The Impact of Cargo Handling Efficiency in Customers' Satisfaction in Tanzania

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Abstract
This paper employed the data from the study conducted at Dares Salaam port aimed to asses the impact of cargo handling efficiency in customers' satisfaction in Tanzania. . Specifically, the study examined the current practices of the cargo handling challenges that hinder customer satisfaction, and suggesting possible solutions for the effective cargo handling practices. The study employed a convergent research design, incorporating a mixed methods approach. The study also employed both simple random sampling and purposive sampling techniques, with a sample size of 95 respondents. Data collection involved interviews and surveys, while data analysis was conducted using thematic analysis for qualitative data and descriptive statistics for quantitative data. The study found that Dar es Salaam Port uses container cranes, straddle carriers, yard cranes, and specialized equipment for bulk and non-containerized cargo. It manages storage yards, adheres to safety and security standards, and employs automated stacking cranes, RFID tracking, and port management software. The cargo handling challenges that hinder customer satisfaction at Dar es salaam Port include long wait times, outdated infrastructure, poor coordination, security issues, bureaucratic delays, and communication gaps. The solutions for the effective cargo handling practices include acquiring advanced equipment, implementing Port Community Systems (PCS), increasing berths and storage, training personnel, and adopting advanced traffic management systems. The study recommended that there was a need of increasing the number of berths and enhancing port infrastructure to handle more vessels and reduce wait times. Also, to expand berth space will ease congestion, speed up loading and unloading, and boost overall efficiency. Additionally, the study recommended again that investing in modern cargo handling equipment, such as advanced container cranes, forklifts, and automated systems, and streamlining handling procedures. Upgrading equipment and procedures will enhance efficiency, cut delays, and minimize operational bottlenecks. Furthermore, the study recommends implementing Port

Community Systems (PCS) to improve coordination and information sharing among port operators, shipping lines, customs, and logistics providers. Enhanced coordination will streamline operations, reduce delays, and keep all stakeholders informed about cargo status and procedures. Lastly, the study recommends upgrading security infrastructure and practices to combat theft and pilferage. Installing advanced surveillance systems and access control measures will safeguard cargo, ensuring safer and more reliable handling operations.

Key words: *Cargo Handling efficiency, Cargo Handling Management, SERVQUAL Model, Service Quality and Customers' Satisfaction.*

1.0 Introduction

All the world, shipping transport is a crucial aspect in worldwide commercial and cargo conveyance, however global business depends on shipping as a means of transporting cargo from one place to another. On the other hand, commercial shipping is influenced by various types of goods and latest vessel designs for quick longer distance cargo transportation, guaranteeing a reduced cost per each long tonnage transported (Awodun and Jongbo, 2017). Moreover, development of seaports resulting to an increase degree of worldwide business as far as transportation of cargo is concerned for an effective and efficient cargo loading and unloading from the vessels. Thus, port management is required to have sufficient skills which enables them perform their duties in effectively and efficiently, in conjunctions with favourable port infrastructure as well as modern technological transport equipment and ships (Maneno, 2019).

Ucla, (2019) noted that most governments worldwide have invested a lot of efforts in controlling ports since most ports increase more revenue to the respective countries, these efforts include increasing port investments specifically in port infrastructures, terminal sites, information technology systems and stowage facilities to which all these boosts cargo handling as well as saving time of cargo loading at the port environment. UNCTAD (2019). argued that poor planning, inefficiency, incapacity, institutional framework and poor regulatory frameworks are the factors which bring some obstacles to gate operations at the port area.

Tanzania is a maritime nation, having 61,500 km^2 of its 945,087 km^2 total land area sheltered by water bodies. Tanzania's residents increased from 12.3 million in the years after the 1967 independence census to 59.7 million in 2020 census. Tanga, Mtwara, and Dar es Salaam are three of Tanzania's main seaports along its 1,424 km of Indian Ocean coastline (AFDB, 2013)

. **2.1 Definition of Key Terms**
2.1.1 Port
Port is a harbour where maritime terminal facilities are provided, this facility includes piers or wharf at which ships berth while loading or unloading cargo, transit shed and storage areas where ships may discharge incoming cargo and warehouse where goods may be stored for longer period while waiting for distribution (Honke and Fernandez, 2017). They are subdivided into natural and artificial (manmade) harbours, Dar es Salaam, Tanga and Mtwara. Tanzania are three relatively favourable natural harbours. This is quite a good situation in comparison with other African coast lines (Honke and Fernandez, 2017).
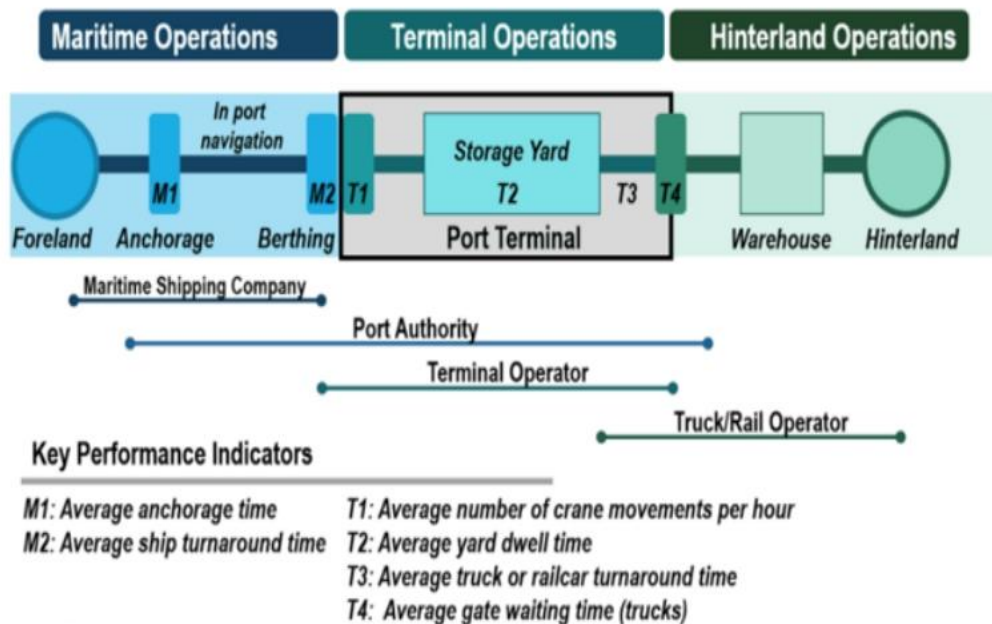### 2.1.2 Cargo
Cargo, as defined by Aminatou et al. (2018), encompasses goods or produce, including agricultural products and livestock like cattle, pigs, or chickens, transported by sea. When

transporting humans, they are referred to as passengers or crew. The term broadly covers all items carried on a ship and documented through a bill of lading or similar receipt. In terms of insurance, carriers are typically required to have a minimum amount of cargo insurance, as noted by Maneno (2019). This is known as carrier liability, which primarily protects the carrier rather than the cargo. Shippers, particularly those with substantial cargo, are advised to obtain their own cargo insurance to safeguard against damage, theft, or loss during transit. This insurance remains effective until the cargo reaches the buyer. It's crucial to carefully review insurance policies, as they often have specific limitations. For instance, in Tanzania, truck shipment insurance offers certain protections for freight.

2.1.3 Cargo Handling

Cargo handling refers to the process of loading, unloading, and transferring cargo between various modes of transportation, such as ships, trucks, and trains, at a port or terminal. It involves the use of specialized equipment, such as cranes, forklifts, and conveyors, as well as skilled personnel who ensure that cargo is efficiently and safely moved from one mode of transportation to another. Strategic cargo handling, on the other hand, refers to a systematic and well-planned approach to managing the cargo handling process to optimize efficiency, reduce costs, and minimize the time required for loading, unloading, and transferring cargo. Improving the cargo handling process requires a comprehensive analysis to identify areas that need enhancement. This involves examining each step of the process, from the arrival of the cargo to its departure, to ensure efficiency and effectiveness. By implementing best practices, such as optimizing workflow and utilizing resources effectively, organizations can streamline operations and reduce costs. Additionally, leveraging advanced technologies, such as automated handling systems and real-time tracking, can further enhance performance and improve customer satisfaction. Furthermore, introducing innovative solutions, such as sustainable practices and green technologies, can help reduce the environmental impact of cargo handling operations. Figure 2.1 provides a visual representation or data analysis of the current process, serving as a reference point for identifying areas of improvement. By continuously evaluating and updating their processes, organizations can ensure that they remain competitive and meet the evolving needs of the industry.

Figure 2.1: Cargo Handling Management

Source: Adopted from (Fahim et al., 2022)

Cargo handling in maritime operations is crucial for port performance, involving key metrics like average anchorage time (M1) and ship turnaround time (M2). Factors affecting these include berthing slot availability for different ship classes and terminal productivity. Navigation in terminals might require pilotage and tugs.

In terminal operations, crane performance (T1) is vital, measured by crane movements per hour, impacting the time ships spend in port. Container movement to storage yards and stacking density also influence terminal capacity. Yard dwell time (T2) for different cargo types is a performance indicator, as is the average truck turnaround time (T3), affected by terminal space and equipment availability. Gate efficiency, judged by average waiting time (T4), is critical, especially in terminals with on-dock rail facilities. Hinterland operations, focusing on transport and distribution servicing the port, like road network capacity and congestion, play a role in port performance but are not a direct performance indicator. Activities like trans loading between maritime containers and domestic trucks also impact hinterland performance.

$$\text{Performance of terminal} = \frac{\text{Terminal's implemented capacity}}{\text{Terminal's designed capacity}} = \frac{\text{Terminal throughput}}{\text{Design throughput of terminal}}$$

Terminal operators always want to optimize a terminal's capacity, which means that a terminal can operate at 100% capacity while minimizing unloading time. However, this is very difficult to achieve in reality. It is commonly admitted that dock utilization performance at 65% will give the highest efficiency. If it is higher, the situation of waiting ships will occur, resulting in congestion, reducing service quality at the terminal, and then delaying the ship's schedule.

2.1.4 Port of Dar Es Salaam

Tanzania, in East Africa's Great Lakes region, boasts an extensive maritime and inland port network. The country, bordered by the Indian Ocean, has major seaports like Dar Es Salaam, Tanga, and Mtwara, facilitating international trade primarily with India, UAE, Saudi Arabia,

China, and Switzerland. The nation's inland ports are predominantly situated on Lake Victoria, which it shares with Uganda and Kenya. Tanzanian ports on this lake include Mwanza, Kemondo, and Bukobo. Lake Tanganyika, in the Kigoma region, hosts ports like Kigoma and Kasanga, while Lake Nyasa features Mbamba harbour and Itungi port(Mwisila and Ngaruko, 2018).

Agriculture stands as a cornerstone of Tanzania's economy, with other economic activities orbiting around small-scale manufacturing and mining. Despite its rich potential, the country grapples with challenges such as corruption and a dearth of modern infrastructure. Nonetheless, Tanzania holds substantial growth prospects, particularly as it continues to develop and modernize its economic sectors.

Dar es Salaam port, a key facility on Africa's Indian Ocean coast, handles over 90% of Tanzania's international maritime trade and serves landlocked nations in the region. It has a natural, well-sheltered harbour and a direct connection to various global regions. The port's capacity includes handling over 10 million tonnes of cargo annually, with facilities for dry general cargo, liquid bulk, and containers.

Its infrastructure comprises eleven deep water berths, a general cargo terminal with storage areas, a container terminal operated by Tanzania International Container Terminal Services Limited, a modern grain terminal with storage and handling capabilities, and two oil terminals for crude and refined oil products, equipped with substantial mooring and pumping capacities (Ali et al., 2022).

2.2 Theories Informing the Study

Studies on factors affecting port performance in Tanzania the case of Dar es salaam port is closely related to several theories and models. However, this study focused on the structure conduct performance theory, and the resource-based view (RBV).

2.2.1 Service quality theory

This theory has been around since the 1980s, when the service business era began. The idea behind the altitude toward service quality comes from the well-known work of Parasuraman et al. (1985). The theory tries to explain how service should be given to meet customer needs. In the service business, service is based on what the customer wants. This is the result of a long-term effort to make quality better so that customers are happy. Quality is about meeting or going beyond what customers expect (Pariseau and McDaniel, 1997). It has to do with the standards that customers want. Still, a lot of researchers suggested methods and changes to the above approach. Recently, a lot of research has been done on the academic standards of the two main service quality serve models.

A space frame-based model created by Parasuraman et al. (1985) called "SERVQUAL" suggests that customers judge the quality of service based on the difference between what they expected and what they actually got. One way to judge an organization's service quality is by looking at five factors: responsiveness, empathy, assurance, and tangibles. In real life, SERVQUAL connects what customers expect (E) and how they see things (P). To find the value of the expression P – E = Q (service quality), the mean value of the presentations must be found. There is a weakness in terms of service if Q is negative. When Q is positive, on the other hand, the service provider goes above and beyond what the customer expects.

2.2.2 Relationship Between Service Quality and Customer Satisfaction

According to Bitner and Hubbert. (1994), customers prefer to use more service if their needs to that service are met. Feelings and opinions about customer satisfaction differ from one

customer to another. From the definition by Bachelet (1995), customer satisfaction is simply arousing response of customers to their experience on a product or a service. Typically, it is well believed that quality of service is determined by customer satisfaction. Many studies argued that service quality and customer satisfaction are two typical concepts (Zeithaml and Bitner, 2000). Generally, customer satisfaction can be used as conception to express utility when consuming a service. Most of the time service quality focuses on a particular component of service (Zeithamal and Bitner, 2000). Many studies established this relationship and suggested such relationship available between service quality and customer satisfaction (Cronin and Taylor, 1992).

2.2.3 Relationship between the service quality theory and the seaport service quality

There are a lot of variables in the theory, including real-world resources. The real resources in this study are the cargo handling equipment. The study checked for the presence of cargo handling equipment, how well it works, and how much weight it can hold to see if it can meet customer needs. Resources: the amount of cargo handling equipment in stock at the port and how well the port works (service time).

Capacities: this refers to how fast a service can carry or deliver goods to customers, how reliable it is, how uniform it is, how safe the goods being handled are, how accurate the paperwork is, how varied the service is, and how ready it is. The process is mostly about how employees treat customers, how they respond to their wants and needs, and how they use technology in customer service. This theory says that being reliable, quick to respond, understanding, reassuring, and giving tangible things are very important for keeping customers happy. The study agrees with this theory to guide the study because of this kind of reasoning.

2.3.2 Queuing theory

Many ports are having issues with the equipment they use to handle cargo, which causes delays in clearing cargo. Customers are unhappy because of the constant lines at the port, which is thought to be caused by delays in clearing cargo. When there isn't enough cargo handling equipment, there are delays in clearing the cargo and lines that make it take longer to deliver goods. This theory best explains these effects. Queuing theory is the study of how waiting lines are organized by number. The theory was made so that people can guess how long lines will be and how long they will have to wait for service. Agner Krarup came up with this theory in 1990, when he was making models to describe the Copenhagen telephone exchange. Janos (2012) says that the theory is about one of the worst parts of life: waiting in line. Next, Calls and Erlang (year) came up with the queuing theory. They were the first to use it to solve congestion problems at the start of the 20th century.

This theory can also be used to figure out how well a service is being delivered.In order to show a queuing system, you need to know about the randomness of the flows of requests, service times, and service disciplines (J'anos, 2012).The process of entry can be shown by the letter A (t) = P (inter-arrival time < t), which shows how the customers' arrival times are spread out. In the theory of queuing, these times between arrivals are usually thought of as random variables that are independent and have the same distribution. The other random variable is service time, which is also known as service request work. Its distribution function is shown by B(x), which means that B(x) = P (service time < x).

The theory showed that the service times and the inter-arrival times should normally be separate random variables. The theory also says that the structure of the service and service disciplines tell us how many servers there are, how much space the system has, and how many customers can stay in the system at once, including those who are being served (János, 2012).

Service obedience means that there is a rule that says the next customer is chosen. FIFO, which stands for "First in, First Out," is usually the rule. This means that whoever comes in first leaves first. Last Come, First Out (FIFO) means that the person who comes in later leaves earlier. Random Service (RS) means that the customer is chosen at random and given priority.

It is important to know that the main goal of queuing theory is to find the system's performance measures, which are the probabilistic properties of the number of customers in the system, the number of customers who are waiting, the utilization of service, the response time of customers, the waiting time of customers, the idle time of servers, and the busy time of servers (Janos 2012). In this study, a server can be thought of as equipment used to move cargo. Most of the time, the answer depends on assumptions about how the inter-arrival times, service times, number of servers, capacity, and service discipline are spread out.

In 2012, J'anos said that the distributions can only be calculated for a very small number of systems, like elementary or Markovian ones. Most of the time, you can figure out their mean or transformations. This theory says that waiting and queuing are normal for many reasons, since most customers don't get their cargoes at the port on time. For this reason, the researcher chooses this theory to guide this study.

2.2.3 Balanced Scorecard Theory

Everyone knows that cargo handling equipment is an important part of how well the port works and how happy the customers are. But it's very important to keep track of the performance outputs and take the right steps when the expected results don't happen. Regular performance reviews will help keep customers and get cargo cleared on time, since the impact of cargo handling equipment on port performance and customer satisfaction is important. In this way, the theory can help to explain things and guess how cargo handling equipment will work in the future, which can improve port performance and make customers happier.

Kaplan and Norton (1995) came up with this theory. The theory helps us understand and describe things that we can see. Its main goal is to create value, like how well cargo handling equipment works at ports so that customers are happy. Afterward, in a logistics and supply chain management to drive performance improvements and make customers happy. Lord Kelvin, a British scientist, said in the same year, "If you can't measure it, you can't improve it, and you can't satisfy customers."

The balanced scoreboard theory, as explained by Kaplan and Norton (1996), "connects an organization's mission and strategy to a broad set of performance measures that form the basis for a strategic measurement and management system that meets customer needs." As part of its strategic management system, the organization's performance is measured in four fair ways. These include financial measures, which look at the easily measurable economic values of actions already taken; customer measures, which group customers and potential customers into market segments where the business will operate; and business unit performance measures in specific segments. Other includes internal business process, which measures the most important internal processes that an organization must be very good at in order to please customers, and growth, which measures the infrastructures that an organization must build in order to grow and get better over time.

A very interesting thing about the Balanced Scorecard is that it measures and discusses the goals between business units and between different levels of management. By focusing on continuous improvement to meet customer needs, this process helps the company predict and set goals through benchmarking, find tools and resources like cargo handling equipment to help them reach their goals. This theory agrees that the performance of cargo handling equipment at ports is important to keep customers happy. It draws attention to the measurement for

improving performance so that customers are happy. The researcher agrees with this theory to guide the study because of this kind of thinking.

2.3 Empirical Literature Review.

Rojon et al., (2021) conducted a study on the impacts of carbon pricing on maritime transport costs and their implications for developing economies. The study found that, transport costs play a crucial role in a country's capacity to engage in the global economy. Elevated transport costs typically hinder this capacity and frequently have adverse effects on economic expansion. Developing countries, especially Small Island Developing States (SIDS) and Least Developed Countries (LDCs), bear higher transport costs on average, leading to increased obstacles in participating in international trade. The reasons behind their elevated costs become apparent when examining the five categories of determinants influencing maritime transport costs: ship operational expenses, geographical and geopolitical aspects, transported goods, market-related factors, and infrastructure.

Souza et al., (2023) carried out study on port regionalization for agricultural commodities, mapping exporting port hinterlands. The study found that transport costs are more critical in determining the hinterland reach of grain transportation compared to container transport. Agricultural commodity exporters need to pay closer attention to inland costs, especially considering the lower added value. Domestic transport costs pose an even greater barrier in Latin America and other developing regions. However, other factors, such as the relationship between port and inland actors, also play a role. Port regionalization is particularly important for macro logistics analyses that support strategic planning. Understanding the flow of grain chains and their byproducts is crucial for planning projects and interventions in transport infrastructure. The study's results have many practical applications, especially concerning the internal logistics of some of Brazil's main export products.

Hanaysha (2016) conducted a study aimed at analyzing the impact of employee engagement, work environment, and organizational learning on organizational commitment. The research utilized data collected through various means and analyzed it using SPSS and Structural Equation Modeling (SEM) to derive comprehensive insights. The study found that employee engagement plays a crucial role in significantly enhancing organizational commitment, demonstrating that when employees are actively involved and motivated, their commitment to the organization strengthens. Additionally, the research revealed that a positive work environment is strongly associated with increased organizational commitment, indicating that supportive and conducive working conditions contribute significantly to employees' dedication. Furthermore, the study highlighted that organizational learning—through continuous development and knowledge sharing—also plays a vital role in fostering organizational commitment, emphasizing the importance of ongoing learning and adaptation in maintaining a committed workforce.

Phuong et al. (2020) conducted a study to examine the quality of logistics services in Hai Phong, Vietnam. They employed semi-structured interviews involving various stakeholders, including customers, logistics service providers, and port operators, to gather comprehensive insights. Through their research, they identified fourteen key characteristics that influence logistics service quality. Among these, delivery time and shipment condition were highlighted as the most critical factors for all stakeholder groups. Additionally, the study revealed that human factors such as the behavior, attitude, and communication skills of staff, also play a significant role in shaping perceptions of service quality. This finding underscores the importance of not only optimizing logistical processes but also ensuring that personnel are well-trained and effective in their roles to enhance overall service quality.

Mlimbila and Mbamba (2018) conducted a research study that aimed to explore the relationship between information system usage and port logistics performance. The study was conducted at the Dar Es Salaam port in Tanzania, and it employed a quantitative approach that involved using questionnaires to gather data on information system usage and its outcomes. The findings revealed a substantial correlation between information system utilization and enhancements in shipping and trucking costs, timely delivery of goods and services, increased trade volume, and improved organizational logistics capabilities.

The study by Yang et al. (2023) focused on Indicator-Based Resilience Assessments for Critical Infrastructure (CI). They conducted a thorough state-of-the-art review to evaluate the current methodologies and practices in the field. Their approach included presenting relevant terminology to clarify the study's aims, reviewing a broad range of scientific papers that apply indicators for assessing CI resilience, and analyzing these indicators to understand their application and effectiveness. The findings revealed that while indicator-based assessments are widely utilized to enhance CI resilience, there is significant variability and lack of standardization among the indicators used. This variation underscores the urgent need for developing a standardized system of indicators to ensure consistent and reliable assessment of CI resilience. Establishing such a system would facilitate more effective management and improvement of critical infrastructures, which are essential for maintaining societal functions, economic stability, and national security.

Stepanova et al., (2023) carried out study on scientific and chemical foundations of high-performance concrete for the development of Transport Infrastructure. The study found that the creation of high-strength concrete with increased resistance to cracking and improved durability relies on chemical processes within the concrete system, particularly when a highly effective complex chemical additive is present. This additive, with its unique combination of components, is based on a polycarboxylate polymer that significantly boosts the effectiveness of these components. The resulting nano-modified concrete demonstrates enhanced performance and is suitable for use in various construction projects. Specifically, it is recommended for high-rise housing construction, road surfaces for federal highways, and construction sites in regions with permafrost. Additionally, high-strength nano-modified concretes, known for their increased operational reliability, chemical resistance, and durability, are suggested for use in industrial and civil structures, loading and unloading terminals, shipping docks, piers, berths, offshore oilfield hydraulic structures, thermal and nuclear power plants, tunnels, and embankments.

Maneno (2019) Assessed factors causing port congestion of the port Dar es Salaam. The study revealed that the Port of Dar es Salaam is confronted with numerous challenges, including cumbersome documentation procedures, a lack of skilled manpower, inadequate policies, inefficient use of information and communication systems, insufficient equipment, bureaucratic hurdles, inadequate port infrastructure, poor management planning, and limited port area. To enhance efficiency, minimize port congestion, and boost productivity, the study offers recommendations to the government and port authority. These recommendations aim to address these challenges and improve the overall operations of the Dar es Salaam Port.

Masuruli (2020) did study on factors affecting port infrastructure asset maintenance management in Tanzania. The data was collected using questionnaires and document review. The study found that, effective port maintenance management is influenced by a range of factors, which can be grouped into four main categories: management, human resources, technical, and miscellaneous issues. Management-related challenges include the formulation

of maintenance policies and strategies, resource planning, financial considerations, difficulties in procuring spare parts, inflation of maintenance costs by operatives, and challenges with data recording, storage, and management. Human resources factors involve the qualifications of maintenance personnel, their attitudes towards maintenance work, levels of motivation, wages, potential human errors, and the adequacy of training and development programs. Interestingly, the study did not identify any specific technical factors affecting port maintenance. Other significant issues include a lack of maintenance culture, ineffective maintenance programs, natural deterioration of infrastructure due to age and environmental factors, complex infrastructure designs lacking input from maintenance experts, aged infrastructure, and high utilization rates of infrastructure.

Eliakunda, Mashoke and Gurisha (2018) Assessed Dar es Salaam port logistics chain players' service delivery factors and level of their integration for port efficiency and competitiveness in Dar es salaam port. The study examined the level of technology in place among logistics players and the way they integrate documentation process and inter process communication. The study examined the extent of technological adoption among logistics participants and their approach to integrating documentation processes and inter-process communication. A survey method was employed, with questionnaires distributed to 126 logistics service providers and users. Descriptive statistics were used for data analysis. The study revealed that the port should streamline the clearance process, enhance inter-process communication, and align processes to enhance logistics efficiency and competitiveness. Issues such as high duties and logistics charges, the absence of a single clearance window, and multiple agencies involved in cargo clearance need to be addressed, as they impact the port's efficiency and effectiveness.

Munim et al., (2020) Identified the appropriate governance model for green port management: Applying Analytic Network Process and Best-Worst methods to ports in the Indian Ocean Rim. The study revealed that greater privatization in port governance could improve the adoption of Green Port Management (GPM) practices. It also showed that privatization in port governance has the potential to enhance the implementation of GPM practices. The private sector, known for prioritizing efficiency, cost-effectiveness, and competitiveness, can promote the uptake of innovative and sustainable technologies and practices in port management.

Phan et al. (2021) carried out study on port service quality (PSQ) and customer satisfaction: an exploratory study of container ports in Vietnam. The study conducted a survey and developed a questionnaire that was piloted with senior executives from different container shipping lines and logistics firms in Vietnam. The findings show that Perceived Service Quality (PSQ) comprises four factors and 16 items. It was found that an improved PSQ would positively affect customer satisfaction, with the outcomes of port service performance and its image having the most significant impact. Notably, many items related to social and environmental responsibility were excluded, which was anticipated given the context of a developing country like Vietnam.

Ardakani and Fei (2020) carried out study on a systematic literature review on uncertainties in cross-docking operations. The study found that managing the environmental impacts associated with boating and shipping is a notably complex and challenging endeavor. This complexity stems from the fact that these impacts unfold across various spatial and temporal scales, making it difficult to address them with a one-size-fits-all approach. For example, the environmental consequences of maritime activities can differ significantly depending on the specific location and time period being considered. Additionally, the involvement of a broad range of user groups, each with their own competing needs, beliefs, responsibilities, and economic interests, further complicates the task. The diverse perspectives and priorities of these stakeholders can lead to conflicting demands and make it challenging to develop effective

strategies that balance environmental protection with economic and operational considerations. Thus, the study underscores the need for sophisticated and flexible approaches to navigate the multifaceted nature of environmental impact management in the maritime sector.

Byrnes and Dunn (2020) did study on boating and shipping-related environmental impacts and example management measures. The study found that addressing environmental impacts associated with boating and shipping is a complex and challenging task, involving impacts that operate across various spatial and temporal scales. It also involves diverse user groups with competing needs, perceived responsibilities, ambitions, and economic interests. The study highlighted the potential exploitation of legal disparities and inefficient coordination within and between different maritime zones. Despite these challenges, the study identified various measures that can ensure sustainable management of boating- and shipping-related environmental impacts. These measures are broadly categorized as direct regulatory, informational and motivational, or economic instruments. The study noted that direct regulatory instruments have historically been relatively effective in reducing environmental destruction and pollution, especially in cases of gross negligence or willful misconduct.

Kravets et al. (2021) carried out study on transportation and logistics system for preparing areas to unload material resources in the absence of port infrastructure. The study found that despite the recent rapid development of remote territories, the full development of port infrastructure does not always meet the requirements of logistics enterprises and organizations. This has led to an increased need to unload material resources on unequipped coasts. Although there has been ongoing discussion about improving technologies and developing methods for unloading material resources on unequipped coasts, a satisfactory solution that considers all the relevant factors has not yet been found.

Fahim et al.(2022) carried out study on port performance evaluation and selection in the Physical Internet in USA. The study used the Bayesian Best-Worst Method (BWM) to derive weights for the criteria. The study found that, in the initial stage of modeling intelligent agents' performance preferences, there are slight differences in weights compared to the existing literature on port performance evaluation and selection. This transition from the current state to the Performance Index (PI) is somewhat reassuring for port authorities, as they can largely focus on the same set of performance indicators to appeal to both decision-makers. However, the study also revealed differences among agents, with a notable increase in the importance of Level of Service, Network Interconnectivity, and Information Systems.

Lin et al., (2022) carried out study on an analysis of port congestion alleviation strategy based on system dynamics in China. The study used a system dynamics model of dual-port operation is developed considering the factors of the integrated service level of liner routes, empty container allocation, port congestion and regional economics, and so forth. The study found that port congestion primarily arises from the implementation of epidemic preventive measures. Among the three strategies considered, the hybrid strategy was found to be the most effective in mitigating port congestion, improving integrated service levels, and stabilizing container prices. Additionally, many current ports are investing in more human resources and fixed assets to address port congestion. The study also discussed the impacts of various investments in human resources and fixed assets on alleviating port congestion. Finally, the study offered suggestions for the government to enhance cooperation between ports and promote the development of port facility resources.

Sun and Kauzen (2023) carried out study on the Impact of Port Infrastructure and Economic Growth in Tanzania. The study found a direct relationship between seaport infrastructure and the economy. It also determined the relationship between seaport infrastructure and

international trade. Additionally, the results indicated a significant relationship between international trade and economic growth. The study recommends improving seaport infrastructure alongside international trade to maximize its potential in promoting Tanzania's economic growth. This is because transporting goods through maritime routes is cheaper compared to other modes of transportation.

Mwendapole (2015) analyzed the Factors Contributing to Poor Seaport in Tanzania. The study revealed that poor port performance can be attributed to several factors, including inadequate hinterland connections, socio-economic and political challenges, deficiencies in port facilities, a lack of expertise, deficiencies in ICT management, and inefficiencies in supervision and motivation. The study also identified appropriate methods for measuring seaport performance, highlighting the use of Port Performance Indicators (PPIs), which are categorized into operational and financial indicators. Additionally, the researcher proposed several measures to enhance seaport performance, such as implementing effective customs clearance procedures, improving connections between seaports and hinterlands, and installing modern maritime and port facilities.

Lee et al., (2018) carried out study on decision support system for vessel speed decision in maritime logistics using weather archive big data. The study found that, the revised fuel consumption function provides more accurate fuel consumption estimates compared to the benchmark method, which does not account for weather impact. This improvement is particularly noticeable in long voyage legs. Therefore, for intercontinental long voyages where weather and sea conditions vary significantly compared to closed seas, the proposed Decision Support System (DSS) can lead to significant cost savings. Additionally, the Particle Swarm Optimization (PSO) solver of the DSS produces Pareto optimal solutions, enabling trade-off analysis between fuel consumption and port service level. This allows liner operators to determine vessel sailing speeds for each leg based on customer requirements.

Baik (2017) carried out study on impacts of Mega container ships on ports, the container shipping market is saturated but mega ships are running major container routes and this affects ports and terminal operators. The study found that as container lines focus on maximizing profit margins and engage in intense price competition, leading terminal operators also face increased pressure to outperform their competitors in terms of efficiency and cost-effectiveness. The use of mega ships has led to additional infrastructure costs for ports, which are borne by investors. Mega carriers wield significant influence over ports, as they can threaten to divert their cargo elsewhere if they do not receive favorable rates and conditions. Some industry experts believe that the advantages and disadvantages of mega ships will balance out with the introduction of the next generation of 24,000 TEU vessels. Effective collaboration between ports and shipping lines hinges on good communication.

Gracia et al., (2019)'s The study revealed that the container loading and discharging process is inherently complex. Moreover, port terminal managers are currently confronted with a growing number of constraints that hinder their ability to respond effectively to disruptive events. This paper presents various operational strategies that were tested to assess their impacts on container loading and discharging operations. These strategies were evaluated in terms of Vessel Handling Time (VHT) across four scenarios designed to replicate potential vessel servicing situations at the container terminal. To facilitate our study, we proposed an experimental framework based on a simulation model, scenario comparison, and search experimentation. This approach enabled us to draw robust conclusions regarding the operational strategies that could be implemented to enhance the loading and discharging process.

Densberger and Bachkar (2022) did study on accelerating the adoption of zero emissions cargo handling technologies in California ports in Los Angeles and Long Beach. The review of articles revealed that the Ports of Los Angeles and Long Beach are at the forefront of sustainable practices, implementing zero-emission cargo handling equipment projects at a higher rate than other ports in California. This leadership position underscores their commitment to a sustainable circular strategy. The study identified key lessons from the ports' ongoing zero-emission planning documents and demonstration projects, highlighting the importance of collaboration, innovation, and proactive policy-making in driving the transition to zero emissions. The Ports of Los Angeles and Long Beach serve as exemplary case studies, showcasing best practices for other ports seeking to accelerate the adoption of zero-emission technologies. Goerlandt and Montewka (2015) studied a framework for risk analysis of maritime transportation systems: A case study for oil spill from tankers in a ship–ship collision in Finland. A two-stage risk description is applied. In the first stage, Bayesian Network (BN) modeling is applied for probabilistic risk quantification. The model functions as a communication and argumentation tool, serving as an aid to thinking in a qualitative evidence and assumption effect assessment. The evidence assessment is used together with a sensitivity analysis to select alternative hypotheses for the risk quantification, while the assumption effect assessment is used to convey an argumentation beyond the model. Based on this, a deliberative uncertainty judgment is made in the second risk analysis stage, which is supplemented with a global strength of evidence assessment. The frame- work is applied to a case study of oil spill from tanker collisions, aimed at response capacity planning and ecological risk assessment. The BN-model is a proactive and transferable tool for assessing the occurrence of various spill sizes in a sea area. While the case study uses evidence specific to the Gulf of Finland, the model and risk analysis approach can be applied to other areas. Based on evaluation criteria and tests for the risk model and risk analysis, it is found that the model is a plausible representation of tanker collision oil spill risk.

Mwisila and Ngaruko (2018) carried out study on factors affecting Productivity of Container Terminals of Ports in Tanzania. The study found that the productivity model's explanatory variables are jointly significant. However, these predictors do not have either long-run or short-run relationships with the respondent variable, as they are insufficient to stimulate it. There are weaknesses in the model, such as the controversy that Total Number (TN) and Container Shipments (CS) are decreasing while Container Terminal Throughput (CTP) is increasing. This inverse relationship might be acceptable for CS if larger container ships were replacing smaller ones, but this was not the case due to draft limitations. Despite an increase in Container Moves per Hour (CMPH), the port still faces congestion and delays. This indicates that the increase in CMPH does not match the increase in CTP, making CMPH undesirable for reducing ship turnaround time. Additionally, the increase in Dwell Time (DT) results in containers staying longer at the port before clearance. The study recommends a precise review and setting of productivity factors and benchmarks for the quay, yard, gate, and cost-effective areas.

Ali, Buana and Suastika (2022) did a study of Efficiency of Container Terminals in Tanzania. The study found a range of technical efficiency scores among container terminals, with the lowest score at 0.430 and the highest at 0.997. On average, the terminals in the sample operated at around 82.1% efficiency, indicating that there is room for improvement to reach their maximum potential output. The most efficient terminal identified was in Zanzibar, while the least efficient was in Mtwara. The study suggests that automation is urgently needed to reduce inefficiency levels, ensuring timely submission, delivery, and higher quality services.

2.4 Conceptual Framework

A conceptual framework is an analytical tool or a visual representation that helps researchers and academics to systematically organize and structure their ideas, concepts, and theories in the context of a research study. It serves as a foundation for understanding the relationships between various variables and constructs and guides the development of research questions, hypotheses, and methodology. The conceptual framework plays a crucial role in research by providing a clear structure and direction for the study. It helps researchers to define the research problem more precisely, identify the key variables that need to be studied, and establish the theoretical foundation that guided their investigation. By outlining the relationships between these variables, the conceptual framework helps researchers to formulate hypotheses and develop a coherent research design.

Figure 2.1 presents the conceptual framework to illustrates the relationships between the key variables, showing how they are expected to influence one another. This conceptual framework helps to conceptualize the study but also makes it easier to understand the theoretical underpinnings of the research. Additionally, the conceptual framework serves as a roadmap for researcher, guiding the collection and analysis of data. By providing a clear outline of the key variables and their relationships, the framework helps researcher to stay focused on the specific objectives of the study. This ensures that the data collected is relevant and contributes directly to answering the research questions. Moreover, the framework acts as a tool for evaluating the findings of the study, enabling researcher to determine whether the results support the proposed relationships between variables.

Figure 2.1: Conceptual Framework
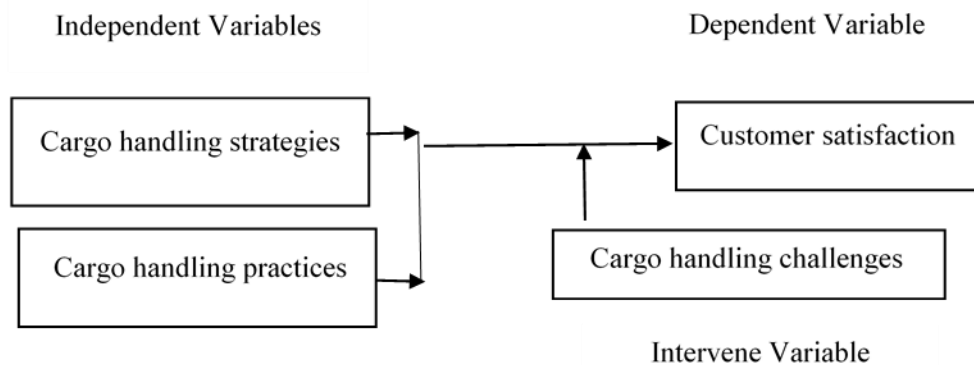
Source: Researcher (2024)

2.5 Variables Propositions

2.5.1 Cargo Handling Practices

Effective cargo handling practices are essential for ensuring that logistics services meet or surpass customer expectations. When these services are effectively implemented, they result in reduced waiting times and expedited delivery, which are essential for ensuring customer satisfaction (Farafontova et al., 2023). Ensuring efficiency in the packing process is crucial for maintaining product safety during transit, preventing delivery errors and losses. A well-executed packing process is essential for productivity and ensuring accurate and intact delivery of orders (Mikishanina, 2023).

On the other hand, insufficient handling methods can result in a higher likelihood of cargo being damaged. This has a direct impact on the customer's perception of the quality of the logistics service. Studies suggest that different aspects of logistics service quality (LSQ),

including the accuracy of orders, the promptness of service, the condition of orders, the quality of personnel contact, and the reliability of information, have a substantial impact on customer satisfaction (Ulitskaya et al., 2023). These dimensions are frequently assessed in relation to expectations and can greatly impact customer perceptions, thereby affecting the probability of service reuse (Melnyk and Malaksiano, 2020).

The complexities of effective cargo management are further emphasized by the multiple stages involved in the warehousing process, including dispatching, kitting, and the intricate logistics of handling delicate merchandise (Melnyk and Malaksiano, 2020). A streamlined dispatch process guarantees prompt delivery and precise order completion, which are crucial for ensuring customer satisfaction (Zhao et al., 2020). Similarly, utilizing software for inventory monitoring enhances the efficiency of the supply chain by guaranteeing optimal stock levels and mitigating the likelihood of stock outs or overstocking. The meticulous focus on detail during the warehousing process not only enhances efficiency but also strengthens the overall performance of the supply chain, resulting in improved customer satisfaction (Densberger and Bachkar, 2022).

2.5.2 Cargo Handling Challenges
Obstacles in the field of logistics, such as adverse weather conditions, delays in the transportation process, and regulatory obstacles, can greatly hinder the prompt and safe delivery of goods (Densberger and Bachkar, 2022). The occurrence of intense weather events and other natural calamities, worsened by the effects of climate change, bring about uncertainty in the process of organizing and managing logistics. This uncertainty has the potential to interrupt the flow of goods and result in delays or harm to the cargo (Aminatou et al., 2018).

Changing climate conditions can impact transportation, such as when significant decreases in water levels in major rivers hinder shipping routes and schedules (Aminatou et al., 2018). In addition, the ever-changing cybersecurity threats require strong measures to safeguard logistics data, which adds further complexity to operations. Effectively addressing these risks is crucial for ensuring the reliability of cargo delivery and upholding customer confidence (Magenge, 2022).

2.5.3 Cargo Handling Strategies
Implementing strategic measures such as advanced tracking systems significantly improves logistics service quality by providing real-time visibility and monitoring, which increases operational efficiency and reduces costs (Kuznetsov et al., 2017). Technologies like GPS and RFID tracking, alongside telematics systems, offer a granular level of detail about the location, speed, and even the temperature or humidity conditions of shipments. This kind of visibility ensures that fleet managers can optimize routes, anticipate and address potential issues, and provide timely delivery information to customers, leading to improved satisfaction (Kuznetsov et al., 2017).

3.0 Methodology

The study employed a quantitative and qualitative research approach. This based on the nature of the problem, objectives, data collection methods as well as analysis and interpretation in order to establish the associations between variables and to determine the relationship between the two variables. Quantitative approach focuses much on measurement of numerical data consequently to the presented filled information by the respondents. The approach will enable the researcher to collect large data from sample subset, it will also allow researcher to ignore

the doubtful information data according to the response from respondents when filling the data (Saunders *et al.,* 2015).

3.1 Research design

The study employed a convergent research design to investigate the impact of handling efficiency on customer satisfaction at Dar es Salaam Port. This approach was chosen because it integrated both quantitative and qualitative methods, enabled the triangulation of findings and thereby enhanced the validity and reliability of the research. Triangulation involved comparing and cross-verifying results from survey and interview methods to ensure data consistency and accuracy.

3.2 Study Area

The study was conducted at the Dar-es-Salaam port, which was chosen as the research site for several compelling reasons. Firstly, as the principal port of Tanzania, Dar es Salaam holds significant importance in the country's maritime operations. Secondly, it is responsible for handling approximately 95% of Tanzania's international trade, serving not only Tanzania but also the landlocked countries of Malawi, Zambia, Democratic Republic of Congo, Burundi, Rwanda, and Uganda (TPA, 2021). Furthermore, the strategic location of the Dar es Salaam port positions it as a convenient freight linkage for countries in East and Central Africa, as well as those in the Middle and Far East, Europe, Australia, and America (Basso, 2019).

Figure 3.1 Map of the study Area
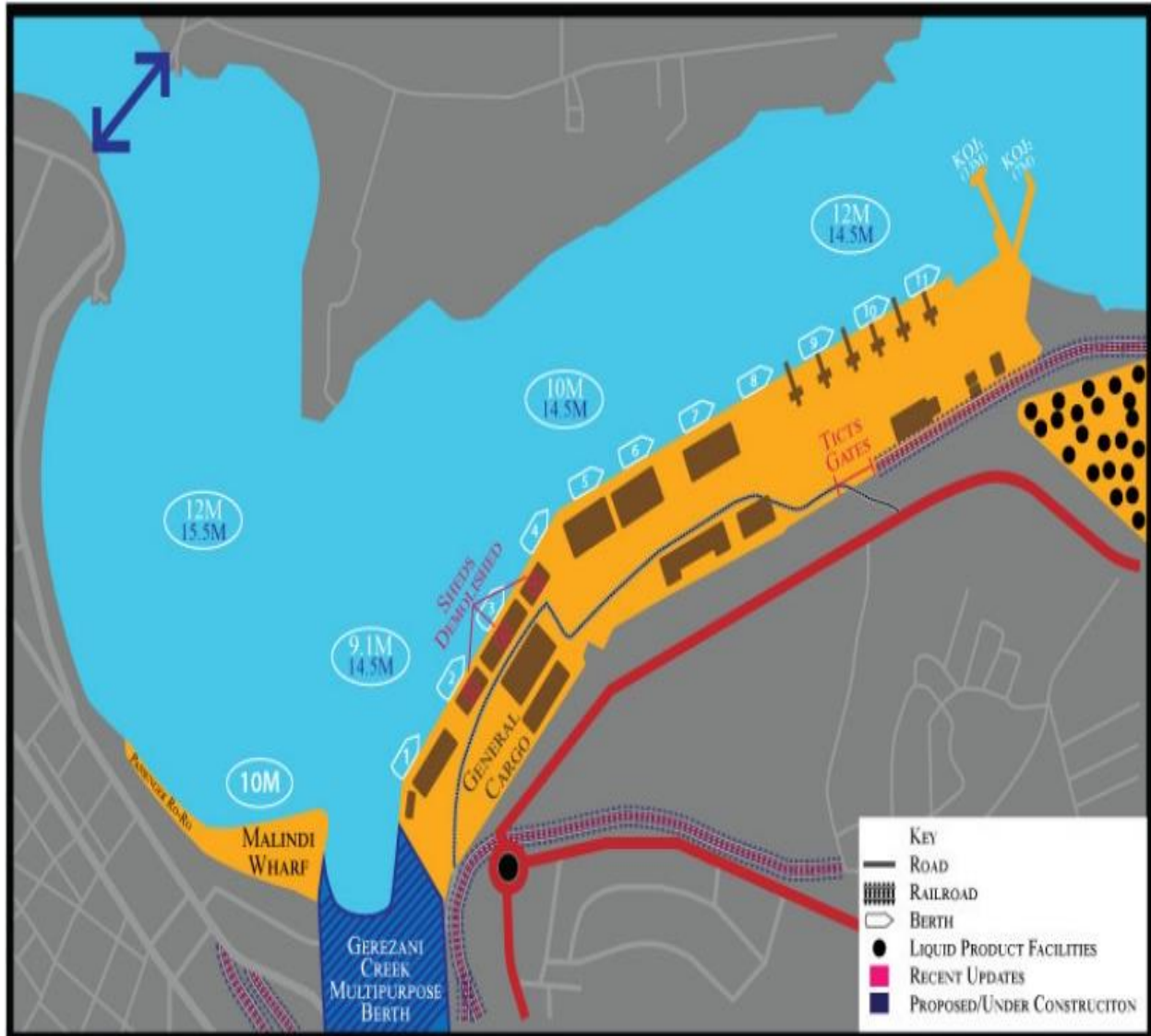
3.3 Study Population

The population of a study refers to the specific group targeted for research, from which inferences can be made. As Kothari (2004) points out, it represents the complete collection of elements that the study aims to investigate. In this case, the study population comprised 1,500 individuals working at the Dar es Salaam port, including staff members of Dar es Salaam Port, Director of Security Services, Director of ICT Services, Director of Engineering Services, Director of Corporate Planning, Director Quality and Risk Management, Director of Marine & Port Operations, and Director of Infrastructure, Planning and Investment.

3.4 Sampling Technique and Sample Size
3.4.1 Sampling Technique

The study employed simple random sampling and purposive sampling techniques were employed to select respondents of the study.

3.4.2 Sample Size
The study had a sample of 95 respondents categorized as follows:
Table 3.1: Unit of Inquiry

Unit	Sample Size	%
Top Management		
Director of Security Services	1	1
Director of ICT Services	1	1
Director of Corporate Planning	1	1
Director of Quality and Risk Management	1	1
Director of Marine and Port Operations	1	1
Director of Infrastructure, Planning and Investment.	1	1
Staff Members		
Clearance and forwarding Officers	30	32
Customs officers	29	30
Operational officers	30	32
Total	**95**	100

Source: TPA (2023

4.0 Data Collection Method
4.1 Survey Method

The study employed the survey method to gather information from staff members at the Dar es Salaam Port Authority, focusing on current practices in cargo handling equipment and the challenges impacting customer satisfaction.

4.2 Interview Method
The study employed interviews to gather primary data from key respondents such as the Director of Security Services, Director of ICT Services, Director of Engineering Services, Director of Corporate Planning, Quality and Risk Management, Director of Marine & Port Operations, and Director of Infrastructure, Planning & Investment.

5.0 Findings of the Study

Based upon this study, it revealed the following main findings:

5.1 The Current Practices of Cargo Handling Equipment at DSM Port
The study found that Dar es Salaam Port employs a range of cargo handling practices and equipment designed to manage diverse types of cargo and ensure efficient operations. This comprehensive approach includes the deployment of container cranes, both ship-to-shore and gantry cranes to facilitate the loading and unloading of containers from ships. The use of these cranes is essential for managing the high volume of containerized cargo that flows through the port, enabling quick and effective turnaround times for vessels.
In addition to container handling, the port employs straddle carriers and yard cranes to transport containers within the port area. These vehicles are pivotal in organizing and relocating containers in storage yards, thereby streamlining the overall cargo flow and minimizing congestion. The port's ability to manage bulk commodities such as grain, coal, and minerals is supported by specialized equipment like grabs, hoppers, and conveyor systems. This equipment

is tailored to handle the specific needs of bulk materials, ensuring that these goods are transferred efficiently and safely.

For non-containerized cargo, including breakbulk and project cargo, the port relies on forklifts, reach stackers, and other handling equipment. This versatility in equipment is crucial for managing the diverse nature of non-containerized cargo, which often requires different handling techniques compared to containerized goods. The management of storage yards and warehouses at the port also plays a significant role in maintaining an organized system for temporary storage, allowing cargo to be held securely until it can be transported onward.

Safety protocols are another critical aspect of the port's operations. The study highlights that the implementation of safety measures for equipment operation and cargo handling is a priority, aimed at preventing accidents and ensuring the well-being of port personnel. Additionally, measures to secure cargo against theft or damage are integral to protecting the integrity of the goods and maintaining trust in the port's services.

The adherence to international standards for port security demonstrates the port's commitment to global best practices, enhancing its reputation and operational compliance. The incorporation of advanced technologies, such as automated stacking cranes, RFID tracking systems, and port management software, further underscores the port's efforts to optimize operations. These technologies contribute to improved efficiency by automating processes, enhancing tracking capabilities, and streamlining management tasks.

The study findings implying that, by employing a broad array of equipment and practices, Dar es Salaam Port is positioned to handle a wide variety of cargo types effectively. The integration of specialized equipment for different cargo categories ensures that the port can cater to diverse needs, enhancing its competitiveness in the regional and global shipping market. The emphasis on safety and security protocols not only protects cargo and personnel but also bolsters the port's reliability and reputation. Finally, the adoption of advanced technologies signals a forward-looking approach that can lead to increased operational efficiency and improved service quality. These practices collectively contribute to the port's ability to support economic growth and facilitate international trade, reinforcing its strategic importance in the region.

The study findings align with the research conducted by Pinto and Costa (2019), which examined the impact of advanced technologies on port operations. Their study revealed that the implementation of automated stacking cranes, RFID tracking systems, and sophisticated port management software resulted in significant operational improvements. Specifically, these technologies contributed to a 30% increase in operational efficiency, which highlights their effectiveness in streamlining port activities and optimizing resource utilization. Additionally, there was a notable 20% reduction in labor costs, demonstrating how automation and technology can reduce the need for manual labor and associated expenses. With RFID tracking systems, Port of Beira was able to monitor the movement and status of cargo in real-time, leading to more accurate and efficient handling processes. The integration of automated stacking cranes and advanced port management software also played a crucial role in refining these processes. As a result, the Port of Beira in Mozambique experienced improvements in service quality and customer satisfaction. The ability to provide timely and reliable services not only boosted operational performance but also contributed to a better overall experience for customers, underscoring the positive impact of these technological innovations on port management and service delivery.

5.2 The Cargo Handling Challenges that Hinder Customer Satisfaction at DSM Port

The study found cargo handling challenges that have been hindering customers satisfaction at Dar es Salaam Port. The challenges including long waiting times for vessels, trucks, and cargo

due to insufficient berth space, inefficient handling procedures, or inadequate coordination between different stakeholders, outdated or inadequate port infrastructure, including insufficient berths, outdated handling equipment, and inadequate storage facilities, poor coordination among port operators, shipping lines, freight forwarders, and customs authorities, inadequate handling practices that result in cargo damage or loss during loading, unloading, or storage lengthy bureaucratic processes, including customs clearance procedures, documentation errors, and administrative bottlenecks, cargo theft, pilferage, and inadequate security measures within the port premises, inability to handle peak cargo volumes efficiently, leading to congestion, delays, and increased costs for customers , and poor communication between port authorities, shipping lines, and cargo owners regarding the status of shipments.

The study findings implying that the inadequate berth space, which has led to prolonged waiting times for vessels, trucks, and cargo. This challenge is attributed to inefficient handling procedures and poor coordination among the various stakeholders involved, such as port operators, shipping lines, freight forwarders, and customs authorities. The lack of modern infrastructure, including outdated handling equipment and insufficient storage facilities, intensifies these delays and inefficiencies.

Furthermore, the study findings implying that outdated port infrastructure significantly hampers operational efficiency. The port's inability to accommodate peak cargo volumes results in congestion and delays, driving up costs for customers and leading to a decrease in overall satisfaction. The bureaucratic processes, including customs clearance and documentation errors, contribute to additional delays and administrative hurdles, further straining the system.

The study findings further implying that security concerns also play a significant role, with instances of cargo theft and pilferage highlighting the inadequacy of current security measures. These security lapses, combined with poor communication between port authorities, shipping lines, and cargo owners regarding shipment status, create a fragmented and unreliable experience for customers. In summary, the study underscores the urgent need for infrastructural upgrades, improved handling practices, enhanced security, and better coordination to address these challenges and improve the overall efficiency of cargo operations at Dar es Salaam Port. The study findings are on the same line with the study by Smith (2021) which revealed that Mombasa port in Kenya had faced the operational challenges that significantly impact its effectiveness. One major the challenge is congestion, particularly in the cargo handling and logistics areas, which causes delays in the clearance and movement of goods. The port's infrastructure is another critical concern; it is not adequately equipped to manage the increasing cargo volume. This inadequacy is evident in the limited storage facilities, outdated equipment, and insufficient berthing space for large vessels. Customs procedures at the port also contribute to inefficiencies. The process is bogged down by bureaucratic delays and complex procedures, which extend the time required for import and export processing. The absence of streamlined digital systems exacerbates these issues. Additionally, the transportation network linking the port to inland destinations is plagued by logistical bottlenecks.

5.3 The Solutions for the Effective Cargo Handling Practices at DSM Port

The study found solutions for the effective cargo handling at Dar es Salaam Port. The solutions including acquiring and deploying advanced container cranes, forklifts, and reach stackers would significantly enhance cargo handling efficiency at the port. Also, implementing Port Community Systems (PCS) would improve coordination and information sharing among

stakeholders, such as shipping lines, customs, and logistics providers, was recommended. Additionally, conducting training programs for port personnel, equipment operators, and customs officials to boost their skills and efficiency. Furthermore, increasing the number of berths, storage facilities, and handling equipment was proposed to handle larger cargo volumes and reduce congestion. Lastly, adopting advanced traffic management systems would help better coordinate cargo flow and minimize bottlenecks within the port.

The study findings implying that, focusing on acquiring and deploying advanced container cranes, forklifts, and reach stackers, the port can significantly enhance its cargo handling capabilities. These advanced pieces of equipment are essential for speeding up the loading and unloading processes, thus addressing one of the primary challenge in port operations. Efficient cargo handling machinery not only reduces turnaround times for vessels but also helps in managing the increasing cargo volumes more effectively.

The study also implying that, the implementation of Port Community Systems (PCS). PCS would foster better coordination and information sharing among various stakeholders such as shipping lines, customs authorities, and logistics providers. This interconnectedness is crucial for streamlining port operations, as it facilitates real-time data exchange and collaborative problem-solving, thereby reducing delays and improving overall operational efficiency.

Training programs for port personnel, including equipment operators and customs officials, are also highlighted as a significant component of the study will enhance the skills of the port employees which is vital for maximizing the effectiveness of the new technologies and systems being introduced. Skilled personnel are better equipped to handle sophisticated equipment and navigate complex customs procedures, which contributes to smoother and faster cargo processing.

Additionally, the study findings imply that, the number of births, storage facilities, and handling equipment will allow the port to accommodate larger volumes of cargo and reduce congestion. This expansion is essential for keeping pace with growing trade demands and preventing delays caused by limited capacity. Laslty the adoption of advanced traffic management systems will contribute to better coordination of cargo flow and minimize challenges within the port. These systems can optimize traffic patterns and ensure that cargo movement is as efficient as possible, thereby addressing the problem of congestion.

The study findings align with Hassan (2018)'s study which found that deploying state-of-the-art container cranes, forklifts, and reach stackers has a profound impact on port operations. These advanced pieces of equipment play a crucial role in speeding up the loading and unloading processes. Their adoption is essential for managing increased cargo volumes efficiently and reducing vessel turnaround times in Egyptian ports. By integrating such technologies, Egyptian ports had effectively addressed challenges associated with handling large quantities of cargo. Additionally, the study found the importance of implementing Port Community Systems (PCS) to enhance coordination among various stakeholders. PCS helped Egyptian ports to facilitates real-time information exchange among shipping lines, customs authorities, and logistics providers, which streamlines operations and reduces delays. This improved connectivity is essential for optimizing port processes and overall operational efficiency.

6.0 Conclusion

The study concluded that current practices of cargo handling equipment at Dar es salaam Port including the use of container cranes (ship-to-shore and gantry cranes) for loading and unloading, straddle carriers and yard cranes for internal container transport, and specialized

equipment like grabs, hoppers, and conveyors for bulk commodities. Additionally, forklifts, and reach stackers have been used to handle non-containerized cargo. The port also manages storage yards, implements safety protocols, and adheres to international security standards. Lastly, automated stacking cranes, RFID tracking systems, and port management software are utilized to optimize operations and enhance efficiency.

Also, the study concluded that cargo handling challenges at Dar es Salaam Port include long wait times due to insufficient berth space and inefficient handling procedures, outdated port infrastructure, poor coordination among stakeholders, inadequate security leading to theft and pilferage, lengthy bureaucratic processes, and poor communication regarding shipment status. Again, it was concluded that, the solutions for effective cargo handling at Dar es Salaam Port including acquiring advanced equipment like container cranes and forklifts, implementing Port Community Systems (PCS) for better coordination, and conducting training for port personnel. Increasing the number of births, storage facilities, and handling equipment is essential to manage larger cargo volumes and reduce congestion. Additionally, adopting advanced traffic management systems would help better coordinate cargo flow and minimize bottlenecks within the port.

7.0 Recommendations

The study recommends increasing the number of births and enhancing port infrastructure to handle more vessels and reduce wait times. Expanding berth space will ease congestion, speed up loading and unloading, and boost overall efficiency. Additionally, the study recommends investing in modern cargo handling equipment, such as advanced container cranes, forklifts, and automated systems, and streamlining handling procedures. Upgrading equipment and procedures will enhance efficiency, cut delays, and minimize operational bottlenecks. Furthermore, the study recommends implementing Port Community Systems (PCS) to improve coordination and information sharing among port operators, shipping lines, customs, and logistics providers. Enhanced coordination will streamline operations, reduce delays, and keep all stakeholders informed about cargo status and procedures. Lastly, the study recommends upgrading security infrastructure and practices to combat theft and pilferage. Installing advanced surveillance systems and access control measures will safeguard cargo, ensuring safer and more reliable handling operations.

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