Productivity Analysis Stevedore a Descriptive Analysis Method with Integration, Importance Performance Analysis, Quality Function Deployment (Case Study: PT. Port Indonesia III (Persero) Branch Gresik)

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Abstract. Gresik port is a port with a very strategic location in the region Gresik industrial area, productivity can be achieved with the implementation of a better way of working, organized, effective, efficient, creating something better. the productivity of loading and unloading the target of service to satisfaction of stakeholders, how to determine the factors that influence and by improving the productivity of loading and unloading at the port of Gresik. With descriptive analysis method to know the level of EF: BT is still yet to be achieved was based stevedoring productivity director general of sea transportation standards already achieved. Methods importance performance analysis is used to determine the perception of the services to be improved the speed in the process of loading and unloading, the availability of facilities and port equipment, fleet readiness ocean going ship expeditions, circumstances and facilities yard, competency officers loading and unloading, the speed of completing complain, system lighting port. Methods of quality function deployment used to determine priority in handling an increase in productivity of loading and unloading at the Port General Gresik.

Key words: Productivity Stevedoring, Descriptive Analysis, IPA and QFD

1. Introduction

Loading and unloading are the activities of the movement of goods from sea transport mode for inland transport modes or vice versa, which includes [1]:

1. Ship operation is loading activities (loading cargo) and unloading (unloading cargo / discharge) from or to the ship.
2. Quay transfer operation is a displacement activity on the dock charge of the side of the hull to the location of the buildup or otherwise, the term cargo which is the second phase of a series of operations dock.
3. Storage operation is the buildup of cargo at the port which is an important step in the transfer of cargo between sea and land freight transport. Which is the third stage of a series of operations quay (berth operation).
4. Receiving / Delivery Operation is the activity and delivery of goods cargo that goes on the side of the hull / dock, warehouse or yard.
Stevedoring productivity is the level of ability and speed of execution of demolition activities handling goods from the ship to the warehouse or yard or vice versa for loading activities of goods from the warehouse / yard up to the vessel. Service performance of port operations is measurable work results achieved in implementing port service vessels, goods and utilization of facilities and tools, in a period of time and a certain unit [2]. Loading and unloading performance measured in tones / Gang / hour is the amount of goods in tons or M3 unloaded / loaded within a period of one hour of work by a gang:

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TGH = \frac{\sum \text{Goods unloaded or loaded each ship}}{\sum \text{Aisles each shift each ship \times effective hours each ship}}
\] (1)

The analytical method of Quality Function Deployment [3] commonly used to determine the priority of the measures to be taken to make improvement. QFD is a matrix diagram tool, which is very useful for organizing the data collected, helping to facilitate the repair process. QFD structure used to organize information known as the House of Quality. In a broad sense, QFD House of Quality to show the relationship between the dependent (WHATS) and independent (HOWS) variable (Woods, 1994). In order to effectively use the QFD requires the participation of a team and discipline inherent in the practice of QFD, which has proven to be a highly experience team building well. In this study, after unloading performance was analyzed by IPA then the variables are in quadrant I, which is a variable with a low performance level but has a high level of interest will be sought and priority handling solutions with QFD to build a house of quality.

Previous research has introduced a new approach that was done by Agus Triyono, Achmad Wicaksono, M. Ruslin Anwar with the title Operational Performance Assessment and Public Port Development Strategy Gresik by using IPA, SWOT IFAS EFAS methods in 2015. M. Rum Raehan, Ludfi Djakfar, Alwafi Puji Raharjo with the title Performance Evaluation General Stevedoring at the Port of Gresik by using IPA, QFD methods in 2017. In this study combines with the integration of descriptive method of analysis, science and QFD to obtain the priority measures to be taken by the management of PT. Port Indonesia III (Persero) branch Gresik to enhance productivity and achievement stevedoring better performance. The Limitations of this study is in the process of loading and unloading of ships in the Port Gresik the public pier and dock pier 78 dry bulk and logs.

The process of loading and unloading at the port is one of the dominant factors that affect the performance of a port. The duration of the process of loading and unloading at the port also has implications for the duration of the turn round time a ship that would make ships more expensive operating costs [4]. From the results of previous studies showing too long ship in the dock because many are waiting for a load so often happens hanging slings, truck loading and unloading systems losing, cargo to be loaded on the ship was still in the warehouse line II. Things like this affect the quality of logistics services. Optimization of time in dealing with the loading and unloading process is expected to improve the performance of loading and unloading. loading and unloading of the performance review and identify the factors that cause the length of the loading and unloading process [5].

1.1. Problem formulation
Based on the background described, the formulation of the problem in this research are:
1. How to determine the factors that affect the performance of loading and unloading of goods at PT. port Indonesia III (Persero) Branch Gresik?
2. How to know stevedoring productivity at PT. Port Indonesia III (Persero) Branch Gresik?
3. How to improve the productivity of loading and unloading of goods at PT. port Indonesia III (Persero) Branch Gresik?

1.2. Research Objectives
Based on the formulation of the problem and the assumptions above, the purpose of this study are as follows:
1. How to determine the existing condition of the performance of loading and unloading in the port of Gresik.
2. How to determine the factors that affect the performance of loading and unloading in the port of Gresik general.
3. What efforts should be made to increase the productivity of public loading and unloading in the port of Gresik.

2. Methods

Figure 1. Flowchart of Research Methodology

Figure 1 shows that this study takes a place at the pier and dock dry bulk log Gresik 78 public ports, while the flow of this research is the show role in the diagram as follows: Collecting data using secondary data is data from the report Gresik port operations, while primary data obtained by giving IPA questionnaires and interviews as well as suggestions from stakeholders that ship agency, stevedoring companies and owners of goods that have activities in the port of Gresik.

The population used in this study is the number of vessels that carry out loading and unloading in the port of Gresik General during January s / d in March 2019, especially the Dry Bulk Terminal Pier and Log, Pier 78. The number of samples based on the formula [6] as follows:

$$n = \frac{N}{1 + Ne^2}$$

(2)

n = sample size
N = population size
e = fault tolerance (error) 5%
3. Result and Discussion

3.1. The realization of performance-based Stevedoring Descriptive Analysis

Guidelines used is the Decree of the Director General of Sea Transportation UM.002 numbers / 38/18 / DGLT-11 and Regulation Director General of Sea number: HK.103 / 2/18 / DGLT-16. The standard value of each aspect associated with loading and unloading can be seen in Table 1.

Table 1. the standard value of each aspect.

| No. | Service                              | Unit      | 2011 | 2016 |
|-----|--------------------------------------|-----------|------|------|
| A   | Boats services                       |           |      |      |
| 1   | Waiting Time                         | Hour      | 1    | 1    |
| 2   | Approach Time                        | Hour      | 2    | 2    |
| 3   | ET: BT                               | %         | 70   | 70   |
| B   | Goods Services                       | T / G / H | 30   | 35   |
| 1   | General Cargo                        |           |      |      |
| 2   | Cargo Bag                            | T / G / H | 35   | 35   |
| 3   | Liquid Bulk                          | T / H     | 100  | 100  |
| 4   | Dry bulk                             | T / H     | 100  | 150  |
| C   | Utilization Facilities & Operations Equipment |            |      |      |
| 1   | Berth Occupancy Ratio                | %         | 70   | 70   |
| 2   | Shed Occupancy Ratio                 | %         | 65   |      |
| 3   | Yard Occupancy Ratio                 | %         | 80   | 65   |
| 4   | Equipment operations                 | %         | 70   | 70   |

Source: Standard Performance Based Sea Relations Port Authority Office Gresik

Based on the Table 1. To determine the effective time: berthing time, the productivity of loading and unloading as well as loading and unloading equipment in the utility set minimum standards, achievement of operational service performance of each indicator ET: BT, performance and readiness for operation of loading and unloading equipment is determined as follows:

a. If the value of the achievement of the above values of operational service performance standards specified, otherwise good;

b. If the value of the achievement of above 90% up to 100% of the value of the operational service performance standards set, considered quite good.

c. If the value of the achievement of less than 90% of the standard values of performance, still inadequate.

Table 2. Value Achievement Performance Dry Bulk Terminal Pier & Log January S / D March 2019

| Commodity     | Number of Ships | Performance indicators                  | Standard  | Unit      | Achievement | Information |
|---------------|-----------------|----------------------------------------|-----------|-----------|-------------|-------------|
| General Cargo | 19              | Productivity loading unloading ET: BT   | 35        | T / G / H | 62.3        | Reached     |
| Dry bulk Logs| 73              | Productivity loading unloading ET: BT   | 70        | %         | 53          | Not achieved|
|               |                 |                                        | 150       | T / G / H | 228         | Reached     |
| General Cargo | 40              | Productivity loading unloading ET: BT   | 70        | %         | 61.5        | Not achieved|
|               |                 |                                        | 35        | T / G / H | 62.25       | Reached     |
| Cargo bag     | 7               | Productivity BM ET: BT                 | 70        | %         | 53          | Not achieved|

Source: Port Authority Office Gresik
Table 2 is influenced by factors that idle time waiting truck unloading coal, equipment trouble on cranes, cargo waiting and waiting labour and also influenced by factors that idle time waiting truck for loading and unloading trucks used also for delivery in the field as well, waiting for hours TKBM labour has not been 24 hours, Trouble equipment, and bed weather.

3.2. Importance Performance Analysis Results Analysis Methods
Measuring the level of interest of the facility and operational performance levels of loading and unloading facilities using a Likert scale of 5 levels. Degree of importance is given a score of 1 (very important / very good to 5 (very important / very good) [7].
By taking the average of the Y-axis (level of importance) and the X-axis (level of performance) are obtained Cartesian diagram as follows:

| No. | Commentary                                      | Interest | Performance |
|-----|------------------------------------------------|----------|-------------|
| 1   | Speed in doing process unloading and loading    | 3.53     | 3.97        |
| 2   | Availability of facilities and equipment unloading and loading | 3.53     | 3.92        |
| 3   | Readiness ocean going ship expeditions (trucking) | 3.56     | 3.86        |
| 4   | Circumstances and capacities Field cumulation   | 3.31     | 3.84        |
| 5   | Pier with Field cumulation                      | 4.17     | 3.78        |
| 6   | Stacking Field Access to Dock                   | 3.75     | 3.92        |
| 7   | Warehouse Capacity Stacking                     | 3.44     | 3.53        |
| 8   | Stacking Warehouse access to the Wharf          | 3.72     | 3.75        |
| 9   | Stacking Warehouse Access to the Road great     | 3.44     | 3.47        |
| 10  | Warehouse facilities and field cumulation       | 2.67     | 3.53        |
| 11  | Availability Labor Unloading and loading        | 3.72     | 4.25        |
| 12  | The accuracy of the operation planning          | 3.69     | 3.92        |
| 13  | Harbor Area Cleanliness                         | 3.61     | 3.69        |
| 14  | Speed document administration unloading and loading | 4.00     | 4.28        |
| 15  | Rates unloading fit                             | 3.67     | 3.83        |
| 16  | Type a commodity which in Unloading / unloading | 4.14     | 3.83        |
| 17  | competency officer unloading fit                | 3.53     | 3.97        |
| 18  | Speed complaint settlement                       | 2.94     | 4.11        |
| 19  | Environmental Safety Harbor                     | 3.89     | 3.58        |
| 20  | Port Facility Condition                         | 3.58     | 4           |
| 21  | Validity data unloading fit                     | 3.61     | 3.81        |
| 22  | Port lighting system                            | 3.5      | 4.25        |
| 23  | Easy Access Information Systems / IT Technology updated | 3.64     | 4.03        |
| 24  | Availability of parking of vehicles in the port area | 3.19     | 3.72        |

Source: The data processing

Based on table 3 we can do in a Cartesian diagram IPA analysis, there are four quadrants divided by two axes. The axis is the abscissa (X) and ordinate (Y), where the axis is based on the average value the overall level of performance (X) and interest (Y). IPA Cartesian diagram analysis can be seen in figure below:
Figure 2. Cartesian diagram Importance Performance Analysis

From Figure 2 above results Cartesian diagram IPA analysis is divided into four quadrants, for the first quadrant (top priority) are: (1) C1. The speed in the process of loading and unloading.; (2) C2. The availability of facilities and port equipment; (3) C3. EMKL fleet readiness; (4) C4. State and yard facilities; (5) C17. Competency Unloading Officer; (6) C18. Speed Complaint Resolution; (7) C22. Lighting system at the Port.

3.3. Unloading Productivity Performance Improvement, Quality Function Deployment
Priority handling productivity improvement unloading at the Port General Gresik used QFD analysis based on the variables contained in the first quadrant analysis results IPA. The next step is to determine the relationship "item what" to "how the item" [8]. It shows in table below:

Table 4. The ways how to handle "Item How"

| No. | "What Item"                                      | "Item How"                                                                 |
|-----|--------------------------------------------------|---------------------------------------------------------------------------|
| 1.  | The speed in the process of loading and unloading| 1. Training of Crane Fixed operators whose expertise is uneven in each group harbor loading unloading logs |
|     |                                                 | 2. At unloading the goods from the manufacturer should be stacked goods used in the field / warehouse |
| 2.  | The availability of facilities and port equipment| 3. That for unloading the logs need addition both the number and capacity forklift |
| 3.  | Fleet readiness EMKL                             | 4. Since many goods are loosing then the third coordinate ocean going ship expeditions road traffic |
|     |                                                 | 5. Adding to the fleet in the event of delays on the road and crowded in the Warehouse destination |
| 4.  | State and yard facilities                        | 6. Need to restructure yard in the given zone according to the type of commodity goods. |
|     |                                                 | 7. Expanding yard                                                          |
| 5.  | Officers Competency Unloading                    | 8. Loading unloading need training to officers on the use of the Tab / for real time activity |
| 6.  | Complaint Resolution Speed                       | 9. Service users in order to coordinate the time of closing time ship out with the port authorities. |
| 7.  | Lighting system at the Port                      | 10. Need additional lighting at the point in the yard.                     |

Source: the data processing
Based on table 4 we can do in a house of quality analysis, there are two item: (1) item what, (2) item how. Item “what” is divided to be seven sub items namely: loading and unloading until port lighting system as like shown in the figure 3. Item “How” is divided to be ten sub items namely: item how 1 until item how 10 as like shown in the figure 3.

![Figure 3. House of Quality](image)

Based on figure 3 To repair the problem based on the analysis of the IPA on the priority measures to be carried out in accordance analysis QFD is expanding its container yard, additional lighting, zoning yard, adding a fleet of trucks when crowded, service users coordinate first with the port authorities when closing time ship, training the use of tan on the loading and unloading personnel, training of crane operators at each loading and unloading labor group, the addition of forklift when unloading logs, goods are loosing to coordinate the road traffic, goods to be stacked first in the yard or warehouse harbour.

4. Conclusion
1. According to standard of decree of the Director General of Sea Transportation UM.002 numbers / 38/18 / 11 and DGLT-Regulation Director General of Sea number: HK.103 / 2/18 / DGLT-16, then for good productivity unloading dry bulk terminal and the terminal log 78 has been reached, whereas ET: BT is not achieved at both terminals.
2. Descriptive analysis of the results of loading and unloading speed is influenced by several factors including idle time waiting truck, cargo waiting, waiting labor equipment and bed weather trouble.
3. IPA analysis of the results obtained some things that should be improved to increase the productivity of loading and unloading at the port of Gresik namely speed in the process of loading and unloading facilities and port equipment availability, readiness ocean going ship expeditions fleet, State and yard facilities, Competency Unloading Officer, Complaints Resolution Speed, Lighting System in the Port.
4. As suggestions to management of PT. Port Indonesia III (Persero) branch Gresik are need to restructure yard layout with giving appropriate zoning commodity goods to be unloaded or loaded. Establish a commitment to cooperative loading and unloading labor Gresik port so bad to work for 3 shifts 24 hours due to the loading of logs to 3 am alone.
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