PORT MANAGEMENT SYSTEMS AND OPERATIONAL EFFICIENCY AT THE INLAND CONTAINER DEPOT - EMBAKASI

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DECLARATION

I submit that the content of this paper has not been presented for award of a degree in this or any other institution and is a product of my original work.

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DEDICATION

I dedicate this paper to my parents and siblings for their sacrifice and support towards my education and continued support.

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I give glory and honor to God for his grace, guidance and provision to carry out this project work.

I express my sincere gratitude to Madam Angela Kaguara, Mr. Onserio Nyamwange and the entire department of management science for your constructive criticisms, guidance and for pushing my thought process and increasing my knowledge base to be the best that I can be with this project work.

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ACRONYMS AND ABBREVIATIONS

B2B	Business to Business
CAD	Computer Aided Design
CAM	Computer Aided Manufacturing
CCTV	Closed Circuit Television
CTI	Computer Telephony Integration
EDI	Electronic Data Interchange
ESCAP	Economic and Social Commission for Asia and the Pacific
eSW	Electronic Single Window
GPS	Global Positioning System
ICD	Inland Container Depot
IFC	International Finance Corporation
ITI	Internet Telephony Integration
KIFWA	Kenya International Freight and Warehousing Association
KEBS	Kenya Bureau of Standards
KenTrade	Kenya Trade Network Agency
KMA	Kenya Maritime Authority
KPA	Kenya Ports Authority
MRP	Material Requirements Planning
MSDS	Material Data Sheets
NTTCA	Norther Corridor Transit and Transport Coordination Authority

JICA	Japan International Corporation Agency
JKIA	Jomo Kenyatta International Airport
KRA	Kenya Revenue Authority
AEO	Authorized Economic Operators
RMG	Rail Mounted Gantry
RS	Reach Stacker
RTG	Rubber Tyre Gantry
SGR	Standard Gauge Railway
SCEA	Shippers Council of East Africa
TEUs	Twenty Foot Equivalent Units
ICMS	Integrated Customs Management System

ABSTRACT

In the 21st century there is global competitiveness in international trade which is becoming increasingly tougher and the need for efficiency in operations as a tool to remain competitive is essential. Ports are one of the primary components of the transportation sector and are nowadays linked to the expanding world economies. While ports (both sea ports and inland deports) hold great promise for economic prosperity of any country, operational inefficiency continue to undermine their potential. Adoption of automated systems globally is giving hope for effective and efficient operations and service delivery. In Kenya today, the scenario has been replicated but the use of Operations Management Systems have so far not achieved the desired objectives. In order to get the insight into the use of Port operations management systems, reviews of studies which several scholars had done was conducted and are used to strengthen the ideas presented in the study. The study employed a descriptive approach to study and describe the use of port operations management systems and their impact on efficiency. Structured inquiry methods were used to collect quantitative and qualitative data from a sample of 45 respondents comprising of Transporters, Government Agencies and Agents operating within the Inland Container Deport (ICDE) where the study was based. Data was analyzed to determine the respondents' view on the use of automated systems in key operations of the ICDE, including documentation, yard operations, gate operations and Rail side operations. The key findings of the research included Lack of a synchronized port operation system for all activities, lack of enough infrastructure, improper manpower management among others. Based on the findings, the study recommends that a holistic view of the entire ports operation systems with a view to improving infrastructure and port management systems in order to create an efficient working environment need to be considered.

CHAPTER ONE: INTRODUCTION

1.1 Background of the Study

In the 21st century there is global competitiveness in international trade which is becoming increasingly tougher and the need for efficiency in operations as a tool to remain competitive is essential. Transport has been identified as an enabler to achieving sustainable development goals with emphasis on creation of intermodal transport and logistics systems especially intermodal or multimodal transport corridors with seamless physical and operational connectivity with intermodal facilities such as dry ports, critical to the efficiency of such corridors (ESCAP, 2018). Efficiency at the sea port is enhanced through additional facilities and infrastructure but due to the constraints in expansion of the facilities at the sea port, the concept of dry ports in their many forms has gained momentum over the past few years. The efficient and effective operation of the dry ports reflects on the sea port (Cullinane W. , 2013).

World trade increased between 1966 and 1983 and this has been shown to have coincided with the adoption of the container as a means of transacting in global trade (Bernhofen, El-Sahli, & Kneller, 2013). Containerized trade is still on the rise and in the year 2018, it grew by 6.4 per cent and based on forecasts, dry bulk and containerized cargo is expected to have the fastest growth contributing to a 3.8% forecasted compounded rate of growth in world trade between the year 2018 and 2023 (UNCTAD, Review of Maritime Transport, 2018). Extensions of the sea port can be in various forms based on specialization of cargo handled. It can be a dry port or an Inland Container Terminal (ICD). A dry port is accommodates all types of cargo wheareas ICD specializes in containerized cargo, (UNCTAD, Globalization of port logistics: Opportunities and challenges for developing countries, 1982).

Due to the constraints brought about by increased traffic volumes in maritime trade, sea ports have been increasing the development of ICDs as operational and space improvement strategic centers. An ICD is a facility used by various parties other than a seaport that offers capacity to handle and store containers connected to the port at sea by a high volume mode of transport and controlled by customs. Other activities that occur at an ICD include Cargo merger and distribution, receiving and delivering of containers, clearance by customs and container maintenance (Mwemezi & Huang, 2012). The phenomenon of ICDs is well developed in the

developed countries and in the recent past it has gained pace in the developing countries including Asia and Africa. It has far reaching benefits to the sea port, hinterland and the nation including capacity increase and decongestion of the seaport, reduced road accidents, congestion and road maintenance costs and pollution following reduction of trucks on the road, new job opportunities and reduced migration to the sea port (Lumsden, Roso, & Kent, 2009).

1.1.1 Port Management Systems

ISO defines a management system as a way in which a firm manages the interrelated parts of its business so as to achieve the set objectives (Stevens, 2018).

For a manager to be in control in a port setting, there is need to approach a systematic way of doing things as there are different moving parts, cargo, vehicles, gangs (human resources) and information (Wang, 1999). For the case on Inland Container Depots, key would be storage operations, rail-side operations (for those served by railway) and reception and delivery operations. Cargo operations have different sub-systems which will interact with other systems or sub-systems within the port for efficient actualization of work. A container terminal being a central point for the maritime and land logistics requires a management system that is compatible and standardized for the business processes (Park, 2003).

Most terminal operating systems (TOS) installed contain two modules; main service and added service that combine information and intelligence processing e.g. container location and automatic recognition of container numbers at the gates. The main service modules are Electronic Data Interchange (EDI) systems used for linking other related components that work together to achieve a common goal or objective (Park, 2003). Stand-alone TOS may lack some operational functionalities that ebsures efficiency, data disconnection and non-standardized operational practices. An ERP system approach is used to deal with the stand alone TOS problems by looking at information interconnection, information sharing and information service (Park, 2003).

This study will focus on these operations management systems applied on an ERP system approach; Main TOS and supporting systems applied in the main areas of an inland container depot operations; storage, rail operations and gate operations focusing on planning, operations and information sharing.

1.1.2 Operational Efficiency

Operation is the discharge of a function and involves different people doing different things whereas efficiency is the quality of doing things without wastage of time and money (OxFord Learners Dictionary). Operational efficiency is the corner stone of every undertaking for any organization and is concerned with minimization of waste and maximization of resources utilized in providing quality goods and services. It entails designing of new work processes to improve productivity and quality through elimination of inefficiencies and pursuance of best practices in a given industry (Batra, 2016). An organization is said to have efficiency when a correct combination of the human resource, processes and technology are used to enhance the productivity of its operations while reducing the cost of running the routine activities. With this, resources which would have otherwise been used to run routine activities are redirected to enhance other capabilities of the business (Richard, 2011).

Operational efficiency is measured for achievement of strong, long lasting results intended to grow an organization. Each unit in an organization has different objectives which contribute to the overall objective of the firm and operational efficiency is meant to be evaluated from time to time so that the overall objectives are achieved not only for survival in the long run but also for income and wealth creation (Batra, 2016). Monitoring of port efficiency is necessary and important due to the part they play in the development of a country and their impact on global trade. Further to this, it is a vital point of control due to the increasing nature of competition in the world over (Elsevier, 2017).

Efficiency entails setting up of standards or targets and measuring achievement against such set standards. It has more to do with the measure of the ability of men, machine, material, money and management to be productive (Batra, 2016). Efficiency has to do with how well something is done in term of speed, time and resource utilization. The speed of moving cargoes in and out of a port will determine performance thus port efficiency is a determinant of port performance (L.Tongzon, 1994). Port operational efficiency is mainly monitored to increase or maintain throughput; total traffic handled and in the case of containerized cargo, it is the total number of twenty foot equivalent units (TEUs) that go in and out of a terminal. Throughput is dependent on efficiency. Operational Efficiency is mainly affected by factors within the control of an

organization and therefore an organization seeking to improve its performance should seek to reduce their inefficiencies (Rajasekar, 2014).

1.1.3 Inland Container Depot – Embakasi

Inland Container Depots in their form as dry ports have been participating in a noteworthy role in port capacity expansion and thus the need for them to operate efficiently so as to continue being agents of good sea port performance (ESCAP, 2018). The ICD at Embakasi having been established in 1984 was expanded in 2017 following the operation of the Standard Gauge Railway with a throughput capacity of 450,000 TEUs annually (Kenya Ports Authority). By the end of the first quarter of 2018, the ICD received approximately 450 Twenty Foot Equivalent units (TEUs), up from less than 100 TEUs previously, a figure which was expected to rise to 1,200 TEUs by December 2018 (SCEA, 2018).

The need for efficiency within the ICDE is among other issues that have been highlighted as a means of preventing cargo from being held up at the facility and prolonging the supply chain. Other issues identified that lead to a complex last mile were inefficient use of equipment, mismanagement, procedures and processes which are isolated and lack of strategy coordination and planning. The Terminal Operating System (TOS) was identified as having a crucial role in achievement of efficiency at the facility and its modernization was recommended for linkage with transporters. Good positioning of scanning equipment to ease exit of trucks and provision of a document processing center for cargo requiring additional intervention for adherence to set laws were also recommended as issues that would enhance efficiency at the ICDE (SCEA, 2018).

In terms of cargo documentation, the ports have made strides in digitalization and automation of trade transaction processes with the introduction of an online clearance platform; Kenya TradeNet System under the Kenya Trade Network Agency (KenTrade). The module based system is aimed to automate cargo clearance documentation through integration or interfaces for 42 stakeholders and more than 1000 users who include 35 Partner Government Agencies (PGA's) and having a link to financial institutions through the iTax system owned by Kenya Revenue Authority and Governments eCitizen platforms. This ensures an end to end cargo documentation platform (KenTrade, 2011).

The ICD offers services rendered by different stakeholders and mainly clearance of cargo by customs. It is fully operated by the Kenya ports Authority who offload and load trains and trucks for delivery of cargo to customers. Their ISO Objectives are to have trucks turn around within 30 minutes of entry into the ICD and for wagons to enter and leave within 2 hours 30 minutes after offloading and loading of a train (Kenya Ports Authority). Among the key selling points of the ICD is being a one stop center for shipping and cargo documentation and reduction of cargo dwell time by enhanced dispatch of imports and take off of export containers, points which speak to the efficiency at the facility (Kenya Ports Authority). However, in the last quarter of 2018, the facility was highly criticized for not matching its efficiency with the increased use of the Standard Gauge Railway (SGR) (Standard Digital, 2018).

1.2 Research Problem

Management systems assist organizations achieve their targets by providing information internally and externally for the support of the management function, give advance information to managers for planning purposes, help in improvement of administration and in making accurate large scale decisions overly affecting the performance of organizations. The systems help to reduce managerial and human costs and make work more accurate and faster (Malkawi, 2013). Due to the increase in information and task complexity, revolution in the use of systems has reduced physical human work output and increased the cognitive load. However, manpower is still being utilized to improve efficiency across the industry (Kumar & Kumar, 2019).

In Kenya, there is an ongoing drive between the government and all stakeholders, including shipping lines to promote logistics efficiency and cost effectiveness through the northern corridor served by the SGR through its freight operations to the Inland Container Depot Embakasi. These will be achieved by using a new model where cargo shall terminate at the Inland Container Depot (ICD) as opposed to Mombasa (NTTCA, 2007).

The dry port concept has already been very beneficial globally, having an impact in logistics efficiency, the environmental and logistics quality. However, regional and local authorities must identify the exact challenges associated with the developments of dry ports so as to come up with the best solutions for developing efficiency, effectiveness and sustainability while recognizing that dry ports are a global phenomenon with local characteristics (Wilmsmeier, Cullinane, & Rickard, Dry Ports - A golbal Perspective: Challenges and Developments in Serving Hinterlands,

2013). Many developments have been made to ensure the efficient working and competitiveness of the ports in global trade but terminal operating systems were identified as the brain in charge of all processes produced within an inland port and are deemed to enhance port efficiency and the supply chain (Peralta, 2019).

Peralta (2019) established that terminal operation systems are mostly used in the following areas; Warehousing, Maritime part of Operations, gate management, Master Data, Communications, and ERP Dashboard. In his research he identified tracking of vessels in the time aspect, ability to optimize space, generation of loading and off-loading tallies, and the enhancement of ease of locating containers as some of the most relevant functionalities. The study concluded that to improve on efficiency and performance, the use of the functionalities should be enhanced (Peralta, 2019). In a study in conducted by Omwansa (2013) which aimed at establishing the role of various information technologies in the improvement of operational efficiency in supermarkets in Nairobi, and the relationship between the level of adoption of these applications and operational efficiency attained, it was established that supermarkets with largest extent of ICT application in their premises had the highest operational efficiency. Further, establishments with a wide array of applications had higher efficiency in their operations (Omwansa, 2013). In a paper presented in the seventh global Conference on Business and Economics titled The Influence of MIS and ICT on Performance Management and Satisfaction, which sought to examine whether MIS and ICT have affected the assessment of business performance and strategies, it was found that the more technological systems and the more information provided, the more successful the performance of the firm (Boonmak, 2007). This study seeks to find out critical factors affecting operational efficiency at the ICDE and in particular how port management systems impact on efficiency as well as understand mitigation measures that can be implemented to fuel growth in the country and region as envisaged.

1.3 Research Objectives

The main objective of study is, identification of critical factors impacting on the operational efficiency of dry ports taking a case study of the Inland Container Depot - Emabaksi. The specific research objectives are:

i. To establish the extent of utilization of port management systems at the Inland Container Depot at Embakasi

ii. To establish the relationship between Port Management Systems and Operational efficiency at the Inland Container Depot at Embakasi

1.4 Value of the Study

The ministry of transport under will find the knowledge useful in financial and strategic decision making even as they seek to implement an additional facility in Naivasha served by the Standard Gauge Railway (SGR).

Stakeholders in the transport sector, who import, export and use the SGR for logistics; shipping lines, clearing agents, and the general public who will get a deeper understanding of the inland port.

Other government agencies whose activities are conducted within the dry port will benefit in understanding factors impacting on operational efficiency and if their operations systems affect the efficiency.

The study will also provide reference for scholars and academicians as a point of further study in the area of dry port efficiency and factors affecting it.

CHAPTER TWO: LITERATURE REVIEW

2.0 Introduction

This chapter scrutinizes available literature review on the various port management systems and their effect on operational efficiency.

2.1 Theoretical Foundations

A port is a system of the whole transportation system. For this study, the system theory shall be applied. The theory applied to organizations operates on two principles; the organization's boundaries and the relationship with its environment. The theory eliminates the association of an organization and its parts to the environment in that the boundaries are permeable and it gets feedback from its environment allowing the organization to adapt to changes. It also promotes the idea that one part of the system affects the others making the whole system work (Heylighen, Joslyn, & Turchin, 2000).

A system has two components; elements and interrelationships and can therefore be defined as a set of elements standing in interrelations among themselves and with the environment (Wang, 1999). A port has many more functions with a close relationship with the function of cargo handling and storage and they collaborate to make everything work efficiently. The interrelationships within a port are tangible; can be modelled mathematically or verbally. For example port indicators can measure the relationship between operational efficiency and performance, half tangible; can be seen in the relation of world trade without clear impact levels whereas intangibility comes about when the port performance is affected by external factors. The port is also a physical social open system; it is physical in that it has infrastructure, social in that it involves a lot of social activities e.g. customs authority activities and is an open system as it interacts with the environment (for it to function cargo comes in and out) (Wang, 1999).

The three main elements of transportation are nodes (port), lines (Railway) and flows (vehicles on the routes) and the port is significant due to the interfaces it has with the rest. Technological changes and globalization of trade have led to revolution in transport causing change in the uses of the ports through increased cargo-handling, improved operational methods and facilitation of land access and new ways of handling different forms of cargo. Based on the numerous activities

that take place in a port, there are a lot of elements involved including operations, relations between people and equipment, financials and problems; social, economic and political. Due to this, the port is an entity to be planned and arranged. Port is a system of the whole transportation system and therefore the system theory applies (Wang, 1999).

2.2 Port Management Systems

Competitive advantage and business performance have in the recent past been heavily influenced by service innovation. For port development, management systems have been seen to play a big role in information processing from origin to destination in addition to facilities and infrastructure. Good modern equipment with an integrated automated system was seen to have a close relationship with efficiency of port service provided and overall performance of the port (Hariondo, 2017). According to (UNCTAD) 1999, ports were regarded as service centers that play a vital role in sustainability of the supply chain through efficient operational and logistic activities (Hariondo, 2017). The Inland Container Depot at Embakasi enables cargo owners to clear their cargo from the hinterland and the facility has a one stop center where they can access all services required for the clearance of cargo.

Stakeholder operating inside the port and involved in the clearance processes at the port are the Kenya Railways (KR), Kenya Revenue Authority (KRA), Kenya Bureau of Standards (KEBS) ,Kenya Trade Network Agency (KenTrade), Transporters who offer last mile solutions, clearing and forwarding agents, shipping lines and port security agencies. Inadequacy in systems infrastructure and services by these stakeholders also affects the flow of cargo through the port (Ojadi & Walters, 2015). In an effort to enhance empowerment to the Kenya Maritime Authority (KMA) and appreciate the risk management approach to KEBS, the Electronic Single Window (eSW) was implemented through KenTrade, financed by the International Finance Corporation (IFC). Among the key benefits of the implementation was cost reduction, improved connectivity, Processes and Procedures, enhanced efficiency, Productivity and Consistency in Operations of Government Agencies, Reduction in Time and Number of Processing Pre-import Documents, Increased Level of Automation, Productivity and Consistency in Operations of Private Sector Organizations and Faster Clearance and Release of Cargo among others (International Finance Corporation, 2018).

The stakeholders involved in the port activities need to work together to enhance efficiency at the facility and this involves collaborative planning and coordination from rail planning, resource planning which includes analysis of resource, allocation of personnel and equipment, yard planning for exports, imports and empty containers (Hyung Rim Choi, 2003). Typical port operating systems include gate systems, yard equipment systems and control room systems. Among these, Gate systems are considered the most important because almost all activities are tied to the gate process and it has an effect on the traffic situation for the community outside the port. Yard system technology includes those involved in automating crane systems, Global Positioning System (GPS) and tags in the ground. They also include Hand Held Terminals which can be used to pick container details. Control room systems majorly installed to oversee the general health of the port operations and react to uncertainties and bottlenecks as they have an overview of the situation in the whole port. It usually includes high resolution Closed Circuit Television (CCTV) cameras (Seng, 2010).

Documentation systems include all the systems that are utilized for Vessel, container, cargo and gate documentation, those that provide system generated reports and the billing system used at the port (Seng, 2010). Such systems are critical for the support of decision making for management. They ensure visualization for prompt response to eventualities, contact with the customer through one platform for purposes such as tracing of cargo and viewing of status. They can be implemented through various methods; Web, Computer Telephony Integration (CTI) or Internet Telephony Integration (ITI) (Hyung Rim Choi, 2003).

2.3 Operational Efficiency

Operation is the part of the business tasked with producing goods or services. For the purpose of this study, we shall focus on the production of services which entails activities providing a combination of time, location, form and psychological value. Ports whether sea or inland greatly affects the productivity of a country and thus their understanding, what affects their efficiency and how to control and maintain operational efficiency is paramount. Port efficiency is mainly monitored to increase or maintain throughput which is a measure of performance. Operational Efficiency is mainly affected by factors that are within the control of an organization and therefore an organization seeking to improve its performance should seek to reduce their inefficiencies (Rajasekar, 2014).

The process of cargo handling at the ICDE begins with the arrival of containers through the SGR and is placed in designated blocks within the port. The location of the TEUs is recorded in the KPA terminal operation system which provides real time information on cargo at the facility. The cargo is taken through scanners to monitoring and analysis of contents of the TEUs. The scanners are part of the rollout of the KRA integrated Customs Management System (iCMS) expected to be fully operational by the end of 2019. The system which can scan cargo on the move is expected to reduce the human intervention in verification of cargo by customs officials from the current 60% of containers to only 30%. Cargo owners through clearing agents then provide the various government agencies with declarations of contents for ascertaining of the various taxes and levies required which upon payment they can collect their cargo. The transporters then access the ICD through either of the two gates available and are directed to the location of their cargo and go through the scanner as they exit the facility (SCEA, 2018).

For purposes of this study efficiency we shall focus on the physical flow which includes the flow of information that fuels the activities at the port. Information flows to be considered are: Sharing of information between stakeholders to fuel work, sharing of information between the three physical flow areas; rail side, yard and gates (Planning and operation systems), sharing information between the ICD and the client (Documentation system).

Efficiency indicators for the three operation areas shall include time taken to share vital documents that fuel operations (Train manifest, loading lists, declaration documents, pre advice list, gate in/out tickets), time taken to offload and load a train and truck, train turnaround time, truck turnaround, equipment idle time, Equipment moves/hour, number of trucks gated in and out, truck waiting time.

2.4 Port Management Systems and Operational Efficiency

As world trade and containerization continues to grow, it is expected to be increased demand in the port systems, more than is currently being experienced. Ports being the linkages between sea and other modes of transport must therefore operate efficiently while providing this link. Global freight demands of the intermodal freight transport system are growing exponentially whereas available land for infrastructure additions and improvements is reducing drastically. This means that ports will soon be operating in sever land constraints in addition to the human resource controls. Installation of additional infrastructure cannot happen meaning that what is available

has to be utilized efficiently to create capacity. Port Management Systems offer the opportunity for capacity expansion through optimization of the existing infrastructural resources (Bieschke, 1998). Inland Container Depots are a critical transfer point for cargo through the transportation and distribution process yet transfer between vessel and inland destinations is weak, least efficient and costly (Transportation Research Board, 1992).

There is increased need to cut costs for intermodal terminal operators, reduce congestion and claims on damages, and achieve higher yard efficiency overall levels leading to implementation of various port systems in a bid to revolutionize the impacts on physical freight distribution. Technologies that are deemed to improve the operational efficiency are cargo and equipment tracking, Automated guided vehicles and communication and data exchange technologies (Bieschke, 1998). Such systems offer the capabilities of tracking, identity and monitoring of cargo and equipment in real time ensuring inventory control, reduced stowage time, reduced labour associated costs and simplified inventory checks for faster, reliable and efficient operations.

In freight transportation, if information does not move, then neither does the cargo. The more seamless information sharing is then the faster cargo moves form origin to destination. Therefore to save of cost, time and improve efficiency adoption of electronic modes of data exchange is critical. They help reduce processing inside the terminal and inspection time, increase the throughput of vehicles, improved accuracy of data, yard efficiency enhancement, and elimination of paperwork at the gates (Bieschke, 1998).

According to (UNCTAD) 1999, ports were regarded as service centers and they play a vital part in sustainability of the supply chain through efficient operational and logistical activities (Hariondo, 2017). Competitive advantage and business performance have in the recent past been heavily influenced by service innovation. For port development, management systems have been seen to play a big role in information processing from origin to destination in addition to facilities and infrastructure. Good modern equipment with an integrated automated system was seen to have a close relationship with port service efficiency and overall port performance (Hariondo, 2017). From the elaboration of the port management systems above and their

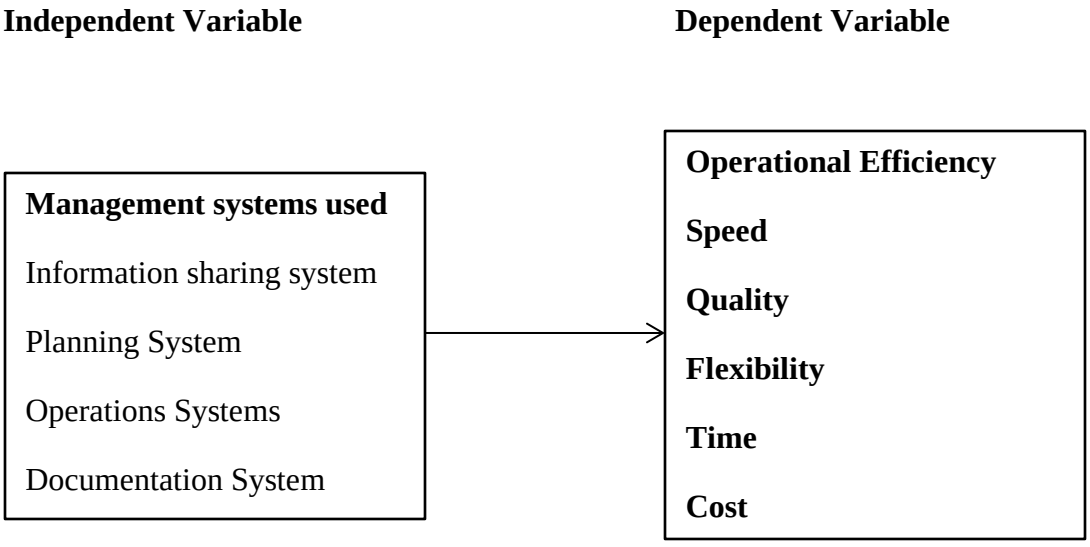
functions, their impact on port efficiency is clear based on their benefits in cost, speed, time and quality; elements of efficiency.

2.5 Empirical Review and knowledge gap

Study	Objective	Research Gap	Source
KPI Evaluation and Performance Measurement in Dry port-sea port systems: A Multi Criteria Approach	Develop a new model of performance measurement for the dry port-sea port system	Improving recognition of requirements and diversity of agents that operate in the dry port-seaport system environment	(Bentaleb, Mabrouki, & Semma, 2015)
Sea-Port Operational Efficiency: An evaluation of five Asian Ports using Stochastic Frontier Production Function Model	Evaluate operational efficiency of ports and reveal their position in the port competitive environment	Use of a different approach to examine the determinants of efficiency at ports and the study of more ports	(Kennedy, Lin, Yang, & Ruth, 2011)
Process and Challenges of Implementing strategic change: A Case study of KWATOS project at KPA	Determine the change process used in the implementation of KWATOS project at KPA Determine the challenges faced by KPA in the implementation of KWATOS	Evaluation of KPA Port management system after implementation	(Katema, 2009)
Determinants of Port Performance and Efficiency	Establishing a model for port performance and efficiency	What other factors influence performance and efficiency of ports	(Tongzon, 1994)

2.6 Conceptual Framework

The conceptual framework is represented in the diagram below. For this research we shall concentrate on the activities that are directly concerned with container movement in the Inland Container Depot which directly affect operational efficiency excluding other background activities which are individual to particular organizations within the port community. We shall narrow down to the critical activities touching on cargo movement; Information sharing which fuels operations, Loading and Offloading, and Gate Operation scheduling and operation. The end goal of effective use of port management systems is attainment of operational efficiency that will generate into increased throughput. Operational efficiency is explained using variables of speed, flexibility, quality and cost efficiency.



Source: Researcher

CHAPTER THREE: RESEARCH DESIGN

3.0 Introduction

The following section will discuss the design of the research under study, targeted population and the way the data will be collected for each area of interest (data gathering) and how the data gathered will be analyzed for interpretation of results.

3.1 Research Design

This research is a case study of the Inland Container Depot and it will employ the both descriptive and exploratory research methodology in an attempt to explain the impact of port management systems on Operational Efficiency and find out the other factors affecting operational efficiency at the Inland Container Depot respectively. The research will apply both quantitative and qualitative research designs to answer the research questions.

3.2 Respondents

The study targets the port community which is constituted by Management of the Key government agencies, members of the Kenya International Freight and Warehousing Association which is an umbrella body for all the clearing, forwarding and warehousing companies in Kenya, agents, staff for the different government agencies, Kentrade, clearing agents and Kenya Ships Agents Association. Stratified sampling method will be used to come up with a sample for each of the groups.

3.3 Data Collection

The study shall employ qualitative and quantitative measures of Primary data collection shall be employed. For the qualitative study In Depth interviews shall be conducted through the use of interview guides (Appendix 1). Quantitative data shall be collected by use of questionnaires that shall be administered to the respondents face to face at the Inland container Depot (Appendix 2). For operations data, observation and recording of time taken shall be done and recorded in a data sheet spread out within the three shifts in the port (Appendix 3). This will ensure the information is recent and better in terms of reliability as there is opportunity to control the process of collection.

3.4 Data Analysis

Qualitative data collected shall undergo content analysis for classification, summary and tabulation. Analysis will involve description and interpretation in answering the question of factors affecting operational efficiency and extent of system use. Data collected will be used to generate descriptive statistics indicators e.g. means, percentages and frequencies, to analyze the demographics and questions that will answer specific research questions. Perceptions will be analyzed on a Likert scale. A regression analysis will be used to establish impact using Statistical Package Social Sciences (SPSS) to run the regression analysis in the following form:

$Y = b_0 + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 \ldots\ldots b_pX_p$ Where;

Y = Operational Efficiency

b_0 = Constant

b_1 to b_p = Estimated regression coefficients

X_1 to X_p= distinct independent variables are the systems used by the port community (For this case Government Agencies, Clearing agents, Transporters). E.g. X_1 = extent of usage of Port Management Systems in ICDE activities.

A summary of the methodology that will be used is as follows:

Table 1: Methodology

Objective	**Data Collection Method**	**Data Analysis Method**
To establish the critical factors affecting operational efficiency at ICDE	Questionnaires	Descriptive statistics
	In Depth Interviews	Content Analysis
To establish the extent of utilization of port management systems at ICDE	Questionnaires	Descriptive statistics
	Observation	Descriptive statistics
To establish the relationship of Port Management systems and efficiency at ICDE	Questionnaire	Regression Analysis
	In Depth Interviews	Content Analysis

CHAPTER FOUR: DATA ANALYSIS, PRESENTATION, INTERPRETATION AND DISCUSSION

4.0 Introduction

Findings based on the objectives of the study are discussed in this chapter. It includes data on the questionnaire return rate, demographic characteristics of the respondents, interpretation and present findings obtained from the field on the critical factors affecting operational efficiency, extent of utilization of port operations management systems and impact of Port Management Systems on Operational Efficiency at ICDE.

4.1 Questionnaire Return Rate

There were 32 respondents that participated in this study indicating a 71.11% response rate. This was deemed sufficient enough for this study. The study also employed the use of interviews as a way of getting in-depth information on the use of systems in port operations and its effect on efficiency.

4.2 Demographic Characteristics of the Respondents

The study targeted three categories of respondents grouped into the three critical areas of port operations namely; Government agencies, agents and transporters. The demographic information of the respondents was therefore grouped as per the functional areas and is presented in table 2.

Table 2: Transporters demographic information by gender

Gender

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	16	100.0	100.0	100.0

All sampled transporters were male respondents, representing 100 percent of the sampled population

Table 3: Transporters Demographic Information for years worked

Years Worked at ICD

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Below 5 Years	3	18.8	18.8	18.8
	Between 5-15 years	9	56.3	56.3	75.0
	Between 15-25 Years	3	18.8	18.8	93.8
	Above 25 Years	1	6.3	6.3	100.0
	Total	16	100.0	100.0	

From the data obtained from the respondents, most respondents had between 5-15 years of experience in the facility. This represented 56.3% of the respondents. Table 2 shows the summary of the years worked by the respondents in the sector. Among respondents from government agencies, males represented 40% of the respondents while females were 60%. The data is presented in table 3.

Table 4: Agencies demographic information by gender

Gender

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	2	40.0	40.0	40.0
	Female	3	60.0	60.0	100.0
	Total	5	100.0	100.0	

Table 5: Agencies demographic information by years worked

Years Worked at ICD

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Below 5 Years	5	100.0	100.0	100.0

All respondents in this category had worked at ICD for less than 5 years as shown in table 4 above. Table 5 indicates that 81.8% were male while 18.2% were female respondents.

Table 6: Agents demographic information by gender

Gender

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	9	81.8	81.8	81.8
	Female	2	18.2	18.2	100.0
	Total	11	100.0	100.0	

Data further shows in table 6 that 45.5% of respondents had worked in the sector for between 5-15 years while those who had worked for below 5 years and above 25 years each accounted for 27.3% of the respondents.

Table 7: Agents demographic information on years worked

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Below 5 Years	3	27.3	27.3	27.3
	Between 5-15 years	5	45.5	45.5	72.7
	Above 25 Years	3	27.3	27.3	100.0
	Total	11	100.0	100.0	

4.3 Critical factors affecting operational efficiency at the ICDE

The general aim of this research was pick out the critical factors affecting operational efficiency. This was important because the data obtained would inform the researcher on the areas that need focus in bringing change to the sector. The researcher sought to find out from all categories of respondents the factors that they think affect the operational efficiency in cargo movement in ICDE. The data collected was sorted and categorized into System factors, infrastructure, resource management, documentation, external factors and natural effects. The findings were summarized in table 7 below.

Table 8: Critical factors affecting operational efficiency

Category	Indicator
System factors	• System downtime • Lack of an all in one system for ICDE users • Lack of integrated system between agencies

	• Delays in updating the system
Infrastructure	• Machine Breakdown • Lack of feeder roads to ICDE • Lack of enough parking space
Resource Management	• Bureaucracy • Congestion • Inefficient loading and unloading processes • Delays in change of shifts
Documentation	• Clients inability to locate containers for loading • Lack of proper documentation process • Delays in documentation • Mis-declaration of cargo
External Factors	• Government policies
Natural effects	• Weather conditions
Others	• Corruption

The respondents were further requested to give suggestions on measures to be taken to improve operational efficiency at ICDE. The suggestions given by respondents include; regular maintenance of equipment, establishing uniformity in clearing and documentation of different kinds of goods, Automation of processes, review of government policies, sensitization of clients to ensure transparency, partnering with private sector, integration of all systems, elimination of bureaucracy, addition of more port handling equipment, dedicated entry and exits, proper management of personnel and shifts and addition of more train wagons for empty containers. This information points to lack of proper infrastructure in ICD which affects port operations.

The content analysis from interviews conducted showed that 60% of cargo was cleared within 4 days while 40% took longer because of several challenges as summarized in table 9.

Table 9: Challenges faced in port operations

Challenge	**Description**
Government Agencies	Determination of which cargo comes to ICD: There is no clear science in which cargo is railed to ICD as they rely on an address location to move cargo to ICD. Companies have Nairobi addresses but the factory is in Mombasa leading to their cargo being railed to Nairobi
	Regulations: Regulations requiring certain documentations done e.g approval

	for exemptions, different declarations. This takes time as it is not system based Interventions of suspect cargo that needs further intervention after scanning; concealment, classification for coding for tax purposes, value of cargo. This may take a while as KRA has to rely on another agency to relocate such cargo to designated areas which may take time. Sometimes, higher level decisions and tests may be required, which brings in KEBS whose target is 14 days for testing and reporting.
Importer challenges	Finances not ready, disputes with the clearing agent or exporter due to documents not availed leading to delays
Clearing agents	Lack of facilitation by not doing a timely, accurate declaration, and facilitation for the clearance process; physical files have to be submitted, organizing for cargo slated for further intervention to be relocated to the correct area.
Other stakeholders	Transporters and others who play a role in the clearance process

When asked about the remedies to the identified challenges, the respondents noted that several interventions had been put in place, these include; Coordination of cargo clearing agencies, reduction of cargo clearing agencies from 24 to only 4 to facilitate fast movement of cargo with only KRA and KEBS intervening, Accountability by KRA and KEBS agencies with KEBS taking charge of all the other agencies that may want to intervene, investment in systems and processes to reduce clearance time, Incentives to importers, especially compliant importers through a program dabbed Authorized Economic Operators (AEOs), Improve on visibility of cargo and status for everyone including the government agencies importers, agents and transporters for ease of financial and logistical planning and follow up of their cargo through partnership with JAICA, TMEA and the US government, cargo on transit to other countries shall be cleared at Naivasha port while all Kenyan imports shall be cleared at ICD as soon as the SGR line to Naivasha is completed. Lastly, the respondents noted that physical files were in the process of being phased out and a new ICMS system put in place to facilitate faster clearance of cargo.

4.4 Extent of utilization of port operations management systems at ICDE

The study also aimed at finding out the extent of utilization of management systems in port operations. This was important because use of information systems is believed to greatly affect the efficiency of operations in all sectors. Questions were posed to respondents to find out if automated systems were used to carry out any of the activities for movement of cargo at ICDE. 87.5% of the respondents in transporters category agree that automated systems are used. 12.5% disagree. This is summarized in table 10 below.

Table 10: Use of automated systems in movement of cargo

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	14	87.5	87.5	87.5
	No	2	12.5	12.5	100.0
	Total	16	100.0	100.0	

Among respondents in government agencies, 100% of the respondents are of the opinion that automated systems are used in ICDE while among the agents, 72.7% indicate that automated systems were being used.

In order to find out the extent to which systems are used in port operations, respondents were asked to rate the use of the systems in the listed activities in the port. They were required to indicate their perception in a scale of 1-5; categorized as; 1= "Never", 2 = "Almost Never", 3 = "Occassional/Sometimes", 4 = "Almost every time" and 5 = "Always". This information was sourced from agents and Government agencies categories of respondents only. Likert scale was used to interpret the feedback from the respondents. Table 11 shows the findings from agents category of the respondents.

Table 11: Use of systems in port activities (Agents)

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation	Variance	Kurtosis

	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error
bi-directional automated data transfers between TOS and other port systems	9	3	5	4.00	1.000	1.000	-2.429	1.400
Automated population of 3rd party data including EDI, XML, XLS etc.	10	2	5	4.00	1.155	1.333	-1.393	1.334
Automated the dissemination of reports via e-mail	10	1	5	3.80	1.398	1.956	-.146	1.334
Select and Show real time KPI status	9	3	5	4.33	.866	.750	-1.079	1.400
Configure and customize performance dashboards	9	2	5	3.67	1.118	1.250	-1.486	1.400
Ability for electronic reception and authorization from agents, transporters etc.	10	1	5	3.50	1.509	2.278	-1.410	1.334
Visibility and ETA for customers and partners	9	3	5	4.44	.882	.778	-.446	1.400
Electronic proof of delivery	10	3	5	4.60	.699	.489	2.045	1.334
Valid N (listwise)	7							

Table 12 shows the summarized data from government agencies

Table 12: Use of systems in port activities (Agencies)

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Integration facility for bi-directional automated data transfers between the TOS and other port systems that maintain business rules and application logic	5	4	5	4.40	.548
Automated population of third-party data into or out of the system (including EDI, XML XLS, etc.)	5	3	5	4.20	.837
Automated the dissemination of reports via e-mail	5	1	5	2.80	1.643
Select and Show real time KPI status	5	2	5	3.40	1.517
Configure and customize performance dashboards	5	1	5	2.60	1.673
Provide the ability to electronically receive authorizations or approvals from brokers, freight forwarders, truckers etc.	4	1	4	2.50	1.732
Visibility and ETA for customers and partners	5	1	4	2.80	1.643
Electronic proof of delivery	5	1	5	4.00	1.732
Valid N (listwise)	4				

From the data presented, it is evident that these categories of respondents accept to a large extent that automated systems were being used to manage port operations. This is shown by the relatively low standard deviation which symbolizes that there is a small variance in the perception of the respondents on the use of systems.

Analysis of interview response reveals that important platforms especially for government agencies without standalone systems for approval of permits and certificates had been brought together. Agents are able to apply for specific permits for particular imports and KRA can get it upon upload into their system. This eliminated the physical hard copy approvals, reduced time and increased transparency. They further noted that the systems will be integrated with the ICMS and would improve speed of processing documents, transparency as all information would be available to everyone who may want for audit purposes. This information would also assist in profiling which will reduce intervention of cargo, increase in speed of flagging mistakes and corrupt dealings.

This clearly therefore, confirms that systems had been deployed at ICD to manage port operations. It is also clear that the systems were not synchronized.

4.4.1 Use of automated systems in documentation

The researcher had identified lack of proper documentation as major factor causing operational inefficiency in port operations. It was therefore important to get the views of the respondents regarding the use of automated systems in documentation in the port. The respondents generally agree that documentation is done through a system. These are presented in tables below.

Table 13: Use of systems in documentation

Is documentation at ICD done through a system? (Government agencies)

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	5	100.0	100.0	100.0

Is documentation at ICD done through a system?(Agents)

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	11	100.0	100.0	100.0

Is documentation at ICD done through a system?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	15	93.8	93.8	93.8

	No	1	6.3	6.3	100.0
	Total	16	100.0	100.0	

In order to find out the effectiveness of the system use in documentation, the researcher sought to get the perception of the respondents on the use of the system in specific activities related to documentation. The listed activities were put to a scale of 1-5, categorized as; 1= "Never", 2 = "Almost Never", 3 = "Occasional/Sometimes", 4 = "Almost every time" and 5 = "Always". Likert scale was used to interpret the feedback from the respondents. The findings are summarized in table 14.

Table 14: Use of systems in documentation

Descriptive Statistics (Agencies)

	N	Minimum	Maximum	Mean	Std. Deviation	Variance	Skewness	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error
Accommodate customer KPI/SLA requirements	5	1	4	2.80	1.643	2.700	-.609	.913
Incorporate known arrival and dispatch schedules	5	1	5	4.00	1.732	3.000	-1.925	.913
Physical inventory count and reconcile inventory discrepancies	5	4	5	4.80	.447	.200	-2.236	.913
Detail all items by description and reference number	5	4	5	4.80	.447	.200	-2.236	.913
Visibility of all items by arrival/dispatch	5	4	5	4.80	.447	.200	-2.236	.913
Pre-advised pick up orders to match work orders	5	5	5	5.00	.000	.000	.	.
Valid N (listwise)	5							

Descriptive Statistics (Agents)

	N	Minimum	Maximum	Mean	Std. Deviation	Variance	Skewness	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error
Accommodate customer KPI/SLA requirements	11	2	5	3.91	1.044	1.091	-.431	.661
Incorporate known arrival and dispatch schedules	11	3	5	4.09	.944	.891	-.209	.661
Physical inventory count and reconcile inventory discrepancies	10	2	5	3.80	1.135	1.289	-.661	.687
Detail all items by description and reference number	10	1	5	3.80	1.317	1.733	-1.008	.687
Visibility of all items by arrival/dispatch	10	3	5	4.50	.850	.722	-1.358	.687
Pre-advised pick up orders to match work orders	11	2	5	4.18	1.079	1.164	-1.014	.661
Valid N (listwise)	10							

The findings point to a perception that even though the system was deployed to handle most documentation issues, there were still gaps in meeting the client documentation needs.

4.4.2 Use of planning and operation systems in port operations

As part of identifying the extent of the use of automated systems in port operations, the researcher set out to establish the extent to which planning and operation systems were used in port operations. Respondents were asked to indicate whether operational aspects were done through the system in a scale of 1-3 where 1 represented "Yes", 2 Represented "No" and 3 represented "Don't know". Their responses were summarized in table 15.

Table 15: Use of planning and operation systems

Descriptive Statistics (Transporters)

	N	Minimum	Maximum	Mean	Std. Deviation	Variance
Yard Operations	16	1	2	1.06	.250	.062
Gate Operations	16	1	1	1.00	.000	.000
Rail side Operations	16	1	3	1.25	.683	.467
Valid N (listwise)	16					

Descriptive Statistics (Agents)

	N	Minimum	Maximum	Mean	Std. Deviation	Variance
Yard Operations	11	1	3	1.27	.647	.418
Gate Operations	11	1	2	1.09	.302	.091
Rail side operations	11	1	3	1.18	.603	.364
Valid N (listwise)	11					

From the data, most respondents agree that all listed operations were done through the system. This is shown by the average mean of 1.14 and an average standard deviation of 0.414.

This was further clarified by analysis of frequency tables as shown in table 16 below

Table 16: use of systems in aspects of port operations

Yard Operations

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	9	81.8	81.8	81.8
	No	1	9.1	9.1	90.9
	Dont Know	1	9.1	9.1	100.0
	Total	11	100.0	100.0	

Gate Operations

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	10	90.9	90.9	90.9
	No	1	9.1	9.1	100.0
	Total	11	100.0	100.0	

Rail side operations

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	10	90.9	90.9	90.9
	Dont Know	1	9.1	9.1	100.0
	Total	11	100.0	100.0	

An average of 88% of respondents agrees that systems are used in port operations. To get a definite answer on the use of planning and operation systems in port operations, the researcher set out to gauge the perception of respondents towards the use of the system in some activities of the port. The respondents were requested to indicate their perceptions in a scale of 1-5, categorized as; 1= “Never”, 2 = “Almost Never”, 3 = “Occasional/Sometimes”, 4 = “Almost every time” and 5 = “Always”. This information was sourced from agents and Government agencies categories of respondents only. Likert scale was used to interpret the feedback from the respondents. The findings were presented in table 17.

Table 17: Summary of perception of respondents of use of systems

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation	Variance
Analyze work orders from customers and match to workforce capacity and flag capacity issues	4	3	5	3.75	.957	.917
Match available hours with work order components	5	3	5	4.00	1.000	1.000
Integrate measures of time by activity and operator	5	3	5	4.00	1.000	1.000
Measure of efficiency by individual and task	5	3	5	4.20	.837	.700
Notification of pending arrivals to gate personnel	5	1	5	3.00	2.000	4.000
Notification of yard personnel of pending truck and train arrival	5	1	4	2.60	1.517	2.300
Identify location of each TEU by desired requirements	5	1	3	1.40	.894	.800
Valid N (listwise)	4					

An average mean of 3.28 the system is not always used in port operations. This points to lack of strict utilization of planning and operation systems at ICD.

4.5 Impact of the use of automated systems on efficiency

The researcher sought to gauge the perception of the respondents towards the contribution of the use of systems to efficiency in port operations. This was important in order to identify the contributions of the system to successful operations of the port. Respondents were asked to rate the current way of doing operations as per the listed aspects relating to how business was conducted at the port in a scale of 1-5, categorized as; 1= “Insignificant”, 2 = “Minor”, 3 = “Moderate”, 4 = “Major” and 5 = “Severe”. Likert scale was used to interpret the feedback from the respondents. The findings are summarized in tables 18.

Table 18: Impact of use of systems

Descriptive Statistics (Agencies)

	N	Minimum	Maximum	Mean	Std. Deviation	Variance	Skewness	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error
Speed	5	3	4	3.60	.548	.300	-.609	.913
Cost	5	3	4	3.20	.447	.200	2.236	.913
Flexibility	5	2	4	3.60	.894	.800	-2.236	.913
Quality	5	3	4	3.40	.548	.300	.609	.913
Valid N (listwise)	5							

Descriptive Statistics (Agents)

	N	Minimum	Maximum	Mean	Std. Deviation	Variance	Skewness	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error
Speed	10	1	5	3.40	1.350	1.822	-.244	.687
Cost	10	2	5	3.80	.919	.844	-.601	.687
Flexibility	10	1	5	2.90	1.101	1.211	.238	.687
Quality	4	3	4	3.25	.500	.250	2.000	1.014
Valid N (listwise)	4							

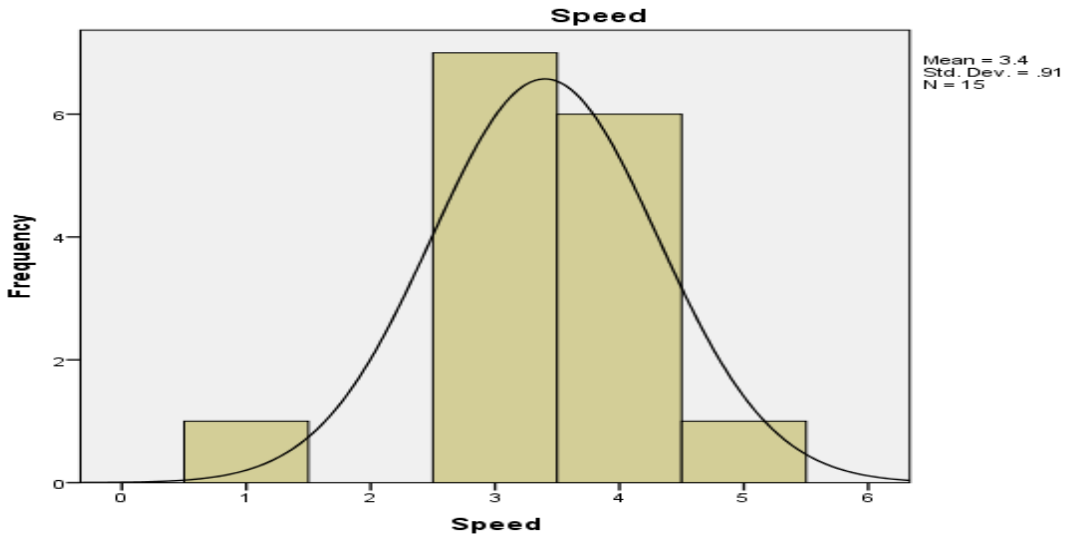
Descriptive Statistics (Transporters)

	N	Minimum	Maximum	Mean	Std. Deviation	Skewness	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error
Speed	16	3	5	3.44	.629	1.183	.564
Cost	16	3	4	3.31	.479	.895	.564
Flexibility	16	3	5	3.19	.544	3.030	.564
Quality	16	3	4	3.19	.403	1.772	.564
Valid N (listwise)	16						

From the responses, it is evident that all categories of respondents agree to some extent that use of systems improve operational efficiency. However, an average mean of 3 points to some problems within the port operations that have not been solved by the use of systems.

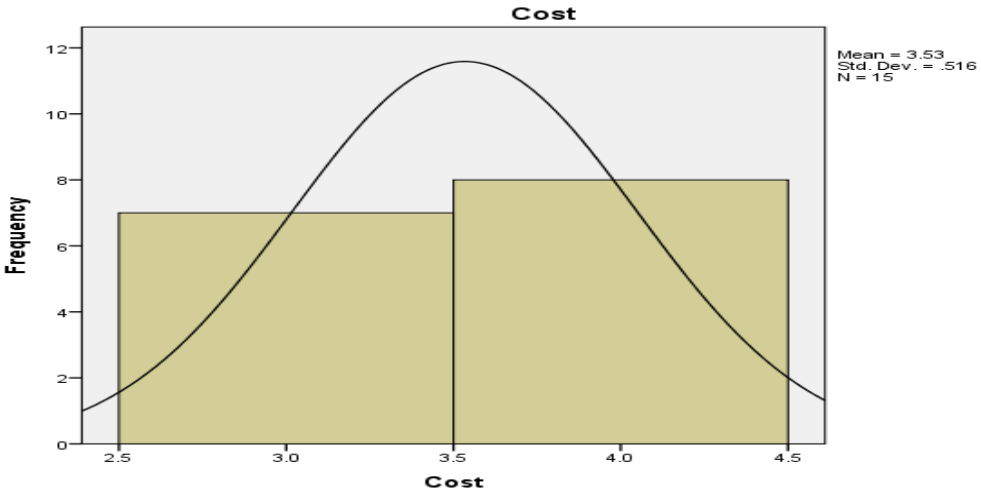
The following figures further clarify the findings from the study.

Figure 1: Effect of systems on speed



A mean of 3.4 would suggest that the respondents to a large extent agree that the current way of doing operations at ICD had an impact on the operational efficiency (speed). This would further suggest that any strategic change in the way of doing business and operations would affect efficiency in port operations.

Figure 2: Effect of Systems on Cost



The cost implications is also clearly demonstrated with a mean of 3.53 suggesting that operational activities majorly affects the cost of movement of goods in the port. This also applies to flexibility as demonstrated in the figure below.

Figure 3: Effect of systems on flexibility

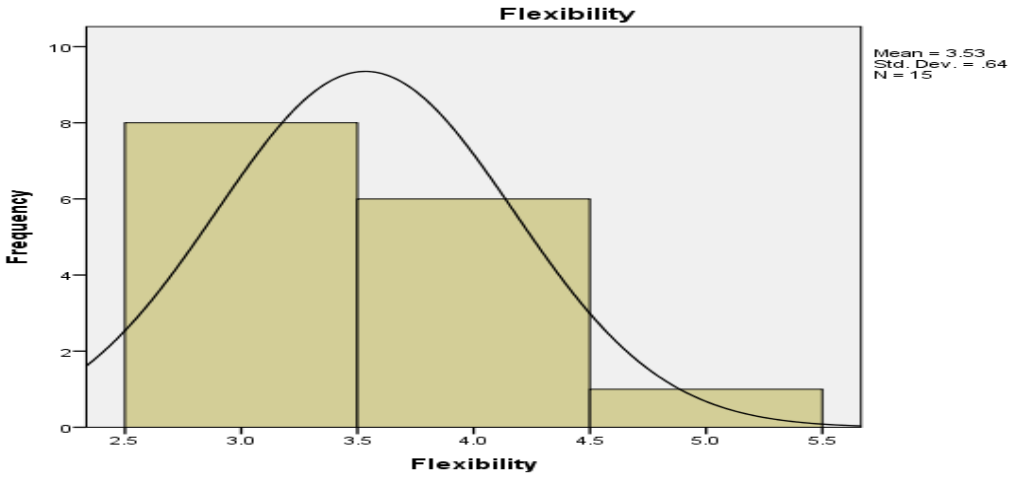
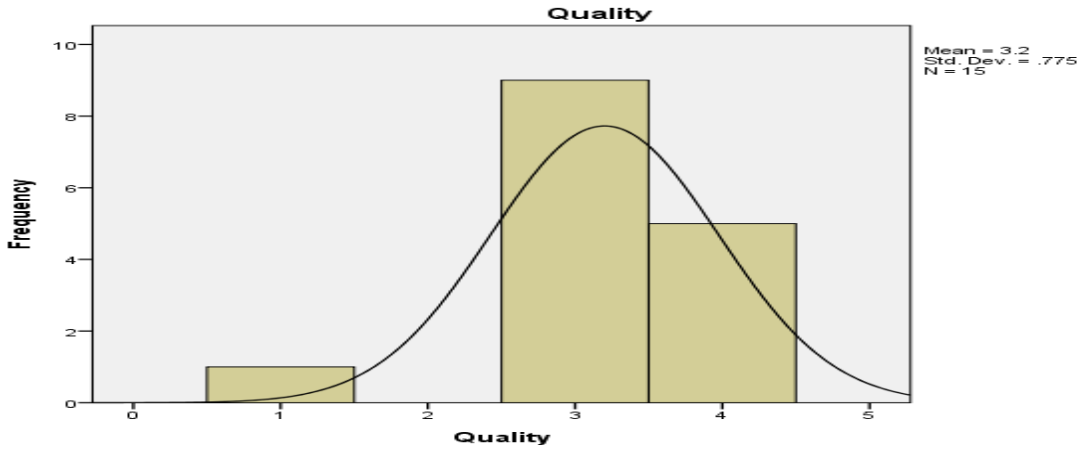


Figure 4: Effect of systems on quality



The data also indicates that quality of service delivery is to a large extent affected by the operational activities at the port. The standard deviation from above diagrams is relatively small. This point to an assumption that the operational efficiency indicators are affected by the systems currently in use at the port. This was also supported by results of regression analysis on data which indicate that automated systems have a direct positive linear correlation between the use of systems and aspects of operational efficiency.

Regression

Model Summary[d]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.054[a]	.003	-.122	.84058	.003	.024	1	8	.881
2	.548[b]	.300	.100	.75297	.297	2.970	1	7	.128
3	.821[c]	.674	.511	.55518	.374	6.876	1	6	.039

a. Predictors: (Constant), Govt_agencies

b. Predictors: (Constant), Govt_agencies, Agents

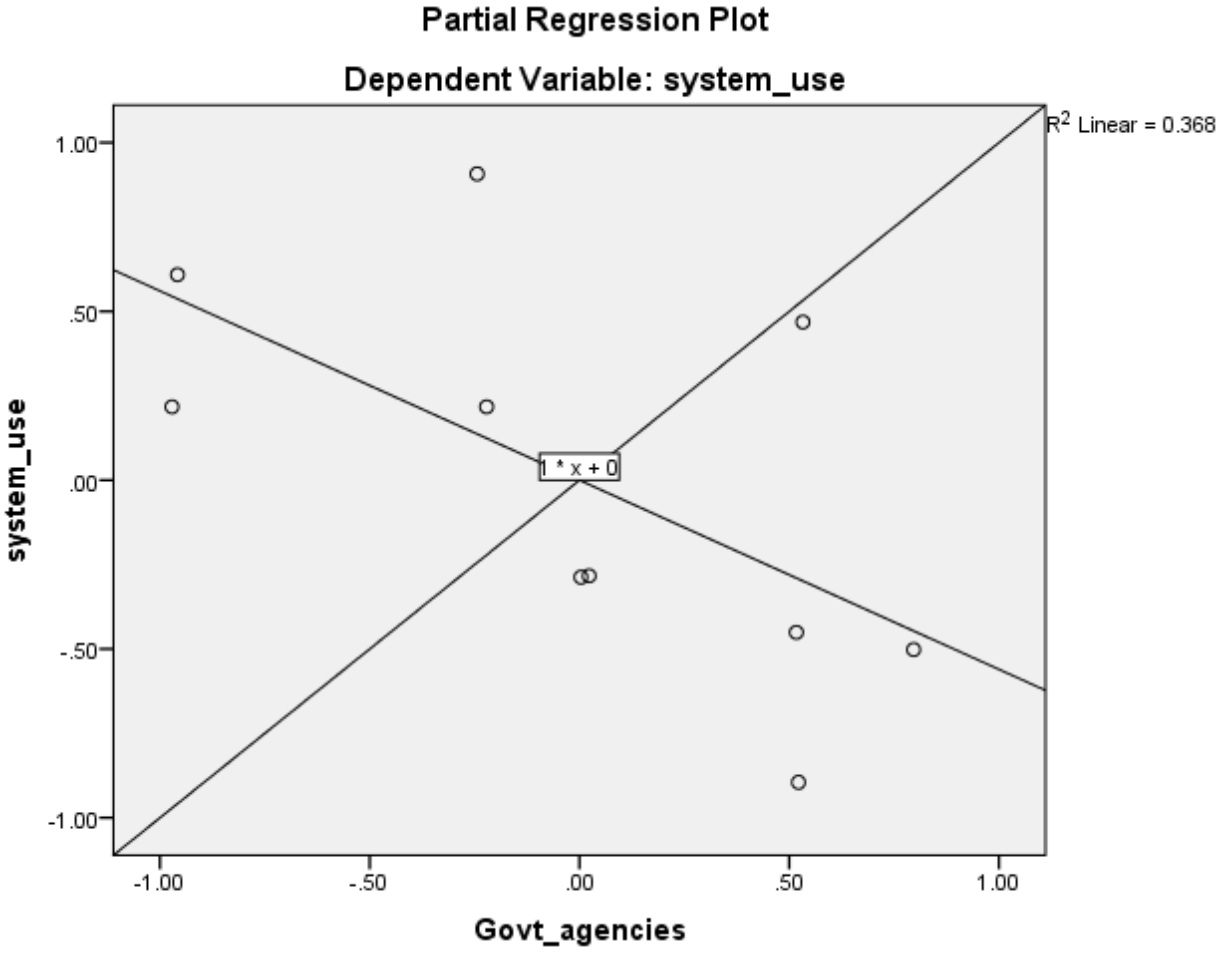
c. Predictors: (Constant), Govt_agencies, Agents, Transporters

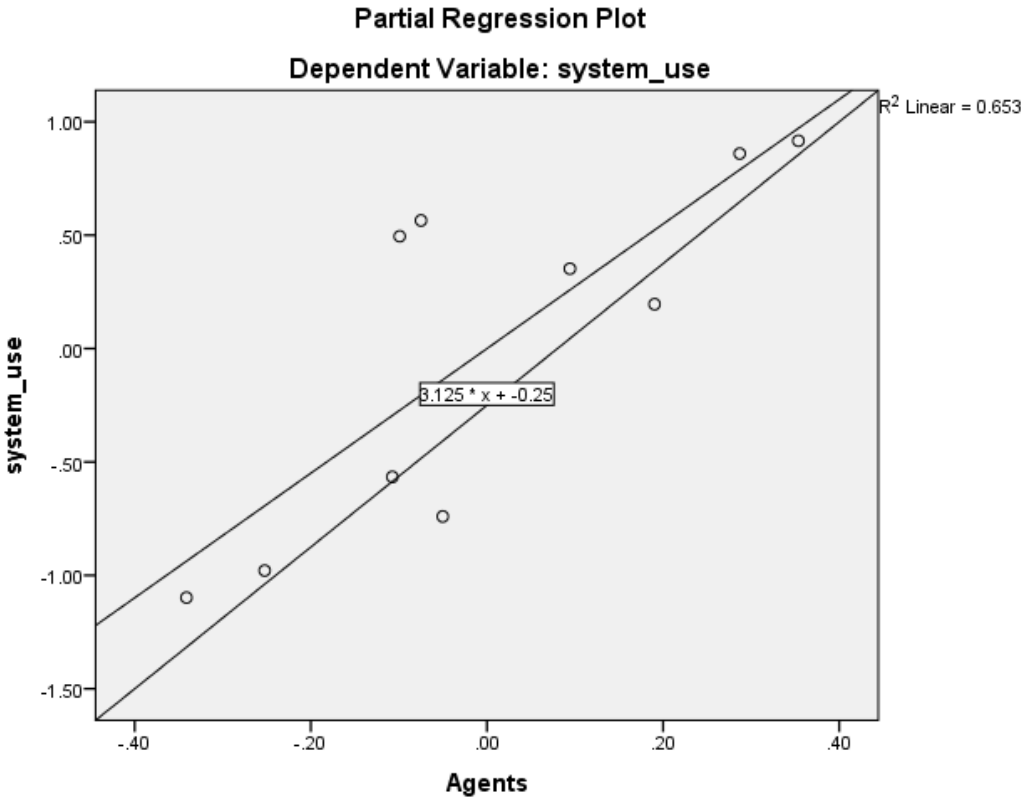
d. Dependent Variable: system_use

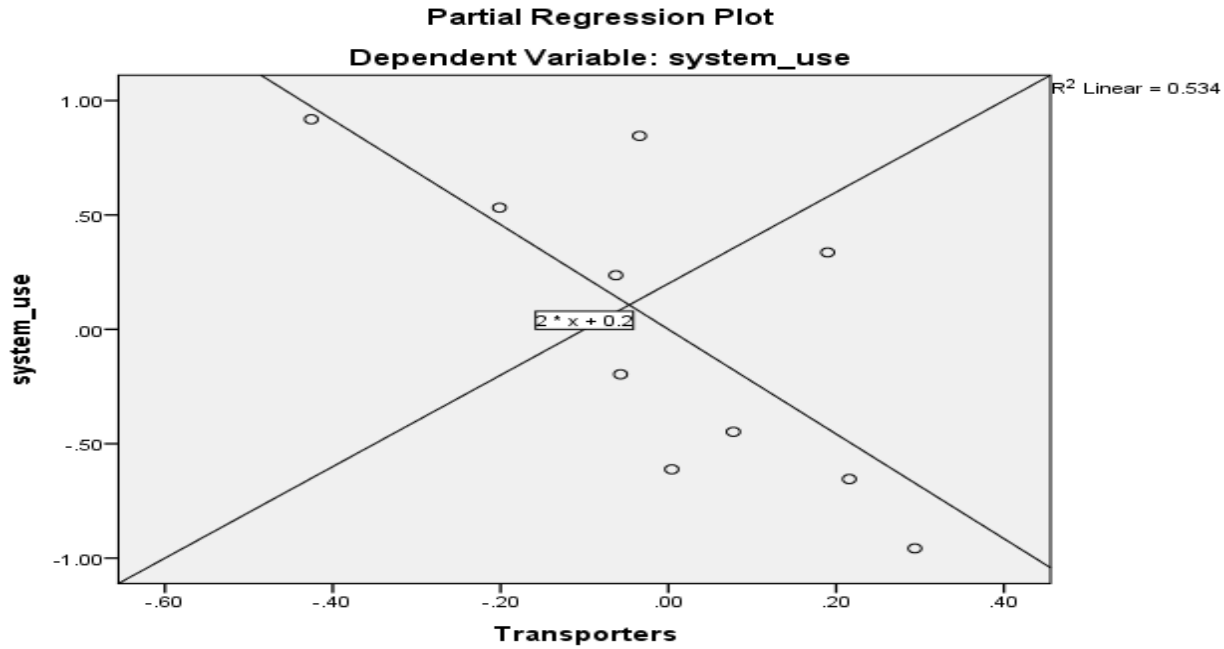
Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	4.009	.747		5.369	.001
	Govt_agencies	.034	.222	.054	.154	.881
2	(Constant)	3.376	.763		4.425	.003
	Govt_agencies	-.577	.406	-.920	-1.420	.199
	Agents	.806	.468	1.117	1.723	.128
3	(Constant)	4.596	.730		6.296	.001
	Govt_agencies	-.561	.300	-.893	-1.870	.111
	Agents	2.747	.817	3.806	3.364	.015
	Transporters	-2.288	.872	-2.781	-2.622	.039

a. Dependent Variable: system_use




Partial Regression Plot
Dependent Variable: system_use
R² Linear = 0.653
3.125 * x + -0.25
system_use
Agents
1.00
.50
.00
-.50
-1.00
-1.50
-.40
-.20
.00
.20
.40


Partial Regression Plot
Dependent Variable: system_use
R² Linear = 0.534
2 * x + 0.2
system_use
Transporters
1.00
.50
.00
-.50
-1.00
-.60
-.40
-.20
.00
.20
.40

Using the regression analysis model:

$Y = b_0 + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 \ldots\ldots b_pX_p$ Where;

Y = Operational Efficiency

b_0 = System use

b_1 to b_p = Estimated regression coefficients

X_1 to X_p= distinct independent variables are the systems used by the port community (For this case Government Agencies, Clearing agents, Transporters). E.g. X_1 = extent of usage of Port Management Systems in ICDE activities.

Using the plot formulas above,

Y=1(x)+0 +3.125(x2)-0.25+2(x3)+0.2

At the point of intersection of y and x axes in the charts, $Y= R^2$
Therefore,

$Y=r_1^2+r_2^2+r_3^2$
Y=0.368+0.653+0.534
Y=1.555

Using a scale of 1-5, efficiency level can be calculated as 1.55/5*100 = 31.1%
This shows that use of systems at the port accounts for only 31% of efficiency levels. This means that there are other factors that affect efficiency in port operations other than the use of systems.
From the general equation, Operational efficiency at ICDE is affected by system use by the port community in this case government agencies, clearing agents and transporters.
Multiple regression analysis was used to test if the use of systems has an impact on operational efficiency and it found out that systems used by government agencies impacted on operational efficiency to a level of 36.8% as did those used by agents 65.3% and the same for those used by transporters at 53.4%.

4.6 Conclusion

In conclusion therefore, the data presented in this chapter clearly supports the hypothesis that the use of port management systems has a direct effect on the operational efficiency of the port but other factors affect efficiency to a greater extent. Through the use of statistical tools the researcher was able to identify the key areas of operational efficiency by analyzing the data collected from the respondents.

CHAPTER FIVE: SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.0 Introduction

This section offers a summary of the findings in relation to the objectives that were set out in this study. The chapter concludes with recommendations for further research in relation to the relationship between the use of port Operation Management Systems and operational efficiency.

5.1 Summary

In the 21st century there is global competitiveness in international trade which is becoming increasingly tougher and the need for efficiency in operations as a tool to remain competitive is essential. Ports being key areas of the transport sector and are nowadays connected to the expanding world economies. Transport has been identified as an enabler to achieving sustainable development goals with emphasis on creation of intermodal transport and logistics systems especially intermodal or multimodal transport corridors with seamless physical and operational connectivity with intermodal facilities such as dry ports, critical to the efficiency of such corridors.

This study aimed at finding out critical factors affecting operational efficiency at the ICDE and in particular how port management systems impact on operational efficiency as well as understand mitigation measures that can be implemented to fuel growth in the country and region as envisaged. The study had two main objectives; to establish the extent of utilization of port operations management systems and to establish the impact of Port Operations Management Systems on efficiency at the Inland Container Depot.

The study employed the use of descriptive statistics to analyze quantitative data, which are presented in frequency tables and charts in chapter 4.

The study investigated the critical factors affecting operational efficiency and found out that there were several factors which were categorized into; System factors, Infrastructure, Resource Management, Documentation, External Factors, Natural effects among others. One of the major highlight of these factors includes lack of enough handling equipment, lack of proper road network and frequent system down time.

Through the analyzed data, it was also noted that Management systems were in use in most port operations and the respondents believed that to the system was able to handle various aspects of the port operations. However, it was noted that there were other factors that were hindering efficiency in port operations. The respondents mentioned that document management systems, planning and operation systems were regularly used to manage movement of cargo in the port.

The study also noted that the use of port management systems had a significant impact on operational efficiency of the port and how business was conducted. But despite the fact that management systems increase speed, reduce costs, improve flexibility and quality of service delivery, its potential has still not been achieved.

5.2 Conclusions

The study confirms the importance of Port management systems cannot be underestimated. It is evident that the port management systems are critical in achievement of operational efficiency and affect how business is conducted at ICDE. This study arrived at the conclusion that; port management systems are important and plays a critical part in operational efficiency in the port, nonetheless, the inefficiency of the port is greatly caused by infrastructural deficiencies including access roads, improper utilization of existing equipment which mimics insufficiency, lack of dedicated entry and exit points for trucks, Management systems in use were not synchronized and different agents at the port are using different components which lead to lapse in

documentation and lack of proper flow of activities. Lastly operational inefficiency was partly caused by lack of proper management of shifts and personnel which impact on proper operations of the port.

5.3 Recommendations

Based in the findings, the study recommends focus on improvement of infrastructure around the ICDE, especially road networks and handling equipment are vital to enhancement of operational efficiency. The plans for rehabilitation and construction of access roads to the facility was set to happen within six months after opening of the upgraded facility but these has not happened therefore delaying the gains that were to be derived from the facility in terms of speedy accessibility and transportation of cargo to the customers premises. Handling equipment, especially terminal tractors that in turn affect the efficiency of the overhead cranes should be sufficient. Their operations should also be monitored for clear demarcation of the issue between sufficient numbers and personnel issues ranging from idle time, slow movement, inappropriate us etc.

There is need for synchronization of systems being utilized at the port especially for government agencies. This will allow for better collaboration, better planning of operations, monitoring of progress and grid locks in the clearance process thus allowing for immediate and directed interventions to seed up operations. Full automation of processes should take place to eliminate the current need for officers to authorize progress. The system should have an interface with other stakeholders and customers for tracking of progress.

There should be continuous education, awareness creation and campaigns on processes and requirements for all stakeholders, and especially importers and exporters using the ICDE to facilitate progress and encourage new users to know the right things to do. This will eliminate

rework time for documentation which was identified as a key area of delay form the customers end. Location of containers remains a problem at the facility and more should be done in terms of automation of this process in the KPA system KWATOS.

Government policies on transportation and logistics should be wholesome and not those that correct one area and create an impediment in another. They should be based on expert advice from stakeholders using the facility while trying to balance on regulations and government strategy. Like many other facilities, the ICDE is affected by bureaucracy and corruption and the individual agencies should continue putting measures and changing the culture of their employees to eliminate it.

5.4 Suggestions for further research

This study looked at use of systems in port operations. However, there are other factors that can lead to inefficiency at the depot including the aspects of performance management, bureaucratic culture, government policy, corruption among others. Further studies therefore need to be undertaken to comprehensively study these factors. Processes of other stakeholders and their involvement with the critical port activity; cargo clearance and security needs to be investigated even as synchrony of systems is sought.

In terms of system use, there were gaps identified by this study including integration of systems especially by government agencies and interface with the customers. There are plans on introduction of systems to solve these problems and continued study is prudent to measure effectiveness. There is also need to investigate the user knowledge and capacity on existing systems.

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APPENDICES

APPENDIX I: QUESTIONNAIRE TRANSPORTERS

INTRODUCTION				
This is a survey conducted in partial fulfillment of my Master's degree in Business Administration which seeks to find out the Impact of Port Management Systems on Operational Efficiency at the Inland Container Depot (ICD)				
DEMOGRAPHICS				
Organization:				
Mobile No:	**Gender**	**Male**	**1**	
		Female	**2**	
How many years have you worked at the ICD?				
Below 5 years			1	
Between 5-15 Years			2	
Between 15-25 Years			3	
Above 25 Years			4	
SCREENING				
Have you participated in any survey in the past three months? (screening)	Yes (**(Discontinue Interview)**		1	
	No		2	
MAIN QUESTIONNAIRE				
1. In your opinion, what factor(s) affect the operational efficiency in matters of cargo movement at ICD?				
2. What improvements would you give that would make cargo movement easier at ICD?				
3. Do you use any automated systems to carry out any of the activities for the movement of cargo at the ICDE?		Yes	1	
		No	2	
INFORMATION SHARING (ALL)				
4. Do you use systems in information sharing in the conducting of your activities at ICD?		Yes	1 [GO TO 6]	
		No	2 [GO TO 5]	
5. IF NO IN 4 ABOVE, Please state how you get information?				

6. Is the method stated in Q5 enough for your information sharing needs?	Yes [GO TO 7]	1	
	No	2	

7. Please state any improvements that can be made to the systems used for information sharing [PLEASE STATE AT LEAST ONE]

8. Please rate the level of impact the information sharing systems used have on the following aspects relating to how business is conducted at ICD

Aspects of Operational Efficiency	**Insignificant [1]**	**Minor [2]**	**Moderate [3]**	**Major [4]**	**Severe [5]**
Speed					
Cost					
Flexibility					
Quality					

DOCUMENTATION SYSTEMS (ALL)

1. Is documentation done through a system?	Yes	1 [GO TO 23]	
	No	2	

2. IF NO InQ21, Please state how it is done

3. Is the method used sufficient for your needs?	Yes	1	
	No	2	

4. What can be done to make it appropriate for your needs?

5. Rate the level of impact the means of documentation has on the following aspects pertaining to documentation

Aspects of Operational Efficiency	**Insignificant [1]**	**Minor [2]**	**Moderate [3]**	**Major [4]**	**Severe [5]**
Speed					
Cost					
Flexibility					

Quality					

PLANNING AND OPERATION SYSTEMS

1. Are planning and operations in the following areas done through a system?

Operations	**Yes [1]**		**No [2]**		**Don't Know [3]**	
	PL	**OPS**	**PL**	**OPS**	**PL**	**OPS**
Yard Operations						
Gate Operations						
Rail side Operations						

2. What can be done to improve the way operations are done at the following areas?

Operations	**Improvements suggested**
Yard	
Gates	
Rail side	

3. Please rate the general level of impact the current way of **planning** and **carrying out operations** has on the following aspects

Aspects of Operational Efficiency	**Insignificant [1]**		**Minor [2]**		**Moderate [3]**		**Major [4]**		**Severe [5]**	
	PL	**OPS**	**PL**	**OPS**	**PL**	**OPS**	**PL**	**OPS**	**PL**	**OPS**
Speed										
Cost										
Flexibility										
Quality										

APPENDIX II: QUESTIONNAIRE FOR AGENTS

INTRODUCTION				
This is a survey conducted for the purpose of my Master's degree which seeks to find out the Impact of Port Management Systems on Operational Efficiency at the Inland Container Depot (ICD)				
DEMOGRAPHICS				
Organization:				
Mobile No:	**Gender**	**Male**	**1**	
		Female	**2**	
How many years have you worked at the ICD?				
Below 1 years			1	
Between 1-3 Years			2	
Between 3-5 Years			3	
Above 5 Years			4	
SCREENING				
Have you participated in any survey in the past three months? (screening)	Yes (**(Discontinue Interview)**		1	
	No		2	
MAIN QUESTIONNAIRE				
1. In your opinion, what factor(s) affect efficiency of operations in matters of cargo movement at ICD?				
2. State improvements that would make cargo movement easier?				
3. Do you use any automated systems for activities at		Yes	1	
4. ICDE?		No	2	
INFORMATION SHARING (ALL)				
5. In carrying out your mandate at ICD,do you use systems in information sharing ?	Yes	1 [GO TO 6]		
	No	2 [GO TO 5]		
6. IF NO ABOVE, Please state how information is shared				

7. If Yes In Q5 above, rate system use for the following activities on a scale of 1 to 5 where 1 is Never and 5 is always

Never	Almost Never	Occasionally	Almost every time	Always
1	2	3	4	5

Facility offering integration for bi-directional automated data transfer between the main TOS and the additional systems in use	1	2	3	4	5
Automated addition of data by other parties into and out of the system					
Automated submission of reports via email					
Select and show real time KPI status					
Configure and customize performance dashboards					
Electronically receive authorization from agents, transporters etc.					
Visibility of ETA for customers					
Electronic proof of delivery					

8. Is the method stated above sufficient for your information sharing needs?	Yes [GO TO 7]	1	
	No	2	

9. List at least one improvement that can be made to the systems used for information sharing

10. Please rate the general level of impact the information sharing systems method(s) used have on the following aspects of relating to how you conduct your business at ICD

Aspects of Operational Efficiency	Insignificant [1]	Minor [2]	Moderate [3]	Major [4]	Severe [5]
Speed					
Cost					
Flexibility					
Quality					

DOCUMENTATION SYSTEMS (ALL)

6. Is documentation done through a system at ICD?	Yes	1 [GO TO 23]	
	No	2	

7. IF NO InQ21, state how it is done

8. Is the method of documentation sufficient for your needs?	Yes	1	
	No	2	

9. What can be done to make it suitable for your needs?

10. Rate level of impact the current way of documentation has on how you conduct your business

Aspects of Operational Efficiency	**Insignificant [1]**	**Minor [2]**	**Moderate [3]**	**Major [4]**	**Severe [5]**
Speed					
Cost					
Flexibility					
Quality					

PLANNING AND OPERATION SYSTEMS

11. Is planning in the following areas is done through a system?

Operations	**Yes [1]**		**No [2]**		**Don't Know [3]**	
	PL	**OPS**	**PL**	**OPS**	**PL**	**OPS**
Yard Operations						
Gate Operations						
Rail side Operations						

12. Is planning of operations in the listed areas done in collaboration among the government agencies at ICD?

Operations	**Yes [1]**		**No [2]**		**Don't Know [3]**	
	PL	**OPS**	**PL**	**OPS**	**PL**	**OPS**
Yard Operations						
Gate Operations						
Rail side Operations						

13. List suggestions for improvement in the way operations are done at the following key areas of port operations

Operations	Improvements suggested
Yard Operations	
Gate Operations	
Rail side Operations	

14. Rate impact of systems on the following

Aspects of Operational Efficiency	Insignificant [1]		Minor [2]		Moderate [3]		Major [4]		Severe [5]	
	PL	OPS	PL	OPS	PL	OPS	PL	OPS	PL	OPS
Speed										
Cost										
Flexibility										
Quality										

THANK YOU

APPENDIX III: QUESTIONNAIRE FOR GOVERNMENT AGENCIES

INTRODUCTION				
This is a survey conducted in partial fulfillment of my Master's degree in Business Administration which seeks to find out the Impact of Port Management Systems on Operational Efficiency at the Inland Container Depot (ICD)				
DEMOGRAPHICS				
Organization:				
Mobile No:	**Gender**	**Male**	**1**	
		Female	**2**	
How many years have you worked at the ICD?				
Below 5 years			1	
Between 5-15 Years			2	
Between 15-25 Years			3	
Above 25 Years			4	
SCREENING				
Have you participated in any survey in the	Yes (**(Discontinue Interview)**		1	

past three months? (screening)	No	2	

MAIN QUESTIONNAIRE

11. In your opinion, what factor(s) affect the operational efficiency in matters of cargo movement at ICD?

12. What improvements would you suggest that would make cargo movement easier or better at ICD?

13. Do you use any automated systems to carry out any of the activities for the movement of cargo at the ICDE?	Yes	1	
	No	2	

INFORMATION SHARING (ALL)

14. Do you use systems in information sharing in the conducting of your activities at ICD?	Yes	1 [GO TO 6]	
	No	2 [GO TO 5]	

15. IF NO IN 4 ABOVE, Please state how you share information?

16. [IF [YES] IN 4 ABOVE] Please rate the use of systems for the following activities on a scale of 1 to 5 where 1 is Never and 5 is Always

Never	**Almost Never**	**Occasional/Sometimes**	**Almost every time**	**Always**
1	**2**	**3**	**4**	**5**

	1	**2**	**3**	**4**	**5**
Automated data transfer between the TOS and other port operating systems					
Automated population of data from other parties into and out of the system					
Automated the dissemination of reports via email					
Select and show real time KPI status					

Configure and customize performance dashboards						
Receive electronic authorization or approvals from third parties						
Visibility and ETA for customers and partners						
Electronic proof of delivery						

17. Is the method stated in Q5 sufficient for your information sharing needs?	Yes [GO TO 7]	1	
	No	2	

18. Please state improvements that can be made to the systems used for information sharing [PLEASE STATE AT LEAST ONE]

19. Please rate the general level of impact the information sharing systems method(s) used have on the following aspects of relating to how you conduct your business at ICD

Aspects of Operational Efficiency	**Insignificant [1]**	**Minor [2]**	**Moderate [3]**	**Major [4]**	**Severe [5]**
Speed					
Cost					
Flexibility					
Quality					

DOCUMENTATION SYSTEMS (ALL)

15. Is documentation at ICD done through a system?	Yes	1 [GO TO 23]	
	No	2	

16. IF NO InQ21, Please state how it is done

17. [IF [YES] IN 21 ABOVE] Please rate the use of systems for the following activities on a scale of 1 to 5 where 1 is Never and 5 is Always

Never	**Almost Never**	**Occasional/Sometimes**	**Almost every time**	**Always**
1	**2**	**3**	**4**	**5**

	1	**2**	**3**	**4**	**5**
Accommodate customer KPI/SLA requirements					
Incorporate known arrival and dispatch schedules					

Physical inventory count and reconcile inventory discrepancies					
Detail inventory items by description and reference number					
Visibility of every item of inventory by arrival/dispatch					
Pre-advised pick up orders to match work orders					

18. Is the documentation method used sufficient for your needs?	Yes	1	
	No	2	

19. What can be done to make it better and appropriate for your needs?

20. Please rate the general level of impact the current way of documentation has on the following aspects relating to how you conduct your business at ICD

Aspects of Operational Efficiency	**Insignificant [1]**	**Minor [2]**	**Moderate [3]**	**Major [4]**	**Severe [5]**
Speed					
Cost					
Flexibility					
Quality					

PLANNING SYSTEMS (GOVERNMENT AGENCIES)

21. Is the planning for your activities done through a system?	Yes	1
	No	2
22. Is planning done in collaboration with the other government agencies?	Yes	1
	No	2

23. [IF [YES] IN NO. 9 ABOVE] Please rate the use of systems for the following activities on a scale of 1 to 5 where 1 is Never and 5 is Always

Never	**Almost Never**	**Occasional/Sometimes**	**Almost every time**	**Always**
1	**2**	**3**	**4**	**5**

	1	**2**	**3**	**4**	**5**
Match Operative competencies with work order requirements					
System request for Equipment and resource					
TIME allocated PER TASK					

Create and manage truck delivery appointments					
Notify PENDING rail ARRIVALS.					
Submission dispatch and retrieval requests to gate operations					
Manage and control dynamic terminal CAPACITY LIMITS.					
Creating customizable yard layout for multiple traffic patterns/route					
Real time visibility at all locations for the items					
Optimize space utilization of the yard					
Yard management system Integration with equipment					

24. Is the method used for planning sufficient?

Yes	1	
No	2	

25. Please state improvements that can be made to the systems used for Planning to make it better for its purpose [PLEASE STATE AT LEAST ONE]

26. Please rate the general level of impact the planning systems/method(s) used have on the following aspects of relating to how you conduct your business at ICD

Aspects of Operational Efficiency	**Insignificant [1]**	**Minor [2]**	**Moderate [3]**	**Major [4]**	**Severe [5]**
Speed					
Cost					
Flexibility					
Quality					

OPERATING SYSTEMS (GOVERNMENT AGENCIES)

27. Are the following activities done through a system?

Operations	**Yes [1]**	**No [2]**	**Don't Know [3]**
Yard Operations			
Gate Operations			
Rail side Operations			

28. IF [YES] IN Q16 ABOVE] for any of the operations, Please rate the use of systems for the following activities on a scale of 1 to 5 where 1 is Never and 5 is Always

Never	Almost Never	Occasional/Sometimes	Almost every time	Always
1	2	3	4	5

	1	2	3	4	5
Analyze work orders from customers, match them to work force abilities and raise matters of problem in capacity					
Availability of matching and adjustment of available hours and work orders					
Measurement of time by activity and by operative in an integrated platform					
Measure of efficiency by individual and task.					
Notify gate staff of remaining truck arrivals after a truck is received					
Notify yard staff of remaining truck and rail arrivals and cargo to be loaded after receiving a truck at the gates					
Identify ideal position for each TEU based on its destination, loading/unloading succession, or requirements for intervention					

29. Is the operating method used sufficient for the operating needs?

Operations	Yes [1]	No [2]
Yard Operations		
Gate Operations		
Rail side Operations		

30. How can be done to improve the way operations are done at the three key areas at the port?

Operations	Improvements suggested
Yard Operations	
Gate Operations	
Rail side Operations	

31. Please rate the general level of impact the current way of doing operations has on the following aspects relating to how you conduct your business at ICD

Aspects of Operational Efficiency	Insignificant [1]	Minor [2]	Moderate [3]	Major [4]	Severe [5]
Speed					

Cost					
Flexibility					
Quality					

THANK YOU.

APPENDIX IV: IN DEPTH INTERVIEW GUIDE

1. Icebreaker and familiarization
    a. Organization and years of engagement
    b. Work at ICD
    c. Social economic characteristics; gender, age group
    d. Contact details
2. Port Management Systems
    a. What is the benchmark in the industry based on organization
    b. Which ones are used at ICDE (depending on organization)
    c. Duration of implementation, use at ICD
    d. Impact on operational efficiency
    e. Benefits and gaps
    f. Future plans in terms of system implementation and automation
    g. Port system capabilities (Table below)
3. Electronic Single Window System
        i. Extent of implementation in Kenya
        ii. Impact it has had on the maritime business and more so for the port
        iii. Impact on processes at ICD
        iv. Benefits and gaps
        v. Progress and development