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## The Influence of Stacking Yard Utilization and Operational Performance on Loading and Unloading Productivity at the Koja Container Terminal Joint Operation

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### Abstract

Indonesia is the largest archipelagic country in the world. Indonesia has extraordinary natural resources and human resources because of its strategic location between the continents of Asia and Australia and between the Indian and Pacific Oceans. Ports as trade gateways and providers of public services play a very important role in economic movements, and the economy plays an important role. very important in the economy. In the accumulation field utilization variable (X1) there are 13 indicators which are statements to be answered based on the suitability felt by the respondent. The questionnaire was created using a Likert scale which has answer options ranging from Strongly, no, disagree, disagree, not sure. , Agree and completely agree "Maximum loading and unloading productivity quality and in accordance with the set targets"; "The level of use of stacking yards for export activities is quite high" with an average of 4.5455, which means that respondents strongly agree. On the other hand, the lowest average is Information regarding the relationship between operational performance and loading and unloading productivity can be used to direct policy and strategic decisions.

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## INTRODUCTION

By having a variety of natural resource wealth. Also included in the Indian Ocean and the Pacific Ocean have very potential human resources and natural resources. Indonesia should have sea ports as a means of economic exchange between the country and the region. Shipping has two main sides: the "port side" and the "ship side". Indonesia, the largest archipelagic country in the world, is in a strategic location between two continents, Asia and Australia. The coastal areas of this country have many very important economic benefits. This phenomenon shows the important role of ports in world economic activities. Ports as trade gateways and public service providers play a very important role in economic movements, and the economy plays a very important role in the economy including ports, transportation, business, industry, agribusiness, agro-industry, tourism, and train business areas. Of course, this is an important point for the government to develop this sector.

Difficulties are the driving force for national development, where the development of transportation infrastructure, especially seaports, is a top priority. Maritime transportation is a system that includes transportation by water, in ports, safety and protection of the marine environment, including island and inland waters. The port as a cruise ship facility provides services for ships, goods and passengers. Industrial ports are becoming truly global entities as they distribute most of the products to customers from manufacturers. The port functions as a defense/buffer against the entry of goods and individuals in and out. As a result of this role, the price difference between producers and consumers is not large or reasonable.

As an archipelagic country, maritime ports in Indonesia have a major and strategic role in the movement of people and goods, which drives the country's economy. "ship end" means transportation companies and "port side"

means seaport operations, so the two areas cannot be separated when talking about shipping, as both areas are common intermediaries in international trade. According to Veenstra (2015), ports as the main part of sea transportation have a major role, port performance will have an impact on ship productivity in the transportation sector. This is of course a gap as well as an opportunity for the Koja Container Terminal by optimizing the use of the yard for other services within the framework of increasing performance and productivity which leads to increasing container flow.

According to Republic of Indonesia government regulation number 64 of 2015 amending law number 61 of 2009 concerning ports), sea ports act as a protective buffer for foreigners and prohibited items entering regions in Indonesia. Clearance of foreign nationals is carried out by the entry immigration authority and free movement of export-import goods is carried out by the customs office. Another function of ports is to bridge the gap/distance between producers and consumers, because ports facilitate transportation when cargo is shipped from the start of production to the point of consumption (Lasse, 2015). Koja Container Terminal is the first private and modern container terminal in Indonesia, as a Joint Operation between PT Pelabuhan Indonesia II (BUMN) and PT Hutchison Ports Indonesia (a subsidiary of Hutchison Ports Holding). Operated since 1997, and officially inaugurated in early 1998. With a VISION: Becoming a Company that Provides Container Services and World Integrity. MISSION: As a comprehensive and innovative container terminal service provider that provides added value for customers by building reliable human resources to maintain stakeholder trust in the facilities as follows :



Fig 1. Suprastructure Facilities

Field utilization has not been maximized so that the maximum capacity of the maximum field has not been reached, which means that there are facilities that are idle for quite a long time. Loading and unloading productivity at the Koja Container Terminal is not yet optimal. Based on the background description in the issue request as follows:



Fig 2. Infrastructure Facilities

1. The utilization of the piling yard has not been maximized so that the maximum capacity of the piling yard has not been reached, which means that the facility has been idle for quite a long period of time.
2. Service to service users is less aggressive and still slow.
3. There is no mapping of after-sales service.
4. Loading and unloading productivity at the Koja Container Terminal is not yet optimal.

This is due to natural factors and less than optimal loading and unloading performance caused by loading and unloading equipment which has started to enter old age and is outdated so it is less competitive with other terminals.

5. Increased competition/competitors in the container loading and unloading industry around Tanjung Priok and shipping to other terminals.
6. There are provisions for service rates at container terminals based on the decision of the Ministry of Transportation and service rate guidelines by PT Pelabuhan Indonesia (Persero) formerly Pelindo Indonesia II (Persero).

Apart from that, this research is also limited to the period March-August 2023. Research using questionnaires to service users at the Koja Container Terminal in 2022. Considering the breadth of research and research time, the author limits this analysis to only affecting field utilization and operations. on loading and unloading productivity at the Koja Container Terminal.

The formulation of the research problem can be stated as follows: (1) Is there any influence? utilization of the stacking yard on the results of operations at the Koja Container Terminal?; (2) Is there an impact on loading and unloading productivity on operational performance at the Koja Container Terminal?; and (3) Is there an influence on stacking yard utilization and loading and unloading productivity together on operational performance at the Koja Container Terminal?

The aim of this research is: (1) Analyze and develop the influence of stacking yard utilization on operational results at the Koja Container Terminal; (2) Analyze and develop the influence of operational performance on loading and unloading productivity at the Koja Container Terminal; and (3) Analyze and develop the influence of stacking yard utilization and operational performance together on loading

and unloading productivity at the Koja Container Terminal.

The benefits that can be obtained from this research are: (1) Theoretically, researchers are expected to be able to use the theories and concepts learned in lectures at STIP; and (2) In a practical way. It is hoped that this research will result in improvements and development in providing research, studies, scientific work in the field of international transportation, especially the influence of terminal stacking yard utilization and loading and unloading productivity on operational performance at the Koja Container Terminal and a reference for further studies as well as becoming a literary reference material for similar studies. It is hoped that this research will increase our knowledge and understanding of terminal stacking yard utilization and productivity which are negatively correlated with operational performance. Besides that, it is hoped that this analysis can be used as a reference and comparison material.

**METHOD**

In economics, productivity refers to the relationship between what is gained and what is sacrificed to produce something. includes three components, namely: first, production is the physical product of the production business unit, second, productivity is the level of success of industrial management in utilizing manufacturing facilities. Third, productivity is the effective use of equipment and labor. Technically, productivity is the comparison between output (results) and all required resources (inputs). Productivity also includes a comparison between output and the role of labor at one time. The ratio of output to a measure of efficiency in using limited resources to produce goods and services. A higher ratio number indicates a higher level of efficiency. In simple terms, the production ratio formula is:

$$\text{Productivity} = \frac{\text{Outputs}}{\text{Inputs}} \quad (1)$$

(2) There are two basic types of productivity ratios, for example: (1) Total production, which relates the value of all inputs and outputs, uses the ratio of total output and total input; and (2) Partial production uses the total output/partial input ratio to relate the value of only the main inputs to the value of all output.

Employee productivity index, because employees are one of the most important ongoing costs for most coordination. On the other hand, the productivity ratio measures the number of units that must be done and the amount of waste material (wasted material). The dimensions and indicators of operational productivity are: (1) Effective, with indicators: good productivity, productivity is running, labor level, equipment condition, and security; and (2) Efficient, with indicators quality of service

Utilization comes from the word "utilization", which means "utilization" and "use". Therefore, the word "utilization" in this research means "exploitation". facilities in container terminal activities. Utilization of services by a group of people or individuals is known as service utility. A person's knowledge of a service influences how they utilize it. Facilities are a company's way of serving its clients to meet client needs and increase client satisfaction. Before a service can be provided to customers, physical resources must exist, and facilities can be provided to meet customer needs. In general, a service is any tool or module that a service provider can provide to its customers to improve their experience. The completeness of existing facilities is one of the factors that can determine the quality of a port; The following are some of the main sea port facilities: (1)The purpose of wave protection is to withstand the waves because there are many piers in the harbor that allow ships to dock; (2)

A bridge is a construction in the form of a bridge that extends from the beach or land to the sea; (3) A dolphin is a standard set of iron, wooden or concrete rods used to moor a ship for loading and unloading goods; (4) The place where ships dock to carry out activities is called Mooring Buoy; (5) The high corners were water holes where ships moored for work; (6) Single Buoy Berth is a mooring buoy where oil tankers can unload their cargo through a pipe in a buoy that connects to land or a supply source; (7) Part of the port of entry is the port pool and the shipping lane or exit from the ship; (8) The signs indicated by the ship's signs are placed in the water to the port to direct the ship to dock; (9) A warehouse is a place where goods are locked and protected from bad weather; and (10) Ships lying at the dock can dock or dock to carry out their duties such as loading and unloading or other activities.

Modernization of ship loading and unloading equipment helps the process and time of loading and unloading from ship to land or vice versa. Using loading and unloading tools that are appropriate to the type of goods being unloaded will be more efficient and effective. Two groups consist of loading and unloading aids, namely: (1) Tools for loading and unloading ships; and (2) Tools for transporting goods at the port (land). Their facilities are divided into physical and non-physical facilities. Physical or material facilities are anything in the form of inanimate or tangible objects that function to assist the process, such as classrooms, laboratories, libraries, administrative rooms, school equipment, teaching media and so on.

Port performance is the result or level of success in the use of port services, facilities and equipment within a certain period of time. This performance is measured in units of time, units of mass and comparison factors. The focus of international service performance is as follows: (1) As a tool for assessing the success of

maritime management; (2) As a guide to preparation, explain the desired conditions; (3) Achieved at a future date as part of the resource allocation planning process; (4) To help monitor and assess the performance of activity implementation; and (5) As a basis for determining investment and tariff policies.

Performance is affected by components: (1) Individual/personal factors, which include the knowledge, skills, abilities, self-confidence and commitment that each person has; (2) Leadership factors: motivation, guidance, and support from managers and team leaders; (3) Team factors: support and enthusiasm from teammates, trust in each other, team cohesion and closeness; (4) System factors: work systems, organizational processes, work infrastructure or facilities, and organizational performance culture; and (5) Situational, or situational, factors include pressure and changes in the internal and external environment.

Main Port is a port whose main function is to serve national and international sea transportation activities, instead of using large domestic and international sea transportation, and as a transit location for goods and passengers as well as crossings with inter-provincial services. The main function of feeder ports is to serve domestic sea transport, not to accommodate limited quantities of domestic sea transport. The port also functions as a feeder for major and collecting ports, a place where passengers and goods arrive, and a crossing point for provincial services. Sea port operations generally include 7 (seven) port activities, including port pools and port supporting services; (1) Guarantee access to port and water areas for maritime and dock traffic; (2) Providing pilotage services and tugboat services for sea vessels; (3) Providing and providing services at the dock such as mooring/berthing, loading and unloading of animals and goods, and facilities for boarding and disembarking passengers; (4) Providing and providing

warehouse and goods storage services, port water transportation, loading and unloading equipment and port equipment; (5) Providing land for various projects and fields in relation to the smooth sea transportation of industrial products; (6) Providing a network of roads and bridges, parking for vehicles, sanitary sewerage, electrical installations, drinking water installations, fuel depots, and fire fighting vehicles; and (7) Providing a terminal for loading and unloading containers, liquid bulk, dry bulk and RO-RO vessels.

Ports are considered locations for government and business activities in accordance with Law No. 17 of 2008 concerning Shipping. Suyono stated (2007:11), Ports have at least four functions: as a meeting place (interface), gate (gateway), industrial organization, and distribution chain. Types of ports based on the division of customs areas are divided into special ports and free ports. Special ports are subject to customs duties, while free ports are not. The Container Terminal is a temporary storage place for import and export containers which is equipped with storage container handling equipment that meets international service standards, has an appropriate stacking area, reliable human resource support, and has service management data technology for containers. A container has a terminal that collects containers from land or other sea ports for transportation to a terminal for larger containers (Container Unit Terminal abbreviated to "UTC").

The establishment of a container terminal is a means of convergence between land and sea modes, especially container handling with special handling equipment, facilities and special experts in searching efficiency. Koleangan (Ibid) further explained that efficiency has 3 meanings, namely: (1) Cheap loading and unloading rates; (2) Shortage of labor; and (3) Fast loading time. Container terminal activities, where goods are transported

from land to sea using a container transportation system, are full of activities; (1) Land transportation, usually trucks, transports containers (PK) to the port. After that, PK is transported on a gantry with rubber tires (RTG), which is placed in the stacking yard; (2) The container (PK) is lifted and positioned to wait for the transport vessel with RTG; (3) When the transport ship has arrived at the pier and is ready, the containers (PK) begin to be stacked and lifted on the truck (HT) which is mounted on the RTG, leaning against the ship's dock area; (4) Using gantry cranes, containers (PK) are removed from the HT and placed on the ship; and (5) The ship leaves the dock after loading goods on board to a specific country or region.

The use of increasingly large containers certainly requires a place for loading and unloading containers. The container terminal functions as a link between container ships and land transportation modes. Container terminals can also be used as container warehouses before the container owner takes them. In most cases, the container terminal layout looks like this:

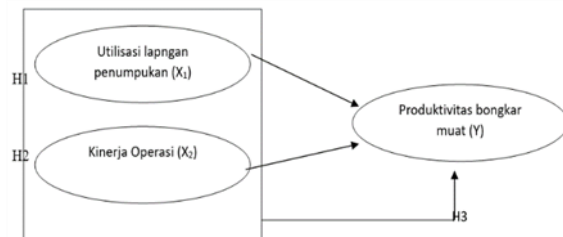


Fig 3. Business Process at the Container Terminal

In most cases, the process flow starting at the container terminal is: (1) The ship docks at the pier to load and unload containers; (2) Loading and unloading is done with a Quay Crane, also known as Ship to Shore (STS); (3) Containers are transported to the loading point (CY) using trucks or HTT; (4) Stacking is carried out by RTG for containers on CY; and Trucks purchased by customers will be their containers in the stacking yard, of course after

being confirmed by the container terminal operator. Apart from trucks, you can also take the train directly, as long as the container terminal is connected to the railway line.

The dimension of port performance or port achievement is output or level performance the success of port services during a certain period of time, which is measured in units of time, units of weight, and percentage comparisons.

The thinking framework, according to Sugiyono (2019:95), is a conceptual model of how theory influences various variables that have been identified as important problems. This conceptual framework describes the influence of the independent variable, namely: stacking yard utilization on the dependent variable, namely: operational performance through the mediating variable: loading and unloading productivity. Based on a review of previous research results, a conceptual framework can be prepared as follows: (1) Independent variables are variables that have an impact, namely factors chosen by researchers to determine the influence between observed phenomena. The exogenous variables in this investigation are: Utilization (X1) and Loading and unloading productivity (X-2); (2) Dependent variables are variable factors that are measured to determine the influence of independent variables, namely factors that appear or not, and which change according to those introduced by the researcher. The table of endogenous variables in this analysis is: Performance (Y)

One of the hypotheses used in this research is: (1) It is suspected that there is an impact of Utilization on Loading and Unloading Performance at the Koja Container Terminal Joint Operations (KSO); (2) It is suspected that there is an impact of Operational Performance on Loading and Unloading output at the Koja Container Terminal Operational Cooperation (KSO); (3) It is suspected that there is an influence of Utilization and Operational

Performance together on Loading and Unloading Productivity at the Koja Container Terminal Operational Cooperation (KSO).

In this research, the survey method was used, but based on the data used was quantitative research. Quantitative methods are objective research approaches and include the collection and analysis of quantitative data using statistical testing methods. "Research usually uses survey methods to obtain data for certain purposes and benefits which are then processed through an analytical approach through investigation instruments in the form of questionnaires distributed to respondents and the results are processed with SmartPLS.

Technique To collect data, this research used questionnaires and interviews. A questionnaire is a data collection method that involves giving respondents a number of questions or written statements to answer. In this research, the questions in the questionnaire are arranged in a way that is appropriate to the dimensions with the aim of ensuring that the questions do not deviate from the research objectives. In this research, the Lickert scale was used. The following table shows the weight values given to each instrument item:

Table 1. Likert scale values

No.	Alternative Answers	Value Weight
1	Strongly Agree (SS)	5
2	Agree (S)	4
3	Undecided (RG)	3
4	Disagree (TS)	2
5	Strongly Disagree (STS)	1

Interviews are a data collection method in which researchers and sources are interviewed directly.

Population is the totality of each element to be studied which has the same characteristics. These elements can be members of a group, events, or objects to be studied. The sampling technique used in this research is a simple random sampling method. Taking sample

members from the population at random without considering the class of the population is known as a simple sample. Taro Yamane's formula for sampling as explained by Ridwan and Engkos Achmad Kuncoro (2010:44). Where  $n$  is regarding the number of samples, then  $N$  is the number of residents and  $d$  is the population being measured ( $10\% = 0.1$ )

The variables investigated are traits or features of a person or organization that can be measured or observed which have certain differences that are identified by researchers to study and then draw conclusions. Independent Variables  $X_1$  and The independent variables in this research are  $X_1$  Use of stacking fields and  $X_2$ . Dependent Variable (Dependent Variable), according to Sugiyono (2011), dependent variability is a variable that is caused or influenced by the existence of an independent variable. In this research, the bound variability is (Y) Loading and Unloading Productivity. To conduct this research, the object of investigation was used as a service user at the Koja Container Terminal. The location of the research was at the Koja Container Terminal Jalan Digul No.1 Tanjung Priok Jakarta 14220.

The data collected in the research is presented in tabular form to facilitate data analysis and research. Data analysis is an action taken after data has been collected from all respondents or data sources. In data analysis, data is grouped according to respondent population variables, displayed based on each variable investigated, calculations are carried out to determine answers to questions, and the proposed hypotheses are tested.

## **RESULTS AND DISCUSSION**

The research instrument used in this study was a questionnaire, chosen as the method for data collection. The quality of the data collected plays a crucial role in determining the reliability and validity of the research results. Validity testing is essential as it assesses how

closely the research findings align with existing empirical conditions. It is through these findings that researchers can propose potential solutions to identified problems. Furthermore, these findings can be used as exemplars for broader connections or areas of research. To demonstrate the convergent and discriminant validity of the Structural Equation Modelling (SEM) analysis, certain criteria must be met. Firstly, the Average Variance Extracted (AVE) value should exceed 0.50 when correlated with its corresponding latent variable. Additionally, the square root of the AVE for each latent variable should be greater than the correlation between the latent variables.

Convergent validity is crucial as it indicates the extent to which different measures of the same construct correlate with each other. In this study, the AVE value serves as an indicator of convergent validity, with a higher value suggesting a stronger relationship between the observed variables and the latent variable they are intended to measure. Discriminant validity, on the other hand, assesses the extent to which a construct is distinct from other constructs in the model. This is important to ensure that the constructs are not measuring the same thing.

The criterion for discriminant validity in SEM is that the square root of the AVE for each latent variable should be greater than the correlation between that variable and any other latent variable in the model. The validity testing process is essential in ensuring the robustness and credibility of the research findings. By establishing the convergent and discriminant validity of the research instrument, researchers can have confidence in the accuracy and reliability of their results, allowing for meaningful and informed decision-making based on the findings of their study.

Reliability in measurement is fundamental as it indicates the degree of consistency and stability in the measurement



process, reflecting the absence of errors. It ensures that measurements are not influenced by random factors, guaranteeing consistent results across different times and types of instruments. Reliability, therefore, plays a crucial role in assessing the accuracy and consistency of the measurement instrument. In this study, the credibility of the measurement instrument was assessed through the examination of outer loadings. According to Hair et al. (2017), the recommended threshold for outer loadings is 0.70 or higher. This criterion ensures that the items in the measurement instrument are adequately capturing the underlying construct they are intended to measure. Items with low outer loadings may indicate poor reliability, suggesting that they are not effectively measuring the intended construct.

Another commonly used measure of reliability is Cronbach's alpha, which assesses the internal consistency of a set of items. A Cronbach's alpha value of above 0.70 is generally considered acceptable, indicating that the items in the measurement instrument are measuring the same underlying construct consistently. A low Cronbach's alpha value may suggest that the items are not effectively measuring the intended construct or that they are measuring multiple unrelated constructs. Composite reliability is another measure of reliability that is often used in structural equation modelling (SEM). It is calculated as the ratio of the squared sum of the standardized factor loadings to the squared sum of the standardized factor loadings plus the error variance. A composite reliability value between 0.70 and 0.90 is considered acceptable, indicating that the items in the measurement instrument are reliable and consistent in measuring the underlying construct.

Reliability is a critical aspect of measurement in research, ensuring that the measurement instrument is consistent, stable, and free from errors. By assessing the reliability

of the measurement instrument through measures such as outer loadings, Cronbach's alpha, and composite reliability, researchers can have confidence in the accuracy and consistency of their measurements, ultimately enhancing the credibility of their research findings. The variable representing accumulation field utilization (X1) encompasses 13 indicators, each comprising statements designed to gauge the respondent's perceived suitability. A Likert scale was employed in the questionnaire, offering respondents a spectrum of options ranging from 'Strongly Disagree' to 'Strongly Agree' to indicate their level of agreement with each statement. The analysis focuses on determining the average value of respondents' reactions to these 13 indicators, providing insights into the variability in piling field utilization (X1).

The data analysis process commenced following the collection of all necessary data. In this research, the analysis began with an external model evaluation phase, which involved assessing the reliability and validity of the variable question items based on responses from an initial subset of 30 participants. This preliminary evaluation aimed to ensure that the measurement items effectively captured the intended construct and yielded consistent results. Upon confirming the validity and reliability of the questionnaire items through this pre-test phase, comprising the responses from the initial 30 participants, the subsequent step involved evaluating the internal or structural model using data from the entire research sample, comprising 44 respondents.

The analysis software employed for this research was SMART-PLS 3.0, a widely used tool for structural equation modelling (SEM) analysis. SEM is particularly suited for exploring complex relationships among variables and is commonly used in social science research to examine causal relationships and predictive models. By utilising SMART-PLS 3.0, researchers can conduct both measurement

model assessment, focusing on the reliability and validity of measurement items, and structural model evaluation, which examines the relationships between constructs.

The process of external model evaluation, conducted initially with a subset of respondents, is essential for identifying and addressing any potential issues with the measurement model before proceeding to analyse the entire dataset. This phase typically involves assessing the reliability of measurement items, ensuring that they consistently measure the intended construct across different respondents. Additionally, validity checks are conducted to confirm that the measurement items effectively capture the underlying theoretical constructs of interest. By establishing the reliability and validity of the measurement model during this external evaluation phase, researchers can proceed with confidence to evaluate the structural model using the entire dataset.

Following the confirmation of the measurement model's reliability and validity, the analysis progresses to the evaluation of the internal or structural model using data from the entire research sample. This phase involves examining the relationships between variables and testing the hypothesised structural pathways proposed in the research model. Through SEM analysis, researchers can assess the strength and significance of these relationships, gaining insights into the underlying mechanisms driving the observed phenomena.

In summary, the data analysis process in this research follows a systematic approach, beginning with an external model evaluation phase to assess the reliability and validity of the measurement model, followed by an evaluation of the internal or structural model using data from the entire research sample. By utilising advanced analytical techniques such as SEM with SMART-PLS 3.0, researchers can gain a deeper understanding of the complex

relationships among variables, contributing to the advancement of knowledge in the field.

## CONCLUSION

Based on the research findings carried out in the previous chapter, it was found that there was a positive and important impact of the utilization of the stacking yard on loading and unloading productivity at the Koja Container Terminal KSO in DKI Jakarta. Apart from that, there is a beneficial and significant impact of operational performance on the level of loading and unloading productivity at the Koja Container Terminal KSO in DKI Jakarta and there is a beneficial and significant impact of stacking yard utilization and operational performance on the level of loading and unloading productivity at the Koja Container Terminal KSO in DKI Jakarta. Cargo Arrangement Planning: Carefully planning cargo arrangement in the field can help maximize available space. Optimization of the Loading and Unloading Process: ensure that the loading and unloading process runs efficiently and without obstacles. Employee Training and Development: Improving employee skills and knowledge in managing the field including loading and unloading processes can increase efficiency and productivity.

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