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TRADE FACILITATION MEASURES AND CARGO CLEARANCE EFFICIENCY AT THE PORT OF DAR ES SALAAM, TANZANIA

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Abstract

The efficient clearance of cargo is a key determinant of the competitiveness of seaports, the reliability of international trade and the cost of regional supply chains. Although the Port of Dar es Salaam has been undergoing reforms in customs, single window affairs, infrastructure enhancement and risk-based controls, delays and operational bottlenecks are still prevalent in the movement of cargo. The study examined four trade facilitation measures namely customs automation, inter-agency coordination, infrastructure efficiency and risk management systems and their impact on the efficiency of goods clearance operations in the Port of Dar es Salaam, Tanzania. This research was conducted using explanatory research design. The target population included customs officers, clearing/forwarding agents, importers/exporters and other government agencies at the port. A stratified random sampling was used in selecting a sample of 189 respondents out of a target population of 358 and 171 usable questionnaires were returned, 90.4% response rate. Descriptive statistics, Pearson correlation and multiple linear regression were performed to analyse the data. Cargo clearance efficiency was found to be significantly positively related with customs automation ($r = .443$), inter-agency coordination ($r = .347$), infrastructure efficiency ($r = .309$) and risk management systems ($r = .449$) ($p < .01$). The multiple regression model was statistically significant, $F(4,166) = 19.61$, $p < .001$, with $R^2 = .321$ and adjusted $R^2 = .305$. Customs automation ($B = .284$, $p < .001$), inter-agency coordination ($B = .236$, $p = .002$), infrastructure efficiency ($B = .218$, $p = .003$), and risk management systems ($B = .297$, $p < .001$) each had a significant positive effect. The standardized coefficient ($\beta = .281$) of risk management systems was the highest. The study's recommendations are that an integrated approach to trade facilitation, involving the use of digital customs systems, coordinated border management, suitable infrastructure and intelligent risk management is the most effective way to improve cargo clearance efficiency. The findings have

implications for customs authorities, port managers and policymakers looking to minimise clearance delays, and improve Tanzania's role as a regional trade and logistics gateway.

Keywords: trade facilitation; customs automation; inter-agency coordination; port infrastructure; risk management; cargo clearance efficiency; Dar es Salaam Port

1. Introduction

Cargo clearance is a key to the efficiency of international trade and a crucial component in the speed of goods being transported from ports to domestic and regional supply chains. Clearance includes documentation, customs declaration, duty and tax assessment and payment, inspection (as required), release, and communicating with many regulatory authorities. Where these activities are performed in a disconnected way or rely on manual steps, traders have to wait longer for clearances, incur higher transaction costs and experience less predictability. The purpose of trade facilitation is thus to streamline, harmonise and modernise trade processes at the border, whilst at the same time ensuring effective regulatory controls. The Trade Facilitating Agreement (TFA) of the World Trade Organization (WTO) is a specific agreement that provides support for customs automation, cooperation between border agencies, risk management and other factors that facilitate the movement, release and clearance of goods. The Agreement also provides for the custom administrations to focus their controls and efforts on high-risk consignments, and rapidly process low-risk cargo, and for the coordination of the activities of the border authorities. [WTO, 2017].

In developing country ports, the importance of these measures is especially pronounced as they are global indicators of the quality of clearance performance where institutional fragmentation, infrastructure limitations and unequal digital capacities are present. According to the World Bank's Logistics Performance Index (LPI), customs efficiency, trade and transport infrastructure, tracking and tracing, logistics services and timeliness are interdependent aspects of logistics performance. Therefore, customs clearance can not be considered as a stand-alone administrative process, but as part of a broader logistics system, where information, physical infrastructure, institutions and risk management mechanisms are interdependent.

Tanzania's Port of Dar es Salaam is a strategic port to East and Central Africa. It is a major sea port and acts as a sea port to Tanzania and landlocked countries through the Central Corridor. The article draws from the thesis which highlights that despite reforms such as the Tanzania Customs Integrated System (TANCIS), Tanzania Electronic Single Window System (TeSWS), infrastructure modernisation and risk-based customs controls, persistent clearance delays, congestion and vessel waiting time and transaction costs remain. The study hence focused on an important practical and empirical question that is; to what extent do selected trade facilitation measures explain the efficiency of cargo clearance at the Port of Dar es Salaam?

The article is thus a contribution to literature as it combines four operational dimensions in one empirical model: customs automation, inter-agency coordination, infrastructure efficiency and risk management systems. The studies reviewed in the thesis in the previous chapters often focused on a particular reform or on a more general measure of port performance. The present study, however, focuses on the efficiency of cargo clearance as the specific outcome and makes estimates of the

concurrent contribution of the four measures. This offers evidence of a coordinated approach to the facilitation of trade at a key East African seaport.

All of these variables are significant at $p < .01$ and have a strong positive correlation with efficiency and customs automation ($r = .443$), inter-agency coordination ($r = .347$), infrastructure efficiency ($r = .309$), and risk management systems ($r = .449$). The multiple regression model was statistically significant, $F(4,166) = 19.61$, $p < .001$, with $R^2 = .321$ and adjusted $R^2 = .305$. Customs automation ($B = .284$, $p < .001$), inter-agency coordination ($B = .236$, $p = .002$), infrastructure efficiency ($B = .218$, $p = .003$), and risk management systems ($B = .297$, $p < .001$) each had a significant positive effect. The highest standardized coefficient ($\beta = .281$) was for risk management systems. The study has found that an integrated approach to trade facilitation, underpinned by good infrastructure, intelligence-led risk management, and coordinated border management combined with digital customs systems, is likely to be the best approach for increasing the efficiency of cargo clearance. The conclusions have implications for the customs authorities, port managers and policy makers looking to mitigate clearance times and boost Tanzania as a regional trade and logistics hub.

2. Literature Review and Theoretical Framework

2.1 Trade facilitation and cargo clearance

Trade facilitation aims to simplify, make more transparent, predictable and efficient procedures and processes for facilitating trade across borders. A major aspect of digitalisation will be the fact that electronic declarations, electronic payments, single-window platforms and electronic data interchange can cut out repetitive documentation and allow authorities to process before the cargo. Studies on maritime digital transformation show that technology can help enhance maritime operations, but also standards, organisational preparedness and collaboration between stakeholders are essential to the process of maritime digital transformation (Tijan et al., 2021). The Tanzania specific evidence in this thesis also shows that TeSWS has helped to reduce clearance time and congestion, whilst ICT limitations, infrastructure constraints, training requirements and stakeholder resistance can reduce the benefits of TeSWS.

2.2 Theoretical perspectives

The study was informed by four theories which were complementary to each other. Systems theory focuses on organizational systems and processes as being interrelated and functioning, with the result being the performance of the system. Within a port, there are interdependent subsystems of customs, terminal operations, shipping lines, clearing agents, inspection units and government agencies. The lack of information flow or processing at one point can thus have an impact on the entire clearance chain. This view is that, clearance efficiency should be jointly affected by automation, infrastructure and coordination.

Institutional theory is an explanation of how rules, regulations, norms and organisation mandates influence behaviour. There are different laws and administrative functions governing the customs, port authorities and other government agencies. Insufficient harmonisation of mandates and procedures can result in duplication and delays. Institutional pressures may also shape the

implementation of reforms (Munir & Baird, 2016). This gives a theoretical framework for the study of inter-agency coordination.

One of the theories discussed is diffusion of innovation theory, which focuses on the uptake and successful adoption of new technologies and practices. As part of port operations, electronic customs platforms, automated scanning, tracking systems and modern cargo-handling facilities are innovations that can change the workflows used. This perspective is further supported by the fact that digital transformation is changing maritime transport and that cooperation and adaptation are needed in order to make it happen (Tijan et al., 2021).

The theory of the stakeholder understands that port performance is based on the interactions between a set of multiple actors who interact and affect each other. Predictable cargo movement is the joint responsibility of customs administrations, port authorities, shipping companies, freight forwarders, importers and exporters, inspection agencies and logistics providers. Stakeholder coordination can, therefore, facilitate information sharing, accountability and effective risk management (Donaldson & Preston, 1995; Lam & Yap, 2019).

2.3 Conceptual relationships

Conceptualization of customs automation was done by the ideas of electronic customs declaration, electronic data exchange, electronic payment and clearance, and electronic processing of data. Joint inspection, system integration, data sharing, and agency roles were indicative of inter-agency coordination. Accessibility, technology and systems, operational capacity and physical infrastructure were all captured as infrastructure efficiency. Cargo targeting, risk assessment, risk analysis and risk profiling were represented in the risk management systems. Indicators used to assess cargo clearance efficiency comprised clearance time, clearance cost and customer satisfaction.

3. Methodology

The study employed explanatory research design because the aim was to understand the relationship or impacts between the trade facilitation measures and the efficiency of cargo clearance. The target population was made up of 358 stakeholders who are directly involved in clearing and forwarding in the Port of Dar es Salaam including clearing and forwarding agents, customs officers, importers/exporters and other government agencies. Stratified random sampling was used to provide representation of stakeholder categories. The sampling procedure stated in the study was adhered to, with a sample size of 189 respondents being taken and 171 of them returning and completing questionnaires, which represents a 90.4% return rate.

The structured questionnaire with five-point likert scale items was used to gather the primary data. The questionnaire included topics related to customs automation, coordination between different institutions, efficiency of infrastructure, risk management systems, and efficiency of cargo clearance. This instrument was pre-tested with a pilot group which constituted 10% of the population of the target group at Tanga Port. Cronbach's alpha was used to determine the internal consistency. The reliability of the instrument for the main study was reported in the thesis.

Data analysis comprised descriptive statistics, Pearson product-moment correlation, bivariate regression and multiple linear regression. Prior to inferential analysis, the following diagnostic tests were performed: normality, multicollinearity, heteroscedasticity and linearity tests. The multiple regression model used was: $Y = \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \varepsilon$, where Y indicates cargo clearance efficiency; X1 customs automation; X2 inter-agency coordination; X3 infrastructure efficiency; X4 risk management systems and ε the error term. Decision making for the statistical treatments was made at the 5% level of significance.

4. Results

4.1 Descriptive and correlational findings

Of the 200 responses, 171 were usable. Pearson correlation results showed that all four trade facilitation measures were positively and significantly related to cargo clearance efficiency. Cargo clearance efficiency ($r = .449$, $p < .01$), customs automation ($r = .443$, $p < .01$), inter-agency coordination ($r = .347$, $p < .01$), and infrastructure efficiency ($r = .309$, $p < .01$) were found to be the most highly related to risk management systems. Correlations between the independent variables were moderately high (.237 to .418), indicating that they were not completely independent, but were sufficiently related to be analyzed together.

Predictor	r with CCE	B	p-value
Customs automation	.443	.284	< .001
Inter-agency coordination	.347	.236	.002
Infrastructure efficiency	.309	.218	.003
Risk management systems	.449	.297	< .001

Note. CCE = cargo clearance efficiency; r values are Pearson correlations; B values are unstandardized coefficients from the multiple regression model. Source: Study data, 2026.

4.2 Multiple regression results

The combined regression model produced $R = .567$, $R^2 = .321$ and adjusted $R^2 = .305$. Together, the four trade facilitation measures accounted for 32.1% of the variance observed in the speed of cargo clearance, and 67.9% was explained by variables not included in the model. The overall model was significant $F(4,166) = 19.61$, $p < .001$, meaning that the predictors taken as a whole accounted for meaningful variance.

Each of the four predictors was statistically significant and positive. Customs automation had an unstandardized coefficient of $B = .284$ ($SE = .071$, $\beta = .268$, $t = 4.000$, $p < .001$). Inter-agency coordination recorded $B = .236$ ($SE = .075$, $\beta = .224$, $t = 3.147$, $p = .002$). Infrastructure efficiency recorded $B = .218$ ($SE = .073$, $\beta = .207$, $t = 2.986$, $p = .003$). Risk management systems recorded $B = .297$ ($SE = .072$, $\beta = .281$, $t = 4.125$, $p < .001$). The estimated equation was: $CCE = .521 + .284(CA) + .236(IAC) + .218(IE) + .297(RMS) + \varepsilon$.

All four null hypotheses were rejected as a result of the results. The evidence suggests that all the chosen trade facilitation measures have statistically significant positive impacts on cargo clearance efficiency, controlling for other measures. The human resource management system, customs automation, inter-agency coordination and infrastructure efficiency had the highest standardized coefficient.

5. Discussion

5.1 Customs automation and cargo clearance efficiency

The positive impact of customs automation suggests that e-declaration, e-payment, e-DI, and automated processing have a positive impact on reducing cargo clearance administrative friction. The bivariate relationship was significant ($r = .443$) and the multiple regression coefficient was positive ($B = .284$) and significant ($\beta = .268$). This indicates that there are additional factors to the effects of coordination, infrastructure and risk management for the clearance efficiency that can be attributed to automation. The finding is in line with the broader trade-facilitation rationale of the WTO TFA, and with maritime digital transformation literature that speaks of digital technologies as key enablers to more efficient maritime operations (Tijan et al., 2021). It is also consistent with the Tanzania-specific evidence that Mkocho and Mwisila (2025) reported, which suggested that TeSWS helped to enhance operational efficiency, and that potential infrastructure and ICT constraints may limit the benefits.

The discovery has significant management implications: simply deploying a digital platform will not ensure that it is used efficiently. The automation needs to be implemented throughout the clearance chain, with a solid infrastructure of connectivity, interoperability, data reliability and user competence. The positive coefficient thus calls for further efforts to move towards paperless and integrated customs processing, but not just the acquisition of technology, but in a reliable and interoperable system.

5.2 Inter-agency coordination and cargo clearance efficiency

Inter-agency coordination was positively associated with cargo clearance efficiency ($r = .347$) and was still statistically significant in the multiple regression model ($B = .236$; $\beta = .224$; $p = .002$). This finding arguably confirms the hypothesis that cargo clearance is a multi-agency process and that multi-agency inspections, information sharing, decision making harmonization and integrated systems can minimize duplication. This is in direct line with the WTO TFA which requires cooperation and coordination of border authorities and specifies joint controls and shared facilities as potential mechanisms for achieving this (WTO, 2017).

The outcome also reinforces the stakeholder theory as it relies on the coordinated actions of multiple actors, not just customs. The stakeholder perspective is very important for ports as they perform interdependent roles between public agencies and private operators (Donaldson & Preston, 1995; Lam & Yap, 2019). The implication for Dar as Salaam is to design institutional arrangements which would ensure that information sharing and joint decision making would become the norm,

rather than the exception, and not be dictated by a relationship of trust between individual officials or institutions.

5.3 Infrastructure efficiency and cargo clearance efficiency

Infrastructure efficiency had the lowest correlation with all four predictors, but a statistically significant positive relationship with the cargo clearance efficiency ($B = .218$; $\beta = .207$; $r = .309$; $p = .003$). The finding suggests that, even taking into account technological, coordination and risk-management issues, infrastructure is still an important enabling condition. Safe berths and storage yards, as well as cargo-handling equipment, access routes, inspection facilities and supporting information systems, facilitate the movement of goods and minimize bottlenecks.

This is in line with reported evidence that port infrastructure and logistics performance has been identified as among the crucial factors that affect trade and economic performance (Munim & Schramm, 2018). It is also suitable with the literature on digitalization: if there is a lack of physical capacity, it cannot be fully compensated by the digital systems. From a working point of view, a customs declaration can be filed electronically but goods can still be kept in storage if there are inspections, storage space, gates and handling equipment and transport facilities limitations. Infrastructure investments should be planned accordingly with customs and information system reforms.

5.4 Risk management systems and cargo clearance efficiency

The most significant bivariate correlation with cargo clearance efficiency was observed between the risk management system and that measure ($r = .449$), and the highest standardized coefficient was for the same relationship in the multiple regression model ($\beta = .281$; $B = .297$; $p < .001$). This is an indication of the need for intelligent, selective customs control. Good risk management helps customs to direct their resources to inspect higher risk consignments, while moving compliant and lower risk cargo at a faster pace. This is in line with WTO TFA that focuses on risk-based controls and prioritisation of low-risk consignment, and WCO's principle of risk assessment, profiling and targeting as core principles of modern customs administration.

This is especially valuable since it implies that there is no inherent conflict between the objectives of clearance efficiency and customs control. Well-designed risk management can help to enhance facilitation and enforcement by minimising unwanted intervention whilst maintaining scrutiny of potentially non-compliant cargo. It is therefore important to focus on improving the quality of data, risk profile, intelligence sharing and analytical capabilities, and continually testing the targeting criteria.

5.5 Integrated interpretation

The overall model presents the most important substantive message of the study, which is that the efficiency of cargo clearance is multidimensional. The R^2 value of .321 suggests that the four chosen measures account for a meaningful portion of the variance, while the other 67.9% suggests there are other factors that are important but not included in this model. Those findings must, therefore, not be taken as evidence that the four measures are sufficient to determine the clearance

performance. Instead, they show that better automation, coordination, and infrastructure and risk management are linked to better clearance outcomes, and these must be added to other elements of a reform programme.

The grouped order of standardized coefficients is also important. Customs automation and risk management systems were the most impactful unique contributions, closely followed by supply chain management. Supply chain management is followed closely by customs automation and risk management systems. This implies that the value of technology comes when it helps making better decisions as to which cargo should be intervened. Coordination and infrastructure are also important, as risk decisions and automated processes need to be acted upon at some point in institutions and physical infrastructure. The findings thus support the systems-theory hypothesis that the success of the entire clearance system is a product of interdependency between the various elements of the system.

6. Conclusion and Implications

Results indicate that customs automation, inter-agency coordination, efficiency of infrastructure and risk management systems all have a statistically significant positive effect on the efficiency of cargo clearance at the Port of Dar es Salaam. All four null hypotheses are rejected by the evidence. The model is statistically significant and accounts for 32.1% of the variation in cargo clearance efficiency. The most significant predictor is risk management systems, followed by customs automation, inter-agency co-ordination and efficiency of the infrastructure.

The results reinforce the need for continued investment in integrated electronic customs systems, interoperability and paperless processing for policy. Formal systems of data sharing, joint inspections and coordinated decision making should be improved among TRA, TPA and other border agencies. The planning of infrastructure should be to make sure that infrastructure planning and digital development go hand in hand. The application of better cargo profiling, intelligence analysis, targeting and modern inspection technologies are especially important for risk management. Ongoing training of staff and community participation are also essential to ensure that reforms are put into practice.

Theory: The findings agree with the use of the lenses of systems theory, institutional theory, diffusion of innovation theory and stakeholder theory as complementary lenses. Cargo clearance performance is not explained by one perspective alone: technology is the basis for automation, institutional structures are basis for coordination, innovation theory is the basis for the adoption of new technology and infrastructure, and stakeholder theory is the basis for interdependency of actors. The integrated theoretical approach is thus suitable for the analysis of complex port-clearance environments.

7. Limitations and Directions for Future Research

This is an explanatory cross sectional study that was conducted using data obtained from self-report questionnaires. The findings therefore reflect the perceptions of the stakeholders at the time of the

study and cannot provide information on how the impact of the trade facilitation measures changes over time. The study also focused solely on the Port of Dar es Salaam area and this constrains generalisation of the results to other ports and border stations that may have different institutional and operational conditions. Finally, the four predictors accounted for only 67.9% of the variance in cargo clearance efficiency.

Further research is needed to explore other areas like implementation of customs policy, competency of staff, port governance, regulatory compliance, quality of documentation, involvement of customs stakeholders and ICT integration. Comparative studies on the different gateways in Dar es Salaam, Mombasa and elsewhere in the region could reveal best practices. Longitudinal studies also could be conducted to measure sustained improvement from ongoing investments in automation, infrastructure and risk management. The statistical relationships could be explained using a mixed methods research approach, which incorporates the views of customs officers, freight forwarders, shipping lines, port operators and traders.

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