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Assessment of the Port Resource Constraints Contributing to Ship Clearance Delays: A Case of Dar es Salaam Seaport

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ABSTRACT

This study assesses the port resource constraints contributing to ship clearance delays. Dar es Salaam seaport is taken as a case study based on its pivotal role in trade and economic growth. Focusing on overcoming obstacles, the study assesses the relationship between ship clearance delays and operational port resources in order to enhance the efficiency at the seaport. A convergent mixed-method design was employed, combining qualitative and quantitative data collected through interviews, observations, questionnaires, and document analysis from port actors involved in ship clearance operations at Dar es Salaam seaport. Purposive and simple random sampling techniques were utilized to select the port actors and respondents respectively. Data were analysed by regression model to give the quantitative relationship between the resource constraints and ship clearance delays whereas thematic method was used to give insights on the relationship of the study variables.

The findings reveal critical issues at the Dar es Salaam seaport, including the lack of an integrated vessel clearance system, berth limitations at the container terminal, inadequate handling equipment and receiving facilities at bulk terminals, and unskilled staff of seaport actors. To address these challenges, it is recommended that an integrated clearance system be implemented to streamline vessel processing by sharing information between port actors and their units to reduce delays. In addition, expanding and upgrading the berth infrastructure, investing in modern handling equipment such as high-capacity conveyor belts, and building a single receiving tank for liquid bulk terminals will enhance operational efficiency. Finally, comprehensive training programs should be developed to up skill port actors' staff, focusing on technical skills and customer service to improve overall port performance and competitiveness.

Keywords: Ship clearance, Resource constraints, Ship clearance delays, Seaport

1. Introduction

Ports are the main entrance to the world trade, facilitating the movement of ships and goods with other actors (Round, 2016), and connecting nations to markets worldwide. For the prosperity of a country and its competitiveness in trade, efficient port operations are necessary to enable smooth supply chain flow. However, many ports face the challenge of delays hindering their operational efficiency (Nikghadam et al, 2021). One of the prominent challenges facing seaports is ship clearance delays (BIMCO, 2021). Shipping companies report that up to 80% of their vessels face delays in ports (Nikghadam et al., 2021). In addition, it is estimated that 30-40% of ship delays are contributed by ports authority (UNCTAD, 2017). Furthermore, more than 50% of ship delays are contributed by the customs authority and ports authority in African ports (AfDB, 2018). These delays have wide-ranging implications, affecting shipping lines, port operators, exporters, importers, manufacturers, consumers, governments and the port environment (ZhenHub, 2022). These delays result in higher logistics costs (Greiner & Stephens, 2017), environmental pollution (Sinay, 2023), supply chain disruptions (Feizabadi, 2018), reduced customer satisfaction, loss of government revenue, and negative impact on economic growth. Globally, delays have significant economic ramifications. For instance, an average delay of one day in clearance leads to a loss of approximately $3.4 billion in global trade (World Economic Forum, 2019). Dar es Salaam seaport in Tanzania as other ports worldwide is no exception to ship clearance delays and this has effectively hampered its competitiveness within the global trade landscape (World Bank, 2017).

There are numerous studies that have focused on mitigating delays in seaport operations through improved information sharing in ports (Nikghadam et al, 2021), delays in cargo clearance (Mwaisaka, 2021; Massami, 2021), delays in ship cargo operations (Abdulrahman et al, 2019), factors causing port congestion (Gidado, 2015; Maneno, 2019), port performance (AfDB, 2014; AfDB, 2018; Mwendapole, 2015), vessel turnaround time (Weerarathna & Sigera, 2021) and ship clearance (Ahmed, 2019). Despite the numerous studies that have examined the relationship between port resource constraints and clearance operations, insufficient evidence exists on the contribution of port resource constraints on ship clearance delays. Given the importance of the resource constraints, this study seeks to examine the effect of resource constraints on ship clearance delays. Therefore, the study's general objective

is to assess the port resource constraints contributing to ship clearance delays at Dar es Salaam seaport. The stated general objective gives the following four specific objectives (SO_1, SO_2, SO_3, SO_4).

SO_1: To assess the effect of integrated IT systems on ship clearance.

SO_2: To assess the effect of berth limitations on ship clearance.

SO_3: To assess the effect of handling equipment and receiving facilities on ship clearance delays.

SO_4: To assess the effect of unskilled workforce on ship clearance delays.

The rest of this article is organized as follows: First, the review of literature is presented; Second, the research methodology is presented; Third, the results and discussion are provided; Last, the conclusions are presented.

2. Review of literature

The port of Dar es Salaam in Tanzania is a crucial hub for trade in the East African region, connecting landlinked countries to global markets. It handles various operations such as vessel handling, cargo processing, customs clearance, and logistics coordination (TPA, 2020). It plays vital role in driving economic growth in the region and facilitating global trade (Mrisho, 2023). Despite its importance, the port faces challenges with ship delays, impacting its competitiveness and the broader economic landscape. Several studies have been conducted on the performance of global ports, focusing on clearance delays, port congestion, and poor seaport performance. Studies based on Dar es Salaam seaport: Maneno (2019) assessed factors causing port congestion focuses on cargo congestion; Mwendapole (2015) analysed the factors of poor seaport performance based on port performance indicators; Massami (2021) and Mwaisaka (2021) analysed the performance of cargo clearance. Globally, Abdulrahman (2019) evaluated the delay factor in dry bulk cargo operations; Ahmed (2019) analysed documentary requirements for ship clearance; Nikghadam et al (2021) assessed the use of information sharing to mitigate delays; and Gidado (2015) assessed the factors that trigger port congestion.

These studies highlight multifaceted challenges facing the port performance such as inadequate port infrastructures, complex documentation procedures, lack of effective communication and collaboration among port actors, adverse weather, and shortages in port skilled staff. However, there is insufficient of studies that assess ship clearance delays at the Dar es Salaam seaport. To address this gap, a comprehensive approach is adopted to assess the resource constraints that contribute to ship clearance delays at the seaport. The conceptual model identifies four key resource constraints: integrated IT systems, unskilled workforce, berth limitations, and handling equipment and receiving facilities. These variables are assessed to understand their effect on the ship clearance delays as shown in Fig.1. It is crucial to the resource constraints on ship clearance delays at the Dar es Salaam seaport in order to enhance port's efficiency and competitiveness in global maritime trade. By addressing the challenges associated with port resource constraints, the port can improve its operational performance and contribute to the region's economic growth. The framework in Fig.1 provides a valuable basis for assessing the variables and identifying improvement strategies.

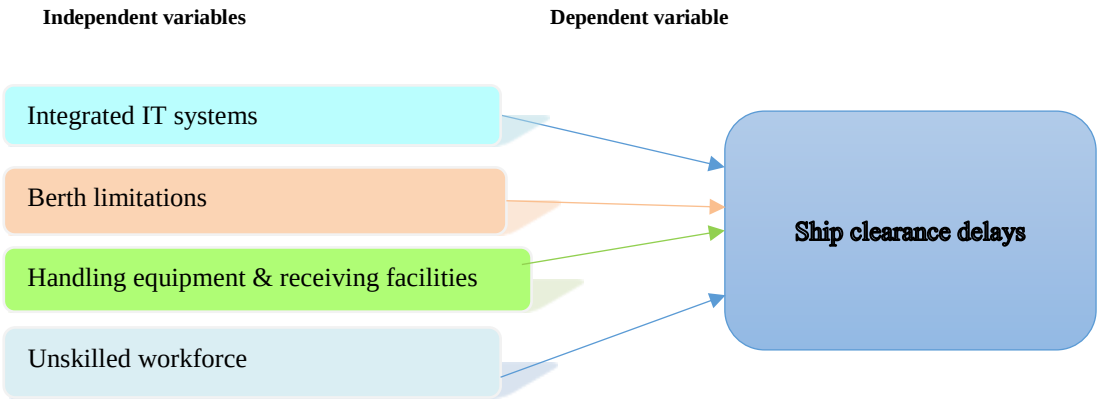

Fig. 1: Conceptual framework on ship clearance delays

Source: Literature Review

Based on the reviewed literature and the conceptual framework, this study comes up with four hypotheses to guide the research process from data collection, data analysis and presentation of findings. These hypotheses (i.e.H_1 to H_4) address specific objectives 1 to 4 (SO_1, SO_2, SO_3, SO_4) respectively.

H_1: There is a significant positive relationship between integrated IT systems and ship clearance delays.

H_2: There is a significant positive relationship between berth limitations and ship clearance delays.

H_3: There is a significant positive relationship between handling equipment and receiving facilities and ship clearance delays.

H_4: There is a significant positive relationship between unskilled workforce and ship clearance delays.

3. Research methodology

3.1 Research design, target population and sampling techniques

A convergent mixed method was used to thoroughly assess the factors that contribute to ship clearance delays at the Dar es Salaam seaport. This research design integrates both quantitative and qualitative data collection and analysis. The used research design followed three key steps as illustrated in Fig. 2. The study population comprised 52 respondents involved in ship clearance operations at the Dar es Salaam seaport, including representatives from government agencies (Tanzania Ports Authority, Tanzania Revenue Authority, Tanzania Shipping Agencies Corporation, Port Health and Immigration), shipping line agencies (Sinotaship, Nyota-Maersk, PIL, Sturrock, and CMA CGM), and shippers/charterers (Azam Ltd and Melts Ltd). These organizations were purposively selected to form the target population based on their involvement in ship clearance operations at the Dar es Salaam seaport. From each organization a respondent was selected using simple random sampling.

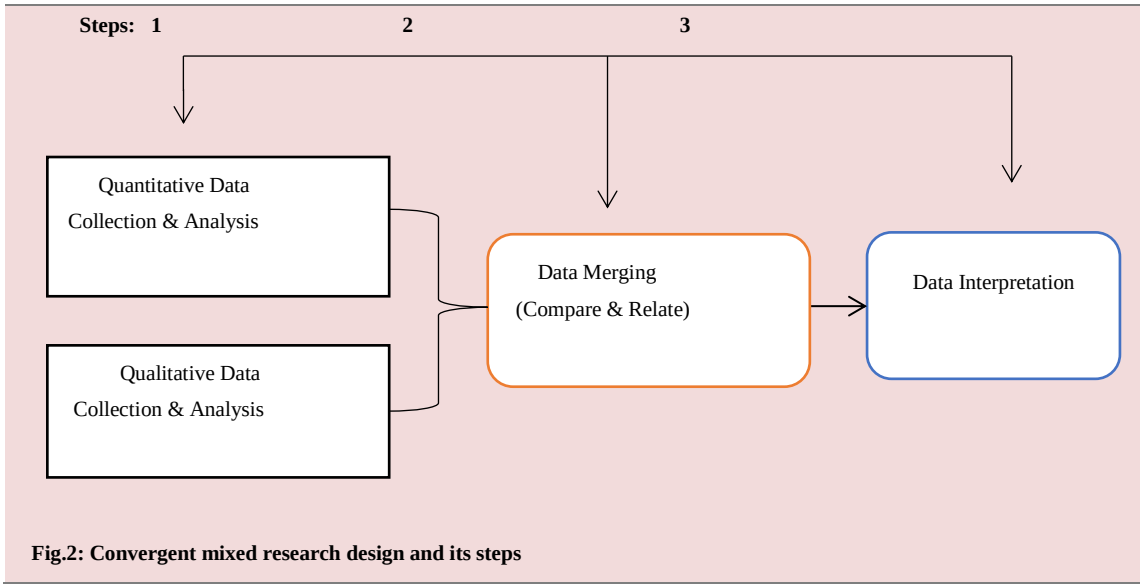

Fig.2: Convergent mixed research design and its steps

3.2 Data collection procedures and instruments

The quantitative data, on the one hand, were gathered using a structured questionnaire administered to 52 respondents who rated the resource constraints affecting ship clearance delays on a five-point Likert scale. This data collection instrument was designed to capture the perceptions of the respondents with regard to the effect of resource constraints on ship clearance delays. Qualitative data, on the other hand, were gathered from the 52 respondents using semi-structured interviews to explore and give a more in-depth understanding of the complex relationship between the port resource constraints and ship clearance operations. In addition, document analysis was conducted by reviewing relevant academic journals, articles, and industry publications from UN agencies, and government and private organizations from the year 2014 to 2024. The review and evaluation of these documents allowed deeper exploration of the challenges identified (Nguyen, 2020).

3.3 Data presentation and analysis

Quantitative data were summarized in a frequency distribution table of resource constraints assessed on a five-point Likert scale to gauge respondents' perceptions with regard to ship clearance delays. To explore the nature and strength of the relationship between resource constraints (i.e. independent variables) and ship clearance delays (i.e. dependent variable), regression analysis was employed. The regression method was selected because it fits the needs of this study. In addition, the regression analysis helps to identify whether the relationship between variables is positive, negative or non-existent. Furthermore, regression analysis was used to determine the significance effect of resource constraints on ship clearance delays. The relationship between the resource constraints and ship clearance delays is modelled as multiple linear regression. The regression analysis gives the model parameters such as R-squared, F-values, P-values and Beta coefficients (i.e. regression coefficients). The model helps to identify the most impactful port resources that contribute to the ship clearance delays at Dar es Salaam seaport. On the other hand, qualitative data from interviews and document reviews were subjected to thematic analysis. This involved coding the interview transcripts and identifying key themes related to integrated IT systems, unskilled workforce, berth limitations, and handling equipment and receiving facilities of the port. The analysis was conducted by reading through transcripts several times to familiarize with the data. Codes were tagged to different segments of the text that represented specific themes or ideas. These codes were then grouped into broader themes that emerged from the data. The themes were then analysed to understand the patterns affecting ship clearance operations.

3.4 Interpretation of the model parameters

R-squared (R^2) which is also knowns as coefficient of determination gives the proportion of the variance in the ship clearance delays that is explained by the model (i.e. resource constraints). The P-value (Probability Value) which takes a value between 0 and 1 provides the least significance at which the null hypothesis is rejected in favour of the alternative hypothesis. If the $P - Value < \alpha$ (level of significance), the null hypothesis is rejected in favour of the alternative hypothesis. Otherwise, the null hypothesis is accepted. The smaller the P-Value, the stronger the evidence and hence, the result should be statistically significant. The F-Value is a test for statistical significance of the regression equation as whole (i.e. it indicates whether the linear regression model fits the data better than the model that contains no independent variables). More specifically, the F-Value assesses whether the independent variables in the model, have a statistically significant relationship with the dependent variable. The F-Value is obtained by dividing the explained variance by the unexplained variance. By rule of thumb, an F-Value of greater than 4.0 is usually statistically significant. For hypothesis testing, if the calculated F-Value is higher than the critical value (i.e. table value), the null hypothesis is rejected in favour of the alternative hypothesis. On the other hand, the Significance F is computed from the F-Value and gives the probability that the model is wrong and thus its value should be as small as possible (GraduateTutor.com, 2024). The beta coefficient (i.e. modal coefficient) refers to the degree of change in the dependent variable for every 1-unit of change in the independent variable. In order to assess whether the beta coefficient is significantly different from zero, t-test is used. If the beta coefficient is positive and significant, then for every 1-unit increase in the independent variable, the dependent variable increases by the beta coefficient value. If the beta coefficient is negative and significant, then for every 1-unit increase in the independent variable, the dependent variable decreases by the beta coefficient value.

3.5 Ethical considerations, validity and reliability of data collection instruments

All respondents were informed about the study's purpose and they provided consent before participation. Data were anonymized and findings reported in aggregate to ensure confidentiality. On the one hand, pre-testing of the questionnaire and interview guide was conducted to ensure the validity of the data collection instruments. On the other hand, the reliability of the questionnaire was confirmed using Cronbach's alpha value (ρ). The Cronbach's alpha value ranges from 0 to 1 and measures the internal consistency (reliability) of a set of survey items. Generally, $\rho \geq 0.7$ indicates that the measure is reliable.

4. Results and discussion

4.1 Profile of respondents involved in the study

***Table 1*: Respondents' profile**

1.	**Age Range (Yrs)**	**Below 25**	**25-35**	**More than 35**	**Above 50**
	Frequency (%)	7 (13%)	27 (52%)	16 (31%)	2 (4%)
3	**Level of Education**	**Certificate**	**Diploma**	**BA/BSC**	**MA/MSC** **PHD**
	Frequency (%)	4 (8%)	12 (23%)	30 (58%)	6 (11%)
4.	**Work Experience**	**Less 3years**	**3-5 Years**	**6-10 Years**	**More than 10yrss**
	Frequency (%)	5 (10%)	21 (40%)	22 (43%)	4 (7%)

Source: Analysed Survey Data, 2024

Table 1 shows that port actors' staff engaged in ship clearance operations at the port mostly are energetic youth, 52% with an age range of 25-35 years, 58% are first-degree holders and 11% are postgraduates. This indicates that the port has an advantage in utilizing the potential of youth and educated workers to facilitate clearance operations. 43% of port actors' staff have between 6-10 years of work experience and 7 % have more than 10 years of experience, which means that they can handle large and complex transaction challenges that arise during clearance operations. On the other hand, 50 % of port actors' staff have below 6 years of work experience which may contribute to ship delays.

4.2 Resource constraints affecting ship clearance delays at Dar es Salaam seaport

The study assesses the port resource constraints contributing to ship clearance delays at Dar es Salaam seaport. A regression model is employed to assess the effect of resource constraints (i.e. IT integrated systems, unskilled workforce, berth limitations, and handling equipment and receiving facilities) on ship clearance delays. The model utilised Likert scale data as shown in Table 2. The interpretation of the results was based on specific statistical thresholds: *Significant Effect*, results when Significance F and P-value fall between 0.01 and 0.05. *Moderate Effect*, results when Significance F and P-value are from 0.06 to 0.1. *Minor or No Effect*, results when Significance F and P-value are above 0.1. In addition, thematic and descriptive charts were employed to

provide a visual summary of the effect of these factors based on the respondents' perceptions. This approach ensures understanding of the four port resources affecting the completion time of ship clearance operations and aids in identifying critical areas for improvement.

***Table 2*: Likert scale distribution on resource constraints**

Obsv	Impact Level	*Integrated IT Systems (VCS)*	*Berth Limitations*	*Handling Equipment&Receiving Facilities*	*Unskilled Workforce*
1	Not a Factor	1 (1.9%)	5 (9.6%)	0 (0.0%)	10 (19.2%)
2	Minor Factor	1 (1.9%)	4 (7.7%)	1(1.9%)	18 (34.6%)
3	Moderate Factor	5 (9.6%)	7 (13.5%)	5(9.6%)	21 (40.4%)
4	Major Factor	15 (28.8%)	13 (25.0%)	28 (53.8%)	3 (5.8%)
5	Critical Factor	30 (57.7%)	23 (44.2%)	18 (34.6%)	0 (0.0%)

Source: Analysed Survey Data, 2024 *Obsv= Observations

4.2.1 Integrated IT systems

From Table 3, the coefficient of determination (i.e. R^2) is 0.848 which implies that the model can explain 84.8% of the changes in ship clearance delays. This shows that the model has strong explanatory power. A Significance F falls between 0.01 and 0.05 and shows how much this resource affects ship clearance completion time. Thus, a Significance F of 0.0263 proves that the model is useful. The P-Value of 0.026356 and the positive beta coefficient of 0.1178 shows that integrated IT systems has a significant positive effect on ship clearance delays. The positive beta coefficient suggests that when the integrated IT systems are enhanced, the ship clearance delays also increase.

***Table 3*:** Regression output on integrated IT systems

SUMMARY OUTPUT

Regression Statistics 1	
Multiple R	0.92096012
R Square	**0.84816754**
Adjusted R Square	0.79755672
Standard Error	0.71141282
Observations	5

ANOVA

	df	*SS*	*MS*	*F*	***Significance F***
Regression	1	8.481675	8.481675	16.75862	**0.026356**
Residual	3	1.518325	0.506108		
Total	4	10			

	Coefficients	*ndard Err*	*t Stat*	***P-value***	*Lower 95%*	*Upper 95%*
Integrated IT System	**0.11780105**	0.028776	4.093729	**0.026356**	0.026223	0.209379

Source: Analysed Survey Data, 2024

In addition, Table 2 reveals that most of the respondents (57.7%) are of the opinions that integrated IT systems is a critical factor. This suggests that most respondents agree that the lack of the integrated IT systems has a profound effect on ship clearance delays. More specifically, the findings reveal that most documentation processes for ship clearance at the port are done manually, which leads to human errors that extend the processing time. Furthermore, the findings reveal that TPA's internal systems are not integrated such that its departments/units are working in seclusion. For instance, after an agent settles port charges via the TPA e-payment system, the receipt is required by the port master to issue a clearance certificate. This verifies that there is no information sharing between the Port master and the finance department, such working style contributes to ship clearance delays.

The challenge related to the integrated systems at seaports is also investigated by Nikghadam et al (2021) who consistently emphasize the need for an integrated and automated system. It should be noted that, most information sharing in the Dar es Salaam port is conducted through unintegrated systems such as phone calls and emails. Finally, adopting vessel clearance system (VCS) allows a paperless environment, smooth data sharing, speeds up clearance procedures and avoids unnecessary delays (UNCTAD, 2021). Therefore, an integrated IT system is required to ensure a higher level of information

sharing in ports to reduce unnecessary ship clearance delays. Furthermore, the findings from qualitative and quantitative studies highlight the importance of implementing an integrated IT system to streamline ship clearance operations at the port. The high explanatory power of the model and the significant influence of vessel clearance issues underscore the need for targeted interventions to address these issues and improve clearance efficiency at the seaport.

Based on the identified findings, it is recommended that Tanzania Revenue Authority (TRA) and Tanzania Ports Authority (TPA) should implement an integrated system such as Vessel Clearance System (VCS) that connect multiple actors inside the port domain, allowing them to share digitized data and information (Nikghadam et al, 2021). For real-time document uploads, tracking of vessels, improving scheduling and optimal allocation of port resources such as workers, equipment and facilities. The system should include features for data analytics to forecast traffic patterns and manage resources proactively, particularly during peak periods. However, the integrated IT systems requires technical expertise and risk of data security and privacy. This could be achieved by establishing a dedicated IT task force to oversee the integration process, ensuring compatibility and data security. Furthermore, providing comprehensive training and support to port staff would facilitate a smooth transition to the new system.

4.2.2 Handling equipment and receiving facilities

From Table 4, the coefficient of determination (i.e. R^2) is 0.675 which implies that the model can explain 67.5% of the changes in ship clearance delays. More specifically, the model can explain 67.5% of the changes in ship clearance delays. The Significance F falls between 0.06 and 0.1, indicating that the factor has a moderate effect on ship clearance delays. The P-Value of 0.087758 and the positive beta coefficient of 0.1023573 shows that the factor has a less significant but still noticeable positive effect on ship clearance delays. The positive coefficient suggests that the inadequacy in port handling equipment and receiving facilities leads to an increase in ship clearance delays.

Table 4*:* Regression output on handling and receiving facilities

SUMMARY OUTPUT

Regression Statistics 2	
Multiple R	0.8219235
R Square	**0.6755583**
Adjusted R Squar	0.5674111
Standard Error	1.0399386
Observations	5

ANOVA

	df	*SS*	*MS*	*F*	***Significance F***
Regression	1	6.755583	6.755583	6.246654	**0.087758**
Residual	3	3.244417	1.081472		
Total	4	10			

	Coefficients	*Standard*	*t Stat*	***P-value***	*Lower 95%*	*Upper 95%*
Handling &Recei	**0.1023573**	0.040954	2.499331	**0.087758**	-0.02798	0.232691

Source: Analysed Survey Data, 2024

Meanwhile, Table 2 shows that 28 (53.8%) of respondents have the opinions that the inadequacy of handling equipment and receiving facilities is a major factor contributing to ship clearance delays. This happens because the port doesn't have enough modern handling equipment and receiving facilities for both cargo and ships. For instance, the port has no conveyor belts in the dry bulk terminal; cargo is moved from ships using dump trucks. In liquid terminals, there is no single receiving tank. This leads to discharge operations consuming more time as the ship discharges into individual oil importers' tanks which is associated with many stoppages of operations (i.e. connecting hose, ullage calculation, and consignee's un-readiness). Despite the fact that the Dar es Salaam port lacks a single tank for the temporary storage of specific petroleum products, the available handling equipment has low pumping capacity of 750 tonnes per hour, and a discharge rate of 882.9 tonnes (2,500 cubic metres) per hour at KOJ and SPM terminals respectively (TPA, 2020). This capacity is low compared to other global ports like Visakhapatnam Port in India with a discharge capacity of 5500 tonnes per hour (Visakhapatnam Port, 2016). In addition, the Dar es Salaam port has only 6 tugs for towage with a bollard pull of 60 tonnes (588.6 kN) which is less compared to tugs of Klaipeda port of 500-600 kN which handle container ships of 11,000 -15,000 TEUs (E class), 18,000- 23,000 TEUs (G class), Suezmax and Post Panamax (Paulauskas et al, 2021).

The insufficiency of berths for tankers handling liquid oil/gas via pipelines at the port has been strongly supported by Merk and Dang (2012). Hoffman et al. (2021) also support that inadequate modern equipment in many ports is the main reason for the long waiting time of the ships outside the port particularly bulk cargo and container ships that need special and unique equipment. In addition, Nikghadam et al (2021) show that most of the service delays at seaports are a result of the high level of utilization of port infrastructure and resources, such as the fairway, pilots, tugboats and berths. Thus, the inadequacy of port resources at Dar es Salaam Port is one of the contributors for ship clearance delays. The middling effect revealed by the regression analysis, along with a significant portion of respondents rating it as a major factor, reinforces the need for improvements in handling equipment and receiving facilities to enhance ship clearance efficiency at Dar es Salaam seaport.

In an effort to enhance the handling equipment and port facilities, the Tanzania Ports Authority (TPA) should invest in modern and high-capacity handling equipment, and receiving facilities, such as conveyor belts for the dry bulk terminal, a single receiving tank for the liquid bulk terminal (KOJ and SPM), and automated cargo handling systems. On the other hand, seaward port services should be improved by providing properly manned pilot boats, and mooring boats. For instance, currently the Dar es Salaam port has only 6 berthing tugs of up to 60 tonnes of bollard pull and 16 smaller tugs for towing lighters (TPA, 2020). Thus, the port should investment more in both seaward and landward handling equipment and facilities in order to reduce ship discharge time, vessel turnaround times, and towage time which in turn would make Dar es Salaam seaport competitive in the region.

4.2.3 Berth limitations

From Table 5, the coefficient of determination (i.e. R^2) is 0.819 which implies that the model can explain 81.9% of the changes in ship clearance delays. More specifically, the model explains that 67.5% of the changes in ship clearance delays is caused by berth limitations. Since the F-Value is 0.034 which falls between 0.01 and 0.05, indicates that there is significant relationship between berth limitations and ship clearance delays. The P-Value of 0.0345 and the positive beta coefficient of 0.1820 show that berth limitations have a significant positive effect on ship clearance delays. The positive beta coefficient suggests that an increase in berth limitations leads to an increase in ship clearance delays at the port. The findings are supported by Weerarathna and Sigara (2021) who argue that berth constraint is the second influential factor on vessel turnaround following cargo handling delays.

Table 5: Regression output on berth limitations

SUMMARY OUTPUT						
Regression Statistics 3						
Multiple R	0.90508274					
R Square	0.81917476					
Adjusted R Square	0.75889968					
Standard Error	0.77637028					
Observations	5					
ANOVA						
	df	*SS*	*MS*	*F*	***Significance F***	
Regression	1	8.191748	8.191748	13.5906	**0.034599**	
Residual	3	1.808252	0.602751			
Total	4	10				
	Coefficients	*Standard*	*t Stat*	***P-value***	*Lower 95%*	*Upper 95%*
Berth Limitations	**0.18203883**	0.049379	3.686544	**0.034599**	0.024892	0.339186

Source: Analysed Survey Data, 2024

Table 2 shows that 44.2% of respondents have the opinions that berth limitations is a critical factor. This suggests that at least half of the respondents view berth limitations as a major contributor to ship clearance delays. With the high growth of global trade, the port receives many ships and ship owners and shippers prefer to utilize big ships for economic scale benefits, this poses challenges to the port. Increases in ship size and traffic volumes may overwhelm port infrastructure, resulting in ship delays. In 2023, the port handled 21.5 million tons and is expected to handle 30 million tons in 2026 which can be achieved even before 2026. This trend shows that there is traffic volume that needs sufficient berth capacity to accommodate the coming vessels and commodities (Mrisho & Mzinga, 2023). The findings reveal how berth limitations slow down ship clearance operations at Dar es Salaam seaport. The high rating of the respondents further supports the critical effect of the berth limitations on ship clearance delays.

In order to circumvent the berth limitations, the Tanzania Ports Authority (TPA) should prioritize the expansion and upgrading of berthing capacity to accommodate more and larger ships. This includes developing new berths and modernizing existing ones to handle increased traffic volumes. As the Dar es Salaam seaport expansion is constrained with urban development, the TPA should consider developing new Ports away from the city to reduce port investment cost. Additionally, the Port should consider upgrading the Single Point Mooring (SPM) i.e. Outer berth to be multipurpose berth while implementing phased construction to minimize disruptions to on-going port operations. The port should conduct a continued assessment of the available berth and its capacity against the size and capacity of the ships visiting the ports to identify the potential causes of delays.

4.2.4 Unskilled workforce

From Table 6, the coefficient of determination (i.e. R^2) is 0.3676 which implies that the model can explain 36.76% of the changes in ship clearance delays. This suggests a relatively weak explanatory power of the unskilled workforce on ship clearance delays. Since the F-Value is 0.278 which is outside the range of 0.01 and 0.05, indicates that there is no significant relationship between unskilled workforce and ship clearance delays. In addition, the P-Value of 0.2783, which is much higher than 0.1, supports the lack of statistical significance. Furthermore, the negative coefficient of -0.1050 suggests that, an increase of an unskilled workforce is associated with a decrease in ship clearance delays. The findings conflict with Onifade et al. (2020) who argue that

highly skilled staff improve port performance. However, given the high P-Value, the relationship between unskilled workforce and ship clearance delays is not statistically significant.

Table 6: Regression output on unskilled workforce

SUMMARY OUTPUT						
Regression Statistics 4						
Multiple R	0.60633906					
R Square	**0.36764706**					
Adjusted R Square	0.15686275					
Standard Error	1.45184129					
Observations	5					
ANOVA						
	df	*SS*	*MS*	*F*	***Significance F***	
Regression	1	3.676471	3.676471	1.744186	**0.278319**	
Residual	3	6.323529	2.107843			
Total	4	10				
	Coefficients	*Standard*	*t Stat*	***P-value***	*Lower 95%*	*Upper 95%*
Unskilled Workforc	**-0.105042**	0.079537	-1.32068	**0.278319**	-0.35816	0.148079

Source: Analysed Survey Data, 2024

Table 2 reveals respondents' perceptions with regard to the effect of unskilled workforce on ship clearance delays. The respondents' ratings are: critical factor (0.0%), major factor (5.8%), moderate factor (40.4%), minor factor (34.6%), and not a factor (19.2%). The findings indicate that unskilled workforce contributes moderately to ship clearance delays. However, the discrepancy of findings between descriptive and inferential statistics with regard to the effect of unskilled workforce on ship clearance delays necessitate further investigation.

Paulauskas et al (2021) argue that poor training and port staff knowledge are the main risks at Indian ports. Their study found that most actors' staff lack ship clearance skills since some of them are recruited from different fields such as marketing. It should be borne in mind that the ship clearance operations are complex operations that need relevant staff in the field (Olesen, 2014). On the contrary, Nikghadam et al (2021) reveal that most services delayed at the port are the result of the port infrastructure, rather than technical skills or weather conditions. In our analysis, the regression model reveals that the unskilled workforce doesn't have a significant effect on ship clearance delays. The high P-Value and low explanatory power of the model suggest that other factors are more critical in explaining ship clearance delays. However, the perceptions of respondents that the unskilled workforce is a moderate factor highlights a potential area for further qualitative investigation.

Despite the unskilled workforce being a constraint with moderate effect on ship clearance delays at Dar es Salaam seaport, the TPA and its actors are advised to keep developing training programs to boost their staff skills. The focus should be on improving the competencies of the existing workforce to reduce ship clearance delays. In addition, actors' staff should have refresher courses in ship handling procedures, efficiency utilisation of the available systems, and compliance with the standards guiding ship clearance operations. Furthermore, cross-functional hires of staff from non-maritime fields are highly discouraged.

4.3 The distribution of the effect of resource constraints on ship clearance delays

The descriptive analysis reveals that the integrated IT systems (VCS) and berth limitations as the most critical resource constraints affecting ship clearance operations at Dar es Salaam port. Meanwhile handling equipment and receiving facilities is a major resource constraint affecting ship clearance operations. Ironically, unskilled workforce albeit noted insignificant resource constraint, it moderately affects ship clearance operations.

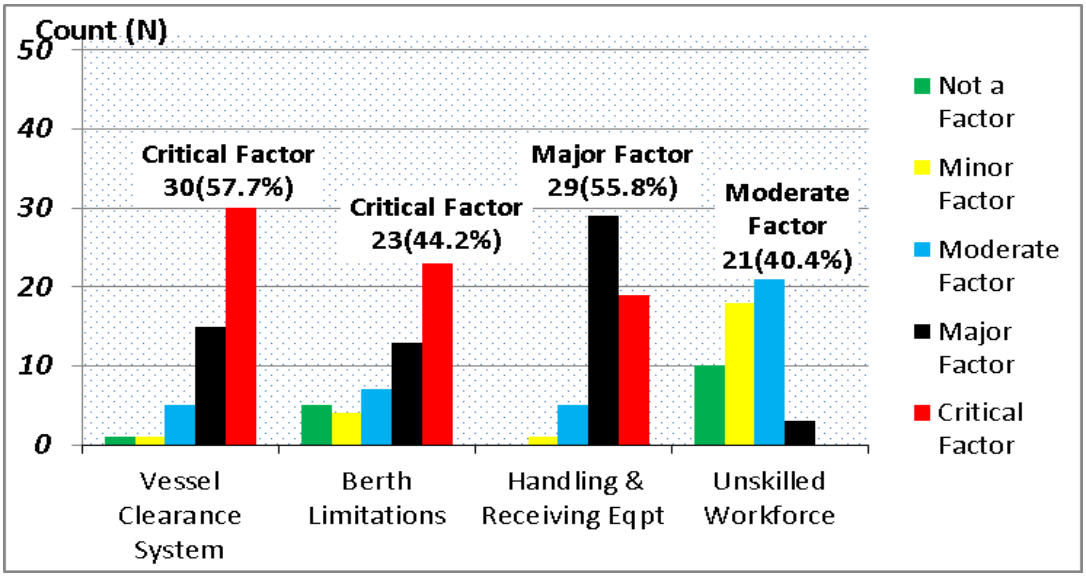

Fig. 3: The effect of port resource constraints on ship clearance delays at Dar es Salaam port

Generally, all the resource constraints presented in Fig.3 have adverse effects on ship clearance operations. Thus, in order to curb the ship clearance delays, the Dar es Salaam seaport should formulate and implement strategies which would optimize ship clearance operations based on the following order of the resource constraints: Integrated IT systems, Berth limitations, Handling equipment and receiving facilities, and unskilled workforce. Furthermore, the improvement of these resource constraints would ultimately make the Dar es Salaam seaport more competitive and attract more trade volumes.

5. Conclusions

The objective of this study was to assess the factors contributing to ship clearance delays at Dar es Salaam seaport. A convergent mixed research design was used whereby the purposive sampling was used to select the port actors to form a sampling frame and simple random sampling was used to select the respondents from the identified organizations. The regression analysis and thematic analysis were used for quantitative and qualitative data respectively. After testing the hypotheses, it is confirmed that integrated IT systems and berth limitations have a significant and positive effect on ship clearance delays. These findings reveal that the lack of integrated vessel clearance system and berth limitations are the critical constraints that need urgent attention. The analysis also confirms that handling equipment and receiving facilities have a moderate and positive effect on ship clearance delays. Thus, the inadequacy of handling equipment and receiving facilities at the Dar es Salaam port is the major constraint that need close attention. Furthermore, the analysis has confirmed a lack of significant relationship between unskilled workforce and ship clearance delays. However, the descriptive statistics show that the effect of unskilled workforce on ship clearance delays is moderate. Thus, further qualitative investigation is called to gain a deeper understanding of the relationship between unskilled workforce and ship clearance delays.

To evade from the identified challenges, it is recommended that an integrated vessel clearance system should be implemented whereby the port actors could access and share information in real-time. More specifically, the Tanzania Ports Authority (TPA) should enhance collaboration with actors involved in ship clearance operations, including shipping lines, CFAs, and government agencies, to streamline effective communication and coordination. In addition, TPA is called to invest in berth infrastructure, modern handling equipment and receiving facilities. Furthermore, the port actors are called to recruit the fit for purpose (i.e. competent and qualified) staff and implement comprehensive training programmes based on technical skills and customer relationship management (CRM). Most importantly, TPA should establish regular meetings with port actors to discuss challenges, share best practices, and develop joint solutions to common issues to address the raised concerns proactively.

5.1 Implications for research

The findings of this study have theoretical and practical implications. Theoretically, this study seems to be the first to provide a comprehensive framework that examines the relationship involving integrated IT system (i.e. vessel clearance system), berth limitations, handling equipment and receiving facilities, and unskilled workforce and ship clearance delays. The tendency has been to provide simple frameworks that examine the relationship involving few (i.e.one or two) resource constraints.

Practically, results highlight on what makes a port actor profitable. With insights from the literature review, this study advances knowledge on port operations management by revealing the relative importance of each resource constraint on ship clearance operations. Managers of enterprises engaged in ship clearance operations can identify areas of improvement within their settings and be able to reduce cost and attain profitability.

5.2 Limitations and directions for future research

Firstly, the regression analysis reveals a negative and statistically insignificant relationship between the unskilled workforce and ship clearance delays. This contracts with the findings of other literature. Secondly, this study employs a cross-sectional research strategy lacking the longitudinal connection of the effect of port resource constraints on ship clearance delays, hence care must be taken in an attempt to generalize findings in other seaports. However, the identification and testing of the conceptual model, could assist in developing comparative studies that may lead to more generalizable findings. Thirdly, its data are collected from one specific port, which might not apply to other ports. Lastly, the study has zeroed in on port resources constraints (e.g. berths, workforce, integrated IT systems, and handling equipment and receiving facilities of cargo and ship) leaving out other factors that could have ramifications on ship clearance operations. Therefore, future studies should include other factors to gain deeper understanding on the interaction of the port resource constraints and ship clearance operations.

REFERENCES

Round, D. (2016). Port Operations, Planning, and Logistics. Routledge. Lu, C., Yuan, W., Qiu, L., & Hu, H. (2020). Analysis of Delivery Delay Influencing Factors in the Context of International Shipments. *Journal of Traffic and Transportation Engineering*,7(4), 435-444.

Nikghadam. S, Molkenboer. K, Tavasszy. L, Rezaei. J. (2021). Information Sharing to Mitigate Delays in Port. *Maritime Economics & Logistics*, 25:576–601.

BIMCO. (2021). Ship Operating Costs. [Online]. Available: https://www.bimco.org/data/ship-operating-costs. [Accessed September, 2024].

UNCTAD. (2017). Roadmap for Building a Trade Single Window. [Online]. Available: https://unctad.org. [Accessed October 08, 2024].

AfDB. (2018). African Development Bank Group-Annual report 2018: Port development in Africa. African Development Bank. [Online]. Available: https://www.afdb.org. [Accessed September, 2024].

ZhenHub. (2022). Cargo Ship Delays in 2022. [Online]. Available: https://zhenhub.com. [Accessed September 11, 2024].

Greiner. R & Stephens. M. (2017). Ship Operating Costs: Current and Future Trends. [Online]. Available: https://globalmaritimehub.com. [Accessed September 11, 2024].

Sinay. (2022). What are Five Environmental Impacts Related to shipping? [Online]. Available: https://sinay.ai/en. [Accessed October 08, 2024].

Feizabadi, O. J., & Lee, C. Y. (2018). Analysis of Risks and Disruptions in a Port Service Supply Chain. *Journal of Waterborne Transportation*, 21(1), 25-41.

World Economic Forum. (2019). Enabling Trade Index 2018: The Global Enabling Trade Report. [Online]. Available: https://globalledge.msu.edu. [Accessed September 11, 2024].

World Bank. (2017). Improving Trade and Transport for Landlocked Developing Countries. Washington DC: World Bank. [Online]. Available: https://www.worldbank.org. [Accessed September 11, 2024].

Mwaisaka, A (2021). An Assessment of Technical Efficiency of Customs Clearance Agencies Offering Cargo Clearance Services at Dar es Salam Port. *International Journal of Innovative Science and Research Technology*, 6(12) :2456-2165.

Massami, E.P. & Manyasi. M.M. (2021). Analysis of the Performance of Cargo Clearance Formalities Based on Fuzzy VIKOR Clustering Model. *Journal of Economics and International Business Management*,9(1):1-19.

Abdulrahman. N, Othuman. M, Sanusi. I, Mdaron. A, & Ismail. A (2019). Evaluation of Delay Factors on Dry Bulk Cargo Operation in Malaysia. *The Asian Journal of Shipping and Logistics*, 3(35):127-137.

Gidado. U. (2015). Consequences of Port Congestion on Logistics and Supply Chain in African Ports. *Developing Country Studies*. 5(6): 160-167.

Maneno, F.H. (2019). Assessment of Factors Causing Port Congestion: A Case of the Port Dar es Salaam. World Maritime University Dissertations. [Online]. Available: https://commons.wmu.se/all_dissertations/1208. [Accessed September 11, 2024].

AfDB. (2014). Tanzania's Seaports and Transport Corridors as Development Opportunity for East and Southern Africa. NEPAD, Regional Integration and Trade Department. Paper No. 3. [Online]. Available: https://www.afdb.org. [Accessed September 11, 2024].

Mwendapole, M.J.; Zhihong, J.(2021). Evaluation of Seaport Service Quality in Tanzania: From the Dar es Salaam Seaport Perspective. *Sustainability*. 13(18): 1-16.

Weerarathna, J. & Sigera, I. (2021). Study the Affecting Factors for Break Bulk Vessel Turnaround Time at Port of Colombo. Research for Transport and Logistics Industry Proceedings of the 6th International Conference, October 2021, Colombo, Sri Lanka, 54-56. [Online]. Available: https://slstl.lk. [Accessed October 10, 2024].

Ahmed. Z. (2019). Analysis of Ship Clearance in the Maldives: Trade Facilitation Perspective. [Online]. Available: https://commons.wmu.se/cgi. [Accessed September, 2024].

TPA. (2020). Tanzania Ports Authority (TPA) Por Handbook 2019-20. Port of Dar es Salaam. [Online]. Available: https://www.ports.go.tz. [Accessed October 08, 2024].

Mrisho. M & Mzinga. B. (2023). 45 Minutes Television Series. *ITV Channel.* Development and Challenges in Dar es Salaam Port. ITV.

Nguyen, H. (2020). Analyzing the Efficiency of Vietnamese Seaports Using a Two-Stage DEA Model. *The Asian Journal of Shipping and Logistics, 36(3). 126-136.*

GraduateTutor.com (2024). Interpreting Regression Output (Without all the Statistics Theory). [Online]. Available: https://www.graduatetutor.com. [Accessed October 09, 2024].

UNCTAD. (2021). Review of Maritime Transport 2021. [Online]. Available: https://unctad.org. [Accessed October 08, 2024].

Visakhapatnam Port Trust. (2016). Environment Impact Assessment Study for Modernisation of Existing Facilities and Addition of New Facilities Entailing Capacity at Visakhapatnam Port. Available: https://vizagport.com. [Accessed October 08, 2024].

Paulauskas, V., Simutis, M., Pla˘ciene, B., Barzdžiukas, R., Jonkus, M. & Paulauskas, D. (2021) The Influence of Port Tugs on Improving the Navigational Safety of the Port. *Journal of Marine Science Engineering*. 9(3):342.

Merk, O., Dang, T. (2012) 'Efficiency of Word Ports in Container and Bulk Cargo (Oil, Coal, Ores and Grain)'. OECD Regional Development Working Papers, 2012/09. OECD Publishing. [Online]. Available: https://www.oecd-library.org. [Accessed September 11, 2024].

Hoffman. A, Rabe. S & Hartpence. K. (2021). Quantifying the Relative Contributions of Customs, Trade, and Ports to Cargo Time Delays. *World Customs Journal*, *15*(1), 55-68.

Onifade. M, Afolabi. O.J & Oroye, O. J. (2022). Modelling the Manpower Planning of Nigerian Port Operations. *Journal of Academic Research in Economics (JARE), 12*(3), 494-508.

Olesen, P. B., Damgaard, C.M., Hvolby, H., Dukovska-Popovska, I. & Sommer, A.F. (2014). Framework for Information Sharing in a Small-to-Medium Port System Supply Chain. IFIP International Conference on Advances in Production Management System (APMS), September 2014, Ajaccio, France, 257-264. [Online]. Available: https://inria.hal.science/hal-01388256. [Accessed September 11, 2024].