IMPACTS OF CONTAINERISED CARGO HANDLING SYSTEM IN LOGISTICS PERFORMANCES: A CASE OF TANZANIA PORT AUTHORITY

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A DISSERTATION SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF BUSINESS ADMINISTRATION – TRANSPORT AND LOGISTICS

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CERTIFICATION

The undersigned certifies that this dissertation is the work of the candidate carried out under my direct supervision. The undersigned certifies that he has read and hereby recommends for consideration by The Open University of Tanzania the dissertation entitled: **Impacts of Containerised Cargo Handling System in Logistics Performances: A Case of Tanzania Port Authority i**n partial fulfilment of requirements for the Degree of Master of Business Administration (Transport and Logistics) of The Open University of Tanzania.

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Dr. Silvio Macha

(Supervisor)

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Date

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DECLARATION

I, **Magenge Yese**, do hereby certify that this dissertation is my own original work and that it has not been submitted for a similar degree in any other University.

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Date

DEDICATION

This work is dedicated to my lovely family. However, the special dedication is to my parents who always insisted for higher education attainment.

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ABSTRACT

The study aimed at assess the impact of containerised cargo handling system in logistics performance at Tanzania Port Authority (TPA).Specifically the study aimed at assessing the storage facilities used for container handling, identifying the challenges facing internal operation procedures and the assessing the role of transport system in facilitating short container dwell time.The study employed descriptive case study design. In addition, the study employed a sample of 57 respondents. Simple random sampling was used to select this sample. Primary and secondary data collection methods were used. Both qualitative and quantitative approaches were employed. Questionnaire, interviews and observation were used for collecting primary data and while documentary review was used in collecting secondary data. Data analysis was done using content analysis for qualitative data and descriptive statistics (frequencies, percentages, Mean and standard deviations) was done for quantitative data, using SPSS software version 20.The findings revealed that in enhancing storage facilities, TPA employed technologies in cargo handling such as internet, EDI processing, wireless LANs and RFID technologies. The study also identified challenges such as inadequate container storage space, inadequate handling equipment's. However, findings showed that trade fluctuations, poor inland modes of transport, IT system breakages affect logistics performance. Furthermore, transport was found to have significant positive effects on the roles of logistic. The study concluded that the containerized cargo handling system at TPA has not effectively contributed to logistic performances. The study recommends that the port should continue to improve handling equipments, increase terminal spaces, enhance information processing and improve inside and outside infrastructures.

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LIST OF ABBREVIATIONS

AGV	Automated Guided Vehicle
AMI-ICD	Transami SDV
ASCs	Automated Staking Cranes
CFSs	Container Freight Standard
CIF	Cost, Insurance and Freight (INCOTERM, commonly used for
CRT	Cross Navigate Ton (measure of the cargo carrying capacity of Import cargo)
DICD	Dar es Salaam Inland Container Deport
ECOWANS	Economic, Community of West Africa states
EDI	Electronic Data Inter charge
FOB	Free on Board (Community Applicable to export Cargo)
GANTYLY CRANE	Crane for Transferring Containers between Ship and Shore
ICD	Inland Container Deport
ISPS	International ship and port facility security code
KICD	Kurasini Inland Container Deport
MCC-ICD	Malawi Cargo
MOWCA	Maritime organization of West and Central Africa
NTC	National Transport regulatory commission
PMAESA	Port management association of West and Central Africa
QCs	Quay Cranes
RMG	Rail Mounting Cranes
RTG	Rubber Tire Gantry
SCs	Straddle Cranes

SGG	Shore Gantry Cranesship)
SSA	Sub-Saharan Africa
SSATP	Sub-Saharan Africa, Transport policy program
TEU	Twenty Feet Equivalent Unit (Applies to containers)
THA	Tanzania Harbors Authority
TICTS	Tanzania International Container Terminal Services
TOS	Terminal Operating System
TPA	Tanzania Port Authority
TRH – ICD	Tanzania Road Haulage
UICD	Ubungo Inland Container Deport
UNECA	United National Economic Commissions for Africa
WCA	West and Central Africa

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background of the Problem

The growing of globalization and internationalization has become of great importance in enhancing and facilitating countries economic development in recent decades. In a globalised economy it involved the exchange of goods and services through waterways, airways, roads and railways. In facilitating the exchanges or business handling containerised cargo is of great importance in smoothing the economic growth as well system management in ports operations. However, this development resulted to congestions of the containers at many ports due to limited port operations capacities in loading and offloading goods. This shortages lead to poor customer satisfactions.

The container concept as it was introduced in the 1950's has not changed drastically in the last 50 years with various developments in container sizes and volume though the current containers are very similar to the first container of 1956 (Caldeirinha, 2010).. The introduction of the container system led to necessity of having a proper and efficient handling system. This resulted to developments like the electronic container terminal, the unmanned vehicles, several cranes and the developments in liner shipping. The container ships have become much larger the last years, with a higher depth up to 20 meters (Sayi, 2008).

The importance of containerised operations is good and reliable handling system is not worthy but is necessary to facilitate quick operations and therefore attract and maintain business status as well as customer satisfactions. Mpogole (2013) assert that, it is recognised that, due to globalisation, global shipping expansion is a clue whereby, container handling has been long period prevailing problem due to unlimited facilities including, storage, low transaction process and time delivery of cargo. The situation increasing made a need for review of infrastructures facilities and the overall system handling process in word wide ports and Tanzania Ports at Dar es Salaam terminal in particular.

It well agreed that containerisations solve the problem of congestions in harbours. Increased efficiency was achieved. Container could be handled in a mechanised form (cranes) - a process which was later to be (semi-)automated. The required labour force decreased. Costs dropped and profit margins for stevedores grew. Liners could increase the number of shipments per year. Although higher initial investments were required, containerization stabilized the costs of liners companies. Containerisation of ship cargo was first introduced in 1956 (Levinson, 2006), aiming to cut down the costs of maritime transport through reducing cargo handling costs.

Instead of loading/unloading each piece of transport item to or from a ship in a labour-intensive manner, containerisation increases the efficiency and speed of transport by reducing the packing requirements and handling processes at all transfer points - between port, rail and road. At the end of 2005, the world container fleet was expected to have increased to 21.6 million TEUs (twenty-foot equivalent units)

(UNCTAD (2006). Countries without adequate unitized transport services will be disadvantaged in their international trade (Castro (1999). Due to globalisation, the world adopted the revolution which later increases the economy of scale. However, the nature of these transactions later adopted by developing countries likes Tanzania.

Despite of the progress, containerization rate remains low containerization grows rapidly in Africa at the pace of more than 10 percent annually. In recent years, containerization has grown more than three times compare to economic growth port capacity investment plans has little been considered (Drewry, 2006). Thus containers handling ports capacities in Africa become a serious challenge in the region affecting the logistic performances.

Since the establishment of Dar es Salaam Ports was in operation but has come in effective year 1980. Before then, the imported good enter to the country as loose cargo. Effective operations crabbed 1980 due to growth of globalisations and open market. It is when Tanzania Ports Authority (TPA) before called Tanzania Harbour Authority (THA), started its operations using specialised equipments like ship to Shore Gantry Granes (SGG), Rubber Tire Gantry (RTG) and Rail Mounting Crane (RMG).

In recent years, more and more ports are deregulated from government control. This situation leads to greater opportunity for port operators, but also introduces greater competition between ports. Due to poor operation, there was a need of structuring the Dar es Salaam Port in order to smoothened activities efficiently and effectively. The

overall objective is to strengthen the operations and enhancing efficiency and thus increase revenue to the Government. According to Kannapell 1998, handling of containerised cargo has become very popular worldwide. Started in the last decades, it is seen that, there was a remarkable growth in the volume of containerised cargo. On average, the average grows 6% per annum in the USA, 1.5% Canada and 10% worldwide (Chang, 2009). It is remarked that, this trend will be continue in the next decades.

The reason behind that growth is that, it is facilitated by the substantial technological development in maritime intermodal transportations. It's is noted that, the main advantages of containerisations are, First the economy of water in line hauls, where a large number of containers can be moved over long distances at the least (on per unit basis), Second the economy of rail in intermediate tug between the ports and urban markets and lastly the flexibility of truck in local pickup and delivery. Since Containerised cargo does, facilitate smooth handling of the same, depending on the nature of goods and mode of transport to facilitate that will be used for loading and unloading of cargo, organisations and individuals increasingly prefer the science of containerisation.

By taking into considerations, the big issue is whether handling of containerised cargo is well managed by TPA and if the same value of cargo is being shipped properly. The general problem of the study is to assess the impact of containerisation a key focus of the research that will be undertaken. Dar es Salaam port is faced with

a number of problems that inhibits its operations and service provisions to its existing and new customers.

Enhancing the performance of port operations, the government has been working closely with Dar es Salaam Port managements and stakeholders including TRA, SUMATRA, and Authorised Clearing Agents to come up with good strategies in order to enhance the performance, attract and improve customer's satisfactions. However, there are different operations which in operations. The implementations of the existing system include TICTS, TRA ICDs and TISCAN with the objective of improving the performance and increase deliverables.

Due to these collaborations, the Dar es Salaam port management, has introduced dry system (ICDs) such as Tanzania Road Haulage (TRH - ICD), Mukuba (MOFED - ICD), Malawi Cargo (MCC - ICD), Dar es Salaam Inland Container Deport (DICD) and TRANSAMI SDV (AMI - ICD) together with Kurasini Inland Container Deport (KICD), Ubungo Inland Container Deport (UICD) as extension to of TICS to reduce the problem of port congestions. Currently, under the implementation of the system, containers once discharged are transferred to dry ports cantered outside the terminal. The advantage of the system is that, it is expected to reduce port congestions and solve the problem of spacing within the Dar es Salaam port.

1.2 Statement of the Research Problem

Due to poor facilities of storage at the Dar es Salaam port, containerization is a major challenge during loading and offloading of containers from the port to inland. TPA

annual Report 2012, it was expected that, effectiveness of operations at the port if will be realised, significantly increase in government revenue as well as providing employment opportunities. Container terminal operations, is a sensitive area in the country economy in Tanzania and East and Central Africa. In return, it was expected that effectiveness of operation at the port will be realised, significant increase in government revenue as well as providing employment opportunities (TPA annual report, 2002).

Congestions of the port limited the port operations and customers who use the port for loading and offloading goods and services. Due to this fact, the problem of port congestions is due to different factors including bureaucracy, institutions, legal and regulatory framework and the port management. Taking into considerations of the intended good practices with prevailing challenges this study assessed the impact of containerised cargo handling system in the Dar es Salaam port.

1.3 Research Objective

1.3.1 General Objective

The general objective of this study is to assess the impact of containerised cargo handling system in logistics performance of Dar es Salaam port operations and handling systems.

1.3.2 Specific Objectives

i. To identify the terminal operating system used by Dar es Salaam port in reducing congestion of containers at the port.

ii. To assess the storage facilities that is used for handling large volume of containers.

iii. To assess the role of transport system in facilitating short container dwell time within the port.

iv. Challenges facing internal operation procedures for handling containers in facilitating productivity and efficiency of the organization

1.4 Research Questions

i. What terminal operating system used by the port to reduce containerisations problem?

ii. What are the storage facilities used during loading and offloading of cargo?

iii. What are role of the port system in reducing containerisations problem within the port?

iv. What challenges of this system and way forward to reduce the problem of containerisation in the Dar es Salaam port.

1.5 Significance of the Study

The importance of this study help to advice the government and other stakeholders on port operation, to identify and evaluate the weakness of the current containers handling system, storage facilities, facilitation of procedures and control ports, such as procedures affecting turnaround time dwell time and handling cost, facilitating trade and hand transport outside the port on the main trade corridors.

Also the study provides basis for academicians and researchers for further investigation.

1.6 Scope of the Study

The study covered the Dar es Salaam Port. It is a case study approach of one particular area and did not cover other formal ports. The reasons for selecting Dar es Salaam Port as the case of study are the accessibility of data is easy because it the country major port with significant operations and the implementations of the containerization port system on handling container is higher.

1.7 Limitations of the Research

The research faced with various limitations as follows;

i) The research were collected in only one TPA port of Dar es Salam left experiences of Mtwara and Tanga container terminal ports

ii) Added limitation of this research associated with only challenges, storages facilities, system used in reducing congestion and transport roles in logistics performance while not involved in other important factors for containerised cargo handling system factors of human dimensions and policy implications and other Logistics Performance Index (LPI) factors.

iii) Finally, the study was unable to acquire the cost information (panel data) of operating containerization cargo handling in the ports and outputs that can compare yearly detailed efficiency related to logistics performance.

1.8 Organization of the Study

This study covered five chapters. Chapter one is the general introduction. It looks at the background to the study, the objectives of the study and the statement of the problem. It also briefly looks at the research questions, Objectives, scope and organization of the study. Chapter two is the literature review. Literature reviewed according to the research questions used in the study.

The conceptual framework for the study is also outlined. Chapter three is the methodology. It explains the research design. It also gives details about the population, sample and sampling procedures used in the study. It explains the research instruments, methods of data collection, data analysis plan. Chapter four involved the data presentation, analysis and discussion. Chapter five presents the summary, conclusions and recommendations for the study.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Introduction

This chapter is devoted to the review of literature and background information's on maritime container terminals. This section covers the research that was done in the area of port operations and logistics. However the study discussed different topics related to the containerisation system.

The overall goal of this research study is of two - fold. First, to includes the current literature review on container modelling and second, is to show the comprehensive review that few studies have examined the issues that addressed in the research. The background of the study will provide basic introductions to marine container terminal operations. This is important to provide a comprehensive work designed by different authors.

2.2 Theoretical Framework

2.2.1 Conceptual Definitions

Container Handling: Container handling is the process of carrying containers and goods from one place to another. The general concepts relay on mechanical handling of goods during loading and unloading of container. According to the volume and weight of cargo, for containers only mechanical handling is used. Handling equipment’s are used to load and discharge containers from the ship, for import cargo and to truck and from trucks to yard for export cargo.

Miller (2006) defines cargo handling services as loading, unloading, packaging of cargo and includes cargo handling services provided for freight in special containers or for non - containerised freight, services provided by container freight terminal or any other freight, terminal, for all modes of transport and cargo handling services incidental to freight, but does not handling of export cargo or passenger baggage or mere transportation of goods.

Containerisation: Yeo, Song & Roe (2010) define containerization as most designable way to move goods from one country to another by simple handling of contents of the sealed containers(that can be interchanged between ships, trains, and W trucks) with standardized handling equipment, and without re-handling the contents. After the introduction of the container box in 1956, the transport of goods was modernised and the transport market was facing a revolution. The container brought economies of scale and the maritime industry could be operated more efficiently. It did not take long before the container was accepted by all the major shipping lines and container terminals were founded in almost every port worldwide.

Containers; are large boxes that are used to transport goods from one destination to another. Compared to conventional bulk, the use of containers has several advantages, namely less product packaging, less damaging and higher productivity (Agerschou et al., 1983). The dimensions of containers have been standardized. The term twenty-feet-equivalent-unit (TEU) is used to refer to one container with a length of twenty feet. A container of 40 feet is expressed by 2 TEU. Several transportation systems can be used to transport containers from one destination to another.

Transport over sea is carried out by ships. On the other hand, trucks or trains can be used to transport containers over land. To transship containers from one mode of transportation to another, ports and terminals can be used. For example, at a container terminal, a container can be taken off a train and placed on a ship.

These concepts should result in a sufficient performance. In practice, most concepts are developed with the use of simulation or based on practical experience of decision makers. Furthermore, much research is done in this area, results of which could be incorporated in real terminals. We can distinguish between three planning and control levels in making decisions to obtain an efficient terminal, namely the strategic level, the tactical level and the operational level. At the strategic level it is, for example, decided which layout, material handling equipment and ways of operation are used. The time horizon of decisions at this level covers one to several years. These decisions lead to the definition of a set of constraints

Container Terminal: A container terminal is the place where vessels dock on a berth and containers are loaded and unloaded (Henesey, 2004). This terminal is normally distributed into two main areas, the berth area for docking vessels and the yard place for storage of containers.

2.3 Container operation Seaport and Berth allocation

Atkins (1983) gives comprehensive descriptions on how a container port operates. When a container arrives at the port by road or by rail, it is transferred to an assigned location in the yard. Yard storage areas are divided by vessel, port of destination,

container size, and, at times, by weight category. Loading of export containers to a ship must be well planned, taking into account their destination and the weight distribution of the ship. Steenken et al. (2004) provide classification of problems surrounding terminal operations and suggestions for future research.

The research also points out that stacking and storage logistics are becoming increasingly important as a result of growth in container traffic, and are also becoming more complex and sophisticated. Psaraftis (1998) recommends research into a list of problems with the container terminal: scheduling berthing priorities, ship booking by “rendezvous”; berth and cranes allocation problems; yard management problems in minimising movements of straddle carriers; and route and schedule consolidations. Noritake and Kimura (1983) use queuing theory models, M/M/S (and M/Ek /S(∞), to analyse the average waiting time of general cargo ships. This suggested that the total cost of port during the period of port operation is equal to the sum of cost related to berths and the cost related to ships.

The optimum number of berths is determined using the marginal cost of berths. The optimal berth capacity for each queuing model queuing under consideration is then obtained by a capacity curve. In the authors’ later study, Noritake and Kimura (1990) extend their previous work to include cost comparison with inland transport. Kozan (1994) presents a model to analyse the economic effects of alternate investment decisions for seaport systems.

The author emphasises that the best strategy in investment decisions for expansion of the seaport system is one which provides either the maximum present value of net benefits or the minimum present value of the total costs over the planning perspective. Cordeau et al. (2005) investigate the sequence of ports visited by vessels, called services. A model is developed to solve the problem for allocating areas of the yard and the quay to services in a planning horizon. Time-based Tabu Search and space-based Tabu Search are proposed to solve the discrete case and the continuous case of the problem. Lim (1998) states that one of the planning problems encountered at the port is to decide if a given set of ships can be berthed in a section of the port given by certain berthing constraints.

Ships may be of different lengths and arrive at the port at different times. Every ship has a different expected duration of stay. When two ships are berthed side by side, there is a minimum clearance distance between them. Akio, Etsuko & Stratos (2008) also describe that ship berthing position is restricted by a number of factors including the length of the ships, the pier-side depth and the number of shore power cables. So berthing is among the problem that contributes to container terminal inefficacies that contributes to poor logistics.

Different types of cost functions (including linear and quadratic) are analysed and the problem is solved using network-flow and dynamic programming techniques. Imai et al. (2001) paper studded the problem of berth assignment to ships in the public berth system identified the problem as Mixed Integer Programming Problem (MIP). Also suggest that low usage of berths is highly coupled with small amount of cargo

handled results in high port charges per container. The Two models are proposed - a model for static berth allocation where all the ships are already in port; and a model for dynamic allocation where some ships may not arrive at port before berth assignment.

Lagrangian relaxation was also applied to find optimal berth assignment in relation to the minimum total time for ships staying in port within a planning horizon. In a later study, Liu, Jula & Ioannou (2002) extended that the dynamic berth allocation problem to include the water-depth and the length of the quay that can be solved through genetic algorithms (GA). Liu et al (2002) apply simulation in optimising berth allocation.

The authors concludes that optimisation of berth scheduling can be achieved using simulation. Based on the findings that the vessel inter-arrival time is exponentially distributed, Akio, Etsuko & Stratos (2008) apply simulation to analyse different container berth allocation policies. They conclude that the existing "Home Berth" policy is not as good as the three other proposed new policies. Akio et al., (2008) propose an expert system for ship berthing and material discharging for ship berth at a multi-user container terminal with a flawed quay capacities.

2.1.1 Container Terminal Operations

Container terminal operations are becoming more and more important. Therefore, an ever increasing number of publications on container terminals have appeared in different studies. Decision problems at container terminals are comprehensively

described by Vis & de Koster (2001) (with some 55 references up to 2001). Similarly, Park & Kim, (2002) also developed a relevant literature for Container terminal operations problems such as arrival of the ship, un-loading of a ship, transport of containers from ship to containers stack, inter terminal transport and complete terminals operation is provided.

However, Kozan (1997) discusses major factors for the transfer efficiency of multimodal container terminals. Found that a network model reflecting the logistic structure of a terminal and the progress of containers shows the minimization of the total time as the sum of handling and travelling times of containers. Cordeau, Laporte, Legato, & Moccia, (2005) examining the use of operations research models and methods in the field of design and operation of container terminals with its decision problems on strategic, tactical and operational level.

Due to increasing demand and necessity of higher throughout a year, the early construction of new terminals is being suggested. In line with, Mwendapole (2015) describes various interrelated complex decision problems occurring daily during operations at container terminals. This lead to port operations staff work on decision support tools such as uses of TANSIS system and discuss mathematical models and algorithms in addressing the problems. The uses of decision support tools and mathematical models and algorithms present a comprehensive description of logistics and optimization systems in container terminals for example in Burchardkai (Hamburg port).

Konings (2005) presenting a survey of the possibilities for an intermodal transport concept of high quality identified conditions for best development of centers, that integrate transshipment, storage, collection and distribution of goods, are outlined. This indicates that the internal transport system is identified as key element in container terminal cargo handling system a perquisite to logistic performance. Caldeirinha (2013) also describe that adoption of advanced technologies such as intelligent planning systems, operation systems and automated handling systems for container terminals helps the efficiency at container terminals. However automation does not always guarantee out performance (e.g. higher productivity) this are highly it depends on terminal characteristics such as labor costs.

In addition Liu et al., (2010) identified four different types of automated container terminals in a simulation model with very detailed cost considerations. The performances criteria that are used in this study to evaluate and compare different terminal systems are summarized as follows: Throughput number of moves/hour/quay crane; throughput per acre; ship turnaround time: time it takes for a ship to get loaded/unloaded; truck turnaround time: average time it Container terminal operation and operations research takes for a truck to enter the gate, get served, and exit the gate, minus the actual processing time at the gate; gate utilization: percent of time the gate is serving the incoming and outgoing container traffic; container dwell time: average time a container spends in the container terminal before taken away from the terminal idle rate of equipment: percent of time the equipment is idle. The authors conclude that performance and costs of conventional terminals can be improved substantially by automation.

Important features of a terminal are related to the location of equipment and resources over the terminal. This refers to resource allocation problems but also to some dispatching problems. Objectives may be an intelligent assignment of technical equipment (e.g., gantry cranes and straddle carriers) to the different terminal areas as well as an efficient job assignment to the utilized resources presenting a method for forecasting daily demand in terms of the number of container movements in a terminal based on online data in order to improve supply side decisions like allocation of handling equipment, work scheduling, etc.).

Moreover, in Automated Guided Vehicle (AGV) systems the layout of the network for the vehicles (in manufacturing systems it is called guide path network) has a major impact on system effectiveness. While optimization methods for guide path network design have been considered for various production environments, it may also become a thread in the layout of container terminals.

While most work is related to a single terminal, some harbors even have more than one terminal. Munim & Schramm (2017), discussing possible savings with respect to distances travelled for the in Far East under the assumption that different terminals are combined together into one so-called mega-terminal. This indicates that different types of ‘terminals’ may have the same or only lightly modified structure compared to container terminals. This may be easily seen from carefully investigating intermodal traffic terminals or so-called mega hub terminals for rail traffic or even airports. Processes at Container Terminals.

2.1.2 Loading and Unloading Process

Ships are nowadays unloaded and loaded at large terminals. According to Konings (2005) loading and unloading process can be divided into different sub processes, described below. When a ship arrives at the port, the import containers have to be taken off the ship. This is done by Quay Cranes (QCs), which take the containers off the ships hold or off the deck. Next, the containers are transferred from the QCs to vehicles that travel between the ship and the stack. This stack consists of a number of lanes, where containers can be stored for a certain period.

The lanes are served by systems like cranes or straddle carriers (SCs). A straddle carrier can both transport containers and store them in the stack. It is also possible to use dedicated vehicles to transport containers. If a vehicle arrives at the stack, it puts the load down or the stack crane takes the container off the vehicle and stores it in the stack. After a certain period the containers are retrieved from the stack by cranes and transported by vehicles to transportation modes like barges, deep sea ships, trucks or trains.

This process can also be executed in reverse order, to load export containers onto a ship. Most of the terminals make use of manned equipment, like straddle carriers, cranes and multitrailer-systems. However, a few terminals, like some terminals in Rotterdam, are automated. At such terminals automated guided vehicles (AGVs) may be used for the transport of containers. Furthermore, the stacking process can also be done automatically by automated stacking cranes (ASCs).

2.1.3 Arrival of the ship

When a ship arrives at the port, it has to moor at the quay. For this purpose, a number of berths (i.e. place to moor) are available. The number of berths that should be available at the quay should be one of the decisions that have to be made at the strategic level. In Jiang, Chew, Lee, & Tan (2012a) describes that queuing models is efficient to be evaluated in making this decision. They conclude that some of these queuing models can be used when the model and parameters are chosen carefully and the results are evaluated precisely.

One of the decisions at the operational level is the allocation of a berth to the ship. In Imai et al. (2005) studied how to allocate berths to ships while optimizing the berth utilization indicates that optimal berth allocation can be obtained by minimizing the sum of port staying times. As a result, ships moor at the quay according to the "*first come first served* "principle. On the other hand berths can be allocated, without consideration of ships arrival order, by allocating ships at a berth closest by the area in the stack in which most containers for this specific ship are located. As a result, terminal utilization will be maximal, but ship owners will be dissatisfied by the long waiting of the ships. Consequently, a trade-off exists between the total staying time in the port and the dissatisfaction of ship owners caused by the order in which ships are berthed.

The berth allocation problem could be considered as a machine scheduling problem. However, the introduction of a multi-objective approach is really new in machine scheduling problems. A two objective non-linear integer program is formulated to

identify the set of non-inferior berth allocations which minimizes the dual objectives of overall staying time and dissatisfaction on order of berthing (Imai et al., 2005). Overall ship staying time equals the sum of the staying time of each ship, which exists of the waiting time until the berth is available and the berthing time itself. Dissatisfaction equals the sum of the number of cases in which a ship arrives later and is mooring earlier than a particular ship.

After defining the two objective non-linear integer programs, the problem has to be reduced to a single objective problem. The resulting single objective problem is similar to the classical assignment problem. The objective consists of two parts, namely the sum of the waiting times plus the sum of dissatisfaction. To identify the set of solutions, generating techniques can be used which do not require prior statements about value judgments, like preferences and priorities, of the objectives.
The generation method used in this paper is the waiting method. The set of non-inferior trade-offs between the first and the second term of the objective is identified by varying the value of weights. From numerical experiments, it can be concluded that the trade-off increases if the size of the port increases.

2.4.2 Unloading and Loading of the Ship

The number of import containers that has to be unloaded at the terminal is in practice usually only known shortly before the arrival of the ship. The unloading plan indicates which containers should be unloaded and in which hold they are situated in the ship. Successively, these containers are unloaded. Within a hold the crane driver is almost free to determine the order in which the containers are unloaded. The

unloading time of a container depends on its place in the ship. Consequently, a large variance occurs in the container unloading times.

In contrast with the unloading process, there is hardly flexibility in the loading process. To ensure fast and efficient transshipment of containers, a good distribution of containers over the ship is necessary. Therefore, at the operational level stowage planning is made.

According to Tecle (1999), the containers, to be stowed, have to satisfy a variety of constraints, which arise as a result of physical limitations of the ship and containers and the sequence in which ports are visited by the ship. Tecle (1999) this a system is presented to assist in this planning process. The stowage problem is solved with the Monte Carlo method. Many different possible ship loadings are generated and the most efficient one is given. This system has been used worldwide since 1981. The most efficient plan is displayed with the precise loading order of export containers. For every container the exact place in the ship is indicated.

According to Yeo, Song, & Roe (2010) the container stowage is a problem thus, the size of depends upon the capacity of the ship and the supply and demand of containers at each port. This suggests that finding an optimal solution is not realistic within reasonable times, because of the fact that the stowage plan has to be made across a number of ports. Therefore, the authors propose to decouple the process into two sub processes, namely a strategic and a tactical planning process. In the first process, generalized containers are assigned to a block in the ship. Secondly, specific

containers are assigned to specific locations within the blocks determined in the first phase.

The block stowage problem can be solved by applying a branch and bound algorithm. The problem in the tactical phase can be solved by applying Mpogolo (2013). In this way, good but not always optimal solutions will be found within reasonable computation times. As described, decisions have to be made for questions that arise at three different levels this is one of the decisions that have to be made at the strategic level. This involves which type of material handling equipment will be used for the unloading and the loading of containers from the ship. QCs are used both at an automated and a manned terminal. QCs are manned because automation of this process encounters practical problems, like exact positioning of containers.

The QCs are equipped with trolleys that can move along the crane arm to transport the container from the ship to the transport vehicle and vice versa. The containers are picked with a spreader, a pick up device attached to the trolley. The QCs move on rails to the different holds to take/put containers off/on the deck and holds. It can occur that at the same moment one QC is unloading a container and another QC is loading one.

At the tactical level, one of the decisions to be made is the exact number of QCs that work simultaneously on one ship. These days, it is necessary to carry out the process of unloading and loading very fast to satisfy customers demand. Therefore, it is necessary to minimize the delay of ships. The most ports are faced with the crane

scheduling problem when ships arrive at different times at the port and queue for berthing space if the berths are full. The objective in this case is to serve all the ships while minimizing the total delay of the ships. Brooks, Schellinck, & Pallis (2010) assert that ships are described by the number of holds they have whereby only one crane can work on a hold at a time. This means that static crane allocation problem in which a collection of ships is available at a berth to be handled at the start of the planning horizon and no other ships will arrive during this planning horizon.

2.4 Key Challenges of Container Cargo Handling in Ports

According to Caldeirinha (2013) various challenges have been noted in handling containers in the ports that hinder its performances. These involves Insufficient container storage space, long container dwell time, rapid increased in container traffic, low performance of inland modes of transport especially the rail lines with very low availability of wagons and locomotives.

Mpogole (2013) also identified other challenges includes problems of acquiring more space for port actives, low infrastructure developments e.g. purchasing new equipment's. Inadequate use of ICDS, undeveloped integrated IT system and lack free port activities, inadequate restructuring the management model, improved safety, security and environment protection to meet international standards.

Caldeirinha (2013) indicates that the inefficiency in unloading and loading of the Ships being the major obstacles in logistic performances in the ports. Thus number of import containers that has to be unloaded at the terminal is in practice usually only

known shortly before the arrival of the ship. It is important to have unloading plan indicates which containers to be unloaded and in which hold they are situated in the ship. Successively, the unloading time of a container depends on its place in the ship. Consequently, a large variance occurs in the container unloading times. In contrast with the unloading process, there is hardly flexibility in the loading process. To ensure fast and efficient transshipment of containers, a good distribution of containers over the ship is necessary. Therefore, at the operational level stowage planning is made.

Clark et al. (2004) also indicates ports are too costly for shippers and shipping lines which increases time for warfages and time for unloading and loading of containers at the port terminals. Because of numerous constraints, port charges are high for shippers. Shipping lines face congestion costs and poor port productivity and pass these costs to the shippers. Consequently African economies, as a whole, bear the cost of congestion and poor port efficiencies. Delmas calculated that, in 2014, 146 days were lost on the weekly service Europe-Africa because of congestion, which corresponds to an estimated cost approaching US$5 million (Delmas, 2014). In Nigeria ports congestions were extremely high in 2003 calculated that the average cost a call Lagos port was twice higher than in Felixstowe port (UK) (Sanchezet al., 2003).

Sanchezet al., (2003) in the study of Maritime Economics and logistics identified West Africa ports inefficiency being the victims of world trends in trade and shipping sectors West Africa ports are facing a challenge to receive bigger ships and

provide quick and efficient container hand line. Major ocean carries may be reluctant to call at certain ports due to high turnaround time and poor port efficiency. Yet, this challenge is also an opportunity as over time, these developments should result in more efficient transport operations, which, if completed with commensurate efficiency gains on the port landside, can significance, drive costs down. Ports in the region with substantial hinterland traffic should be the natural competitors to become hub ports. However, decisions on Trans shipping centres in WCA inevitably will reflect a wide range of additional business considerations by ocean, including the capacity of the ports to handle significance increased traffic kin order to minimize dead time for vessels. This might lead to a situation to a situation where medium size ports in the region can be serious competitors for consideration for development as hubs.

Port Physical Constraints that involve the location constraint for the sustainability of certain port it has been challenge described by Yeo, Song, &Roe (2010). Thus many of the regions are embedded in cites, resulting in port and cites congestions. Improper port access from land transport corridors is usually inadequate, requiring better joint planning between ports and cites. The location of many of the long establish ports such as Lagos- A papa within the urban area makes them difficult for their sustainability in the future (Anguibi, Balla, & Allate, 2016). Port-rail connection may also have to be redesigned and requires detailed consideration in each case. Indeed, rail yards may take up a significant area within or adjacent to the port with rail lines representing up to 10 percent of the port estate.

The efficiency analysis on operational performance of container terminals for seaports study conducted by Mpogole (2013) also indicates that the presence of limited shipping services has been problem in logistic performances. Shipping lines face increasing costs in handling containers due to poor port efficiency insufficient port equipment. Ports receive calls from about forty container, Ro/Ro and multipurpose vessels. For example, the number of vessels docking at West Africa coasts has from 15,000 in the early 1990s to more than 20,000 during the early 2000s, West Africa benefit from limited shipping services (Alan & Raballand, 2007). Large ship does not call in West ports due to a limited in terms of installations, poor facilities and usually a lack of maintenance dredging. Ship size calling in WCA increasing in the early 1990s and since then has remained steady. WCA is now the region, where most port do not receive ships in excess of 2,500 TEU. Most vessels calling in WCA are in the range of 1,000-2,000. TEU, with three shipping lines providing ships in excess of 2,000 TEU capacituy11: Demas Mitsui OSk and Maersk Sealand.

Cumbersome Procedures and Poor Link to the Hinterland Reduce Port Efficiency implemented a program, “solidarity on the water” aiming promoter transit operations destined to landlocked countries (Alan & Raballand, 2007). However, port s competitiveness does not only depend on its infrastructure and services. It also hinges on the quality and fluidity of the land transport networks which serve it (most often being the regional interstate roads). The beneficiaries of this emerging trade completion will be the countries that have, at the same time, efficient ports, goods roads without roadblocks, operational rail lines and border

post with the least administrative formalities. The competitions between transport corridors could be a triggering mechanism to do away with the numerous road blocks and other obstacles to the fluidity of goods and people's movement.

Anguibi et al., (2016) also added that, there are the traditional "non- infrastructure " and " non-official" barriers at the ports and at border crossings that slow trade movements and increase their costs without adding economic value. The search for efficient ports and shipping has to be complemented by associated measures, which increase transparency and reduce corrupt practices. The five landlocked countries of west and central Africa are Burkina Faso, Central African Republic, Chad, Mali and Niger. Their transits traffic registered by WCA ports amounts to three million tons, representing a value of about four percent of all West African port traffic (Anguibi et al., 2016).

2.5 Empirical Literature Review

Under this section the study will concentrate on reviewing the work done by other past researchers assist to know what the challenges are facing containerization procedures and to propose some strategies on which will be efficiently and effectives in container handling systems. Reliable means of handling will facilitate quick transfer and therefore minimize turn round time hence better operations at less cost.

2.4.2 Empirical Literature in the World (International Experience)

Containers have to be transported from the stack to other modes of transportation, like barges, rail and road. It is expected that, with the growth of terminals in the future, this inter terminal transport becomes more and more important.

According to Van Horssen (1996), new concepts and technologies have to be developed to handle the large numbers of containers expected in the future. Furthermore, research has to be done to the various transport systems by which containers can be transported between the terminals. This inter-terminal transport can be carried out by vehicles like multi-trailer systems and automated guided vehicles. In certain terminals it is possible that containers are put directly on, for example trains without using transport vehicles. One of the systems, the multi-trailer system (Wang & Cullinane, 2006). A method is presented that can be used for the planning of the inter-terminal transport. This method is based on a technique which tries to minimize the number of empty trips. To obtain the minimum number of trucks needed an integer linear problem model is developed. For a particular case, it is concluded that the utilization of the multi-trailer systems can be reduced dramatically. But on the other hand the number of transport vehicles can hardly be reduced.

Kozan (1997a) an analytically based computer simulation model is developed to describe the container progress at a rail container terminal. Furthermore, the major factors influencing the throughput time of containers, which is a function of cranes, stackers and transfer systems, are discussed. The simulation model is combined with heuristic rules to describe the progress of containers in the system. Firstly, a cyclic heuristic rule is used to assign handling equipment to trains. This rule selects the first available resource beginning with the successor of the last resource seized. As a result, workloads are balanced and utilization of handling equipment and throughput are higher. Secondly, a new heuristic rule is developed to dispatch trains to tracks.

When a train enters the system there may or may not be a queue for the tracks. If there are no free tracks, the train will join the queue. Otherwise, the system sends trains first to track 1 and then to track 2 or 3 if they become available for track 1 and if they minimize total throughput time. In the case that more than one track is used, the train with the fewest number of containers will be unloaded first. A simulation model is developed by using data from a terminal in Australia. Due to cyclic train schedules a weekly simulation period was used. It is concluded, by applying the Wilcoxon Rank Test between the simulation output and the observed data for the total throughput times of containers, that the simulation program imitates the rail terminal effectively.

According to Wilson &Roach (2000), the container stowage is a problem thus, the size of depends upon the capacity of the ship and the supply and demand of containers at each port. This suggests that finding an optimal solution is not realistic within reasonable times, because of the fact that the stowage plan has to be made across a number of ports. Therefore, the authors propose to decouple the process into two sub processes, namely a strategic and a tactical planning process. In the first process, generalized containers are assigned to a block in the ship. Secondly, specific containers are assigned to specific locations within the blocks determined in the first phase.

Slack (2015) on the different models and solution methods tested on realistic data on the allocation of containers on trains in containers transshipment. He concluded that the number of container moves and the use and quantity of equipment can be

decreased. Container terminal operations has been growing and expanding globally. This rapid growing has called for terminal operators and users to globally seek out how this can be done efficiently. In line with different researchers has suggested the following; The decision to invest in ICT and other technologies, particularly the implementation of EDI between various entities involved in port operations, for example shipping agencies and custom authorities, required carefully considerations and should be based on thorough analysis and assessment of the commercial and technical impact and constraints. (Ministry of Transport, Egypt, June 2001).

In general, the port operating system is used in older and more established operating system where the port authorities hold strong positions, for example at the Dar es Salaam Port in Tanzania. In the case of improving the port operations, ICT in sea port management is of importance in operations.

2.4.3 Empirical Literature Review in Africa

Alan Harding, Gylfpa'isson & Gae'lRaballand (2007) presented the current trends in maritime transport and port sector in West and Central Africa (WCA) and proposed several policy recommendations to improve maritime transport and port efficiency in order to enhance economic growth . West and Central Africa economics, which depends on maritime transport for an overwhelming proportion of their trade, really on efficient maritime's transport and port sectors to be competitive on world markets. It was prepared for the sub- Saharan Africa Transport policy program (SSAPT), in the overall context of the World Bank's efforts for the facilitation in sub – Saharan

Africa as a follow –up to the 19997 Cotonou II meeting of West and Central Africa (WCA) Ministers.

Sanchezet al., (2003) also argued that global maritime transport has considerably changed in the last decade. Maritime transport is growing at a high pace. Container traffic is the fastest growing segment of maritime transport. Shipping lines have invested in over growing containerships in order to benefit from economies of scale: the threshold of 10,000 TEUs per vessel was surpassed whereas, ten years ago, the largest vessels contained 4,400 TEUs (Panamax). As a result of increased competition, mergers and takeovers have taken place in the recent years to establish "mega –carries". This trend of larger ships will increase pressure for better port facilities and for significant improvement in port productivity.

2.4.4 Empirical Literature in Tanzania

The Tanzania Ports operations under Tanzania Ports Authority (TPA) are currently composed of Dar es Salaam, Tanga, Mtwara ports and all lake ports. The enactment of TPA Act No. 17/2004 has the following main functions: To establish and Coordinate system harbours, to provide facilities relating to Harbours and provide harbour services with the approval of the Minister, to construct and operate new harbours, to construct, operate and maintain beacons and other navigational aids and to carry on the business of stevedore, what age or lighter man. And also to provide amenities of facilities that Authority considers necessary or desirable for persons making use of the facilities or services.

Logistic chain in Tanzania is still facing various challenges, Poor performance is being Severe impeded by inability to clear cargo quickly in the port. The country role as the channel for the trade from the land locked countries is impeded by incomplete road and rail networks, and the poor quality and high cost of land transport. It is essential that over the next 20 years there is much closer integration of planning across all modes of transport in Tanzania.(Kozan, (1997).

Business Daily News (2014) Tanzania outsources cargo handing to improve efficiency at Dar es Salaam port. The Tanzania port Authority (TPA) has hired private companies for its cargo handling business to improve the flow of goods through Dar es Salaam. TPA earlier this month announced an investment of 60 million from the private sectors investor Hutchison ports holdings Wai Chau and TICTS, to run for five years, to facilitate its ports operations in easing congestion. TPA's planning managers, said that private sector involvement was among the steps taken by the authority in order to cub challenges facing ports country wide.

According to the planning manager (Mr. Kakusa (2018), the progress is expected to open up competition in the sector which will attract more players hence enabling the habour to increase its effectiveness. Tanzania has been facing serious problems which have placed Mombasa at Advantages and turned it in to a region hub currently handling 75 percent of total transit cargo to Uganda Mombasa has also been handing .Transhipment business to India Ocean Island when there is serious congestion in the Dar es Salaam port.

Berth occupancy for the containers at the Dar es Salaam port was about 60 percent in 2007 and 2008, which experts say it is a sign of congestion. Although the dwell time according to the terminal design is 10 days, the actual number in 2008 was 25 days compared to Mombasa which recorded only seven due to the automation of the port operation and the 24 hours working program Crane productivity in Dar es Salaam has been falling since 2006 an indication of long ship waiting time. In 2002 the cranes made 22 moves per hour compared 16 recorded in 2008.

However, with improved efficiency, the port has the capacity to take part of the Transit business handled through Mombasa and the Transhipment option. A delegation from TPA was in Kampala mid this year to announce plans to return to Uganda's logistics industry, which was left to Kenya, they spoke of a project to expand the physical, operational and managerial capabilities of TPA to a level where cargo can move from Dar es salaam to Kampala in Just four days. TPA also appointed an Agency based in Uganda to Market their services, against those offered by KPA. Through the agency, TPA's offer is expected to reach markets in Rwanda, Burundi, DRC, and southern Sudan which transit goods through Uganda and Kenya. The KPA has announced changes in cargo handling charges, which took effect on October 1, 2012 that included scrapping payment for several services, which experts interpreted as reaction to Dar es Salaam on slaughter.

License fees for private mooring, buoys and Jetties were also reduced and the free storage period was adjusted for domestic and transit cargo, in keeping pace with development and to address rising cost in maritime trade, Kenya ports Authority

wishes to announce minor tariff adjustments, managing director of KPA Mr James Mulewa Said.

In 2007 following the post-election violence Uganda was greatly affected by disruptions and has been considering other routes to insure the country against Kenya's political instability. The government mid this year announced plans to rehabilitate two ferries Mv Pamba and Mv Kaawa to facilitate movement of cargo on Lake Victoria between Mwanza in Tanzania and port Bell in Uganda. The biggest challenge facing the port of Mombasa is piracy off the Somali coast. Ships calling at the Mombasa port use the Somali lane more than those heading to Dar–es-salaam, exposing them to attack by pirates.

Higher Handling Rates - Other challenges that those importing goods through Mombasa face are higher cargo handling rates compared to Dar-es-Salaam. There are currently over 21 charges levied on importers at Mombasa most of which are unique to the port. For instance, one pays $ 70-80per container as terminal handling charges, a fee Tanzania scrapped same years back. This fee is charged by shipping lines but with KPA also charging a similar fee, shippers end up paying double for cargo handling. Uganda vigorous search for an alternative route was prompted by the growing Kenyan political instability. Kenyan youths recently uprooted a section of the railway in Nairobi in protest over the territorial migingo island dispute in Lake Victoria. There also fear of a repeat in disruption of Transport as happened after the disputed 2007 General election in Kenya. Tanzania has move stable political situation than Kenya.

Anyango Gardon (1996) The research study explain in details the major cost components which contribute major challenges facing the importation of containerized cargo handling system and general cargo to other land locked countries from the port of Mombasa and Dar es salaam port. This analysis does not include time cost related to inefficiencies and delays at each port.

Clearing and forwarding charges - Most transit cargo from Mombasa inevitably crosses move than one border as compared to transit traffic at Dar-es-salaam where there is only one border crossing. The crossing two boarder post entails increased transactions both at Mombasa and the respective border posts. Similarly the detailed involvement of CFAs in Mombasa including verification of containers posting of security bonds involvements with the police and escort convoys, cancellation of bonds and general financing costs all combine to generate clearing and forwarding costs that are more than the equivalent costs at Dar-es-salaam .It has been estimated that cost and freight charges could average as much as 6.5 percent of cost insurance and freight (CIF) at Mombasa compared to 3.5 percent of CIF at Dar-es-salaam which has relatively simpler procedures that are less cumber some. Four major cost components have been identified as comprising the overall costs of Transportation from the pots of Mombasa and Dar-es-salaam to the land locked countries.

Port Charges - Since the revision of the port tariff in Dar-es-salaam in September 1992, this fort has become the most expensive transit port in the eastern Africa including Mombasa that become effective in January 1995 is even more concessionary than the previous tariff that had been in use since July 1989. The high

tariff at Dar es salaam had a devastating effect on the port's traffic handling in1993, a decline of 44 percent, from 5.1 million tonnes in1992 to a mere 2.9millions tones. In terms of relative costs, charges for Transit Traffic at Mombasa are only 43 percent and 45 percent of the equivalent charges at Dar es Salaam, for general cargo and containers, respectively; similarly, domestic cargo rates at Dar es Salaam are about twice as much as equivalent costs at Mombasa.

Freight Costs -By route: The rail/lake connections between Dar-es- Salaam and Mwanza to port bell, and between Dar-es-Salaam and Kigoma to Bujumbura have the lowest freight rates for traffic to Uganda and Burundi respectively. None the less, the Isaka rail/road system offers the greatest potential for Rwanda and Burundi cargo. The traditional northern corridor road route (now not in operation though previously recognized as the most convenient transit route to the land looked countries of Rwanda and Burundi, has currently no cost advantages over the Isaka rail /road system, which together with the Dar –es- salaam –Kigoma rail/lake ferry connection are the most cost effective routes to Burundi and Rwanda. The Kigoma rail/ferry connection to Burundi is particularly cost effective for general cargo traffic. The proposed road /ferry alternative route from Mombasa via Kisumu and Kemondo Bay would have an overall lower cost structure compared to the two routes in central corridor.

By Mode*:* The freight coast related to the road mode is generally higher than the equivalent rail or rail/ferry combination. The road freight costs are higher than rail because they include interline Transit charges payable by the transporter on transit

which includes transit goods licenses, entry permits, transit bonds, border fees, temporary road licenses, foreign vehicle permits tall charges and foreign commercial licenses selectively applied by different transit countries at varying levels, depending on whether the vehicle carrying cargo to the landlocked countries is registered in that country, or in another country. An analysis of these charges indicates that they amount to as much as 20 percent of the direct freight costs (11 to 14 percent of the total costs of Transport). None the less, roads in good condition, such as the malaba route are associated with costs tending toward the equivalent rail or rail/ferry costs. Road Transport operations within the region are also subject to police checks at makeshift road blocks operated by various police department. It is under stood that substantial sums of money are paid an officially and corruptly to police officers manning these road blocks in the pretext of enforcing road traffic regulations, for example, drivers spend as much as US$20 between Mombasa and Malaba. Road transporters have also been prosecuted and fined large sums of money or have corruptly paid their way because of over loading.

General Cargo VS Containers - General cargo rates and those applicable for containers are fairly similar for each transit route in the region consequently, container traffic does not benefit from the concept of containerization particularly for importers. When containerization was introduced in East Africa in 1965, necessary handling equipment was installed at both the ports of Dar-es-salaam and Mombasa to facilitate the speedy handling and movement of container traffic. However, these equipment and facilities have been outstripped by the increasing containerized traffic. Additionally, at Mombasa containers are sometimes stripped. At Dar-es-

salaam, the stacking areas are several kilometres from the port this local movement is costly to the shipper.

Finally the charges related to demurrage of containers in transit, and the costs related to the return of empty containers, all combine to increase the costs of containerization in the region, with on benefits accruing to the importer. Indeed, there are instances in this study in which it has been found that the overall cost of Transportation of containerized traffic is higher than the equivalent costs of general cargo movement.

Costs Due to Inefficiency and Delays in Transit - It is assumed that for each consignment the importer has a normal budgeted transit time for proposes of planning, 12 days for Uganda and 15 days for both Rwanda and Burundi. On this basis all routes in the region exhibit average transit times in excess of budgeted transit time. It is argued that the excess transit time can be related to excess funding costs assuming cost of working capital at 20 percent and Inflation at 20 percent. These additional costs here been estimated to be between US$111 and US$ 597 for 40 ton general cargo consignment for all four Uganda routes and between US$139 and US$ 426 for all the routes to Rwanda and Burundi is these ranges are very similar for containerized traffic to the three countries.

Cargo handling equipment and system perform the vital port function of the physical transfer of goods between ships and land transport. The provision of suitable equipment to match the anticipated types and volumes of traffic and their efficient

operation and maintenance therefore has an important bearing on the efficiency of the port. Smallest and least complex today's overhead lifting equipment is the hand lifting block suitable only for intermillent infrequent or just plan small hoisting jobs when the time taken is not important. For heights of lift above a few feet, it becomes worth investigating the installation electrically operated pulley blocks. This will reduce the time taken for each lift to be made and in addition eliminate manual effort.

i) In the majority of cargo handling equipment (especially crane) selection is problems, common sense plays of important part, cranes normally fall into three main groups

ii) Alternating and stand by duties where they won't be used for large part of its life

iii) Industrial and general purpose duties where it will be used for a large part of time but not to a rigid schedule

Rapid handling duties where it has schedules operations continuously, load capacity obviously plays a large part in selection when you need good efficiency and performance, but always in conjunction with the units intended function. Example of one problem which faces the crane during the transit of the structure through the water surface is that high hydrodynamic forces occur this can cause slack in the hoisting wire followed by high snatch load. This may also happen during other phases of the operation of instance when the structure is close to the to the sea- bed sea loads of ships and offshore structure. (Wilmsmeier & Hoffmann (2008) state that function will also affect the various operating speed required hoisting cross travel

and long travel. Looking more closely at overhead travelling cargo handling equipment(eg crane) you need to know before making it on operation ; frequency of operation maximum safe working load or lifting capacity conditions under which it will operate (ie temperature, Dampness, gaseous atmosphere etc.

According to one type of the cargo handling which has been used in Dar –es- salaam port known as mobile gantly. This is very useful class of crane, small portable gantry crane have almost unlimited use in factories stock yard and vehicle loading area and around the port and its capacity range UP to 30 tonnes. So more jobs around that port are done by using this different types and size of cargo handling equipment and make more good efficiency / performance addition of that all kind of equipment's need maintenance and safe when used the following are safe in use of all type of cargo handling

i. What lifting height is require
ii. What is speed required
iii. What is the weight of the loads to be handled in your work per gang per shift
iv. What are your operating conditions?

Cargo Handling Performance: Equipment performance is the degree of extent to which equipment operations approach on ideal set of operations or set standard the better; (Hand book of physical Distribution management; 3rd Add, by John Gattorna 1983).There are many ways of measuring performance depending on the standards. An idea set of operations would be as follows

i. Equipment are mechanically fit all the time except when they are with drawn to the workshop for maintenance or service.

ii. The cargo handling and operation equipment's are always in use except when they are in queue for loading.

iii. There are operators or drivers to run the equipment's as scheduled

There are adequate funds to finance the necessary in puts eg spare parts, fuel and lubricants etc. However the ideal set of operations list is not exhaustive but what is important on each item listed at list one performance measure (standard) can be set. In measuring index derived from the second item, example the utilization ratio can be given that:

$$\text{Utilization} = \frac{\text{Available days} - \text{parked days}}{\text{Available days}} \times 100$$

However the denominator of the ratio forces us to use an index derived from the first item; the availability ratio ie

$$\text{Availability} = \frac{\text{Days of month- days that machine is sick}}{\text{Days of month}} \times 100$$

For both ratio then we can use also turnaround time such as the time taken the equipment or machine posers for loading from point A to B and after being unloaded then it starts from point B to A also for both ration then the higher the ratio or

percentage the better is the performance utilization indicates the level of efficiency or other wise of the following:-

i) Marketing Dept – Availability of traffic

ii) Traffic Dept – Efficient logistic

iii) Personnel Dept- Operator / driver availability

Sleeper (2012), further states that port performance level will be different depending on ships cargoes or inland transport vehicles are served. Thus port performance cannot be assessed on the basic of single value or measure meaning full evaluation of port performance will rate to the duration of ships stay in port ,the quality of the cargo handling and operational equipment's and the vehicles during their passage through the port.

2.6 Conceptual framework

The conceptual framework was used during the study and a model (Figure 2.1) was designed for effective researcher performance during the study.

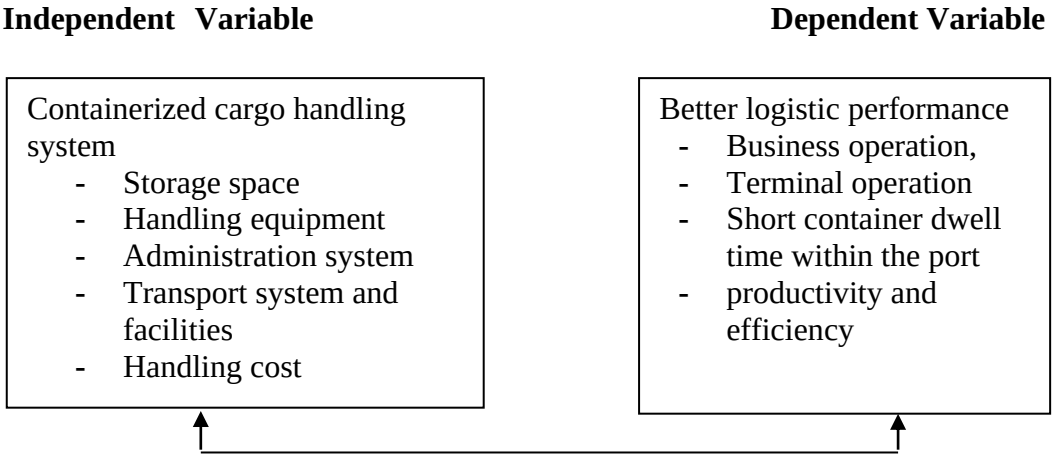

Figure 2.1: Factors in the Design of Logistics Performance

Source: Donald waters Hand book (2003)

The framework consist of the factors such as storage space, transport facilities, handling equipment and administration system, which are independent variables and Business operation, terminal operation short container dwell time, productivity and efficiency within the port. These were considered to be depended variables. Furthermore, the recent observed development in container importation system prospects for reduction in shipping and Operation Cost. Short container dwell time and productivity and efficiency, will depend to the government and other stake holders.

In maritime sector facilitating procedures and control in port, such as procedures affecting turnaround time, dwell time, handling cost, facilitate trade and land Transport outside the port. Most areas around Dar es Salaam port are congested therefore investing in road infrastructure will improve port access, through that business operation, Terminal operation would be at productive and effective level to handling large consignment of containerized cargo within the port.

2.7 Research Gap

Most of the studies that have been conducted have tended to concentrate on handling system of containerized cargo on general for effective performance of employees and organizations (Juri Kondratjev, 2015, Mpogole, 2013, Brooks et al., 2011, Caldeirinha (2010). Apparently, no study has been done to make assessment on the impact of containerized cargo handling system in logistics performance. Thus the good intention of ports cargo containerization that target to ensure; maximum space utilization, ensuring safety and security and timely

handling and picking for significant contribution to best logistic performances important for economic growth in the country. Unfortunately there noted existing gap between aggregates, strategic targets, like throughput volumes and vessel service times, and operational, day-to-day operational targets, such as quay crane efficiency and means of transportation services. Hence, this study intends to fill the gap by assessing the causes and impact of containerized cargo handling system in logistics performance at the Tanzania Ports Authority (TPA).

CHARTER THREE

3.0 RESEARCH METHODOLOGY

3.1 Introduction

This chapter describes various methods/techniques that the researcher used in conducting his research study. It is concerned with research design, sampling procedures, type of data needed and their sources, types of measurements and, method of data collection, sample size, analytical methods as well as reliability and validity of those data been used.

3.2 Research Design

Kothari (2006); define Research design as the arrangement of conditions for collection and analysis of data in a manner that aims to combine relevance to the research purpose with economy in procedures. For the study, descriptive case study design was adopted. The aim was to study in depth rather than breadth of the problem under study that places more emphasis on the full analysis of a limited number of the events and their interrelations. This research design was chosen on grounds of minimizing bias and maximizing the reliability of the data collected.

3.3 Area of the Study

The study covered the Dar es Salaam Port. It is a case study approach of one particular area and will not cover other formal ports. The reasons for selecting Dar es Salaam Port is accessibility of data will be easily and Dar es Salaam Port is the major port in Tanzania where importation of containers cargo handling system is

higher within Tanzania and other land locked countries which use Dar es Salaam port such as Democratic Republic of Congo (DRC), Zambia, Rwanda and Burundi

3.4 Population of the Study

The population comprised personnel from various Deportment within Dar es Salaam port, customs officers and clearing and forwarding companies which participating in containerised cargo handling system daily activities at the port personnel to be consulted depended on the individual's roles played in container handling system and documentation procedures. Thus all these factors determined to come the total number of sample size to be consulted by the study.

3.5 Sampling Design and Procedures

Since the study is a case study, non-probability technique was employed. Simple random sampling and judgmental sampling were used select only sample that brought the best information that satisfied the intention of the research.

Simple Random Sampling: The techniques employed to randomly selecting respondents to collect data from each stratum, which is going to be used to make a list of overall respondents. The aim of using this technique is to minimize out biases by giving each unity in the population an equal chance of getting into the sample.

Judgmental Sampling Methods: Judgmental or Purposive sampling method employed in order to determine the sample to represent, TPA staffs especially Engineering and Planning Officers, Head of Transport department, clearing and

forwarding officers, administration department and other normal staff within Dar es Salaam port, who are involved in container documentation and handling procedures.

3.5.1 Sample Size

The sample size for the study comprised employees especially head of departments, Clearance and forwarding officers and normal staff because they are directly involved in port operation. These are likely to produce more reliable data which useful in conducting the study. Thus the total number of sample size involved 57 people involving in container handling system documentation procedure and general logistic system within the port.

Table 3.1: Number of Respondent in Research Findings

RESPONDENTS	**No.**	**Percentage**
TPA Managers/Head of Departments	15	26.3
Clearance and forwarding Officers	10	17.6
Customs officers	9	15.8
TPA Operational Staff	23	40.3
TOTAL	57	100

3.6 Data Collections Methods

3.6.1 Primary Data

These are data which collected direct from the source. Questionnaire, interviews and physical observation were main instruments to obtain this data. Researcher collected primary data from Dar es Salaam port container terminal believed to have reliable information pertaining research objectives.

3.6.2 Secondary Data

These are data extracted through reviewing various documents e.g. textbooks, journals, magazines and other published information that are expected to be available within Dar es Salaam port. They also include literature such as text book magazine, manuals and newspapers relating to the topic under investigation.

3.7 Data Collection Tools

This is the process of preparing and collecting data mainly to obtain reliable information which could be useful in making decision on important issues regarding containerisation procedures. In conducting this study; both qualitative and quantitative methods were employed during the data collection. Therefore study involved.

3.7.1 Interview

This method carried out orally; the researcher interview different respondents aims at obtaining relevant information which are essential to the study. According to McNamara, (1999), this means the verbal conversation between two people with the objective of collecting pertinent information's for the responding to research objectives.

This tool was used to collect data from 15 managers and head of departments at TPA. This based on their positions and nature of their jobs on which interviews data collection method was appropriate to get valid and reliable data as it provide

more opportunities for probing more information important for enriching data for research objectives.

3.7.2 Questionnaire

A set of questions was arranged in which the respondent required to fill in answers. The questionnaires consisted of both closed ended questions and open-ended questions. The purpose is to get relevant information to the research problem under investigation.

The questionnaire was administered to container terminal operational staffs (engineering and planning officers, machines operators, and shift-in charges), Custom officers, clearing and forwarding officers.

Questionnaire was preferred because it minimize bias due to the phrasings, and questions with different respondents, easy to code and analyse and permits anonymity and may result in more honesty response

3.7.3 Documentation Review

This is another method of data collection whereby the researcher engaged in collection of data through reviewing various documents such as researches, container terminal cargo handling reports, and other printed document relating to the organization depending on their responsibilities, the document enable the researcher to obtain information relevant to the problem under investigation.

3.7.4 Physical Observation

Physical Observation done so as to see how basically the staff respondents are involved in the whole process of containerised cargo handling processes and logistics activities at the container terminal in Dar es Salaam port. Under this method the researcher were fully engaged in the daily activities of the containerised cargo handling and see what real on the ground. This method was useful because observes current and reliable evidences in the container cargo system at TPA due to full participation.

3.8 Reliability and Validity of Data

3.8.1 Validity

Validity is the extent to which the instruments used during the study measure the issues they are intended to measure (Kothari, 2006). To ensure validity of instruments, the instruments developed by reviewing other related literatures and study objectives. The designed questions were pre-tested to a close related sample of few port staffs, Engineering and Planning Officers, Head of Transport department, clearing and forwarding officers, management and head of departments to identify ambiguous questions in the tool then rectified according to study the objectives.

3.8.2 Reliability

Reliability of the instrument according to Kothari (2009) refers to the degree to which said instrument consistently measures whatever it is measuring.

The study conducted Test-Retest Reliability consistency among different populations with the same characteristics. To determine the coefficient, the same test is given to a group of subjects on two separate occasions from Tanzania Port Authority Dar es Salaam port. The process checked if provides reliable and similar results in different population with the same characteristics.

The reliability of the data collected is largely determined by the accuracy of the methodology used to collect the data. The methodology used in this study was consistent with the case study research design. For instance, under documentary the source of data shall be mainly port staff and clearing and forwarding personal whose motive is keeping the business s profitability (productivity and efficiency).

3.9 Data Processing and Analysis

3.9.1 Data Management

After having collected all the required information, the researcher will have to inspect them and if possible correct them so as to minimize some errors. The main purpose is to get clean and clear information.

3.9.2 Data analysis

The study analysed both qualitative and quantitative data collected.

The collected Qualitative data were analysed using the Content Analysis Method and presented thematically according to the objectives of the study. The categorization of data into themes is easier for identifying the opinions, views and perception of containerization cargo handling system impact on the logistic performances.

However the method was quick and easy when employed in analyzing oral interviews in the research.

The quantitative data collected from the open ended questions were classified, coded before being entered into Statistical Package for Social Sciences (SPSS) program for analysis to develop quantitative inferences to the subjects of study. Furthermore, the descriptive analysis was performed to compute frequencies, percentages, Mean and standard deviations.

Frequency tables and percentages were utilized in presenting results of the analysed data to draw conclusions.

CHAPTER FOUR

4.0 RESEARCH FINDING AND ANALYSIS

4.1 Introduction

In this chapter findings dealt with era form personal interview, physical observations, questionnaires and documentary reviews of various companies records. The interpretations involved the frequency and percentages while specific objectives were analysed using mean scores and standard deviations to interpret the consensus of respondents with results on variables through interpreting descriptive score values: mean score value of < 1.5 implies not to any extent, 1.5 – 2.4 implies low extent, 2.5 – 3.4 implies moderate extent, and 3.5 – 4.5 implies large extent and > 4.5 very large extent. A standard deviation of >1.5 means a significant variance showing non-consensus in the responses while <1 showing highest significance variance hence consensus in response.

4.2 Respondents Demographic Respondents

4.2.1 Respondents Gender Pattern

The study involved about 57 respondents who actively responded in the study questionnaires and interviews conducted. These respondents were characterized with following demographic characteristics;

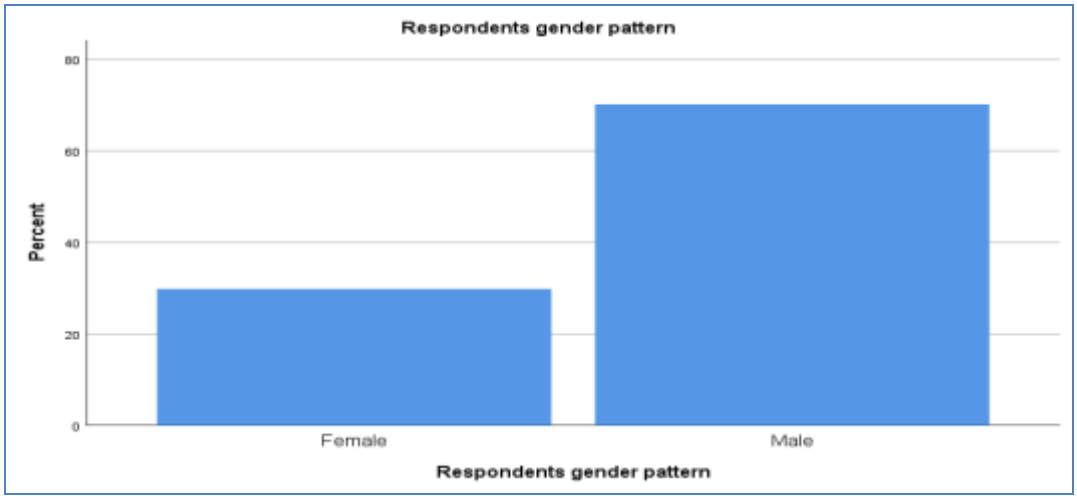

Figure 4.1: Respondents Gender Pattern

Source: Research Findings, 2018

The results in figure 4.1 show that all genders males and female were actively participated in the study. The female participated were 17(29.8%) while male was 40(70.2%). This indicates on the containerised cargo handling system in logistics at TPA male were more dominating the containerised cargo handling system in logistics operations compared to number of female been engaged in containers handling.

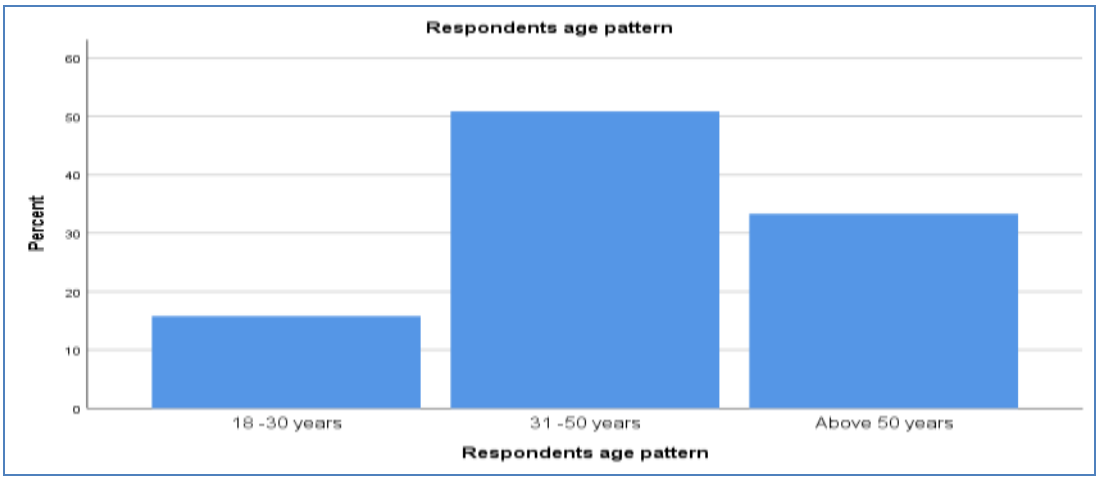

Figure 4.2: Respondents Age Pattern

Source: Research Findings, 2018

The study also encompassed respondents with different ages as postulated in figure 4.2 above indicating the least respondents participated in the study were from age category of 18 -30 years were 9(15.8%) this category involved much of clearing and forwarding respondents, followed above 50 years' category involved 19(33.3%), The findings shows that the majority of respondents involved in the study were under the age category of 31 -50 years age involved 29(50.9%). This suggests that most of the respondents participated in the study were at their active age portraying reasonable experiences in containerised cargo handling system logistics significant in providing reliable information on research questions.

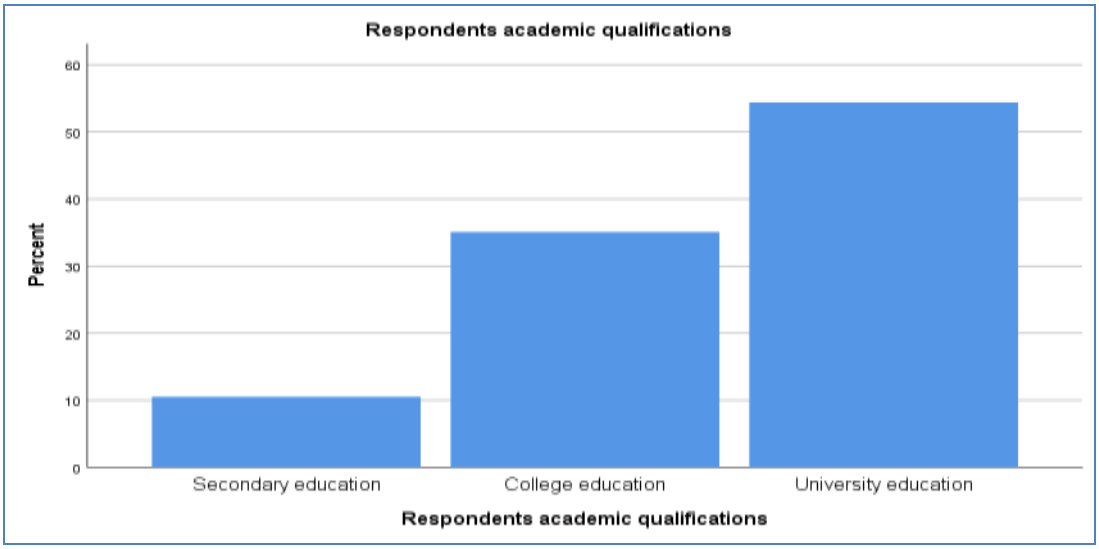

Figure 4.3: Respondents Academic Qualifications Pattern

Research Findings, 2018

Academic Qualifications (education level) of respondents remained to be an important component in understanding and practicing the containerised cargo handling system logistics. The findings shows that, study entailed respondents with different education levels vital in determining their understanding capacity of logistics system offered to answer the research questions.

The figure 4.3 demonstrates; around 31(54.4%) respondents had a University education level ranging from bachelor's degree to master's level extending from business, administration and procurement and logistics, clearing and forwarding disciplines. The respondents with college level education (diplomas and certificates) in various education disciplines participated in the study were 20(35.1%). While only 6(10.6%) of respondents had a secondary education level.

The academic qualification level outcomes illustrate that the huge percent of the respondents possessed a university level of education. This suggest that the respondents were conversant with the issues associated to containerised cargo handling system logistics signifies high validity, accurateness and relevance's of collected data.

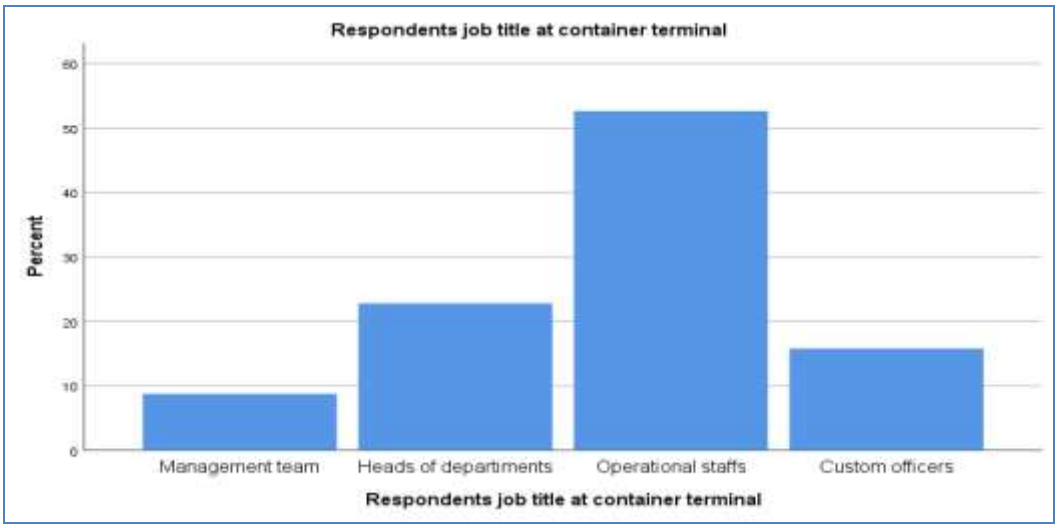

Figure 4.4: Respondents Job Titles at Container Terminal

Source: Research Findings, 2018

The respondent's job position is an important in ascertaining the decisions making roles and responsibilities played by key stakeholders in the containerised cargo

handling in logistics system at TPA. Hence the study examined the respondent's job titles findings were as follows as indicated in Figure 4.5 as follows;

The majority were Operational staffs that includes container handling and transfer, transportation, inspection, scanning and staffing staff and clearing and forwarding officials who are responsible in operating and supervising of containers handling 52(52.6%) followed by Heads of departments 13(22.8) heading the daily containers handling at the terminal. Also 9(15.3%) were Custom officers while the least respondents participated were 5(8.8%) involved directors/managers of different directorates and departments. This signifies that the respondents are well equipped with various activities involving the containers handling and logistics system performances at TPA vital in responding to research problem questions.

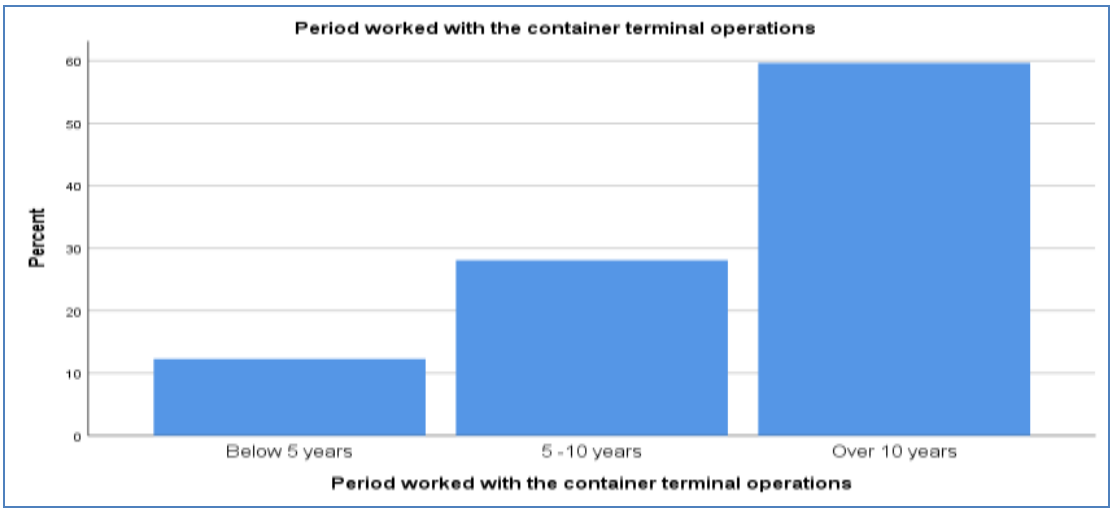

Figure 4.5: Respondents Period Worked with the Container Terminal Operations

Source: Research Findings 2018

The study also examined the duration of respondents been working with various

TAPA container terminal operations. This targeted at examining their involvement and experiences in containers handling logistic system and activities. Findings in table 4.5 above shows that 34(59.6%) of respondents have been working for more than 10 years. Followed by 16(28.1%) worked for a period of between 5 - 10 years. While the lowest period of below 5 years involved 7(12.3%) respondents. The finding infers that most of the respondents have been with containerised cargo handling system logistics for the period of over 10 years above. Meaning that respondents had enough experiences with container handling logistics system practices valid in providing precise and significant information needed for the study.

4.3 Containerised Cargo Handling System in Logistics

4.1.1 Daily Activities in Container Handling for Promoting Logistic Performances

The study examined the container terminal various daily activities in container handling that are associated with promoting containerised cargo handling system in logistics where by various activities were identified as follows;

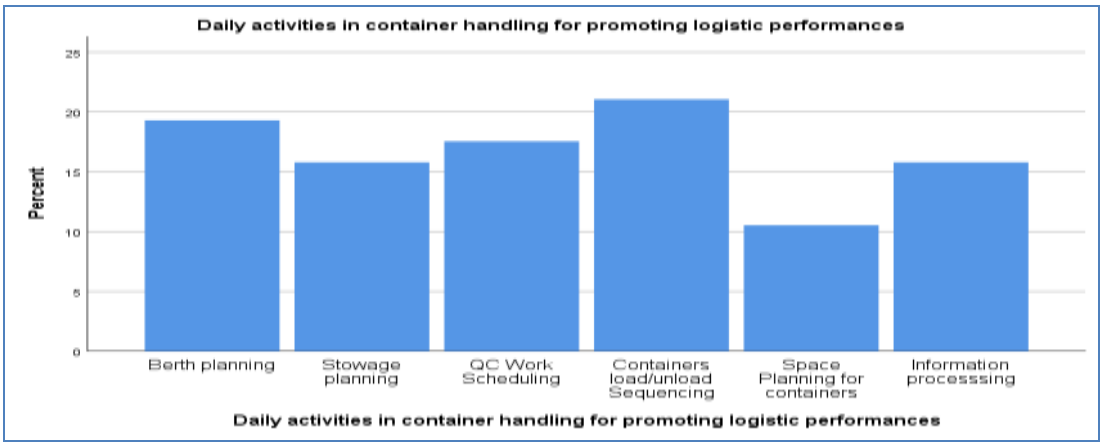

Figure 4.6: Daily Activities in Container Handling for Promoting Logistic Performances

Source: Research Findings, 2018

Container handling logistics system involves various activities that determine the performance of the logistics system. Respondents identified the following major activities been performed at containerised cargo handling system logistics stipulated in the figure 4.6 above; Containers load/unload sequencing 12(21.8%) this involves moving containers from ship, and loading in trucks or railway activities, Berth planning 11(19.3%) involving allocating ships for offloading activities, QC Work Scheduling 10(17.5%), Stowage planning 9(15.8%) that involves searching and allocating for space for customs inspections and clearing verifications activities, Information processing 9(15.8%) involving documentations through TANSIS system activities, Space Planning for containers 6(10.5%) that involving port operation planning for loading and off-loading activities.

These activities were also identified by interviewed operational officer stressed that;

> *"Containers load/unload sequencing, berth planning and space planning for containers are among the common daily activities been done at the container terminal in the logistics system"*

Other identified activities by container department manager involved the;

> *"Timely load/unload sequencing of containerized cargoes, berth planning and space planning for containers and documents processing including tax clearance etc"*

The identified activities have been also found in TPA container terminal operations manual on the employee's job descriptions stated in the standard operation procedures (SOP). The findings indicate the many activities been performed in the container terminal department at TPA. That involving operations, supervision and

managing and handling of the containers logistics. The effectiveness of these activities are the path to better performance of the whole logistics system at TPA.

4.3.1 Components Involved in the TPA Containerised Cargo Handling System in Logistics

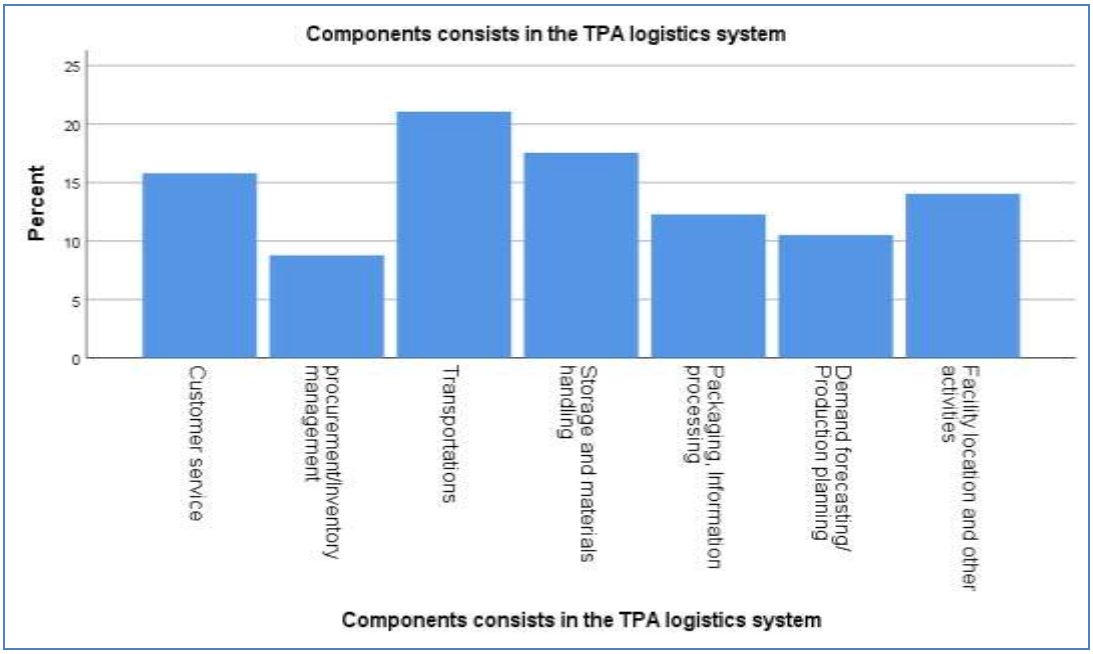

Figure 4.7: Components Consisted in the TPA Containerised Cargo Handling System in Logistics

Source: Research Findings, 2018

The TPA containerised cargo handling system in logistics identified to consisting several components that are being practiced by employees and other stakeholders as follows; Transportations 12(21.1%), Storage and materials handling 10(17.5%), Customer service 9(15.8%) Demand forecasting/planning for physical situation 6(10.5%) for high or low season business to ensure appropriate logistics, procurement/Inventory management 5(8.8%).

In addition to that the interviewed head of the container department also added that;

> *"In the containerised cargo handling system logistics we also do facility locations and other components that includes service support, maintenance functions, returned goods handling, packaging and warehousing"*

The manager from mechanical handling department also assert that;

> *"The container terminal have various components in ensuring that all logistics system been well performed these includes Demand forecasting/ Production planning procurement/Inventory management"*

These components are important in the realization of containerised cargo handling system logistics performances as in their aggregate they form logistics system. Similar to the findings Brooks, Schellinck & Pallis (2010) assert that warehousing and logistics are two unlike sides of the similar coin as when the warehousing, inventory control, information, transportations become safe, signifies facilitating the enhanced flow of goods from one point to another. These means that warehousing, inventories, information, transportations are the subset of logistics.

4.1.2 Determinants Effective Containerized Handling Systems in Ensuring Logistic Performance

The study identified several determinants which plays effective roles in containerized cargo handling systems in ensuring logistic performance at TPA. These determinants or bases identified were ranked as follows; Efficient coordination's between ship agents 12(21.1%) these involves Scheduling of the pier superintendents in accordance with vessel schedules.

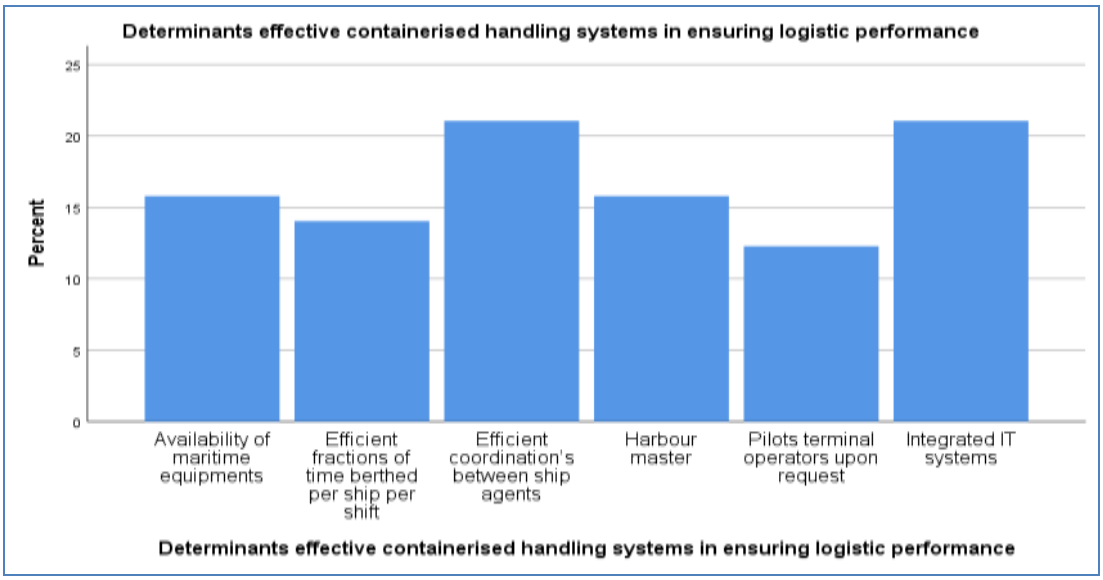

Figure 4.8: Determinants of Effective Containerized Cargo Handling Systems in Ensuring Logistic Performance

Source: Research findings 2018

Integrated IT systems 12(21.1%) such TANSIS system, Pilots terminal operators upon request 10(12.3%) that include continuous synchronisation with line operators, agents and pilots. Respondents identified effectiveness harbour master service 9(15.8%) as determinant involving controlling arms, providing information of the port berth, ships. Availability of maritime equipment's 9(15.8%) for loading/off-loading of cargoes. Efficient fractions of time docked per ship per shift 8(15.8%) such as vessel berthing's and sailings rendering to line operators' proforma.

In addition to that, the interviewed port manager added that;

> *"The efficient containerized handling systems logistic performances depends also on completion of evaluation of cargo reports, billing of the cargo operations and customs clearances"*

Also the mechanical handling head of department adds that;

"The management particularly the harbour master is an important element for cargo containerized logistics as it involves enforcement and permitting and controlling ships movements, transport and security at the port"

The findings suggest that in order to gain the effective containerized handling systems in ensuring logistic performance has be centred on the right type of products or services at the right place, at the right time and in the right conditions. The study findings concurred with Acciaro & Serra (2013) indicating that containerized cargo handling systems logistics system performances depends on availability of maritime equipment's such as gantry cranes that reduces berth time and delays of container ships, dwell time of containerized cargo handling.

4.4 Specific Objective One: TPA Terminal Operational Systems Activities used to Reduce Containerizations Cargo Handling impacting Logistic Performances

A Terminal Operating System (TOS), is a significant fragment of the supply chain and mainly aims in controlling the movements and storages of different categories of cargo in all over the place at container terminals. Based on this function the study assessed the TOS used at TPA container terminals containerized cargo handling and results were as follows;

Table 4.1: TPA Terminal Operational Systems Activities

	N	Mean	Std. Deviation
Ship operations planning and monitoring	56	3.79	1.06
Hinterland operation	57	3.84	.96
Yard operations	57	3.21	1.21
Resource controls	57	3.78	.80
Valid N (listwise)	56		

Source: Research Findings 2018

In understanding the containerized operation system efficiency the study examined various operational systems control activities used to reduce containerizations cargo handling problems in supporting logistic performances. The results were as follows; many respondents agreed that; Hinterland operation (Mean 3.84, SD 0.96) that includes road and rail transportations activities been a leading activities supporting the containerized cargo handling system. Respondents interviewed also said that;

> *"Though Terminal Operational Systems Hinterland operation has been used in handling cargo at terminal still the congestion has been resulted to inefficient arrivals and departures of containerized cargo"*

Also during the port manager terminal respondent interviewed also stated that;

> *"Hinterland Container Terminals system are commonly applied at TPA containerized cargo handling system to reduce some cargo handling problems"*

Thus despite of Hinterland Container Terminals been inhibited in their storage capacities, they have greater container multiplicity, nearly no foreseeable delivery and pickup time openings. This involves the effectual resource-planning and operational capacities in hubs in contemporary logistic-networks. These HCTs such as Ubungo Inland Container Deport (UICD) are targeted to trucks and train transport operations that reduces container cargo handling time, storages. This means that still there is inefficient in handling the received and release of containerized cargo for trans-shipment from storages to other modes of transportations. Moreover, the study identified that the containerized cargo handling system at TPA considers the last-in first-out (LIFO) principle, handling containerized cargo logistics.

Other TPA Terminal Operational Systems activities found involves ship operations planning and monitoring (Mean 3.79, SD 1.06) this is largely Terminal Operational

Systems activities been implemented a TPA terminal. Terminal operation staff rrespondent interviewed described that;

> *"Despite of ship operations planning and monitoring* activities been significantly done at *TPA Operational Systems Control it has not managed to reduce problems on containerizations cargo handling logistic performances"*

This means that still there is inefficiencies in monitoring, tracking cost per shipment, delivery time, cost, speed, quality, locations, modes of shipments and delivery, tracing consignments unloading and loading, flexibility, productivity changes in inputs and outputs at TPA. The findings are similar to PMAESA (2010) study indicating tracking cost per shipment, delivery time, tracing consignments unloading and loading problems been largely affecting the containerized cargo handling logistics at Mombasa port terminal.

The followed by Resource controls (Mean 3.78, SD 0.80) been employed as control system activities employed by TPA. Surprisingly, yard operations (Mean 3.21, SD 1.21) controlling activities that involves arranging containers in a yard blocks of a TPA containers terminal were given less weight by respondents. This contrary to Mwendapole (2015) who assert that yard operations such as loading and off lading is very important in containerized cargo handling logistics as it involves creation of shipping lists, tracking of warehouse levels through tracking machines moving around the port terminal. Thus, all activities are yard stick to yard management at terminal in efficient handling of containerized cargo logistics.

4.4.1 Technologies Employed at TPA Terminal Operational Systems

In implementing the TPA Terminal Operational Systems activities various technologies have been employed to ensure that the containerized cargo handling logistics are efficiently. These includes TANSIS system, TRA (ASCUDA ++), Destination Inspection Scanner Machines (TISCAN).

However, most of respondents 13(98.5%) mentioned TANSIS system, TRA (ASCUDA ++), Destination Inspection Scanner Machines (TISCAN) to be the most automated technologies been utilized at TPA Terminal Operational. However, their contribution to efficient logistics handling have varied based on the respondents' views.

The interviewed container terminal operation staff respondent also added that

> *"the coming of integrated and automated IT systems such as TANSIS system, TRA (ASCUDA ++), Destination Inspection Scanner Machines (TISCAN) has been useful in enhancing operational systems controlling activities but still challenges exists in ship operations planning and monitoring, transportation and* warehousing"

This implies that despite of TANSIS system, TRA (Ascuda ++) system, Destination Inspection Scanner Machines (TISCAN) operation system been useful in cargo handling it hasn't fully reduced containerization cargo handling congestion problem and do not meet the terminal demand on containers handling logistics at the port. That Terminal Operational Systems has been moderately assist in ship transport planning loading and unloading using containerization LO-LO (lift on Lift Off) operations. Also TOS has not managed to assist container terminal use RO-RO ships

that need efficient planning of loading trucks, semi-trailer trucks, or railroad entering in the ships in reducing the containerized cargo.

These findings are contrary to fact that Terminal Operational Systems set of computerized procedures enables easy management and handling of containerized cargo, machineries and peoples in logistics system. This also noted in on December 2018 TPA report indicating the terminal experienced the extremely Berth Congestions and pack of vessels that consumed between 6 – 8 days waiting for berth (www.emiratesline.com)

On other hand, despite of these shortcomings still the TPA by automating the operational system has basically improved but not fully the containerized cargo handling operations, as well as delivering and removing inland container depots at TPA. This important in achieving container cargo handling high productivity and meet containers handling logistics s goal anticipated. For example, compared to the past two decades the uses of these automated technologies has improved various activities efficiencies particularly in identification of cargo, tracking of inventories and stowing movements within logistics system (TPA, 2017). Added to the findings this was added by container terminal head of department said that;

> *"The operational system assist the usage of automated machinery and equipment's increases the containerized cargo handling at terminal"*

This also supported by Mwendapole (2015) describing that Terminal Operational Systems in port terminals has been successful in managing the containerized cargo as it uses technologies controlling containerized cargo through logs that enhances the

pick-ups and pack of containers at the terminal. Similar to findings Ali, Jaafar, & Mohamad (2008) Terminal Operational Systems allows making enhanced usage of assets, labour and equipment's, workload planning as it simplifies in accessing information quickly allowing for efficient, timely and cost-effective decision makings in reducing containerized cargo handling.

4.5 Specific Objective Two: Warehouse facilities Provides Central Location for Receiving, Storing and Distributing Products.

4.5.1 How Do You Rate Your Storage Capacity Effectiveness Based on the Following Functions?

Table 4.2: Storage Capacity Effectiveness Based on the Following Functions

	N	Mean	Std. Deviation
Unloading and loading effectiveness	57	3.54	1.04
Receiving & Checking inbound goods	57	2.93	1.33
Internal containers movements and progression Counting	57	3.60	1.21
Storages and packaging	57	3.02	1.42
Stock sortation's and rotations	57	3.14	1.19
Replenishments and handling returns	57	3.21	1.40
Maintenance & Loss Prevention	57	3.32	1.23
Valid N (listwise)	57		

Source: Research Findings, 2018

Based on table 4.2 descriptive statistics findings indicate that; internal containers movements and progression counting (Mean 3.60, SD 1.21), Unloading and loading effectiveness (Mean 3.54, SD 1.04) Mean values and Standard Deviations being largely effective in containerised cargo handling system logistics.

However, Maintenance & Loss Prevention (Mean 3.32, SD 1.23), that Stock sortation's and rotations (process of exhibiting older container cargoes for storing new cargoes) (Mean 3.17, SD 1.19), Storages and packaging (Mean 3.02, SD 1.42). Receiving & checking inbound goods (Mean 2.93, SD 1.33) storage capacity effectiveness functions were found to moderately effective n containerised cargo handling system logistics performance at TPA.

> *"Though we are doing sorting process still we have problems on accurate sorting* transmitting, amalgamating, *and* diverting *a widespread of cargo to other destinations where can be easily for cargo order selections, processing, packaging, palletizing, storing, and shipping"*

This was stated by mechanical handling department respondent supporting the findings that stock rotations and sorting of containers cargo handling system has been effective in storage capacity at container terminal at TPA.

> *"Storage space and facilities are not enough to cater the volume of containerized cargo handled and passing the terminal"*

The results also indicates that all functions obtained Standard Deviation Values (>1 but < 1.5) indicating the moderate variance of storage capacity functions in influencing the containerized cargo handling systems in ensuring logistic performance. These moderate values of Mean and Standard Deviation implies that the functions does not fully cater storage required to handle containerized cargo contributing to logistic performance at TPA. These findings are similar to Nyema (2014) indicate that inadequate storage has been one the main reasons for poor containerized cargo handling affecting the logistics performance at Mombasa port in Kenya .

4.5.2 Container Terminal Enough and Reliable Quay and Yard Handling Equipment's for Effective Logistic Performances

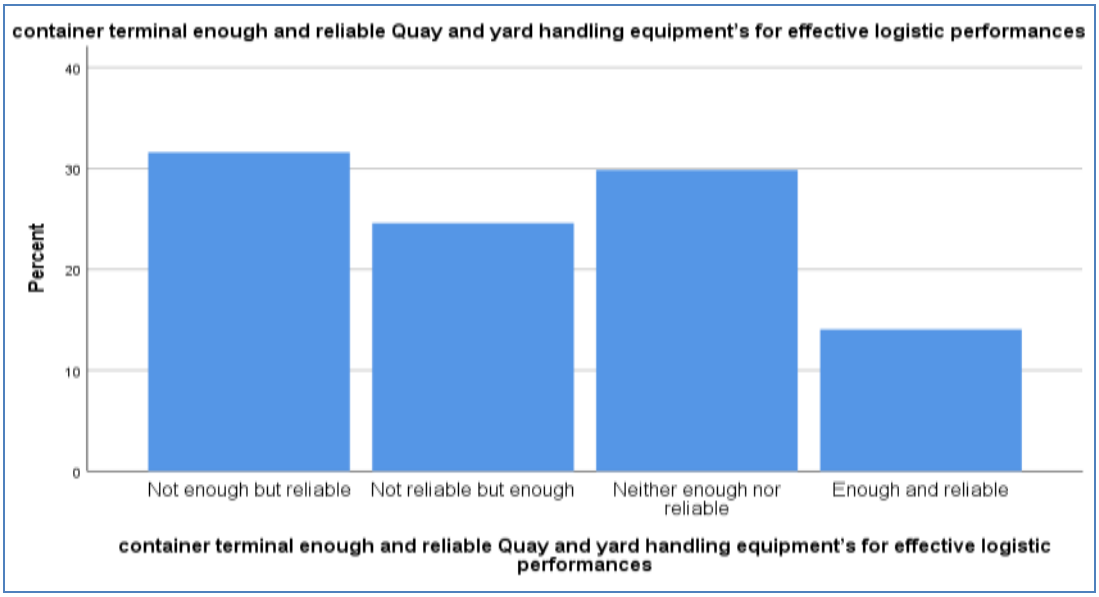

Figure 4.9: Container Terminal Enough and Reliable Quay and Yard Handling Equipment's for Effective Logistic Performances

Source: Research Findings, 2018

The study also examined to what extent the container terminal handling equipment's are enough and reliable Quay and yard for effective logistic performance. Most of respondents mentioned that handling equipment's are not enough but reliable 18(31.6%), followed by 17(29.8%) indicates that equipment's are neither enough nor reliable, while 14 (24.6%) mentioned that equipment's are Not reliable but enough. However least respondents 8(14.0%) mentioned that equipment's are enough and reliable.

The interviewed mechanical department respondent also added that;

> *"Despite of many development and improvement made at container terminal like buying new port equipment's still they are not enough but to certain extent are reliable"*

These findings suggests that containerized cargo handling system needs precise loading and unloading equipment's with adequate berths, loading bays and freight yards to yield logistics efficiency. Hence the equipment's are still impediments to effective containerized cargo handling systems significantly affecting logistic performances that needs proper planning and sourcing enough and reliable equipment's in handling containerized cargo at the port.

4.6 Specific Objective Three: The Role of Transport System in Facilitating Short Container Dwell Time Logistics within the Port

The necessity of transportation in container cargo handling system logistic operations cannot be ignored particularly when port business is to remain competitive in a contemporary economy. Based on this fact the study examined the role of transport in logistics performances revealed the following roles:

Table 4:2 Containers Transportation Roles on Logistics Performances Enhancement

Descriptive Statistics			
	Mean	Std. Deviation	N
Goods delivery to the right place at right time to satisfy customers' demands.	3.25	1.11	57
It brings efficacy and builds a bridge between producers and consumers.	2.79	1.28	57
It a base of business logistics efficiency and economy	3.13	1.29	56
It increases service quality and port competitiveness	3.16	1.37	57
Transportation facilitates high cost or cost saving of transactions in logistics systems	3.70	2.87	57
Transportations economic regulations of set controls over production, market prices, and services in logistic system	3.56	1.18	57

Source: Research Findings 2018

The findings were indicates that; respondents agreed that transportation facilitates high cost or cost saving of transactions in logistics systems (Mean 3.70, SD 2.87), Transportations economic regulations of set controls over production, market prices, and services in logistic system (Mean 3.56, SD 1.18) are largely and significant roles of transport in containerized cargo handling system logistics. However, the transport roles has moderate roles in enabling goods delivery to the right place at right time to satisfy customers' demands (Mean 3.25, SD 1.11), It increases service quality and company competitiveness (Mean 3.16, SD 1.37), It is agreed to be a base of business logistics efficiency and economy (Mean 3.13, SD 1.29), It bringing builds a bridge between producers and consumers (Mean 2.79, SD 1.28) in logistics system at the port.

The findings were also supported by interviewed port manager assert that;

> *"Transportation is essential activity in in connecting container terminal cargo handling to its supply chain partners including cargo suppliers and consumers as it physically moves the cargo from one point to another"*

Another interviewed operational officer also explained that;

> *"Though it has not been much effective at TPA container terminal transportation system have significant cost effects in logistics that affects its overall performance in facilitating the movement of goods with-in a and outside the port"*

The similar findings were also observed in Shang & Marlow (2005) revealing that transport is main part of supply chain managing plans, implementing, and controlling the well-organized storing of goods, services and associated information from the source to the place of consumption for meeting clients' needs. Similar to

that the Caldeirinha (2013) also identified that transportation plays the connective roles in logistics system as it occupies one-third of the amount in the logistics activities.

This were also observed on the statement issued by mechanical handling staff said;

> *"Handling containerized cargo affects the logistics cost due to the cost convoluted in the course of the transportation phases from production point to consumer via supply chain and logistics managing"*

This implies that the generally transportations is among the major logistics activities that though it has not met enhanced flows or timely delivery of containers cargo handling system. Still it has not been effective at handling containerized cargo at the port observed from responses mean and standard deviation values. According to Arvis, et al., (2014); Juri (2015).assert that for long time it has been only transportation facilitates high cost or cost saving of transactions in logistics systems and controls over market prices, and services in logistic system in many ports. This is similar at TPA were transportations have implication on the logistics performances.

4.7 Areas Dar es Salaam Port Containerized Cargo System been Efficient in Promoting Logistic Performances

The study used performance Scores the metric method permits quantitative measurements of relative performances including cost efficiency, technical efficiency, scale efficiency, allocative efficiency and efficiency change.

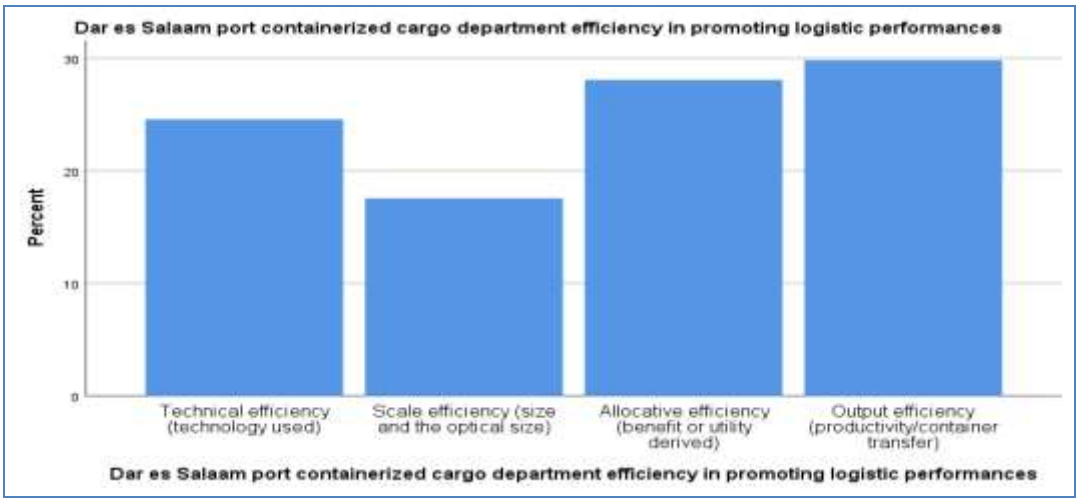

Figure 4.10: Areas Dar es Salaam Port Containerized Cargo Department has been Efficient in Promoting Logistic Performances

Source: Research findings 2018

In assessing the containerized cargo handling system impact logistics various domains of performance were examined to identify which area have been impacted. From the findings it revealed that; the containerized cargo handling system have significant impacts in logistics Output efficiency (productivity/container transfers) 17(29.8%) that involves inputs centered on the infrastructures and machinery information's, terminal quay lengths, terminal areas, number of cargo handling equipment's and storage ability. Followed by Allocative efficiency (benefit or utility derived) 16(28.1%) whereby efficacy derivative from the consumption of a containerized cargo handling system services with respects to a certain level of prices. One interviewed container department operation officer also said;

> *"Hinterland Container Terminals are commonly applied at TPA containerized cargo handling system to reduce some cargo handling problems"*

The findings also identified containerized cargo handling system Technical efficiency (technology used) 14(24.6%) been the area that has been contributes to logistic performance. Technical efficiency at TPA container terminal cargo handling includes the employment of innovative equipment's (mechanical handling equipment's such as cranes, folk lift etc), communications software's (TANSIS system) which have been growing in the recent years. This improved the efficiency and rises output productivity.

While containerized cargo handling system Scale efficiency (port size and the optical size) 10(17.5%) were identified to be little area impacting logistics at TPA container terminal. This indicates how scale efficiency changing with port or terminal size (input level) provided the input mixture such as increase, decrease, and continuous returns to scale, correspondingly. This assist in understanding how to convert inputs level in containerized cargo handling system for obtaining the logistics performance hence attain economical optimum scale.

4.8 Challenges Leading to Containerized Cargo Handling system at Affecting Logistics Performance

From the findings several challenges have been identified whereby Inadequate container storage space due to rapid increased in container traffic (Mean 3.53, SD 1.10), Inadequate handling equipment's availability (portal, mobile, tower, ship to shore gantry cranes) (Mean 3.44, SD 1.10) challenges have been significantly affecting the containerized cargo handling system impacts on the logistics performance.

Table 4.3: Challenges Leading to Containerized Cargo Handling System at Affecting Logistics Performance

	N	Mean	Std. Deviation
Inadequate handling equipment availability (portal, mobile, tower, ship to shore gantry cranes)	57	3.44	1.10
IT system breakages such TANSIS system	57	3.21	1.18
Perceived unfairness and inconsistencies on taxes and port tariffs	57	3.14	1.23
Long container dwell time for import/exports documentation process	57	3.05	1.17
Low performance of inland modes of transport (rail lines/wagons)	57	3.26	1.26
Trade fluctuations at the port terminal levels	57	3.35	1.20
Inadequate container storage space due to rapid increased in container traffic	57	3.53	1.10
Valid N (listwise)	57		

Source: Research findings, 2018

However findings indicates that generally most of challenges are averagely challenging includes containerized cargo handling system leading the negative impacts on logistics performance. These includes Trade fluctuations at the port terminal levels (Mean 3.35, SD 1.20), Low performance of inland modes of transport (rail lines/wagons) (Mean 3.26, SD 1.26), IT system breakages such as TANSIS system (Mean 3.21, SD 1.18), Perceived unfairness and inconsistencies on taxes and port tariffs (Mean 3.14, SD 1.23), Long container dwell time for import/exports documentation process (Mean 3.05, SD 1.17). The interviewed mechanical handling respondent also added that;

> *"In some months there is a larger operational complexity resulted from the much bigger ships that increases containers congestion at the terminal"*

On the loading and unloading containerized cargo handling system various challenges are been affecting the logistics performance ranges from equipment's and labour involvement this was also identified by one of head department at container terminal mentioned that;

> *"In some cases the yard equipment's such cranes are breaking or clashing in yard rows this affects the shifting gang to other hatch and shifting hatch cover on quay for creating spaces for containerized cargoes "*

Moreover, the head of department mechanical handling also added that;

> *"The complexity due to huge container traffic at the terminal lead to more time been spend in locating or identifying the container in the yard"*

Head of department respondent regarding to systems and taxation procedures identified that;

> "*The frequent system breakages such as TANSIS and other taxation integrated systems and long procedures in containerized cargo handling system have been significantly affects the logistics performances at TPA"*

This was noted in interview conducted to port manager identifying the containerized cargo handling system challenges on the logistics performances.

These findings are also supported by El-Nakib & Roberts (2015) who also assert that transportations, loading and offloading equipment's, environmental restrictions (weather variations, temperatures, pressure, humidity, etc), bureaucratic taxation processes, safety in loading and unloading and inadequate appropriate loading equipment's and skilled workforce being a major challenges for logistics performance. The findings implies that containerized cargo handling system has

significant negative impacts in logistics performance as generally respondents agreed that all identified challenges have been affecting the containerized cargo handling system at TPA container terminal.

4.9 Logistics Performance Index Proxy Measures for Transport and Information Infrastructure, Supply Chain Management (SCM) and Trade Facilitation Capabilities

The study assessed how the managerial and physical effectiveness of container terminal cargo handling logistics through Word Bank Logistics Performance Index (2007) this assist in examining challenges and opportunities. The respondents posed with question, how do you rate containerization Logistics Performance Index (LPI) at TPA Port? The results were as follows;

Table 4.4: Tanzania Port Containerised Logistics Performance Index

Descriptive Statistics			
	Mean	Std. Deviation	N
Efficiency of port customs/border agencies in clearances process	3.36	1.07	57
Qualities of transport and information technologies infrastructures for logistics	3.77	1.00	57
Simplicity and affordability of international shipments arrangements	3.56	1.07	57
Competences and qualities of logistics services	3.25	1.11	57
Capacity of tracking and tracing international shipments	2.79	1.28	57
Timeliness of shipments in reaching to the destinations	3.16	1.29	56

Source: Research findings 2018

The findings indicates that Qualities of transport and information technologies infrastructures for logistics (Mean 3.77, SD1.00), Simplicity and affordability of international shipments arrangements (Mean 3.56, SD 1.07) being the major or largely effective in containerisation Logistics Performance at TPA Port.

> "*The performance on logistics has somehow improved in Qualities of transport and information technologies infrastructures for logistics after the uses of the integrated automation systems and port physical improvement"*

This was identified by mechanical handling manager been interviewed in the study.

In addition to above findings LPI measurement indicates that Efficiency of port customs/border agencies and clearances process (Mean 3.36, SD 1.07), Competences and qualities of logistics services (Mean 3.25, SD 1.11), Timeliness of shipments in reaching destinations (Mean 3.16, SD 1.29) and Capacity of tracking and tracing international shipments (Mean 2.79, SD 1.28) being the averagely efficient in Containerisation Logistics Performance (LPI).

According to Arvis, et al., (2014) logistics has various dimensions, its performance measurements in a key elements such as transparency processes and service qualities, predictableness, and reliabilities are very challenging. Based on LPI in examining the competences and qualities of logistics services, timeliness of shipments in reaching destinations and port customs/border agencies in clearances process performances have been found little been performed at TPA container terminal. Thus, time and costs allied with logistics practises such as port handling and processes, customs clearances, transportation and physical inspection are not efficient at TPA contributing to inefficient containerized cargo handling system.

4.10 Operational and External Factors for Delays Cargo Handling Logistic at TPA

TPA as other port terminal world-wide has the drawback factors that in one way or another contributes to delays in containerized cargo handling logistic performance. These include both the operational and external factors also examined by the study and findings were as follows;

Table 4.5: Operational and External Factors for Delays Cargo Handling Logistic

	Mean	Std. Deviation	N
Ship not at berth	3.21	1.23	57
Opening/closing of hatches	3.36	1.19	57
Wrapping/trimming and cleaning	3.40	1.18	57
Re-handling containers required by shipping line/officer	3.28	1.41	57
Waiting for shore (handling equipment's)	3.32	1.07	57
Waiting for labour shift	3.77	1.00	57
Heavy yard traffic	3.56	1.07	57
Equipment's refueling and maintenances	3.25	1.11	57
Weather conditions variations	2.79	1.28	57
Waiting for lorries/wagons	3.13	1.29	56
Shunting/transfer delays	3.16	1.36	57
Waiting for loading documents	3.70	1.17	57

The study categorized the delays on the containerized cargo handling system as follows; shipping related delays factors, operational related delays and external related delays from the findings it indicated that; in shipping related delays factors such the most significant factor includes ships being not at berth (Mean 3.21, SD 1.23) meaning that ships are at dock ready for containerized cargo handling at the port. This was also supported by container terminal operation manger interviewed in the study.

> "Following various operational activities at the port the *containerized cargo handling have been largely impacting the performance on logistics"*

On other side respondents also mentioned Opening/closing of hatches (Mean 3.36, SD 1.19), Wrapping/trimming and cleaning (Mean 3.40, SD 1.18), Re-handling containers required by shipping line/officer (Mean 3.28, SD 1.41) are averagely causing delays containerized cargo handling that have impact in logistics performance.

The second category of operational related delays factors the waiting for labour shift (Mean 3.77, SD 1.00) and Heavy yard traffic (Mean 3.56, SD 1.07) have been identified to delay containerized cargo handling that largely impact logistics performance.

> "The delay sometimes are inevitable as the *containerized cargo handling has to wait* shore *handling equipment's due to equipment's refuelling and maintenances that make significant delays in logistics performance"*

This was identified by mechanical handling head of department.

In additional that respondents also identified that waiting for shore (handling equipment's) (Mean 3.32, SD 1.07), Equipment's refuelling and maintenances (Mean 3.25, SD 1.11) are moderately contributes to delay cargo handling system logistics at the port.

The third category involving the external related delays factors indicates that waiting for loading documents factor (Mean 3.70, SD 1.17) have been strongly affect negatively containerized cargo handling logistics at TPA.

"The performance on logistics is been affected shunting and time wasted in waiting for trucks for transporting containers to clients"

This followed by other delay factors related to Shunting/transfer delays (Mean 3.16, SD 1.36), Waiting for lorries/wagons (Mean 3.13, SD 1.29), Weather conditions variations (Mean 2.79, SD 1.28). The findings were also supported by TPA study report (2018) identified that variations in weather conditions and transportation logistics that hindered timely movement of the containerized cargo handling in most ports particularly in developing countries due to poor infrastructures.

4.11 Satisfaction with Services Offered by Port Cargo Handling System

Finally the study investigated the satisfaction with services offered by the logistic department in port containerized cargo handling system satisfaction level. The responses were as follows;

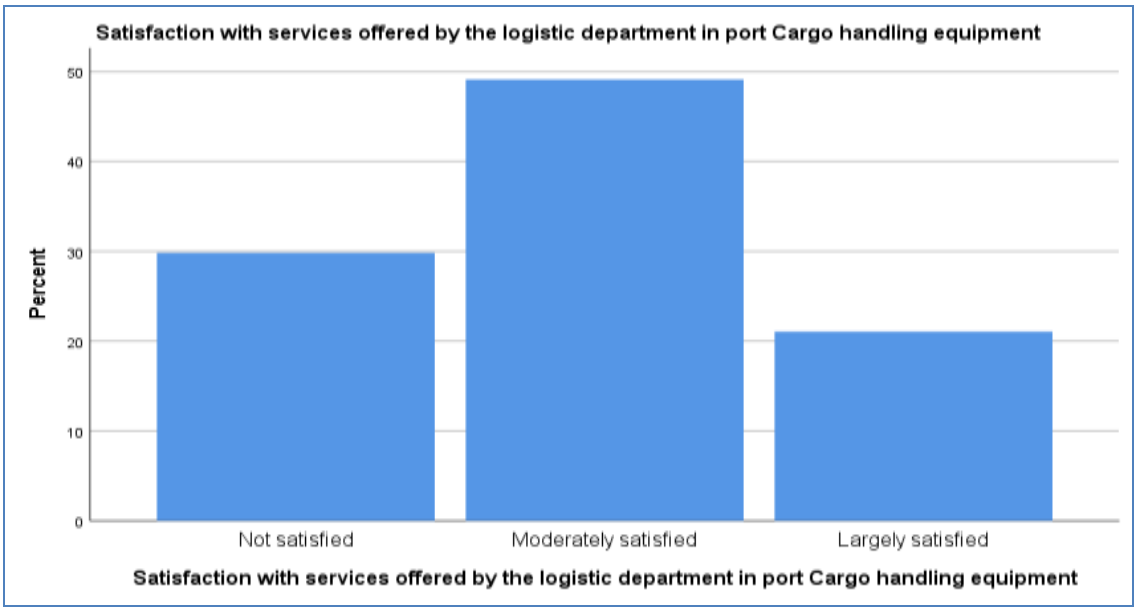

Figure 4.11: Satisfaction with Services Offered By the Logistic Department in Port Cargo Handling

Source: Research findings 2018

Despite of many port physical, equipment's, infrastructures, and computerized integrated systems at TPA ports still the containerized cargo handling logistics services offered are not at satisfactory level. This was observed on the large number of respondents 28(49.1%) identified the services to be moderately satisfied. In the same vein 17(29.8%) respondents identified to have not satisfied with containerized cargo handling services. While 17(29.8%) found to largely satisfied with containerized cargo handling services been offered at TPA.

> *"The current handling system containerisation used does not reduce containerisation problem and does not meet the terminal demand on handling container at the port"*

The statement mentioned by interviewed mechanical head of department respondent. The findings implies that the containerized cargo handling system have not achieved the stakeholders expected logistics performance at TPA. Some of the respondents identified that among the leading satisfaction reasons are;

> *"ASYCUDA++ system used by TRA and machine used to scan the containers (TISCAN) are not well efficient as they frequently being down in performing cargo handling at the port terminal"*

Mentioned by interviewed container terminal operation manager at the port.

Findings also identified that those long procedures leads to misuse of time in the whole process of released cargo compared to Mombasa where cargo was cleared by using bill of landing number only, and even don't have customs inspection section like (TISCAN). Moreover, the study revealed the problem of frequent system down which affect the whole operations at TICS as whole of TPA terminal that significantly affects logistics performances.

4.2 Discussions of the Findings

From the findings indicates that still there are shortcomings in the containerized cargo handling system which is the avenue to effective logistics. The situation implies that generally the customers are automatically not fully satisfied with containerized cargo handling system at TPA despite of many effort done TPA and government. Thus introduction of automated machine's and increasing TPA staff skills have not yield its optimal satisfaction objective to customers on how containerized cargo handling logistics. This also observed to the study by Sintoo (2015) indicating that Tanzania Revenue Authority (TRA) documentations and the system were used (ASCUDA++) being the causing delays in efficient containerized cargo handling system handling logistics.

On storage space enough to cater the volume of cargo passing the terminal respondents concludes that aid storage space is not enough for current business volume at TPA even after introduction of the hinterland storages facilities. This means that the storage problem has significant contribution on the inefficiency logistics performances at the port. This implies that lack/limitation of storage space may be one of the causes of poor terminal containerized cargo handling efficiency.

They said that poor performance of the port also caused by the speed of delivery of Services performed by clearing and forwarding itself. This also identified by TPA, (2013); Daily news (2014) describing that complains on port operations is been contributed by customers lack of professionalism, cheating, under declaration, under invoice, customs long procedures etc. Not only that but also forwarding and

clearing procedures for Dar es Salaam port are very traditional compared to other port like Mombasa. Customs processes are bit longer due to nature of transaction but with modern technology such as introduction of ASYCUDA++, Destination Inspection Scanner Machines (TISCAN) and other modernization services have tried to reduce some unnecessary bureaucratic procedures. The breakages of network has led to inefficacies of that technology and longtime taken in reinstating the network has significant contribution to inefficiencies up to now. Not only that, government institution such as TPA, TBS, TRC, MAPS, TPRI are located in different areas which cause a clearing and forwarding agents to spend much of time to get services from one institute to another that could be reduced when all institutions were centralized.

On top that it was recognized that transportation has not significantly contribute to efficient containerized cargo handling system based on various factors such as uses of gate number 5 for all logistics activities. This gate is mainly used by TICTS for entering empty trucks, loaded trucks leading to delays in operation, shipping and transportation logistics.

CHAPTER FIVE

5.0 SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter consists the summary of the findings, conclusions and recommendations hat drawn in enhancing the containerized cargo handling system that in turn improves the logistic performances at TPA.

5.2 Summary of the Study

The general objective of this study was to assess the impact of containerized cargo handling system or logistics performance of Dar es Salaam port operations and handling systems in TPA. Not only that but also this research examined four measures. Adding yard storage space to facilitate the picking up and/or dropping off containers was a first measures to examine.

The TOS uses in handling containerized cargo utilizes various internet, EDI processing, wireless LANs and RFID technologies in monitoring cargo inflows and outflows at TPA. Through these technologies is where TRA (ASCUDA ++), Destination Inspection Scanner Machines (TISCAN) are operated at the terminal. However, the TOS has been less effective in supporting planning (stowage), grounding decisions, scheduling and equipment's control in reducing containerization cargo handling problem. This contributed by various institutional and structural challenges at the port that in one way or another resulted to shipping,

operational and external delays. On which they significantly lead to low logistics performances.

In research objective two the results indicate that all variables affects the storage capacity functions. As internal containers movements and progression counting and unloading and loading being largely functioning at TPA. Yet, other remaining functions of storage facility including Maintenance & Loss Prevention, Replenishments and handling returns, Stock sortation's and rotations (process of exhibiting older container cargoes for storing new cargo), Storages and packaging and Receiving & Checking inbound goods are moderately functioning in storage facility.

The findings on research objective three indicates all identified transport roles have significant effects on logistics performances. However, more significant effects were observed on transportation facilitates high cost or cost saving of transactions in logistics systems, transportations economic regulations of set controls over production, market prices, and services in logistic system. Yet, the transport roles enabling goods delivery to the right place at right time to satisfy customers' demands, It increases service quality and company competitiveness, It is agreed to be a base of business logistics efficiency and economy, It builds a bridge between producers and consumers found to moderately affects logistics system at the port.

The identified challenges in research objective four reveal that containerized cargo handling system faced with inadequate container storage space due to rapid increased

in container traffic, inadequate handling equipment's availability (portal, mobile, tower, ship to shore gantry cranes) challenges that significantly affects the impacts on the logistics performance. Consequently, the findings shows that most of the identified challenges has moderately negatively impacting the logistics performance. These includes. Trade fluctuations at the port terminal levels, Low performance of inland modes of transport (rail lines/wagons), IT system breakages such as TANSIS system, TRA (ASCUDA ++), Perceived unfairness and inconsistencies on taxes and port tariffs and Long container dwell time for import/exports documentation process.

5.3 Conclusions

This dissertation addresses the system used at the port in containerized cargo handling at the TPA container terminal on the logistics performance.

The Terminal Operation Services use in handling containerized cargo utilizes various internet, EDI processing, wireless LANs and RFID technologies in monitoring cargo inflows and outflows at TPA. Through these technologies is where TRA (ascuda ++), Destination Inspection Scanner Machines (TISCAN) are operated at the terminal. However, the TOS has been less effective in supporting planning (stowage), grounding decisions, scheduling and equipment's control in reducing containerization cargo handling problem. This contributed by various institutional and structural challenges at the port that in one way or another resulted to shipping, operational and external delays. On which they significantly lead to low logistics performances.

Transportation being the other side of logistics coin has not managed to enhance the containerization cargo handling system efficiency despite of been agreed to have significant role in logistics performances. The despite of establishing Hinterland Container Terminals such as UICD storage facilities at the TPA are still inadequate to cater the volume of container cargoes passing through the port. This agreed to have significant effects in logistics performance as it involves a lot allocating and reallocating of containers cargo. Therefore, general conclusion from the study suggest that containerized cargo handling system at TPA is still affected by various factors such as poor transport, infrastructures, shipment, external and operational delays challenges. These have been contributing to delay and congestion at the port impacting logistics performance that increases the incredible impacts to the terminal operations and decreases the reputations due to failure of fulfilling efficient customer service. All these shortages in handling containerized cargo have led to poor logistics leading to decline of the business and customers shift to other ports such as Beira, Mombasa.

5.4 Recommendations of the Study

Based on the findings, the study draws various recommendations on what to be done to ensure the effectiveness of containerized cargo handling system in Port operation at TPA to achieve the efficient logistics performances as follows;

5.4.1 Recommendations to the Terminal Management

The Management of TPA should do the following in order to improve the terminal performance:

i) Employ new and modem handling equipment's and modern systems in order to facilitate quick handling and therefore save time and minimize handling costs and time spent.

ii) Due to global shipping business expansion, the terminal areas need to be extended too in order to meet the current terminal demand.

iii) The current terminal area is not enough for storage and it make container picking to take long time and leads to delay during delivery time.

5.4.2 Recommendations to Terminal Users

Terminal users are customers to the terminal and therefore the terminal survival depends on survival of customers.

i) For terminal operation improvement customers need to be more aware of terminal operation procedures so that process for clearing and forwarding may take short time. If time procedures are clear to customers, clearance of cargo from the terminal will take short time and therefore avoid unnecessary costs resulting from delay.

ii) Customers also need to be aware of current information about the terminal operation such arrival and departure of the vessel, customs procedures as well as government regulations for terminal dealers.

iii) For shipping lines using the terminal must follow the schedule for arrival and departure. This will help importers to plan their business according to the schedule and therefore minimize/eliminate delays.

iv) Customers also need to be aware of current information about the terminal operation such arrival and departure of the vessel, customs procedures as

well as government regulations for terminal dealers.

5.4.3 Recommendations to the Government

The Government of Tanzania need to ensure that terminal operations situation is improved so that more customers are attracted in order to generate more income to the nation and be competitive in the region.

i) To provide more area for terminal expansion in order to meet the current business demand as currently one gate 9 Gate no 5 only) for all activities

ii) To improve infrastructure within and outside the port

iii) To review TRA (ESCUDA++) and other custom procedures take shorter time hence facilitate quick clearance of cargo from terminal

5.5 Contribution to the Knowledge

Ways of working for terminal operations need to be up dated time to time so that to cope with international regulations and technological changes thus;

i) Modern terminal system such as CTS, SPARKS, TRA (ESCUDA++) need to be more encouraged so as to facilitate quicker port operations and thus increase efficiency.

ii) To policy and decision makers; makers; advanced training to terminal users should be provided as well as to staff on modern operation techniques and methods. Data management methods with modern systems should be more encouraged and introduced in each section.

5.5.1 Area for Further Study

i) In view of the study findings, the following areas for further research are suggested: similar intensive study should be conducted on same research problem incorporating wide range of stakeholders such as customers, TRA, People working at ministry of infrastructure and development, TBS, TRC, MAPS, TPRI SUMATRA as well as TASAA.

ii) Also it is recommended that advancement for further research on impact of transportation, handling and storage of containerized cargo at the terminal area where more data can be obtained at the remaining sub sections within the terminal.

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APPENDICES

APPENDEX I: QUESTIONNAIRES

The purpose of this questionnaire is to assist in gathering data that will be in research paper on the challenges facing containerized cargo handling system in Tanzania, case study at Tanzania Ports Authority.

Please, I request you kindly to answer the following questions so as to enable the current study obtaining its objective.

1. What are your daily activities in container handling for promoting logistic performances?
   i. Berth planning ( ),
   ii. Stowage planning ( ),
   iii. QC Work Scheduling ( ),
   iv. Containers load/unload Sequencing ( ),
   v. Space Planning for containers ( ),

2. How long have you been working with this section?
   i. 1-5 years ( ),
   ii. 5-10 years ( ),
   iii. 10 years above ( ),

3. What are the relevance/impacts of transport system in facilitating logistics performance at TPA?
   i. Transport system facilitate the movement of goods, materials and components with-in and outside the port.
   ii. Transportation plays the connective roles in logistics system as logistics management needs transportations to perform its activities

iii. Transportation system have significant cost effects (inventory, warehousing cost, packing cost, management cost, movement cost and ordering cost) in logistics overall performance

iv. Transportation system occupies one-third of the amount in the logistics activities (production, storage, wholesaling, and retail sale etc)

4. As a stakeholder what components consists in the TPA logistics system?
   i. Customer service ( )
   ii. Purchasing/inventory management ( )
   iii. Transportation ( )
   iv. Storage and materials handling ( )
   v. Packaging, Information processing ( )
   vi. Demand forecasting/ Production planning ( )
   vii. Facility location and other activities (service support, maintenance functions, return goods handling) ( )
5. Are you satisfied with services offered by the logistic department in port Cargo handling equipment?
   i. Not satisfied ( )
   ii. Moderately satisfied ( )
   iii. Largely satisfied ( )

6. What are determinants effective containerised handling systems in ensuring logistic performance?
   i. Availability of maritime equipments ( ),
   ii. Efficient of fractions of time berthed per ship per shift ( ),
   iii. Efficient coordination's between ship agents ( ),
   iv. Harbour master ( ),
   v. Pilots terminal operators upon request ( ),
   vi. Integrated IT systems

7. **Warehouse provides a central location for receiving, storing and distributing products. How do you rate your storage capacity effectiveness based on the following functions;**

Warehouse Functions	Worst	Worse	Nothing	Better	Best
Unloading and loading effectiveness					
Receiving & Checking inbound goods					
Internal containers movements and progression counting					
Storages and packaging					
Containers stock sortation's and rotations					
Replenishments (replacing) and handling returns					
Maintenance & Loss Prevention					

8. Does the container terminal have enough and reliable Quay and yard handling equipment's to speed up operations and enhance effective logistic performances?
   i. Not enough but reliable ( )
   ii. Not reliable but enough ( ),
   iii. Neither enough nor reliable ( )
   iv. Enough and reliable ( )

9. What are the transportation roles in containerized cargo handling roles on logistics performances performance enhancement?

Transportation role on logistics performances enhancement	Strongly disagree	Disagree	Not sure	Agree	Strongly agree
Goods delivery to the right place at right time to satisfy customers' demands.					
It brings efficacy and builds a bridge between producers and consumers.					
It a base of business logistics efficiency and economy					
It increases service quality and company competitiveness					
Transportation facilitates high cost or cost saving of transactions in logistics systems					
Transportations economic regulations of set controls over production, market prices, and services in logistic system					

10. The Dar es Salaam port various operational system control activities used to reduce containerizations problems have the following system used in containerised cargo system in supporting logistic performances

The port of Dar es Salaam various operational system control activities for reducing containerizations problems	Strongly disagree	Disagree	Not sure	Agree	Strongly agree
Ship operation planning and monitoring					
Hinterland operation					
Yard operation					
Resource control					

11. A) Does the DSM port available storage facility meet handling needs of the flowing of containerized cargo in export and import activities?
    i. Not all ()
    ii. Moderately meet containerised cargo flow ()
    iii. Largely meet containerised cargo flow ()
    iv. storage facilities that is used for handling large volume of containers

12. What are factors/challenges leading to logistic performances decline of cargo handling system at the Dar es Salaam port

Challenges of port of Dar es Salaam container handling	Strongly disagree	Disagree	Not sure	Agree	Strongly agree
Inadequate handling equipment availability (portal, mobile, tower, ship to shore gantry cranes)					
IT system breakages such TANSIS system					
Perceived taxes and tariffs unfairness and inconsistencies					
Long container dwell time for import/exports documentation process					
Low performance of inland modes of transport (rail lines/wagons)					
Trade fluctuations at the port terminal levels					
Inadequate container storage space due to rapid increased in container traffic					

13. **Based on a composite index based on proxy measures for transport and information infrastructure, supply chain management (SCM) and trade facilitation capabilities. How do you rate containerisation LPI at Dar es Salaam port? 1 (worst) to 5 (best)**

The rate of containerisation the LPI at Dar es Salaam port	Worst	Worse	Nothing	Better	Best
Efficiency of port customs/border agencies in clearances process					
Qualities of transport and information technologies infrastructures for logistics					
Simplicity and affordability of international shipments arrangements					
Competences and qualities of logistics services					
Capacity of tracking and tracing international shipments					
Timeliness of shipments in reaching destinations					

14. **In which ways/areas do the Dar es Salaam port containerized cargo department has been efficient in promoting logistic performances in the country**?
    i. Scale efficiency (size and the optical size)
    ii. Technical efficiency (technology used)
    iii. Allocative efficiency (benefit or utility derived)
    iv. Output efficiency (productivity/container transfer)
    v. Management efficiency

15. One of the major problem in the logistic performance in the port is external, shipping related delays and operational related delay of cargo handling in the ports,. What do you think are the delay leading factors in following?

Category	**Delays reason/factor**	**Strongly disagree**	**Disagree**	**Not Sure**	**Agree**	**Strongly disagree**
Shipping related delays	Ship not at berth					
	Opening/closing of hatches					
	Wrapping/trimming and cleaning					
	Re-handling containers required by shipping line/officer					

Operational related delays	Waiting for shore (handling equipment's)					
	Waiting for labour shift					
	Heavy yard traffic					
	Equipment's refuelling and maintenances					
External related delays	Weather conditions variations					
	Waiting for lorries/wagons					
	Shunting/transfer delays					
	Waiting for loading documents					

16. Give your own opinion of what you think can be done in order to improve the condition in as far as containerized cargo handling system is concerned?
    i. ……..
    ii. ……

APPENDIX II

"Cargo"	Goods carried by ships or operated by Shipping Line/Agent on behalf of customers which included containerised and LCL goods
"Cargo" Manifest"	A detailed list of Cargo carried on board a ship providing among other, the Bill of Lading, Port of loading, Port of Discharge, Shipper, Consignee, Cargo description, measurement etc. required to be declared to Customs and Port before discharging the cargo from the ship.
"Cargo Consolidator"	An individual or corporation engaged in collecting together small lots of cargo, stuff in containers and arrange transportation by sea with the carrier on behalf of the cargo owners. The Cargo de-consolidator does the stripping and delivery to consignee on behalf of the Consolidator.
"Carrier"	The Shipping Line/Agent being an individual, company or corporation engaged in the international transportation or goods by sea.
"Containers"	A rigid, non-disposable, transportable units, which permit intermodal unutilized cargo distribution and may be ventilated, insulated, reefer, flat rack, vehicle rack, or open top; with or without wheels or bogies attached, not less than 20feet in length; and have a closure or permanently-hinged door that allows ready access to the cargo and shall to the extent applicable, include cargo in them.
"Customers'	The Tanzanian Revenue Authority(TRA) Customs and Excises Department responsible for regulating the flow of goods to and from Tanzania and to collect duties levied by Tanzania on

	imports and exports.
"Customers Release Order"	The Customs document certifying the completion of Customs formalities and allow the Custodian of the Cargo to deliver the Caro to the owner
"Dangerous Goods"	Hazardous cargo which requires special handling as provided by International Maritime Organization Dangerous Cargo Codes(IMDG) and as applicable in the law of the country
"Delivery Order"	A Shipping Line/Agent instruction to XXXXXX to deliver the container or cargo to the named consignee or consignee's agent.
"Equipment Interchange Report"	The document executed by the Terminal Operator transferring possession of a container or chassis from one the other, and showing equipment condition
"FCL"	Full Container Load
"ICD"	Inland Container Depot as defined in the East Africa Customs Regulations of January 2007
"Import Container"	Only those containers destined for import into Tanzania
"LCL"	Less than Container Load
"Stripping"	The process of removing cargo from a container
"SUMATRA"	The Surface and Maritime Transport Regulatory Authority, a government body responsible for regulation of Maritime and Surface Transport in Tanzania.
"Terminal"	The terminal operated by the Terminal Operator in the Dar es

Salaam port.

"TEU" Twenty Feet Equivalent Unit.

"TPA" The Tanzania Port Authority, a government institution responsible for management of all Ports in Tanzania Mainland.

1.0 GENERAL INTERPRETATIONS

1.1 In this SOP the singular shall include the plural and the plural the singular except where the test otherwise requires.

1.2 Headings in this SOP are included for ease of reference and shall not affect the interpretation of its text.

2.0 STANDARD OPERATING PROCEDURE FOR ICD TRANSFERS

It is important to have a standard operating procedure which will address all operational issues pertaining to documentation, billing, transfer and handover of containers between the Terminal Operator, ICD Operator and shipping Line/Agent and reconciliation with TRA and others after completion of the transfer process.

3.1 Documentation/Billing

3.1.1 The shipping Line/Agent shall advise the Terminal operator of the name of the vessel nominated for whole ship Transfer (WST), expected date of arrival and nominated ICD to which the Containers have been allocated. The shipping Line/Agent will advise the Terminal operator at least 3 days before expected time of berthing.

3.1.2 The shipping Line/Agent will submit to the Terminal Operator a discharge list indicating containers only which are due to be transferred under the WST excluding all transit, IMCO Class 1 & 2, reefers, WFP cargo and consignee own arrangement with other ICDs and all exceptions which need to be delivered direct from the Terminal. The shipping Line/Agent must submit the discharge list at least 3 days before expected time of berthing. For those containers loaded at a port less than 12 HOURS (Tanga, Mtwara, Mombasa and Zanzibar) sailing form the port, the shipping Line/Agent will

update the discharge list upon berthing with the containers loaded at those ports to be sent to the ICD.

3.1.3 The shipping Line/Agent will also provide the EDI submission to the Terminal Operator at the same time as the discharge lists.

3.1.4 The shipping Line/Agent will provide to the Terminal Operator, the TRA and the ICD two sets of discharge lists as follows:

3.3.4.1 One discharge list showing all containers destined for ICDs, listing the individual ICD to which the container is to be transferred; and

3.1.4.2 One discharge list showing all containers that will remain in the terminal.

3.1.5 For easy facilitation of documentation, the shipping Line/Agent must send the above documents and the manifest electronically to the Terminal Operator as one complete set of documents. Where the ICD does not have the facility to receive the manifest or EDI electronically, the ICD must arrange to collect the manifest and EDI in hard copy form the shipping Line/Agent.

3.1.6 The Terminal Operator will raise invoices for the entire Terminal Operator charges for the ICD to pay before the start of the transfer process.

To facilitate the transfer of containers, the Terminal Operator and the ICD must agree a credit or deposit facility before the berthing of the vessel nominated for the WST on terms and conditions to be agreed between the Terminal Operator and the ICD.

Note: - The shipping Line/Agree must submit the discharge list at least 3 days before expected time of berthing so that invoices can be ready on or before the vessel berthing date.

3.2 **Booking and Transfer**

3.2.1 The ICD shall make a booking at the Terminal Operator's dedicated ICD transfer window by submitting a transfer request to the booking clerk.

3.2.2 The Terminal Operator will provide an Equipment Interchange Receipt (EIR) for each container which is due to be collected by the ICD from the Terminal.

The EIR shall list the container number only, and the truck lenience plate, truck driver name and time shall be inserted manually on the EIR at the moment of loading of the container on to the truck.

3.2.3 The validity of the EIR for the transfer of containers to ICDs shall be 36 hours.

3.2.4 The ICD shall advise the number of containers needed to be collected per day and the Terminal Operator will provide booking for all containers requested.

3.2.5 The trucks must follow the time and date indicated in the EIR to enter the terminal and load the containers.

3.2.6 Trucks failing to enter as per the time and date indicated will have to follow the Terminal Operated amendment procedure for cancellation and re-issue of the EIR.

3.3 **Handing over of Containers**

3.3.1 As indicated above, the handing over of containers to the ICD shall be by EIR which will be collected by the ICD appointed clerk and the driver will acknowledge receipt by signing the bottom part of the EIR.

3.3.2 The handover of the container to the ICD will be deemed to have occurred immediately the container is loaded onto the truck and the truck driver signs the EIR.

3.3.3 The Terminal Operator's responsibility to the shipping Line/Agent for the custody of the container shall cease immediately upon handing over the container to the ICD.

3.3.4 The Terminal Operator's responsibility to TRA for the tax/duty/excise and any other revenue due to TRA of the container shall cease immediately upon successful checking of the integrity of the seal upon leaving the Terminal Operator premises. However, if the actual seal number on the container differs form the seal number declared on the manifest, the container will not be loaded onto the truck and an investigation will occur.

3.3.5 For damaged containers, the inspection will be done at the Terminal Operator's exit gate and remarks will be indicated on the EIR.

3.3.6 For containers with missing, damaged or changed container sealsverification of the containers and cargo if necessary shall be arranged by the Terminal operator in the presence of all interested parties in the Terminal.

3.3.7 Any container destined for an ICD that is scanned and shows short or no cargo shall be returned to the terminal for inspection as per 3.3.6 above. Normal transfer and verification charges will apply.

3.4 **Reconciliation with TRA**

3.4.1 Before any transfer operation, the Terminal Operator shall advise TRA of all containers discharged ready to be transferred to the appointed ICD or ICDs.

3.4.2 Upon completion of the transfer, the ICD shall be responsible to report and acknowledge receipt of all transferred to report and acknowledge receipt of all transferred containers to TRA, the shipping Line/Agent and the Terminal Operator no later than 12 hours after receipt of the last container at received and containers not received.

3.4.3 A copy of each container's EIR should be sent by the ICD to the shipping Line/Agent.

3.4.4 The ICD shall also be responsible to report to TRA, the shipping Line/Agent and the Terminal Operator all local containers not transferred to the ICD indicating the reasons why to enable the shipping Line/Agent to apply for their delivery direct form the Terminal upon completion of TRA formalities and payment of all the Terminal Operator charges

3.4.5 For containers not transferred and delivered direct from the Terminal Operator, the Terminal Operator must provide the customs Release Order (R number) to the ICD, TRA and the shipping Line/Agent.

3.4.6 A full reconciliation of all containers transferred TO ICDs shall be under taken on the last day of each month and all parties (ICDs TRA, shipping Lines/Agents and the Terminal Operator) shall sign off the reconciled data.

4.0 **TERMINAL OPERATOR'S DUTIES AND RESPONSIBILITIES**

4.1 On discharge of the containers, the Terminal Operator shall where possible stack the containers to assist in a smooth loading operation onto the ICD trucks.

4.2 The Terminal Operator shall where possible ensure quick loading of containers onto the ICD trucks in order to facilitate the quick transfer of containers to meet customs time limits.

5.0 ICD'S DUTIES AND RESPONSIBILITIES

5.1 The ICD shall be responsible and liable for (a) the transportation of containers and cargo, (b) the safe storage of containers and cargo at its premises (c)delivery of container and cargo as per stipulated guidelines in this agreement and (d) any other services in compliance with the customs laws and regulations incidental to (a), (b) and/or (c).

5.2 The ICD shall ensure the shipping Line/Agent submits the required documents as per 3.1.4 above to the Terminal Operator before berthing of the designated vessel to enable the Terminal Operator to arrange the containers for smooth transfer as per 4.1 and 4.2 above.

5.3 Subject to 1.1.5 above, the ICD shall make payment for the Terminal Handling Charges and other dues to the Terminal Operator before collection of the containers form the Terminal Operator.

5.4 The ICD shall be responsible and liable for transportation of containers and completion of the transfer of the containers within time limits as directed by TRA and shall be responsible and liable for the consequent penalties due to any failure.

5.5 All drivers engaged in the transportation of containers must be possession of a valid and appropriate license, be duly qualified and experienced in the container transportation business and all trucks used by the ICD shall be in a roadworthy condition with working twist-locks to enable them to transport containers safely and securely.

5.6 The ICD shall remove all containers identified as part of the vessel transfer form the terminal within the permitted free period of seven days for local

containers. Containers remaining in the terminal beyond this period will be charged at US$20/40 per 20'/40' per day until the date of removal to the ICD.

5.7 For containers incurring storage charges, an MPS will be issued and paid for before release of the cargo from the terminal.

5.8 The ICD is responsible and liable for the creation of WES entries for cargo not cleared by importers as per TRA guidelines. The ICD will provide facilities to TRA for the auctioning of cargo.

5.9 The ICD together with the shipping Line/Agent will be responsible and liable for informing customers of the location of containers at the ICD.

5.10 The ICD is required to provide all customer release formalities at their ICD. Importers will obtain release of the consignments form the ICD once al customs and shipping line formalities have been completed.

6.0 PAYMENT OF TPA WHARFAGE CHARGES

The ICD shall ensure that TPA has collected all wharf age due on each container before its release.

7.0 REVISION OF AGREEMENT

All parties in writing may amend this SOP upon agreement.

8.0 CHANGE OF POLICY ON TRANSFER OF CONTAINERS TO ICD

In the event that the policy on transfer of containers to ICDs is changed, this standard Operating procedure shall be amended only to the extent required and the provision of this SOP shall remain in full force and effect.

DISPUTE

In the first instance, any disputes between the parties shall be referred to the port improvement Committee for review.

EFFECTIVE DATE

This SOP shall come into effect immediately upon its signing.