimoto, 2000). Finally, RBV is more resource-oriented than process-oriented, which means it may underplay the significance of continuous process improvement as a central element of lean management (Liker, 2014). Despite these limitations, RBV remains an appropriate theoretical foundation for this study, as it underlines the importance of resource optimization through lean management and supports the development of a framework for leveraging a port's unique resources.

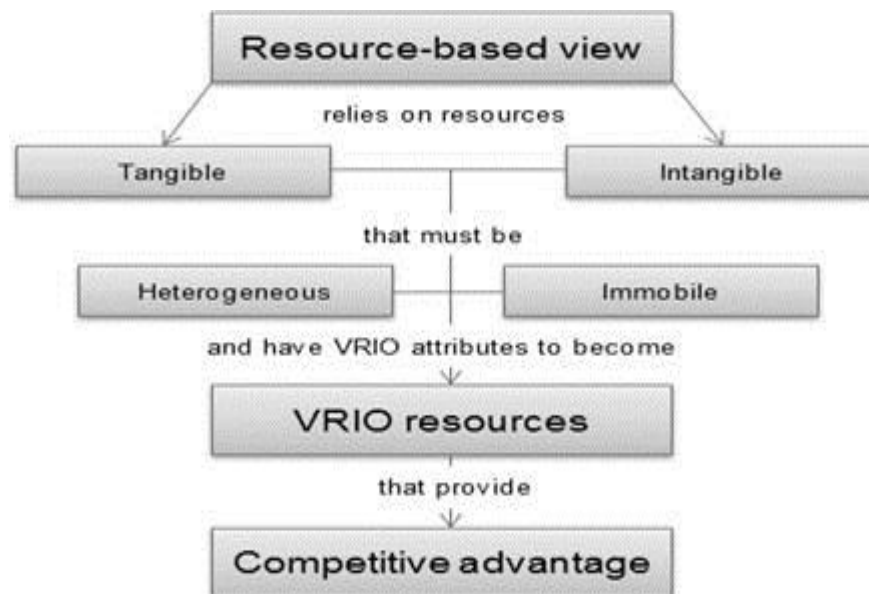


Figure 1: Resource-Based View (RBV)

Source: Barney (1991)

Empirical Review

Waste elimination practices

Mathuva (2018) examined lean practices and operational performance among 78 shipping firms in Kenya, identifying waste minimization in cargo handling, customs, and storage operations, though the study was criticized for relying solely on shipping firms to assess port performance. Similarly, Mukana (2019) investigated lean supply chain management in Tanzanian ports, finding that waste elimination was enabled by technology

integration, stakeholder coordination, and employee training. Rahman (2018), in a survey of 187 participants at Mtwara Port, revealed that lean practices reduced delays, optimized resource utilization, and improved cargo handling, though the cross-sectional design limited causal inference. Chatzoglou and Chatzoudes (2020) assessed lean management across industries, concluding that it enhances organizational performance by improving efficiency, reducing waste, and optimizing resource use, but their broad approach diluted the sector-specific implications for port performance. Zikomo (2019) analyzed cargo handling factors at Dar es Salaam Port using a qualitative methodology, highlighting bureaucracy, clearance delays, logistical issues, and inadequate technology as key challenges, but the absence of quantitative evidence and strategic recommendations limited its contribution. Together, these studies indicate that while lean practices contribute to waste elimination and efficiency, methodological and contextual limitations leave room for further investigation into their specific impact on port logistics performance.

Continuous improvement

Diaz and Cruz (2023) highlight the importance of competence management in facilitating continuous improvement, identifying corruption, bureaucratic delays, and insufficiently qualified staff as key barriers, though their study lacks new empirical evidence. Similarly, Marlow and Casaca (2019) provide a structured framework for lean port performance through process mapping, waste identification, and prioritization of lean tools such as 5S, Kaizen, and Value Stream Mapping; however, the absence of empirical validation and practical implementation limits its applicability. Timans and Ahaus (2019) demonstrate that Lean Six Sigma can improve efficiency and product quality in SMEs, yet the reliance on a single case restricts generalizability to broader industrial contexts. Fransson (2021) further supports the positive impact of continuous improvement on organizational performance using a structural equation model integrating multiple lean tools, though self-reported data and unclear industry context reduce the robustness of conclusions. Jiju and Kumar (2019) reinforce that lean practices enhance process efficiency and effectiveness, but their academically focused review offers limited practical insights. Together, these studies indicate that while continuous improvement and lean management can significantly enhance efficiency, resource utilization, and performance, their effectiveness is often constrained by contextual factors, methodological limitations, and inadequate empirical validation. This synthesis highlights a research gap for context-specific empirical studies in port logistics, particularly in developing countries, to evaluate how lean practices and competence management can be effectively operationalized under local constraints.

Cycle Time Reduction

Lee and Song (2022) proposed conceptual lean organizational strategies for ports, demonstrating improvements in throughput, turnaround time, and resource utilization, but their study lacked empirical evidence to substantiate these strategies. Similarly, Bonamigo and Arcanjo (2023) examined Lean 4.0 in port management as a means to support circular economy objectives, identifying performance benefits such as cycle time reduction, waiting time minimization, and resource efficiency; however, the study also lacked empirical validation. Rodrigue and Notteboom (2021) provided a comparative analysis of North American and European gateway ports, showing that lean implementation reduces lead times, lowers operational costs, and enhances customer satisfaction, though the study offered limited in-depth evaluation of individual ports. Empirical evidence from manufacturing contexts further reinforces the relevance of lean methods for cycle time reduction: Mihir and Vivek (2020) highlighted value stream mapping, Kaizen, and Just-in-Time as effective techniques, while Patil and Inamdar (2019) demonstrated that line balancing in manufacturing air oil separators significantly improved workflow and production efficiency, though both studies are limited by theoretical orientation or single-case design. Together, these studies indicate that lean practices can enhance operational performance, but successful implementation depends on leadership commitment, employee involvement, and adaptation of lean tools to the local context, revealing a gap for empirically grounded research in port logistics.

Conceptual Framework

In this study, the independent variable was the lean management practices, and the dependent variable was port logistics performance. Lean management practices were conceptualized by waste elimination, continuous improvement, and cycle time reduction. Port's logistics performance was observed on increased process efficiency and customer satisfaction. The following figure indicates the framework used in this study.

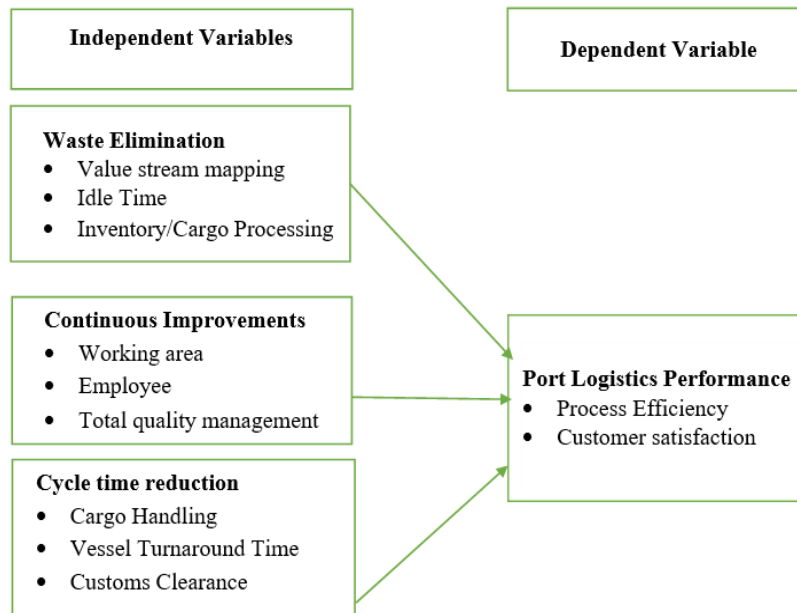


Figure 2: Conceptual framework of the study
Source: Author, 2025

III.METHOD

Research philosophy provides the foundational assumptions guiding the approach to knowledge, reality, and methods of inquiry (Neuman, 2014). In this study, the positivist research philosophy was adopted, as it emphasizes measurable, observable data, systematic analysis, and practical problem-solving, making it suitable for generating actionable insights on port logistics performance (Saunders et al., 2016). The positivist approach aligns with the study's objective of examining the influence of lean management practices, such as waste elimination, continuous improvement, and cycle time reduction, on operational performance.

A quantitative research approach was employed to collect and analyze numerical data on lean management practices and their impact on port logistics performance indicators, including turnaround time, throughput, and customer satisfaction. The quantitative approach ensures objectivity, reliability, and statistical rigor, allowing the identification of measurable patterns and the testing of cause-effect relationships (Creswell & Creswell, 2023). To provide a structured investigation, a descriptive research design was used, offering systematic insights into the extent of lean adoption at Dar es Salaam Port and its effects on operational efficiency, while minimizing limitations of cross-sectional studies through careful variable selection and rigorous data analysis (Chen, 2017).

The study focused on Dar es Salaam Port, selected for its strategic role as a gateway for landlocked countries such as Zambia, Malawi, Rwanda, Burundi, and Uganda, and for handling over 90% of Tanzania's international trade (TPA, 2023; Ally & Mbamba, 2021). The targeted population included shipping companies, clearing and forwarding firms, and flatbed transporters, as these stakeholders form the core service providers responsible for vessel operations, customs clearance, and inland cargo transport (TASAC, 2024; TATO, 2024; Hine & Swan, 2021). The total population consisted of 1,454 entities, from which one respondent per organization, holding managerial or decision-making roles, was selected for data collection due to their knowledge and experience in logistics operations.

Sample size was determined using Yamane's formula, yielding 314 respondents with a 95% confidence level and 5% margin of error, and stratified random sampling ensured proportional representation across the three stakeholder groups (Yin, 2018; Malterud et al., 2016). The resulting sample comprised 247 clearing and forwarding agents, 10 shipping agents, and 57 flatbed transporters (Field data, 2025). Data were collected using structured questionnaires with 5-point Likert scales to assess perceptions of lean practices, facilitating easy statistical analysis and comparability across groups. Analysis was conducted using IBM SPSS Statistics version 27, applying descriptive statistics to summarize data and multiple regression analysis to examine relationships among variables, ensuring meaningful interpretation of the influence of lean management practices on port logistics performance.

In this study, reliability and validity of the survey instrument were rigorously ensured. Reliability was confirmed through a pilot test with 10 respondents, which refined questions for clarity and consistency, and by

calculating Cronbach's alpha to assess internal consistency, with a target value greater than 0.7 (Krueger & Casey, 2015). All variables, including Waste Elimination, Continuous Improvement, Cycle Time Reduction, and Port Logistics Performance, recorded Cronbach's alpha values above the 0.70 threshold, indicating that the measurement items were highly reliable and consistent, thereby strengthening the validity of subsequent statistical analyses. Validity, defined as the extent to which a measurement instrument accurately measures the intended constructs (Krippendorff, 2018), was ensured through content validity and expert review. The questionnaires were developed based on a comprehensive literature review and consultations with logistics experts, and pilot testing further refined the items to guarantee clarity, relevance, and comprehensiveness. Triangulation through multiple data sources reinforced the validity of findings, ensuring that the instrument adequately represented the constructs under study and that the collected data truthfully measured the intended aspects of lean management practices and port logistics performance.

IV. RESULT AND DISCUSSION

RESULTS

Waste Elimination Practices on Ports Logistics Performance

The results indicate that waste elimination practices at Dar es Salaam Port are generally well implemented, with an overall mean of 3.73 and a standard deviation of 0.84, reflecting moderate agreement among respondents. The highest-rated aspects were investment in ICT to support operations (mean = 3.91, SD = 0.724) and a culture against wastage (mean = 3.90, SD = 0.711), demonstrating strong recognition of technology and anti-waste initiatives. Process standardization (mean = 3.80, SD = 0.876) and cross-functional teams for cargo handling (mean = 3.78, SD = 0.746) were also positively perceived, highlighting the importance of defined procedures and collaboration. Employee training to identify non-value activities (mean = 3.76, SD = 0.961) and digitalization of documentation processes (mean = 3.74, SD = 0.954) received favourable ratings, though some variability suggests differences in exposure or experience. The lowest-rated statement concerned timely and transparent communication with customers (mean = 3.45, SD = 0.849), indicating an area for improvement. Overall, the findings suggest that while the port has made notable progress in ICT deployment, process definition, team coordination, and fostering an anti-waste culture, enhancing communication, ensuring consistent training, and applying practices uniformly across departments could further strengthen waste elimination and operational efficiency.

Table 1: Waste Elimination Practices

Statement	Mean	Standard Deviation
The port has trained employees to identify non-value activities	3.76	0.961
There are defined processes at the port	3.80	0.876
Management is committed to delivering value to the customer at an effective cost	3.57	0.839
The port has invested enough resources to ensure effective and efficient ICT to support services	3.91	0.724
There are timely and open communication and passage of information to customers	3.45	0.849
The port does not tolerate wastage and non-value-adding activities	3.90	0.711
Cargo working processes are minimized	3.65	0.970
Digitalization has minimized documentation processes	3.74	0.954
There is a cross-functional team for cargo handling to enhance smooth flow and effectiveness	3.78	0.746
Aggregate	3.73	0.84

Source: Field Data (2025)

1.00 – 1.79 = Strongly Disagree, 1.80 – 2.59 = Disagree, 2.60 – 3.39 = Neutral, 3.40 – 4.19 = Agree, 4.20 – 5.00 = Strongly Agree

Continuous Improvement on Ports Logistics Performance

The results indicate that continuous improvement practices at Dar es Salaam Port are generally well established, with an overall mean of 3.73 and a standard deviation of 0.93, reflecting moderate agreement

among respondents. High ratings were observed for employee commitment to improvement and waste reduction (mean = 3.65, SD = 0.795) and effective communication and teamwork (mean = 3.70, SD = 0.665), suggesting strong consensus on a culture of cooperation and active participation. Formal structures, including defined quality policies (mean = 3.78, SD = 1.010) and check-and-balance systems for waste reduction (mean = 3.75, SD = 0.803), were also positively perceived, though slightly higher variability in quality policies indicates inconsistent implementation across units. Lower-rated items, such as customer engagement in addressing complaints and suggestions (mean = 3.53, SD = 1.061) and orderly arrangement of workplace items (mean = 3.65, SD = 0.950), reveal greater variation in practices, highlighting areas for standardization and improvement. Overall, the findings suggest that while employee involvement, teamwork, and formal quality frameworks support continuous improvement, enhanced consistency in applying policies and reinforcing customer-focused practices is necessary to optimize operational performance across all departments.

Table 2: Continuous Improvement

Statement	Mean	Standard Deviation
Orderly arrangement of needed items/equipment at the workplace	3.65	0.950
Consistent approach in carrying out tasks and procedures	3.85	0.785
The working area is clean and clear for safety and problem identification	3.72	0.957
Employee commitment to improvement and reducing unwanted items in the workplace	3.65	0.795
Effective employee communication and teamwork	3.70	0.665
Stakeholder feedback leads to tangible changes	3.90	1.379
Defined quality policies and commitment to improvement	3.78	1.010
Check-and-balance system for waste reduction and port improvement	3.75	0.803
Customer engagement at all levels to ensure complaints and suggestions are incorporated	3.53	1.061
Aggregate	3.73	0.93

Source: Field data (2025)

1.00 - 1.79 = Strongly Disagree, 1.80 - 2.59 = Disagree, 2.60 - 3.39 = Neutral, 3.40 - 4.19 = Agree, 4.20 - 5.00 = Strongly Agree

Cycle Time Reduction Practices on Ports Logistics Performance

The results indicate that cycle time reduction practices at Dar es Salaam Port are generally well implemented, with an overall mean of 3.93 and a standard deviation of 0.83, reflecting positive perceptions among respondents. The highest-rated items were ship scheduling to reduce vessel waiting times (mean = 4.19, SD = 0.726) and timely commencement of discharge operations (mean = 4.14, SD = 0.688), demonstrating strong agreement that coordinated operations enhance port throughput. Other highly rated practices, including handling rate efficiency (mean = 4.12, SD = 1.393) and flexible use of port resources (mean = 4.12, SD = 0.743), emphasize the importance of operational efficiency and adaptability, though higher variability in discharge operations reflects differences in cargo types and departmental practices. Technological and procedural enhancements, such as investments in clearance activities (mean = 3.93, SD = 0.689) and digitalized customs processes (mean = 3.75, SD = 0.670), were positively perceived, indicating that ICT integration supports cycle time reduction. Lower-rated items, including berth availability (mean = 3.58, SD = 0.773) and real-time cargo tracking (mean = 3.71, SD = 0.851), reveal ongoing challenges in resource allocation and monitoring. Overall, the findings suggest that effective scheduling, resource flexibility, optimized discharge operations, and digitalization significantly contribute to reducing operational delays, though further improvements in berth management and cargo tracking could enhance overall cycle time performance.

Table 3: Cycle Time Reduction Practices

Statement	Mean	Std. Deviation
Handling the rate of discharge operations has reduced processing time	4.12	1.393
The ship's waiting time to start discharging operations is effective	4.14	0.688
Keeping track of goods on board and at the port has enhanced real-time cargo tracking and updates	3.71	0.851
Ship's scheduling has reduced vessel waiting times	4.19	0.726
Berth availability has minimized vessel congestion	3.58	0.773
Flexibility in using port resources	4.12	0.743
The time spent on cargo clearance is sufficient and acceptable	3.77	0.970
Port has invested in clearance activities	3.93	0.689
Digitalization has enhanced customs clearance	3.75	0.670
Aggregate	3.93	0.83

Source: Field Data (2025)

1.00 - 1.79 = Strongly Disagree, 1.80 - 2.59 = Disagree, 2.60 - 3.39 = Neutral, 3.40 - 4.19 = Agree, 4.20 - 5.00 = Strongly Agree

Model summary

The results show a strong positive relationship between lean management practices waste elimination, continuous improvements, and cycle time reduction and port logistics performance at Dar es Salaam Port ($R = 0.799$). About 63.8% of performance variation is explained by these practices ($R^2 = 0.638$; Adjusted $R^2 = 0.634$), with a low standard error (0.33268) indicating reliable predictions. This confirms that lean practices significantly enhance port efficiency and effectiveness.

Table 4: Model summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.799 ^a	.638	.634	.33268	.638	155.376	3	264	.000
a. Predictors: (Constant), Continuous improvements, Cycle time reduction, Waste elimination									
b. Dependent Variable: Logistic performance									

Source: Field Data (2025)

Analysis of variance (ANOVA)

The ANOVA results show that the regression model is statistically significant in predicting port logistics performance ($F = 155.376$, $p = 0.000 < 0.05$). The model explains a substantial proportion of variability, with the Regression Sum of Squares (51.588) much larger than the Residual Sum of Squares (29.218). The high F-value, resulting from the large difference between regression and residual mean squares, confirms a good model fit. Thus, waste elimination, continuous improvement, and cycle time reduction collectively have a significant positive impact on port logistics performance, reinforcing their role as key drivers of efficiency at Dar es Salaam Port.

Table 5: ANOVA

Model		Sum of Squares	Df	Mean Square	F	Sig.
	Regression	51.588	3	17.196	155.376	.000 ^b
1	Residual	29.218	264	.111		
	Total	80.805	267			
a. Dependent Variable: Port Logistics Performance						
b. Predictors: (Constant), Continuous improvements, Cycle time reduction, Waste elimination						

Source: Field Data (2025)

Coefficients

The regression analysis confirms that all three lean management practices significantly enhance port logistics performance at Dar es Salaam Port. Waste elimination ($B = 0.182$, $\beta = 0.225$, $p = 0.022$) positively influences efficiency by reducing non-value-adding activities and redundancies. Continuous improvement ($B = 0.161$, $\beta = 0.211$, $p = 0.018$) also contributes meaningfully through employee engagement and process refinement. However, cycle time reduction ($B = 0.335$, $\beta = 0.394$, $p = 0.000$) is the strongest predictor, underscoring that optimizing operational speed, scheduling, and minimizing delays has the most significant impact. Overall, the findings demonstrate that improving speed, minimizing inefficiencies, and fostering ongoing improvements are critical for competitive and effective port operations.

Table 6: Coefficient

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.406	.125		11.233	.000
	Waste elimination	.182	.079	.225	2.306	.022
	Cycle time reduction	.335	.073	.394	4.618	.000
	Continuous improvements	.161	.068	.211	2.384	.018
a. Dependent Variable: Port Logistic performance						

Source: Field Data (2025)

Discussions

Waste Elimination Practices on Ports Logistics Performance

The study found that waste elimination practices significantly enhance port logistics performance at Dar es Salaam Port ($\beta = 0.182$, $p = 0.022$), with descriptive statistics showing mean scores between 3.45 and 3.91, indicating strong agreement that initiatives such as minimizing non-value-adding activities, streamlining processes, and leveraging ICT improve efficiency. This aligns with lean management literature, as Womack and Jones (2003) emphasize that eliminating muda fosters streamlined, cost-effective operations, while the Resource-Based View (RBV) highlights the competitive advantage derived from efficiently using internal resources such as skilled personnel and ICT systems. At Dar es Salaam Port, ICT investments, trained staff, and cross-functional teams were perceived as key enablers of efficiency; however, moderate standard deviations (0.711–0.961) suggest uneven implementation across departments, reflecting variability in training, exposure, or digital tool adoption, which echoes Kimeu's (2020) caution that lean practices require structured change management and clear communication. These findings further suggest that waste elimination yields optimal

results when integrated with continuous improvement and cycle time reduction, as isolated or inconsistently applied measures may limit operational gains; thus, strategic alignment, employee engagement, and ongoing training are essential to ensure sustained efficiency and reinforce broader organizational goals in enhancing port logistics performance.

Continuous Improvement on Port Logistics Performance

The study revealed that continuous improvement practices significantly enhance port logistics performance at Dar es Salaam Port ($\beta = 0.161$, $p = 0.018$), with mean scores ranging from 3.53 to 3.90 indicating broad agreement that mechanisms for process refinement, employee engagement, and feedback integration are in place. These practices foster a culture of adaptability and responsiveness, enabling employees to actively identify inefficiencies, implement corrective actions, and improve overall operational quality. This finding aligns with lean management principles, which emphasize incremental improvements as central to efficiency, and with Musonda and Mutambo's (2022) assertion that continuous improvement strengthens employee ownership, reduces recurring errors, and enhances workflow effectiveness. At Dar es Salaam Port, initiatives such as audits, structured communication, and monitoring contribute to smoother cargo handling and reduced bottlenecks; however, higher standard deviations in areas like stakeholder feedback ($SD = 1.379$) and customer engagement ($SD = 1.061$) highlight inconsistencies in practice, suggesting the need for uniform training, stronger coordination, and clearer communication across departments. Furthermore, continuous improvement is most impactful when integrated with waste elimination and cycle time reduction, as this synergy ensures that inefficiencies are not only identified but also resolved sustainably. The findings therefore underscore that while continuous improvement is a critical driver of performance, its effectiveness depends on employee buy-in, structured coordination, and alignment with broader lean strategies to maximize logistics efficiency at the port.

Cycle Time Reduction on Port Logistics Performance

The study established that cycle time reduction practices have a strong and highly significant effect on port logistics performance at Dar es Salaam Port ($\beta = 0.335$, $p = 0.000$), with mean scores ranging from 3.58 to 4.19 showing broad agreement that initiatives such as efficient ship scheduling, improved discharge handling rates, and flexible resource utilization effectively minimize vessel waiting times and enhance throughput. These findings align with lean management literature, where reducing cycle times is viewed as critical to efficiency; Womack and Jones (2003) emphasize that shortening process durations eliminates delays and waste, while Christopher (2016) links cycle time reduction directly to improved responsiveness and service quality. The results also support Tiwari and Chan (2017), who found that ports applying automated scheduling, real-time tracking, and flexible resource allocation achieve substantial productivity gains, as exemplified at Dar es Salaam through digital integration in clearance and cargo monitoring. This reinforces the Resource-Based View (RBV), which posits that leveraging ICT and skilled personnel generates competitive advantage. Nonetheless, variability in responses ($SD = 0.670\text{--}0.970$) suggests occasional inefficiencies in berth availability and clearance processes, consistent with Musonda and Mutambo's (2022) observation that outcomes may fluctuate with cargo volumes, workforce capacity, and equipment readiness. The study underscores that cycle time reduction is most impactful when integrated with waste elimination and continuous improvement, as argued by Kimeu (2020) and Womack et al. (2007), since synergistic application ensures sustainable efficiency gains. Overall, the evidence indicates that Dar es Salaam Port's prioritization of cycle time reduction, supported by complementary lean practices, is central to achieving operational excellence and maintaining competitiveness.

VI. CONCLUSIONS

The study concludes that lean practices are most effective when implemented holistically with managerial commitment, employee participation, digital systems, and interdepartmental collaboration. To sustain these gains, the government should invest in modern infrastructure, streamline regulations, and strengthen concessionaire monitoring; port authorities should enforce quality policies, conduct regular audits, adopt flexible berth scheduling, and promote staff training; and other stakeholders must embrace digital platforms, coordinate operations, and align with global standards. The study contributes theoretically by extending lean management and continuous improvement theories into the logistics context of developing economies, supporting the Resource-Based View that trained personnel, structured processes, and technology underpin operational gains. Practically, it highlights cycle time reduction and continuous improvement as the most influential practices, while emphasizing that ICT investments require complementary staff training and change management. Policy-wise, it calls for systemic reforms and inter-agency coordination to create an enabling environment for lean adoption. Future research could investigate additional lean tools such as value stream mapping, 5S, and Just-In-Time delivery, while comparative and longitudinal studies across ports may offer deeper insights into regional best practices and long-term impacts of lean management on port performance.

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