2000

Analysis and evaluation of restructuring of the operation system in the conventional terminal in the Port of Tanjung Priok

Guna Mulyana

World Maritime University

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ANALYSIS AND EVALUATION OF
RESTRUCTURING OF THE OPERATION SYSTEM
IN THE CONVENTIONAL TERMINAL IN THE
PORT OF TANJUNG PRIOK

By

GUNA MULYANA
Republic of Indonesia

A dissertation submitted to the World Maritime University in partial
Fulfilment of the requirements for the award of the degree of

MASTER OF SCIENCE
in
PORT MANAGEMENT

2000

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DECLARATION

I certify that all the material in this dissertation that is not my own work has been identified, and that no material included for which a degree has previously been conferred on me.

The contents of this dissertation reflect my own personal views, and are not necessarily endorsed by the University.

____________________________ (Signature)
____________________________ (Date)

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                World Maritime University

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  Institution/organisation  Port of Trelleborg
DEDICATION

To my father and my mother who teach me how to live
To my sister and brother who always help me to build my life
ACKNOWLEDGEMENTS

I thank Allah the Almighty who bestowed healthy allowing me to finish my studies.

I would like to express my sincere and deep gratitude to the Norwegian government who offered me fellowship through the IMO Facilitation Committee for my studies at World Maritime University, Sweden.

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I would like to thank my college in Indonesian Port Corporation II both in Headquarter office and the port of Tanjung Priok for their assistance and co-operation.

Above all, my deepest gratitude and appreciation to my parents, grandmother, sisters, and brothers for their spirit, helping and encouraging to finish the studies.
Title of Dissertation: **Analysis and Evaluation of the Restructuring of the Operation System in the Conventional Terminal in the Port of Tanjung Priok**

Degree: MSc

This dissertation tries to give a description of improving port performance at the port of Tanjung Priok. Its purpose is to identify how the improvements port performance after implementing the new operation system. It is done by evaluating and analysing physical port performance indicators. The port performance indicates quality of the port management in managing and organising internal and external resources.

The basis of the study is evaluation and analysis of improvement of port performance in terms of time in port. It identifies and examines both external and internal the operational problems and constraints.

The major problems of the port affecting time in port are internal factors such as inefficient utility of facilities and inadequacy of the management information system. Example of external factors are government, stevedoring company, freight forwarding, shipper, ship-owner and dock worker. Unclear function line between government and commercial interest in port operations, unorganised private companies involvement supported by complicated systems and procedures and unreliable information system cause lack of co-ordination and inefficiency of operational planning.

In order to improve the operation system government and management of the port of Tanjung Priok introduced a new port operation system by simplifying system and procedure, reorganising handling operation, implementing control and monitoring operation. However, in implementing the port should face problems which is more complex because involve internal and external factors.

This study suggests some possible solutions to solve the above problems, which are divided into short term and medium term covering improving one roof centre service and Terminal Operation System, remodelling facilities, providing proper training, improving accessibility, developing information system, doing marketing approach, developing new service and tariff policy.

**Key words:** port performance, internal and external factors, port operation system, short term and medium term.
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<tr>
<td>EDI</td>
<td>Electronics Data Interchange</td>
</tr>
<tr>
<td>GDP</td>
<td>Gross Domestic Product</td>
</tr>
<tr>
<td>IPP1</td>
<td>Improvement Port Performance Management of general cargo operations</td>
</tr>
<tr>
<td>IPP2</td>
<td>container terminal strategy</td>
</tr>
<tr>
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<td>Improving port performance: port equipment: policy, management and maintenance: a seminar for policy maker</td>
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| PPSA         | *Pusat Pelayanan Satu Atap*  
One Roof Service Centre |
| OS           | Operation Supervisor |
| TOS          | Terminal Operator System |
| UNCTAD       | United Nations Conference of Trade and Development |
| US$          | United States of America Dollar |
| WMU          | World Maritime University |
CHAPTER 1
INTRODUCTION

1.1 Background of the Study

Frankel (1987) said,

“primarily port function is to provide for efficient, low-cost, inter- and intra-modal transfer, inspection, storage, form change, and control of cargo. For this purpose, the port must be able effectively to accommodate ships and other transport vehicle interfacing at the port” (p.15).

It means that a port as a meeting place of modes of transport, transport and land transport, is a complex unit consisting of activities each of which has a role in affecting the transfer cargo from sea to inland and vice versa. The port should be managed and organized properly to be efficient and effective. In general the efficiency and effectiveness of a port can be measured in ship time in port. It was a factor used by the ship-owners and shippers in selecting a port.

Time in port is affected by internal and external factors. Internal factors are factors under port control including port resources such as availability of berth, storage, handling equipment and reliability of information system. Whereas external factors are defined as factors out of port control. For example weather, traffic, ship condition, and readiness of cargo. Shippers and ship-owners, Port Administration, Harbor Master, Customs, other government institution, stevedoring companies, freight forwarders, and labourers are external players affecting the port management as well. The problem faced the port related to the external players are lack of coordination and lack of operation at planning. The port management must have the ability to accommodate these factors to achieve an efficient and effective port.

This dissertation will focus on evaluating and analyzing the terminal management especially conventional terminal management. The reason is even though today is the era of containerization where port development is mainly focused on
modernization of containers but many conventional terminals still exist in the world especially in developing countries. These kinds of terminals can interfere and affect the type of transport and cargo handling development. It is also because handling break bulk cargo is more difficult than handling containers in terms of the same volume. Such terminals are still dominant as there are only 5 (five) container terminal of total number of 111 commercial ports throughout Indonesia. Therefore, management of conventional terminals should pay more attention to improving their ports.

The difficulties to get more container terminals are economic scale and natural constraints. Development of container terminals needs huge investments both in purchasing cargo handling equipment and improving port facilities which is not in accordance with sufficient cargo using the containers. Natural constraints are shallow water and high sedimentation only allowing the accommodation of small ships, particularly in river ports.

The port of Tanjung Priok is chosen as a port for investigation and observation because this port is the biggest port in Indonesia and its performance as a standard for port development in the country. In 1995 the port reformed the operational management by restructuring the operational system. The aim of restructuring is to reduce time in port.

The new system will be evaluated and analyzed to identify whether it has improved its performance or not. Possibly this system will be applied to other ports in Indonesia, particularly in Indonesia Port Corporation II where the author is working.

The term “conventional terminal” in The port of Tanjung Priok is only used to distinguish it from the container terminal managed Jakarta International Container Terminal (JITC). The former constitutes a terminal serving all types of cargo such as break-bulk cargo, liquid cargo, dry cargo and containers. The latter is a terminal that only handles container cargo special for export and import cargo. The conventional terminal and the container terminal are located side by side. Many container consignments are transferred through the conventional terminal. The terminal has the
same planning operational system held in PPSA as operation center. Therefore, the conventional terminal is part of the integrated system of cargo handling in Tanjung Priok. However, this investigation is only focused on The port of Tanjung Priok.

1.2 Scope of the study

The dissertation would not explain the operation system as a model but it tends to give description about the impact of implementation the operation system, as a model system, to the port performance. By understanding this impact the port management will know what is happening in port operation? and what action should be done to dealt with? In order to improve performance.

The dissertation comprises six chapters, which will explain the background of the study, transportation policy, particularly in the port industry, evaluation and analysis of the port performance in order to know the impact of implementation of the new operation system, and give an input to the management regarding the possibility to improve the implementation and applying the system in other ports specially in Indonesia Port Corporation II. The study does not include an evaluation of the financial performance but only the physical performance.

Chapter one consists of the background of the study, scope of the study, methodology of the study and the objectives of the study.

A country profile and transportation policies, especially in port policy, description of The port of Tanjung Priok including role of the port as the main gateway to Indonesia will be discussed in chapter two.

In chapter three there will be a discussion about the background of the new operation system and why the management introduced a new one. The evaluation and analysis of the implementation of the system will also be discussed at this chapter.
Identification of the problems, which occur in the implementation of the system and its analysis for improving port performance, is elaborated in chapter four.

Chapter five will explain an alternative possible solution, which can be done by the management in order to improve the operation system at the conventional terminal.

Chapter six comprises a conclusion and recommendations. This chapter consists of a summary of the implementation and recommendations on how the management should improve the operation system.

1.3 Methodology

The methodology used in writing this dissertation is collecting data or information concerning operation systems, evaluating and analyzing the data, giving possible solutions and also giving recommendations as to what the management should do in order to improve port performance. Collecting data and information was conducted in two ways; firstly collecting data of the traffic from Tanjung Priok Port Authority, lecture handouts at World Maritime University, brochures, magazines, and Internet.; secondly by interviewing the authorities who are responsible for this subject. The evaluation and the analysis of data were done by comparing data of port performance before and after the implementation of the system and also by comparing with international standards to get to know level of performance.

1.4 Objective of the study

- To evaluate and analyze the implementation of restructuring the operation system
- To identify and analyze the problem of implementation
- To make alternative solutions at least to minimize constraints of the implementation
- To make proposal and recommendations to improve performance of The port of Tanjung Priok and possibility to be used in other ports.
1.5 Limitation

The author faced difficulties in obtaining proper data and information during this investigation such as number of handling equipment and document related to it from terminal operators or private companies who are involved in port activities, training of dock worker or employees involved in port operations, total number of dock workers involved in port activities.
CHAPTER 2
COUNTRY PROFILE AND TRANSPORTATION POLICY

2.1 Country profile

Indonesia is the largest archipelagic country in the world. It has about 17,508 islands with differences of size and structure of geological with more or less 6,000 inhabited islands. As an archipelagic country around 80% area of country consist of waters. Sumatera, Kalimantan, Sulawesi, Irian Jaya and Java-Madura are five major islands with Kalimantan as the largest island. There are 30 smaller group islands such as Bali, The Nusa Tenggara group, Moluccas (Maluku group).

Geographically, Indonesia is situated in a strategic location between the Pacific Ocean and the Indian Ocean and bridge two continents, Asia and Australia. This position and conditions make it possible to develop social, cultural, political and economic factors of the country (Department of Information, 1997)

The Population of Indonesia is more than 210 million spreading out more or less on 6000 inhabited islands. Two thirds of the total population live in Java-Madura and Bali.

Indonesia produces mining such as coal, tin, gold, silver, bauxite, copper and asphalt as well as gases and oil. These sources are spread out in Sumatera, Kalimatan, Java, Sulawesi and Irian Jaya. The agricultural sector is the predominant sector of the Indonesian economy even though its contribution to GDP is lower than that of the industry. According to the World Bank Report the contribution of agriculture to GDP has decrease from 1977 – 1997, (see Table 1).
**Table 1 Structure of the Economic (% GDP)**

<table>
<thead>
<tr>
<th>Sectors</th>
<th>1977</th>
<th>1987</th>
<th>1997</th>
<th>1998*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture</td>
<td>29.6</td>
<td>23.4</td>
<td>16.1</td>
<td>19.5</td>
</tr>
<tr>
<td>Industry</td>
<td>34.3</td>
<td>36.3</td>
<td>44.3</td>
<td>45.3</td>
</tr>
<tr>
<td>Service</td>
<td>36.2</td>
<td>17.0</td>
<td>39.6</td>
<td>35.2</td>
</tr>
<tr>
<td>Private Consumption</td>
<td>61.0</td>
<td>60.8</td>
<td>61.7</td>
<td>70.4</td>
</tr>
<tr>
<td>General Government consumption</td>
<td>9.9</td>
<td>9.5</td>
<td>6.8</td>
<td>5.8</td>
</tr>
<tr>
<td>Import of goods and services</td>
<td>19.2</td>
<td>22.5</td>
<td>28.1</td>
<td>43.8</td>
</tr>
</tbody>
</table>

*1998 data are preliminary estimates


**2.2 Transportation Policy**

As a large archipelagic country, with two thirds of waters, transportation plays an important role in the development of the country. Therefore, the national transportation system has the objective to create an integrated transportation system which will encourage achievement of social and national prosperity, national stabilization, and unity.

Sea transportation, including water inland transport, plays an important role because it has characteristic to carry mass cargoes and passengers, connecting and reaching all islands. Therefore, the government is conducting the program to develop sea transportation such as development of port facilities, navigational safety as well as managing and development the shipping fleet.

The government legislated Shipping Regulation number 1 in 1992, which regulates the port management system. It is divided into two areas public port and special Port. The former port is a port which is built for public purposes whereas the latter is built for self purposes to accommodate specific activities nly for supporting the company.
The organization of the public port itself has been divided into management of commercial port and non-commercial port. The non-commercial port is organized and performed by the government through an organization unit under the General Directorate of Sea Transportation.

The regulation indicates that the government organizes the public port but the port operation can be performed by state enterprises. However, based on an agreement any private company can also be involved by providing supporting activities such as stevedoring and freight forwarding.

The management of the commercial ports are divided into four state enterprises. Each enterprise has its special territory. (See Table 2)

<table>
<thead>
<tr>
<th>No</th>
<th>Administrator</th>
<th>Province</th>
<th>Number of port</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Indonesia Port corporation I. The main office situated in Medan</td>
<td>Aceh  North Sumatera Riau</td>
<td>6 8 12</td>
</tr>
<tr>
<td>2</td>
<td>Indonesia Port corporation. II The main office situated in Jakarta.</td>
<td>West Sumatera Jambi South Sumatera Bengkulu Lampung West Java Jakarta West Kalimantan</td>
<td>3 3 8 1 1 3 3 7</td>
</tr>
<tr>
<td>3</td>
<td>Indonesia Port corporation III. The main office situated in Surabaya</td>
<td>Central Java East Java Bali Central Kalimantan South Kalimantan West Nusatenggara East Nusatenggara</td>
<td>3 8 3 8 2 3 5</td>
</tr>
<tr>
<td>4</td>
<td>Indonesia Port corporation IV. The main office situated in Ujungpandang</td>
<td>East Kalimantan South Sulawesi Southeast Sulawesi Central Sulawesi North Sulawesi Maluku Irian Jaya</td>
<td>5 4 1 2 3 3 6</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td></td>
<td>111</td>
</tr>
</tbody>
</table>

Source: The Overseas Coastal Area Development Institute of Japan (OCDI), 1998
Note: East Timor has separated since 1999
Indonesia Port Corporation II manages 12 semi container or conventional terminals and 2 container terminals. The biggest port, The port of Tanjung Priok is in Jakarta.

In order to involve in port business competition Indonesia Port Corporation II (IPC II) has a determined vision to provide reliable port services with world class quality. The company has performed many efforts to fulfill this target. They include development of human resources, investment in superstructures and infrastructures as well as developing management system to support effectiveness and efficiency operations.

2.3 The port of Tanjung Priok

The port of Tanjung Priok including the container terminal has a good opportunity to contribute to the national economy because the port is a main gateway to the country. Almost 70 % trade value by sea transport trough this port in 1995 (Tradelink, 1998). Figure. 1 shows, the drawing of the cargo throughput and Figure 2, the ship calling the port.

![Figure 1 Cargo Throughput of Tanjung Priok Port](image)

Source: The port of Tanjung Priok
According to the figure above the cargo growth increased 36%. In 1997 and 1998 during the economic crisis the cargo decreased. The cargo and ship growth have correlation, particularly ocean going ships.

Large hinterland which relying on the port is mainly located behind the port as shown in figure 3.
The cargo can be transported by railway or by road. Most of it comes by road. The problem of the port of Tanjung Priok is mainly by road. Traffic jams are inevitable because as a capital city Jakarta is the busiest city in Indonesia. The population is about 12 million in day and about 9 million at night. This condition gives negative and positive impacts to the ports; in negative impacts causes the road as the main access to connect the port and its hinterland becomes less reliable. Whereas the positive impacts is that Jakarta is a big market.

The port of Tanjung Priok provides infrastructures and superstructures to support the services. In general the port services are as follows:

1. Port basin
2. Pilotage and towage service
3. Port infrastructure including quays, dolphin and mooring buoys
4. Reception facilities
5. Warehouse, open storage
6. Container handling
7. Bulk cargo handling
8. General cargo handling
9. Passenger terminal
10. Electric, water supply, telephone facilities
11. Office space
12. Industrial estate

The port of Tanjung Priok has provided infrastructure and superstructure as following:

<table>
<thead>
<tr>
<th>Type</th>
<th>Depth (m)</th>
<th>Number of berths</th>
<th>Total length (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>General cargo</td>
<td>3.5 – 12</td>
<td>42</td>
<td>6,522</td>
</tr>
<tr>
<td>Liquid cargo</td>
<td>5</td>
<td>2</td>
<td>220</td>
</tr>
<tr>
<td>Dry cargo</td>
<td>8 – 12</td>
<td>5</td>
<td>844</td>
</tr>
<tr>
<td>Passenger</td>
<td>6</td>
<td>1</td>
<td>150</td>
</tr>
</tbody>
</table>

Source: The port of Tanjung Priok
### Table 4 Storage

<table>
<thead>
<tr>
<th>No</th>
<th>Storage</th>
<th>Wide (m²)</th>
<th>Capacity (ton)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Shed</td>
<td>123,882</td>
<td>102,757</td>
</tr>
<tr>
<td>2</td>
<td>Open storage</td>
<td>146,182</td>
<td>146,182</td>
</tr>
</tbody>
</table>

Source: The port of Tanjung Priok

### Table 5 Equipment

<table>
<thead>
<tr>
<th>No</th>
<th>Type of Equipment</th>
<th>Number</th>
<th>Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Forklift</td>
<td>16</td>
<td>2 – 10 ton</td>
</tr>
<tr>
<td>2</td>
<td>Mobile crane</td>
<td>1</td>
<td>35 ton</td>
</tr>
<tr>
<td>3</td>
<td>top loader</td>
<td>1</td>
<td>40 ton</td>
</tr>
<tr>
<td>4</td>
<td>grab</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>conveyor</td>
<td>4</td>
<td>400 HP</td>
</tr>
<tr>
<td>6</td>
<td>tug boat</td>
<td>2</td>
<td>1000 – 2300 HP</td>
</tr>
<tr>
<td>7</td>
<td>stowage boat</td>
<td>11</td>
<td>150 – 376 HP</td>
</tr>
<tr>
<td>8</td>
<td>pilot boat</td>
<td>9</td>
<td>82 – 105 HP</td>
</tr>
<tr>
<td>9</td>
<td>mooring boat</td>
<td>7</td>
<td></td>
</tr>
</tbody>
</table>

Source: The port of Tanjung Priok
CHAPTER 3
EVALUATION AND ANALYSIS RESTRUCTURING OF THE OPERATION SYSTEM

3.1 Background

The port has an important role to support the improvement of the national or regional economy. Port activities will give multiplier effects to the surrounding area because the port is a place for economic activities as well. In fact, port is not only a loading and discharging place but also where business activities take place, such as manufacture processing. Therefore, the port can also create employment opportunities directly or indirectly. It can be said that to improve regional or national economy, the port must be well and properly managed. Particularly, for archipelagic states, like Indonesia, which have overwhelming dependence on the sea transport to transport cargo.

Regarding sea transportation the existence of a port should be considered as an important part of the transportation chain. Mismanagement of the port will cause critical issues in time. Time in port is very important for shippers and ship owners because in their opinion time is money. Ma (1999) mentioned that “for ship and cargo owners, the time element could be more important than port charge when calculating the total cost at a port” (p.99). Distribution of port expenses indicate that cost spent by a ship is mainly handling, almost 60 %, and time in port about 20 %. (Franco, 2000). Therefore, the ship-owner will seek the port that gives faster service. It is indicated by availability of berth, fast handling operation, fast documentation process and reliable information system.

Time in port indicates the performance of a port. In order to have good performance time in port should be paid more attention. Francou (2000) mentioned that “the more the port is able to reduce the time spent in the port the more satisfied the ship owner are” (p12).
The port of Tanjung Priok plays an important role and is the main gateway to Indonesia. The Indonesian government through the Ministry of Communications has restructured the port operation system. This restructuring was carried out in order to encourage better service achievement covering the simplified system and procedure as well as complete the cargo handling system, because the port management of Tanjung Priok itself had restructured the cargo handling operation system by introducing the Terminal Operator System (TOS) in advance. However, the latest restructuring measure is more comprehensive.

The reason for restructuring the operational system is that there were many complaints from customers both of shipping companies and shippers concerning port services such as complicated documentation process and berth unavailability causing a long time in port. This situation lead shipping companies to impose additional surcharges to the shippers who wanted to use The port of Tanjung Priok as a place for loading and discharging.

Factors that cause long time in port as basic reasons for restructuring are as follows:

a. There was lack of coordination in operation planning among the Port Authority as the facilities provider, the Port Administration, who was held responsible for giving license for ship seaworthiness, stevedoring companies as providers of handling cargo services, custom clearance for documentation of international trade, and other institutions having related activities in port.

The procedure became complicated and time consuming because the customer have to pass many tables in accomplishing a document. This condition also led to abuse of the authority.

b. The management of the port did not have authority to manage and control port operations fully because the government also had interest in determining the operation planning.
The government intervention and commercial functions overlapped in managing the port operation. The management of the port became inefficient and ineffective. Therefore, the customer satisfaction as the main objective was hard to achieve.

c. There were too many stevedoring companies that carried out activities in the port as the port system allowed private companies to be involved in port activities. Unfortunately, the system was not supported by proper regulations setting requirements for a qualified stevedoring company.

Most of the stevedoring companies did not have skills and competence in port operations. This increased the competitiveness, but the competition led to unfair competition, where they tended to use price as a means to attract customers. Low price without good service quality was the condition at that time.

The stevedoring companies were not equipped with appropriate handling equipment to support their activities. As a consequence, productivity of ship output was low.

d. The stevedoring companies did not have a certain place for doing operations neither proper berth nor storage. They were doing the job wherever the place was available without considering the access between berth and storage and vice versa. This lead to long distance operations.

Since the stevedoring companies did not have the authority to manage and organize special berth and storage facilities, they did not have the responsibility for the safety of the cargo.

The ships took longer time at the berth due to the slow operation; therefore, the shipper tended to use direct routes. The use of direct routes mostly depended on the support of proper transport, readiness of receiving storage of the shipper and the traffic situation. At that time the operation involved
inadequate vehicles, different working hours between the port and receiving storage (shipper storage) and traffic problems outside the port and also on the road to Jakarta.

e. Stevedoring companies were not responsible for managing and organizing dock workers because they only employed dock workers when jobs were available for them.

The stevedoring companies did not have many permanent dock workers so it was difficult to improve quality of dock workers, because the stevedoring companies did not have the responsibility to train them. As a result, the dock workers lacked competence and skills.

Most dock workers are managed and organized by a cooperation, which is not a pure professional dock worker organization. The cooperation management does not have power to manage dock workers fully because cooperation membership was voluntary in nature.

f. There were technical problems with insufficient facilities and handling equipment, so there were imbalance between port capacity and the growth of cargo and ship. Variation of berth draught makes the specific ship take longer time to have suitable berth which increase waiting time. Another technical problem was that the port has not applied electronic systems to deal with document processing like Electronic Data Interchange (EDI) and computerization.

The lack of information made the operation planning become less reliable. The unreliability of information about cargo and vessels led to be an unexpected target of productivity, because many times the number of cargo in the manifest was different to the actual operation. The actual operation figure is often higher than that in the manifest.
These conditions also encourage some of the big shippers to build special port which serve theirs cargoes and sometimes they also serve other shipper as well.

In order to solve these problems action had been taken to restructure the operational system including reconfirmation function of the government and commercial function in port operations. The Indonesian Ministry of Communications had issued an instruction of IM-7/AL.3014/PHB-95 on Stabilization of implementation One Roof Service Center for Ship and handling cargo service in The port of Tanjung Priok to Director General of Sea Communication, Port Administration of The port of Tanjung Priok and Director of Indonesia Port Corporation II, which are responsible for managing The port of Tanjung Priok to do restructuring on management of port services

The Ministry’s instruction has confirmed distinguishing tasks of government and commercial functions in port services. The Port Administrator conducting government functions in port is not involved directly in port operations, but its position and tasks are to coordinate activities of every institution involved in port activities to make sure that cargo services can be provided properly. The activities include monitoring implementation of port operations, checking ship seaworthiness, solving the operational problems that prevent cargo smoothness, which involve other institutions in port. However, the Port Administrator also has authority to determine priority to give precedence service of ship such as passenger ships, war ships, guest ships and the ships which load strategic goods like rice and foodstuff. Port Authority carries out commercial functions in arranging ship and cargo services according to the request; it carries out ship and cargo services, operates berth, yard and storage, determines target of operation output, as well as provides the operational supervisor with the main duty to control and monitor the operation.

As has been told above the port authority is responsible for operating the berth, yard and storage, meanwhile private companies are performing the operation. The management of Tanjung Priok Port has introduced the Terminal Operator System, which will be explained later.
Stevedoring companies either in the Terminal Operator System or others have been instructed to manage dock workers who will be allocated by the Port Administration. They have to be responsible for achieving effective working hours and working productivity, smoothness handling activities and safety of receiving and delivering cargo, providing proper handling equipment, improving dock worker skills, welfare and safety and reliability and validity of operation reports.

Shippers, freight forwarding and sea transport expedition companies are responsible for completeness and validity of cargo documents, readiness of cargo, readiness of transport and receiving storage. In order to improve efficient and effective operations shippers are also encouraged to use storage in port to transit cargo.

Integrated operation planning as a means of simplifying system and procedure services is conducted in a center called One Roof Service Center or Pusat Pelayanan Satu Atap (PPSA). In this new system the customers that request service do not need to contact the related institution directly. It is important to prevent the abuse of the authority. The new system can be seen in figure 6.

![Figure 4 Resume New System and Procedure](image)

PPSA is put on The port of Tanjung Priok organization structure to coordinate operation planning and to determine ship berthing, operation productivity, utilizing yard or storage for stacking cargo and also delivering and receiving cargo involving a shipping company or its agent, stevedoring company, freight forwarding and related government institution.

The customers like shipping companies or ship agents request allocating berthing of ship and handling of cargo to PPSA at least 24 hours before ship´s arrive. Then PPSA will arrange pre-operation planning concerned with specification of ship, type
of cargo, berth, storage and yard availability, labor and handling equipment. PPSA will send a copy and report of services requested from the Port Administration and related institutions. Determination of berthing planning in PPSA meeting will follow pre-operation Planning which have been arranged. PPSA meetings are held daily and attended by the representative of The port of Tanjung Priok, Port Administration, Quarantine, Customs, Port Health, stevedoring companies, freight forwarding and shipping agent. Target of performance or output, which should be achieved, is also determined in the operation planning.

PPSA is equipped by an inter link system connecting Port Administration, Port Authority, Harbor Master, sea traffic, Customs and Quarantine, which facilitates the documenting process. This link makes the customer spent less time in documentary processing. In requesting a service the customer must appoint the stevedoring and freight forwarder who will carry their cargo.

In order to improve productivity of cargo handling services and responsibility of cargo safety in port, the management of The port of Tanjung Priok has taken policy to perform a new operation system called with the Terminal Operator System (TOS). This system take into account the port management system that enables private companies to remain in handling cargo operations but reducing the number of companies. The system has the concept to enable stevedoring companies to manage and operate a set of facilities. Since there is limitation of proper facilities, the initial concept is divided the existing berths, sheds, and open storage areas into eleven packages. Each package consists of berths, sheds and open storage areas. Sometimes, the berth only has a shed without open storage or vice versa depending on the lay out condition.

Terminal operators have the authority to manage and determine the utility of the facilities, so productivity is controlled and measured. They have the responsibility to handle cargo from receiving to loading and vice versa. The terminal operator should fulfill certain responsibilities:
- Protecting and repairing facilities
- Keeping 24 hour operation
- Improving labor skill by training
- Providing handling equipment
- Increasing the effective hour to 21 hour
- Keeping the cargo safe
- Maintaining target throughput per year

The terminal operator system was initially implemented at 34 of 50 existing berths which mainly handle general cargo. The remaining berths are operated by companies, which have contract, to operate and manage special areas for cement, scarped iron and fertilizers. Other berths are impossible to have better operation because of shallow water, less accessibility, and inappropriate area for operation.

By reorganizing stevedoring companies mean that at least there are only eleven operators left. It will reduce the number of stevedoring companies drastically because the number of stevedoring companies operating in port are more than 100 companies. As a consequence there is no choice for them but to continue to exist in port operations by jointing other companies in an alliance. By merging it is expected that they will be stronger and more competence in performing the operation. As a simple drawing about the new cargo handling system it can be seen in Figure 5.

![Figure 5 Cargo handling system](image)

The stevedoring companies can concentrate on performing their activities at a certain place then guaranteeing continuous operation. It will also save time with
shorter distance between berth and storage, so it will be expected to increase indirect route. By implementing this system the advantage from a port point of view is that the controlling and monitoring of port operations are much easier.

Monitoring, controlling and supervising are provided in order to make sure that everything is done the right way and this is one way to the achieve planned operation. This job is called Operation Supervision (SO) and is performed by the port of Tanjung Priok. The main task of the operation supervisor is monitoring and controlling ship and cargo operations such as utilization facilities and handling equipment, utilization of labor and safety work, productivity achievement, coordinating and advising for solving problems and making reports concerning service performance.

In summary, it can be stated that insufficient facilities and lack of sound management operation have created an inefficient and ineffective port. The government and the port management of Tanjung Priok Port are very concerned with port service. By introducing PPSA it is expected that a better coordination and cooperation through a simplified system and procedure will reduce documentation processing time and prevent overlapping jobs. The Terminal Operator System is intended to improve productivity of gang output by concentrating activities at a specific place. The system can not be well implemented if it is not supported by improving competence and skill of the labour force, providing proper handling equipment and reliable information, an active role of shipping companies, stevedoring companies, shippers, freight forwarders and other parties involved in the port.

3.2 Evaluation of impact of restructuring

Physical port indicators such as berth indicators, handling output indicators and storage productivity will be examined to measure the implementation of the new operation system. The evaluation will be done by comparing average growth indicators every 5 (five) years before and after the new operation system.
3.2.1 Berth Indicators

Berth indicators comprise berth throughput, berth services and berth occupancy. Berth throughput explains the berth productivity per current meter. Berth services explains the time in port such as turn round time, waiting time, and berthing time which indicate productivity of the port related to ship service whereas berth occupancy explains the utilization of the berth.

3.2.1.1 Berth throughput

Berth throughput is defined as the actual tonnage loaded/discharged for each berth, expressed per current meter of quay and time. (Wilking, 1990). The quantity of the cargo and the length of the berth influence each other. The more cargo passing the berth, the higher berth throughput and vice versa. Francou (2000) mentioned that there are some factors influencing the berth throughput such as the type of cargoes and package, the cargo mix of small consignments, the shipload tonnage handled, the route inside the port, the handling equipment. The berth throughput for all cargoes passing the conventional terminal as follows:

![Figure 6 Berth throughput](image)

**Figure 6 Berth throughput**
Source Port Traffic The port of Tanjung Priok

According to the Figure 6 the growth of the berth throughput goes hand in hand with cargo throughput passing to The port of Tanjung Priok. (see Figure 2). The berth
throughput goes up and down because the cargo also goes up and down especially during the economic crisis which started in mid 1997. However, the average of the berth throughput growth between 1995 to 1999 is 50 % higher than period 1990 to 1994.

3.2.1.2 Berth Service Indicator

The level of port services is related to how much money is spent on the operation. The shippers and the ship owners will know the level of port services by interpreting the information on turn round time (TRT), waiting time (WT) and berthing time (BT).

3.2.1.2.1 Turn round time

“Turn round time is total time spent by a ship in port, which is calculated from the arrival of the ship in front of the port entrance or the entrance channel to the issue from the port” (Francou, 1999. p.18). Turn round time comprises waiting time which is time used for waiting of the service, approach time which is time used by a ship to come to the berth, berthing time which is time used by a ship at the berth for handling operations and the time when the ship leaves the port after loading or discharging. At The port of Tanjung Priok waiting time consists of approach time, time to approach channels after discharging and loading and postpones time. The two former have been explained. Postpone time is time used by a ship in the basin waiting for cargo, weather or next sailing.

![Figure 7 Turn Round Time.](source port traffic of Tanjung Priok Port)
Based on the information above the average time in port from 1995 to 1999 decreased by 17 % for ocean going ships and 8 % for inter island ships. Decreasing time in port is the result of improving operation planning, better coordination and effective operation monitoring. Computerizing also gives positive effects because of accelerated document processing. However, the impact of the new system was not as high as expected.

3.2.1.2.2 Waiting time

Waiting time is the period of non-working time for the ship in port. The time used by a ship is either waiting allocation berth, clearing document, approaching berth, leaving time after loading or discharging cargo service to release the ship out of port and waiting for cargo or weather. Waiting time at Tanjung Priok can be seen as follows:

![Figure 8 Waiting time](image)

**Figure 8 Waiting time**
Source: The port of Tanjung Priok

According to the Figure 8 above that the average waiting time in The port of Tanjung Priok from 1995 to 1999 decreased by 32 % for ocean going ships, whereas the average waiting time of inter island ships was 2 % higher.
Some factors influencing waiting time are berth availability, cargo availability and documentary processing. Berth availability is more influenced by insufficient draught at certain berth, so a specific vessel can not be handled properly. It causes the ship has to wait. Availability berth also relies on acceleration of cargo handling.

Sometimes the cargo did not arrive on time so the ship have to postpone its sailing. Some factors, such as the use of direct route, enable the cargo to come late because of traffic jams.

Simplifying procedures and computerization have helped in accelerating documentation. However, completing the document that is delivered by the ship owner or shipper will minimize the processing time.

**3.2.1.2.3 Berthing time**

Berthing time or service time is defined as time used for the period of a ship at berth. Franco (2000) indicated time at berth including:

- Time for opening the holds, lashing cargo, preparing ship handling equipment,
- Working period (period when ship is operated by stevedores during the opening hour of the port),
- Non working period (period when the ship cannot be operated because it is not during the opening hours in the port),
- Idle time (time when operation are stopped –even in opening hours – because of problem from the ship or the land side),
- Time spent to shift the ship from a berth to another one,
- Time spent to wait for the pilot and/or the tugs and/or documentation for demurrage (p.20).

As stated in the previous chapter The port of Tanjung Priok is open for 24 hour operations. This means that the services provided are based on a round-the-clock operational system.
According to Figure 9 the average berthing time from 1995 to 1999 decreased by 11% both of ocean going and inters island ship. There was significant correlation between improving operation management and decreasing berthing time. Improving productivity gang output particularly general cargo as implementation of the Terminal Operation System had contributed to the improvement. However, the berthing time is affected by different working time between the port and receiving storage owned by shippers in terms of direct route operation. This causes the operation to give up particularly in shift III.

### 3.2.1.3 Berth Occupancy

Berth occupancy indicates the level of berth utilization. It will explain how long the ship service is taken. As Wilking. D said “the term of “berth occupancy” covers the period of time during which a vessel actually occupies a berth (i.e. from actual arrival at the berth to actual departure)” (1990. p. 199). Berth occupancy is a useful tool for port management in order to understand the utilization of the facilities, and productivity of cargo handling. Therefore by understanding berth occupancy, one will know what action should be taken to improve productivity.
Level of berth occupancy has correlation with level of waiting time. Increasing at berth occupancy will lead to increase waiting time. Berth occupancy of The port of Tanjung Priok from 1990 to 1999 can be seen as following:

![Figure 10 Berth Occupancy](image)

Regarding Figure 10 berth occupancy in 1999 was 71.16 % or 7 % higher than in 1994. Wilking (1990) said that “the average of berth occupancy average for several berth is 60 % without crowded traffic and 40% – 50% in special condition has already imply problem. Berth occupancy 60 % is still guaranteeing a spare capacity for traffic peak” (pp.200-201). The berth occupancy in The port of Tanjung Priok is higher as it is affected by acceleration of cargo handling output, cargo unavailability.

In summary, turn round time indicates the level of productivity of the port. Time in port at The port of Tanjung Priok from 1995 to 1999 was lower than from 1990 to 1994. Many factors influence time in port such as coordination both inside the port and outside the port, as well as readiness of the cargo and productivity of handling cargo. Improving coordination through PPSA has helped better document processing. Establishing the Terminal Operator System in handling cargo has assisted better handling output particularly on general cargo. However, there are still some factors that reduce optimizing time in port in The port of Tanjung Priok such as type and age of the ship, readiness of the cargo, and direct route in delivering of cargo.
3.2.2 Handling Output Indicators

The handling output indicator determines the quality of port services. Good operation management is important to help accelerating of the output. Handling output indicators include ship output, gang output and utilization of equipment.

3.2.2.1 Ship output

“Ship output is the productivity of a ship regarding the volume of tons/units loaded/discharged per hour/shift/day” (Wilking. 1990. p.202). Gang output or mobilization of gang, ability of equipment and ship condition affects ship output.

Figure 10 shows productivity of ship output at The port of Tanjung Priok on the average tonnage per ship hour in port and at the berth.

![Figure 11 Tonnage per Ship Hour in Port](source)

Source Port Traffic of Tanjung Priok Port

28
The average tonnage per ship per hour in the port during period from 1995 to 1999 increased by 89% for ocean going ships but for inter island ships decreased by 1%. This was influenced by increasing tonnage of ships and decreasing of waiting time average for ocean going ships whereas in the case of inter island ships there was a decrease in tonnage.

Meanwhile, the average of the ship productivity at the berth for the oceans going ship increased 75% but inter island ship decreased 5%. Factors, such as number of cargo tonnage and decrease in service time influence productivity. Accelerating handling operations particularly general cargo causes decreased service time or berthing time.

3.2.2.2 Gang output

Gang output is defined as the amount of tons the gang can handle in one hour (Horck. 2000, p.2). Gang output is one of the factors that determines in improvement of port performance. Low gang output means that waiting time is high.
The factors influencing the level of gang productivity are type and age of ships, type of cargo packaging, weight of cargo, handling equipment and number of gang. Understanding the influencing factors will be very useful for operation planners to find solutions how to solve an operation problem in order to improve productivity.

Gang productivity is counted based on type of cargo package because different types of cargo package will be treated differently with different speed because each type of cargo package has specific characteristic. Each cargo requires proper handling equipment because unsuitable handling equipment will make the job harder.

At the port of Tanjung Priok gang output productivity divided into type of cargo and type of trade.

![Figure 13 Gang Output (ocean going ships).](source)

Source Port Traffic of the port of Tanjung Priok
Average achieving gang output in period 1995 - 1999 was better than before especially handling general cargo both ocean going and inter island. However, liquid cargo decreased especially ship ocean going by 36 %. One factor influencing the output is the cargo use direct route which reduces speed of handling. In addition, a manual system handling cargo is still used particularly on inter islands.

Improving speed of gang output of break bulk cargo is the result of better coordination and organization through implementation of the Terminal Operator System (TOS). By TOS is expected that the stevedoring companies have a certain place to do better activities and thus will increase operation readiness as well as having permanent dock workers who can be relied upon.

The problems that reduces handling output are the type of operation, whether direct or indirect route. Direct route is more liable to have more problems such as vehicle unavailability and accessibility to transport to the operational place. Difficulties arise because vehicle availability and receiving storage of the. The vehicle provided by the shipper or freight forwarders was often late because of long trip and traffic jam in terms of direct route. Inappropriate vehicle in operation causes low output, such as in loading and discharging liquid cargo using a tank truck. Readiness of vehicle and
good transportation management are crucial points to achieve high handling productivity. The number of gang per ship per shift is also a decisive factor to reach maximum productivity. Because using the wrong number of gang will prevent from maximizing productivity. Its development can be seen in Figure 15:

**Figure 15 Number of Gang per Ship per Shift**
Source Port Traffic of the port of Tanjung Priok

**Figure 16 Average Tonnage per Ship**
Source Port Traffic of the port of Tanjung Priok
The number of gangs used both on ocean going and inter island ships is almost the same, however, the number of cargo tonnage indicates that the ocean going ship is bigger. It means that the level of difficulties in handling inter island ships is probably higher. The type and age of ships may cause such difficulties. Old ships have the cargo hold configuration that makes it more difficult in handling activities, so cargo handling activities become slower. Ship equipment also determines output because old ships tend to have old derricks with low capacity.

3.2.2.3 Utilization of Equipment

The sufficient and proper equipment is very important to get high productivity. Improving productivity not only depends on the right equipment used for right the cargo but also the worker’s knowledge of the equipment.

Evaluation will only be done for handling equipment owned by the port of Tanjung Priok because the was no detailed information about the utility of the equipment used by the Terminal Operator. Furthermore, there was not enough information about the availability and possible time of equipment but only worked time. Worked time of the equipment can be seen in Figure 17:

![Figure 17 Worked hour](image)

Sources: Corporate Planning of IPC II
According to Figure 17 the utilisation of equipment decreased. It was affected by the port management policy in utilisation of the equipment. The port management had changed the policy not to hire out the equipment anymore so the level of worked hour decreased.

Therefore, terminal operator should be provided with handling equipment in order to perform their activities efficiently and effectively. The number of handling equipment owned by terminal operators is as follows:

### Table 6 Number of handling equipment owned by terminal operator (unit)

<table>
<thead>
<tr>
<th>Type of Equipment</th>
<th>Terminal Operator</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
</tr>
<tr>
<td>Forklift 2.5 ton</td>
<td>10</td>
</tr>
<tr>
<td>Forklift 3.5 ton</td>
<td>2</td>
</tr>
<tr>
<td>Forklift 5 ton</td>
<td>0</td>
</tr>
<tr>
<td>Forklift 10 ton</td>
<td>0</td>
</tr>
<tr>
<td>Forklift 15 ton</td>
<td>0</td>
</tr>
<tr>
<td>Crane 50 ton</td>
<td>0</td>
</tr>
<tr>
<td>Crane 127 ton</td>
<td>0</td>
</tr>
<tr>
<td>Mobile Crane</td>
<td>2</td>
</tr>
<tr>
<td>Top Loader</td>
<td>0</td>
</tr>
<tr>
<td>Trailer</td>
<td>0</td>
</tr>
</tbody>
</table>

Source: the port of Tanjung Priok

Moreover, the equipment above they are also equipped with additional attachment. By owning handling equipment the Terminal Operators can keep their activities continuously, so the operation can be done effectively.

#### 3.2.3 Storage Productivity

A shed is normally used for protecting cargo from weather and for security reasons. Storage productivity is the capacity of cargo handled during a stated period in terms of ton per m². Physically, storage can be divided into close storage (shed) and open...
storage (yard) and operationally, storage can be divided into transit storage and long term storage. The reasons for transit storage usually being located close to the berth where the main port activities are:

- To accommodate for the imbalance between quantity of cargo carried by the ship and the number of vehicles ready for inland transport.
- To allow for administrative formalities
- To provide for cargo held up by weather and other delays
- To permit cargo consolidation (Hork. 2000. p.15)

It means that the transit storage is used to make balance between quantity of cargo carried by ship and availability of vehicles if using direct route. The imbalance between quantity of cargo and readiness of vehicles will cause congestion in port. Traffic jams, far distance receiving storage and differentiation in working hours are problem using direct route. Figure 18 shows distribution of cargo.

![Figure 18 Cargo handling Distribution](image)

Source: the port of Tanjung Priok

According to the figure 18 most cargoes is distributed by direct route. This shows the target to attract shippers to use indirect route have not succeeded. The shippers find it more convenient to use direct route despite all the problems are given. The tend to use the direct route in operations affect utility of the storage as Figure 19
Figure 19  Storage Utility
Sources: the port of Tanjung Priok

One characteristic of general cargo handling is small consignment and big consignees. By using storage as consolidation place is the best way to facilitate the operation. Based on Figure 19, generally, the productivity of shed and open storage decreases. The average utilization of shed decreased 7 % and open storage 15 %. The cargoes stay in storage is shorter, which cause the utility decreases.

3.3 Analysis of impact of restructuring

In this section the implementation of the new operation system will be analyzed to identify problems that influence it. Further, it will be measured whether improvement has achieved optimum or not.

3.3.1 Berth Service

Indicators of berth service that will be analyzed are time in port and berth occupancy (BOR).
3.3.1.1 Time in port

Francou (1999) mentioned that formulation of time in port or Turn Round Time comprise waiting time, maneuver time between entrance to the berth or mooring point, service time or berthing time and maneuvering time to leave the port. However time in port at the port Tanjung Priok is divided mainly into Turn Round Time, Waiting Time and Berthing time as following chart:

![Diagram showing the breakdown of time in port into Turn Round Time, Waiting Time, Berthing Time, and Idle Time.]

**Figure 20 Turn Round Time at the port of Tanjung Priok**

Detailed time in port at the port of Tanjung Priok in 1999 as follows: (see table 7)

<table>
<thead>
<tr>
<th>Description</th>
<th>Ocean Going</th>
<th>Inter Island</th>
</tr>
</thead>
<tbody>
<tr>
<td>Turn Round Time (TRT)</td>
<td>67.69</td>
<td>60.75</td>
</tr>
<tr>
<td>Waiting Time (WT) net</td>
<td>7.31</td>
<td>3.1</td>
</tr>
<tr>
<td>Approach Time (AP)</td>
<td>0.79</td>
<td>1.00</td>
</tr>
<tr>
<td>Postpone Time (PT)</td>
<td>6.11</td>
<td>7.00</td>
</tr>
<tr>
<td>Berthing Time (BT)</td>
<td>53.48</td>
<td>49.65</td>
</tr>
<tr>
<td>Non Berth Working Time (NBWT)</td>
<td>7.96</td>
<td>17.78</td>
</tr>
<tr>
<td>Effective Time (ET)</td>
<td>38.96</td>
<td>27.24</td>
</tr>
<tr>
<td>Idle Time (IT)</td>
<td>6.56</td>
<td>4.63</td>
</tr>
</tbody>
</table>

Source the port of Tanjung Priok
According to information above, the level of the port service such as W ratio, worked ratio, and BOR can be examined. W ratio or grade of waiting measures the correlation between waiting time and berthing time. This information is to measure the quality of services whether fulfil the customer’s need or not. Francou states that maximum acceptable ratio is 10 % (1999, p.24). This formulation is obtained by calculating waiting time divided by berthing time:

\[
\text{W ratio} = \frac{W_q}{W_t}
\]

W q is the Waiting Time in port
W t is the service time

<table>
<thead>
<tr>
<th></th>
<th>Net Waiting Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ocean going (Gross Waiting Time)</td>
<td></td>
</tr>
<tr>
<td>14.21 x 100 % = 26.57 %</td>
<td>7.31 x 100 % = 13.66 % 53.48</td>
</tr>
<tr>
<td>53.48</td>
<td>53.48</td>
</tr>
<tr>
<td>Inter Island (Gross Waiting Time)</td>
<td></td>
</tr>
<tr>
<td>11.1 x 100 % = 22.35 %</td>
<td>3.1 x 100 % = 6.24 % 49.65</td>
</tr>
<tr>
<td>49.65</td>
<td>49.65</td>
</tr>
</tbody>
</table>

Based on the information above, if calculation is based on gross waiting time, which includes approach time (AP), postpone time (PT) W ratio is 26 % for ocean going and 22,35 % for inter island. It means that W ratio of the port of Tanjung Priok is unacceptable. However, if calculation is based on net waiting time the result is 13.66 % for ocean going and 6.24 % for inter island. It means that inter island services are acceptable, whereas ocean going services are quite reasonable.

There are some problems that cause high waiting time, namely the cargo unavailable causing the ships have to wait longer, the berth unavailability for specific ships, ships have to wait for documentation processing, and negotiation between stevedoring companies and shipping companies.
The ships will wait to operate in basin after discharging because cargoes are unavailable. This causes the postpone time high. Because only some berths have sufficient draft for handling specific ships most ocean going ships have to wait. Sometimes the port administration determines priority of ship berthing without coordination with the port authority. As a consequence, the operation can not match with the operation planning because the operation planning should be adjusted. It makes the ships wait for rescheduling or the ship to change to another berth.

Computerising in document processing has not been implemented fully because of computer illiteracy and there is tendency to keep contact personally. This results in operation delay.

Sometimes, the ship wait for berthing because handling rate negotiation has not been achieved between the stevedoring company and the shipping company or its agent.

According to the information above the preferred right for services priority to certain ships in other institutions make the operation was not implemented fully. It causes ambiguity in operation and the target can not be achieved perfectly. Moreover, appointing to stevedoring companies, who carry out the cargo handling, by shipping companies reduce certainty of services and create new bureaucracy.

Berth worked time ratio is a ratio to measure effectiveness of service. The formulation as follows:

\[
\text{Berth Worked ratio} = \frac{\Sigma \text{Worked Time (effective time)}}{\Sigma \text{Service Time (Berthing Time)}}
\]

\[
\text{Ocean Going Worked ratio} = \frac{38.96}{53.48} \times 100 \% = \frac{72.79 \%}{24} = 17.48 \text{ hour}
\]

\[
\text{Inter island Worked ratio} = \frac{27.24}{49.65} \times 100 \% = \frac{54.86\%}{24} = 13.17 \text{ hour}
\]
Based on the figure the effective time of ship service is 72.79 % or 17.48 hours for ocean going ships and 54.86 % or 13.17 hours for inter island ships. Both the ocean going service and the inter island service did not achieve the expected target about 21 hour effective time per day. This condition was caused by cargo unavailability and differences in working time between the port and the shippers.

In this case non-berth working time (NBWT) is influenced by cargo unavailability and direct route operation. Cargo unavailability cause the ship stay longer at the berth as well. Differences working time between port and shipper and direct route used in operation have significant correlation. The cargoes can not be delivered because the shipper’s storage is closed, which causes the ship to have to hang on sling.

Capacity the port can be seen on berth occupancy ratio, if the occupancy is high it means that risk of waiting time is high.

### 3.3.1.2 Berth occupancy

Professor Francou mentioned that formulation to calculate Berth Occupancy Ratio (BOR) depends on the condition or lay out of the port. This occupancy is intended to measure the real capacity the port. It will be used to have right action in solving berth unavailability. The formulation used by the port of Tanjung Priok to measure BOR is

\[
\text{BOR} = \frac{\text{Total Length of Ship} \times \text{Avg. Time at Berth}}{\text{Total Length of Berth} \times 365 \text{ (days)} \times 24 \text{ (hours)}} \times 100 \%
\]

Based the formulation can be used to know how much non-berth working time affect the berth capacity. Because there is no detailed information to make perfect calculation, so the previous information is considered as correct. The assumption for calculation is data in 1999 that the port has 50 berths, total length is 7,736 m, which are opened 24 hours per day and 365 days per year, with the total number of ocean going ships calling the port was 1,679 units and inter island ships 8,809. The level of BOR is 71.36 %. Another assumption are followed:

- Berth time of ocean going ship = 53.48 hours,
- Non berth working time ocean going ship = 7.96 hours
Berth time of inter island ship = 49.65 hours,
Non berth working time inter island ship = 17.78 hours
Ship length (SL) should be found firstly.

Total Length of Ship X Avg. Time at Berth
BOR = --------------------------------------------- X 100 %
     Total Length of Berth X 365 X 24
     (SL x 1,679 x 53.48) + (SL x 8,809 x 49.65)
71.36% = ---------------------------------------------
89,792.92 SL + 437,366.85 SL
67,767,360
Average SL = 71.36 % x 67,767,360 = 48,358,788.1 = 91.73 m
527,159.77 527,159.77

By understanding the average ship length can be used to calculate the occupancy.

(91.73 x 1,679 x 7.96) + (91.73 x 8,809 x 17.78)
BOR = --------------------------------------------- x 100 %
     7,736 x 365 x 24
BOR = 15,593,078.12 x 100 % = 23.01 %
67,767,360
Effective BOR = 71.36 % – 23.01 % = 48.35 %

Actual BOR without non-berth working time is 48.35 %. It means that the port still
has more capacity if the port management can efforts to reduce non-berth working
time.

However, the ships spend time in the port of Tanjung Priok is still longer than in the
port of Klang, which is a neighbouring port being developing fast. The ships time in
the port of Klang can be seen in Table 8.
### Table 8 Ship time in port in the port of Klang (hours)

<table>
<thead>
<tr>
<th>Description</th>
<th>1999</th>
</tr>
</thead>
<tbody>
<tr>
<td>Turn round time</td>
<td>30.9</td>
</tr>
<tr>
<td>Waiting time</td>
<td>0.4</td>
</tr>
<tr>
<td>Berthing time (include Idle time)</td>
<td>30.5</td>
</tr>
</tbody>
</table>

Source: the port of Klang

### 3.3.2 Handling Indicator

The indicators that will be analysed are gang output, handling equipment and dock worker. These indicators related to the implementation of the terminal operator system. By and large the implementation of the terminal operator system and the use of operation supervisor in cargo handling operation help to improve handling output. It was indicated by increasing average gang output of break bulk cargo particularly on inters island ships. However, the improvement has not reached optimum result because another cargo handling output is low. Cargo handling output in 1990 - 1999 is shown in Table 9.

### Table 9 Gang out put

<table>
<thead>
<tr>
<th>Type of Cargo Package</th>
<th>Ocean Going</th>
<th>Inter Island</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Cargo</td>
<td>22.11</td>
<td>26.21</td>
</tr>
<tr>
<td>Bag Cargo</td>
<td>29.67</td>
<td>34.89</td>
</tr>
<tr>
<td>Liquid Cargo</td>
<td>150.33</td>
<td>139.54</td>
</tr>
<tr>
<td>Dry Bulk Cargo</td>
<td>406.23</td>
<td>417.702</td>
</tr>
<tr>
<td>Unitised</td>
<td>28.24</td>
<td>26.16</td>
</tr>
<tr>
<td>Container*</td>
<td>8.00</td>
<td>9.00</td>
</tr>
</tbody>
</table>

Note: *Ocean Going and Inter Island

Source: The port of Tanjung Priok

---

1) From Mohd Faisal Bin Shamsuddin by e-mail faisal@pka.gov.my
Gang output could be increased, but the condition of factors affecting, such as dock worker and handling equipment, should be improved. Professor Francou gives example that the gang output could achieve as seen in Table 10.

Table 10. Expected Gang output

<table>
<thead>
<tr>
<th>Type Packing</th>
<th>Ton/Gang/Hour</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-slung bags</td>
<td>40 – 50</td>
</tr>
<tr>
<td>Bags</td>
<td>20 – 25</td>
</tr>
<tr>
<td>Pallets</td>
<td>25 – 40</td>
</tr>
<tr>
<td>Cases and boxes</td>
<td>12 – 15</td>
</tr>
<tr>
<td>Container cargo (ship crane)</td>
<td>120 – 150</td>
</tr>
<tr>
<td>Dry bulk</td>
<td>1000</td>
</tr>
</tbody>
</table>

Sources: Prof. Dr. Francou, Port Performance Indicators, 2000, p.28.

As characteristic of the conventional terminal is more human and equipment involvement in port operation, so human factor is one of the important factors to achieve high productivity. The productivity of dock workers can be optimised by giving well training and well welfare, so they will be loyalty to the company. These can be achieved by employing permanent dock worker. Because the companies have to maintain quality of their services, so they are responsible to maintain their resources including dock workers. Total number of permanent dock worker is 1423 dock workers. It can be seen in Table 11.

Table 11 Number of Permanent Dock Worker at Terminal Operator.

<table>
<thead>
<tr>
<th>Description</th>
<th>Terminal Operator</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
</tr>
<tr>
<td>Sr. Supervisor</td>
<td>1</td>
</tr>
<tr>
<td>Jr. Supervisor</td>
<td>2</td>
</tr>
<tr>
<td>Ship Foreman</td>
<td>9</td>
</tr>
<tr>
<td>Checker Chief</td>
<td>4</td>
</tr>
<tr>
<td>Administration</td>
<td>6</td>
</tr>
</tbody>
</table>
Sources: the port of Tanjung Priok

By employing permanent dock worker the companies are expected to keep operation continuously and to increase readiness of the operation. However, there is no information about their training, so it can not be explained.

Besides permanent dock workers there are many causal dock workers who also have the role to improve port productivity. They also need more attention because they are part of the port operation. The total number of causal dock workers managed and organised by cooperation management is 4.589 person. Table 12 shows the level of education of the dock workers.

Table 12 Dock Worker base on Education

<table>
<thead>
<tr>
<th>Formal Education</th>
<th>No. of Men</th>
<th>%</th>
<th>Non Formal Education</th>
<th>No. of Men</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uneducated</td>
<td>3,694</td>
<td>80.50</td>
<td>Dock worker</td>
<td>3,280</td>
<td>71.48</td>
</tr>
<tr>
<td>Elementary School</td>
<td>662</td>
<td>14.42</td>
<td>Winch man</td>
<td>911</td>
<td>19.85</td>
</tr>
<tr>
<td>Secondary School</td>
<td>185</td>
<td>4.03</td>
<td>Forklift driver</td>
<td>206</td>
<td>4.49</td>
</tr>
<tr>
<td>High School</td>
<td>48</td>
<td>1.05</td>
<td>Supervisor Handling</td>
<td>52</td>
<td>1.13</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Others</td>
<td>140</td>
<td>3.05</td>
</tr>
</tbody>
</table>

Source: Dock Worker Cooperation

Most of dock workers are uneducated; therefore, they rely on physical capability which is mainly restricted by the age factors. The composition of dock workers based on age is shown in table 13.
Based on the age composition, it indicates that there are regeneration problems, which are mostly dominated by old men. This composition will affect their productivity, which tend low. Productivity of gang output is also influenced by quality of the training of the dock workers. Training done by the cooperation is shown in Table 14.

The total number of causal dock workers who underwent training in 1999 was only 1.74 % from the total number of dock workers. The main problem of less training is financial constraints because theirs salaries did not accommodate the element of training. It can be seen in Table 15.
Table 15 Composition the dock worker’s salaries per shift (Rupiah)

<table>
<thead>
<tr>
<th>Element</th>
<th>Chief group</th>
<th>Winch man</th>
<th>Member</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main Salaries</td>
<td>11,650</td>
<td>9,325</td>
<td>7,000</td>
</tr>
<tr>
<td>Permanent allowance</td>
<td>2,500</td>
<td>2,500</td>
<td>2,500</td>
</tr>
<tr>
<td>Food</td>
<td>3,000</td>
<td>3,000</td>
<td>3,000</td>
</tr>
<tr>
<td>Transport</td>
<td>3,000</td>
<td>3,000</td>
<td>3,000</td>
</tr>
</tbody>
</table>

Source: Dock Worker Cooperation

Another factor affecting handling output is handling equipment. By owning themselves equipment the companies are expected to increase readiness of the operation. According to the previous information that the each of terminal operator has been equipped by handling equipment. However, UNCTAD has recommended the number of heavy handling equipment, depend on the traffic, for multipurpose terminal or conventional terminal is:

- for one berth: two 12/20 ton crane, one 30/40 ton multipurpose crane and one 30/40 mobile crane.
- for two berth: three 12/20 ton, two 30/40 ton multipurpose crane and one 30/40 mobile crane.

Despite of the total number of berth are 50 berths it should consider condition of the berths in determining the number of needed equipment because not all of the berths have similar capacity. Possibly the recommendation to be implemented are at 34 berths, where are occupied for the terminal operators. However, the second option is reasonable as minimum requirement, which is possible to be able be implemented in each of terminal operators. So the total number handling equipment required are

- 3 x 11 = 33 units for crane 12/20 tons
- 2 x 11 = 22 units for crane 30/40 tons
- 1 x 11 = 11 units mobile crane

Regarding to the previous information the total number of heavy handling equipment is; 23 units forklift 10 – 15 ton, 7 units crane 50 – 127 ton and 13 units mobile crane. The number of mobile crane is quite enough but another types such as forklift 10 –
15 ton and crane 30–50 ton should be completed. Another problem is inequitable the equipment, which is only owned by some terminal operators.

### 3.3.3 Storage Utility

Based on the previous figures the average utilisation of storage is decreased. This is because the time for storing cargo is shorter. It was shown by increasing the average of cargo passing storage from 1995 to 1999 than from 1990 to 1994. The growth average percentage is 3.5 % for shed and 88.3 % for open storage. This condition indicates the Terminal Operation System did not guarantee that the shipper would use the storage as transit. It cause the storage become less productive.

### 3.4 Summary

In summary it can be stated that the ship’s time in port is a crucial point for the port because the shipping company or shipper is very concerned with it. The time in port indicates the port performance as a whole.

High time in port at the port of Tanjung Priok is a crucial point, which causes complaints from customers; even the shipping agent will impose additional port surcharges to the shipper who wants to use the port of Tanjung Priok as loading and discharging place. This was caused by lack of co-ordination, unorganised handling cargo, unreliable information system, overlapping the job between government function and commercial function in port operations, complicated system and procedure, less control and monitoring operations and also insufficient facilities and equipment. This problem is also supported by traffic, different working hours between the port and the shipper and availability of vehicles.

In order to improve port performance, the Ministry of Communications and the Port Management of Tanjung Priok Port restructured the operation system by introducing PPSA to simplify system and procedures, the Terminal Operator System (TOS) in
handling cargo operations and improved controlling and monitoring by introducing the Operation Supervisor (OS).

Based on evaluation the implementation of restructuring the operation system has improved port performance, even though it was not significant. It was indicated by reducing the average ship time in port both of oceans going ships and inter island ships and increasing cargo handling, particularly break bulk cargo.

Based on the analysis that there are some problems preventing the optimisation of the new system, both of external and internal, the problem can be clarified as follows:

1. PPSA has not been implemented fully because sometimes the Port Administration involves determining priority of the ship berthing.
2. Document processing was not computerised fully because computer illiteracy.
3. Negotiations of the cargo handling rate take time, which causes the ship to wait.
4. Lack of regeneration of the causal dock worker
5. Lack of training.
6. Unreliability and invalidity of the cargo information from both shipper or shipping company
7. Shipper prefers to use direct route but there are transportation constraints and working time of receiving storage.
8. Not all the terminal operators are equipped proper equipment to support their operation.
9. Unavailability of the cargo causes the ship to wait at the basin or hang on sling.
10. Insufficient facilities of the berth because not all the berths can handle all types of ships, which causes some ships to wait for suitable berths.
11. Less productive of the storage areas.
CHAPTER 4

PROBLEMS OF IMPLEMENTATION

The aim of restructuring the operation system is to reduce time in port by simplifying
the system and procedure of document processing, better operation planning,
allocating the stevedoring companies in a specific place and increasing control and
monitor of the operation.

In general, after implementing the new operation system the port performance is
getting better; however, the port management still faces some problems in achieving
optimum productivity. Based on the explanation in previous chapters, the problems
of implementing the restructuring of the operation system based on areas can be
drawn in Figure 21.

Figure 21 Pattern of the ship and cargo operation
Based on Figure 20 the problems affecting time in port can be clarified as follows:
A is basin area. The ship are waiting for document processing, handling negotiation, berth unavailability, cargo unavailability and next sailing.
B is quay area. The problems are low of the cargo handling operation, cargo unavailability and not working because the receiving storage is closed
C is outside the port. The problem is traffic jam allowing the cargoes come late.
D is shipper storage area. Working time of the shipper storage operation differs with the port working time.

Comparing the problems before and after implementing of the restructuring operation system can be summarized as seen in Table 16.

**Table 16 Problems of implementation before and after restructuring**

<table>
<thead>
<tr>
<th>Description</th>
<th>Before</th>
<th>After</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coordination</td>
<td>Less coordination&lt;br&gt;- Complicated System and Procedure&lt;br&gt;- Overlapping job&lt;br&gt;- Unclear function line between government and commercial in port operation</td>
<td>less coordination with shippers&lt;br&gt;- overlapping job</td>
</tr>
<tr>
<td>Human resources</td>
<td>Less management of dock worker&lt;br&gt;- Personal mentality</td>
<td>less management of dock worker&lt;br&gt;- lack of training&lt;br&gt;- lack of regeneration&lt;br&gt;- personal mentality</td>
</tr>
<tr>
<td>Handling cargo</td>
<td>unorganized stevedoring company&lt;br&gt;- unfair competition&lt;br&gt;- direct route</td>
<td>TOS is only for general cargo&lt;br&gt;- Negotiation handling rate&lt;br&gt;- Direct route</td>
</tr>
<tr>
<td>Facilities and equipment</td>
<td>Insufficient&lt;br&gt;- Inefficient and ineffective</td>
<td>Insufficient&lt;br&gt;- Inefficient and ineffective</td>
</tr>
<tr>
<td>Information computerize and</td>
<td>no EDI system&lt;br&gt;- relying on manifest&lt;br&gt;- no link system&lt;br&gt;- computer is not fully used</td>
<td>EDI have not been fully implemented&lt;br&gt;- Relying on manifest&lt;br&gt;- Computer is not fully used</td>
</tr>
<tr>
<td>Accessibility</td>
<td>Traffic&lt;br&gt;- Long distance between berth and storage</td>
<td>Traffic</td>
</tr>
</tbody>
</table>
4.1 Coordination

Preferred right to give service priority to the certain ship and cargo at other authority allows overlapping the job causing another problem in port operation. Because determining the allocation of the ship without coordination with PPSA who is responsible for the operation.

Less coordination with customers are indicated by high non-berth working time and high waiting time. Tendencies of shippers to use direct routes in handling operations lead to less availability of cargo on time. The ship time in port is going to slow down and the facilities are unproductive. The ships take longer at berth which cause the berth occupancy is high but the effective operation is low. The capacity of the storage is over because the cargoes stay shorter.

4.2 Human Resources Problem

Development of manpower plays an important role in successful organizing of the port as UNCTAD mentioned:

Although ports are of necessity becoming increasingly dependent on machinery for carrying out their primary function, of handling ships and cargo, and automation and computers for much of their planning, control and administrative work, there can be no argument but that, as in other business, success ultimately rest on the skill, attitude and efforts of their management and workforce (UNCTAD, 1990, p.141)

The problems that the port is facing concerning human resources are lack of training, lack of regeneration of dock workers, and difficulties to change personal mentality to work in new circumstances.

Lack of dock worker training lead to low productivity. UNCTAD (1992) mentioned that “there could be no development of human resources without training” (p.70). Obviously, it is difficult to get high productivity without training. The training is needed in order to maintain ability and improve skills and competence of workers. It is important particularly when the new equipment coming up or the equipment need special treatment.
Training done by the cooperation management was only less than 2% of the total number of dock workers in 1999. It indicated that the cooperation management pay less attention to improving skills of the dock workers.

Some institutions prefer to process documents manually because of computer illiteracy, which indicates lack of training as well. This condition tends to reduce optimizing the process.

Approximately 43% of the dock workers, who are organized by the cooperation management, are above 51 years old. This brings dilemma for the cooperation management because it will reduce cargo handling speed that mainly relies on human being and equipment. The cooperation management is powerless to make stricter rules determining the age limitation of membership. It is caused by the principle of cooperation membership being volunteer. The management only gives advice or suggestions to resign.

The difficulty to change the personal mentality in new circumstances is indicated by doing jobs manually, which will lead to abuse of the authority and reduce acceleration of the process, and giving the wrong information about cargo is a deception that will affect operation.

In summary, unskilled and incompetent personnel will lead to less productivity. Reliability of management to organize and manage the personnel is important to support better productivity. Without adequate training, attention for developing human resources, and awareness to do a better job, the ultimate goal can not be achieved.

4.3 Facilities and Equipment

Limitation of berth handling a specific size of ship caused the ships to wait for available berths. This leads to increase waiting time. Some berths, which are fitted with special equipment for handling special cargo, could not be used for other
cargoes. The berth facilities become insufficient because the operation is delay as well. Cargo unavailability or cargo delays cause the ships stay longer at the berth, by which the berths become unproductive. On other side the storage areas is over capacity as an impact of declining the utilization. Because the cargoes tend to stay shorter in the storage.

Improving the number of equipment owned by terminal operators would assist readiness of operation. Although terminal operators are obliged to own their proper equipment not all terminal operators are equipped with proper equipment. This cause imbalance in cargo handling, which reduce capability of optimizing the output.

4.4 Information system

The information system will assist the operation by giving reliable data of the ship calling the port, including type, size and age, the cargo passing the port such as tonnage, type, package, origin and destination. Nowadays, the port relies on information from manifests that sometimes differ from the actual operation. Unreliable information enables difficulties in achieving the expected target, because of the port can not make appropriate operation planning.

The EDI system has not been fully implemented because most customers are not familiar with this technology. It seems longer time is needed for socialization.

4.5 Accessibility

Most of the hinterland is located outside of Jakarta and most cargo is transferred by road. The traffic outside of the port is a problem particularly on certain occasions. Long queuing also happen inside the port because of traffic problem surrounding the ports. This prevents access to the vehicles to the operation place which causes the cargo to be late.
4.6 Cargo handling system

Although the procedure declared the stevedoring companies is appointed by PPSA. A negotiation handling rate between shipping companies or their agents and stevedoring companies, especially for tramp shipping, is inevitable because the companies should also perform to achieve target of the minimum throughput. This cause consume more time. It is a problem of implementing the Terminal Operator System, which will enable the ship owners appoint stevedoring companies to handle their cargo.

4.6 Summary

Even though the restructuring of the operation system has improved ship time in port, the port management still faces the same problem preventing them from optimizing the productivity. The problems are inter correlation, so low of the ship’s time in port is difficult to be achieved.

Unskilled and incompetent the personnel and inappropriate handling equipment reduce handling output. The handling out is also affected by using direct route in operation because long operation cycle. Less of the handling output causes high waiting time. However, the important factors affecting high waiting time is cargo unavailability. The cargo unavailability also affect productivity of storage and berth. This causes over capacity of the storage area and insufficient of the berth.

Another factors affecting waiting time are document processing and appointing of the stevedoring companies.
CHAPTER 5

ALTERNATIVE SOLUTIONS

A solution will be given according to the problem that has been explained in chapter four. It will take into account some possibilities that can be realized by the port management. The main aim of the suggested solution is to reduce time in port. This was not easy to make decision because the problems are not only merely the operation problem which it can be solved at operation level but also it have to be solved by higher level management. The problems are complicated because they are interrelation each other. The operation problem is mainly related to readiness the operation planning including readiness handling equipment, vehicle and dock workers. The management levels are completing the PPSA system and the terminal operator system, providing sufficient berth facilities, making sales and promotion or marketing, providing training and improving coordination.

According to UNCTAD the solution can be planned through stages short term and medium term. (see figure 22)

![Figure 22 Scope of Port Planning Activities](Source: UNCTAD Strategic Planning for Port Authorities, 1993, p.6.)
Classification of the solution into short term and long term is needed because the level of difficulties of problems, which involve internal and external resources. It can be seen from the result of the restructuring in growing of port performance, which is not high. This needs solution comprehensively in planned action. This is expected the port can provide better service and increase its competitiveness. Some solutions will cover in short term and long term such as marketing, providing facilities and developing the information system.

5.1 Short term action

This action should be carried as soon as possible because the operation demand such as improving the PPSA system and the terminal operator system, providing marketing, providing training, improving coordination, providing sufficient facilities and accessibility.

5.1.1 Improving the PPSA system

In order to assist improvement of port operations, PPSA as a part of the operational system must be improved through:

a. Making clear job descriptions regulating authority and responsibility of each institution
b. Having full control and power to determine priority of services that should be carried out in PPSA.
c. PPSA determining the Terminal Operator to handle the cargo.
d. Making efforts to improve abilities of human resources
e. Emphasizing that mentality of personnel is a key to the success of system
f. Facilitating process by computerization is vital
g. Making regular dialog among institutions to solve the problem

5.1.2 Improving the Terminal Operator System (TOS)

Handling cargo as an important factor to improve port performances could be improved its role and capability through:
a. Selective of requirements the stevedoring companies who will operate the terminal such as:
- should have professional have and good management
- should have competence and skilled human resources
- should have capability to perform operation
- should have adequate financial to enable investment
b. The Terminal Operator should have long term handling service contract with liner shipping.
c. Increase target handling output.
d. Increase control and monitor of the operation
e. Responsibility of berth allocating should be on the port.

In general the Terminal Operator System handling general cargo has improved. However, it has not been followed by maximizing other cargoes. The suggestion is to apply the cargo system in the other berths or the existing terminal operator could handle another cargo. Relating to the latter the operator should be equipped by sufficient and proper equipment.

5.1.3 Implementing marketing

The marketing can be carried out in short term and long term. In short term related to promotion the existing resources such as promoting of the storage areas. In short term the open storage productivity can be improved by offering the facilities to the Container Terminal as additional container yard, which are facing limitation of stacking area. It will give mutual benefit to both conventional terminals and container terminals. To improve the storage productivity, the port should offer shed storage for manufacture processes. This will help also acceleration of cargo handling operation by readiness of the cargo.

5.1.4 Providing training

In this term the training is carried by the port to improve competent and skill the employee. The training program should be performed regularly to adapt improving
the technology both cargo handling and information, particularly for Operation Supervisors.

Regarding the dock workers, the port has moral accountability to improve their skills. The port can give assistance through management assistance. As financial constraint is the main problem in providing training the dock worker management can be advised to add training cost into the wages element. This is what the stevedoring company in the port of Arhus did in order to improve dock workers.

5.1.5 Improving coordination

Coordination involves internal and external institutions. Regular meetings among institutions will help to solve the problem immediately but the important thing is the awareness to fulfill the each job. By improving the communication in port community will help better coordination.

Privileged right to specific institution like the right of determining services priority of the ship or cargo handling operation, which will cause less coordination, should be omitted. The suggestion is the port must have full responsibility in operation to avoid ambiguity in managing the operation. This includes the determining the stevedoring company who will carry operation.

5.1.6 Improving facilities and equipment

Availability of facilities and equipment are an important factor to maintain port operations. However, availability of facilities and equipment do not guarantee the port will be better. The more important matter is how port management can manage and organize the existing sources efficiently and effectively.

In short term the facilities improvement close relationship with improving coordination, especially shippers. Equal working time will help improving effective time of operation, of course, will reduce waiting time. Improving capacity the existing
berths through remodeling that be able handle big ship. Improving cargo handling
good operation planning, readiness handling equipment and competent workers.

Although providing of handling equipment is responsibility of the stevedoring
companies the port should also provide it supposing the terminal operator system
only at the existing place.

5.1.7 Developing information system

Proper information about ships and cargoes will lead to be better decision on
determining the target of the operation. Based on the information, the planner can
determine the number of gang, equipment required, number of vehicles, and storage
needed required. Unreliable information about ship and cargo causes less reliability
of operation planning. Regarding the information problem, it is suggested that the
port must develop in information system. The information system that is developed
should have a broad network. Using Internet, online system and port network are
good media for getting better information. Internet has developed tremendously and
has given big impact in communication and network globally. Online system can be
introduced in order to give the customers access to monitor their cargoes or the port
services.

5.1.8 Improving accessibility

The traffic out of the port affects the access of transportation to the port. This
problem reduces speed of transferring cargo but it was out of port control. In the
peak season the condition also affect traffic inside the port. Therefore the port
management should take into account the condition by arranging the appropriate
traffic design. Appropriate traffic design must avoid blocking of the transportation
access to the handling operation place. Determining the gate in and out should be
considered carefully otherwise it will create new problems.
5.2 Medium term

The medium term actions are developing information system, marketing, developing facilities and developing new services. Some areas include short term and medium term action namely developing information system and developing facilities.

5.2.1 Developing information system

Proper information about ships and cargoes can also be obtained by developing the EDI system. Implementation of the EDI system is absolutely needed to accommodate the acceleration of operations. Regarding the limitation of resources, particularly customer, development of EDI system will need more time but the management has to publish and encourage the use of this system.

5.2.2 Marketing research

In medium term the marketing should play important role in developing the port. The port should be more responsive to the market. This is suggested in order to attract more cargo and ship. The port can not be only complacent on captive market because the competition will be more hard along with increasing the number of special port. Nowadays, the customer drives the business; therefore, the port must adapt to the customer’s need. It can only be done by performing marketing research, so the port approach will be more close to achieve the customer satisfaction.

5.2.3 Developing facilities

Regarding the location of the port in a city is difficult to expand so the improving capacity of the existing facilities and improving effectiveness and efficiency the port operation is the best way. Therefore, in medium term the suggestion is to continue remodeling the existing berth. Development new infrastructures depend on result of the market research in accordance with the market demand.
5.2.4 Developing new services

Taking into account the situation outside the port and tendency of the shippers to use direct route in operation. The possibility of developing new services are introducing added value services and multimoda transport. Providing place for manufacturing activities, which have export oriented, such processing, labeling and packing. Whereas multimoda transport can be developed to anticipate shortage the vehicle in direct routes operation. Both of suggestion are implemented depend on result of market research. Implementation of the new service can involve investment of the other private companies.

5.3 Tariff Policy

Other suggestions to help improving an efficient and effective port is tariff policy, which it can be used in short term and medium term. Tariff as a tool that can play an important role to achieve better performance. Flexibility of tariff policy can enable the port to increase productivity. Reducing tariffs in one part will give benefits to the other part, for example, reducing tariff for storage facilities will reduce non-berth working time by increasing readiness of cargo. Offering added value service, whose the main goal is to reduce total transportation cost, by setting special tariffs is needed to attract shippers to use the facilities because the shippers or the companies should have benefit as well by using the port facilities.

In summary, improving the port performance can not be done partially but should be done comprehensively because the problems are complex. This needs planned action. Moreover, improving existing resources, this needs involvement several players such as shippers, ship owners, freight forwarders, dock workers and government institutions. Theirs role will help in achieving effectiveness and efficiency the port.
6.1 Conclusion

A tight sailing schedule of shipping lines claims punctual operation of the port. The port management should try to prevent ineffective and inefficient operation leading the ship to stay longer in port. The level of ship time in port is a parameter of the shippers and shipping companies to measure quality of the port services.

The situation in the port of Tanjung Priok at the beginning of the 90’s was complicated resulting in high time in port. Less coordination and cooperation and low procedure process caused low output. Unclear government and commercial functions in port operation cause ambiguity in implementation. The complicated system and procedure create low document processing.

The port management system enables the private companies involved in port activities. There was no proper regulation setting requirement a qualified company involved in port operation, so the quality of services is low. Unorganized in doing their activities causes difficult to achieve high productivity as well. The stevedoring companies are not responsible to improve dock worker because the dock worker was not their employee. The shippers tend to use direct routes to transfer their cargoes, however, unequal working time between port and receiving storage did not support it.

Those entire problems caused the low of the productivity. The port of Tanjung Priok has a good opportunity to contribute to the national economy because the port is a main gateway to the country. Restructuring the operation system include simplifying
the system and procedures through one roof service center called PPSA and improving cargo handling system called terminal operator system (TOS).

Implementation of the restructuring of the operational system has improved port performance, even though it was not significant. It is proven by reducing time in port. The problem faced during implementation is the restructuring which has not been fully implemented because computer illiteracy, lack of training and personnel mentality as human resources problem, less coordination, insufficient and inefficient facilities, unavailability the cargo, unreliable information, long negotiation handling rate, traffic jam cause less accessibility of transport to the port.

The problems are complex since these involve external and internal factors, therefore, to have best solution it should be done comprehensively and continuously in planned action. The solution is divided into short term and medium term depending on the level of difficulties and to make the port more competitive through better services. In short term actions cover complete improving the PPSA system and the terminal operator system, providing marketing, providing training, improving coordination, providing sufficient facilities and increase accessibility. In medium terms are developing information system, marketing, developing facilities and developing new services, which support efficiency and effectiveness the port operation. Flexibility tariff policy will help the port more lively.

6.2 Recommendation

Based on evaluation and analysis of the implementation of restructuring the operation system including the One Roof Service Center (PPSA) and the Terminal Operator System (TOS) has assisted in improving the port performance. Therefore, to increase the port performance is recommended:

a. The Terminal Operator should not only handle general cargo but also other cargo
b. Implementing the Terminal Operator System at the ports under management of the Indonesian Port Corporation II.
c. Implementing the One Roof Service System (PPSA) mainly ports with international trade.
d. Developing information systems such as EDI and Port network.
e. Doing a marketing research to anticipate customer’s demands
f. Applying flexibility tariff policy.
Bibliography


Morisse M. D (1990). Aspect and Trends of Conventional General Cargo Handling,

The Overseas Coastal Area Development Institute of Japan (OCDI). (1998). Draft
Final for The Study on Port Development Strategy in The Republic of

Port of Tanjung Priok. (1996a). Buku Panduan Pelaksanaan Tugas Suverpisi
Operasi. Unpublished, Jakarta: Author


Jakarta: Author.


Malmö: Sweden.


Development of Ports: Improvement of port operations and connected

Geneva: Author.


Nations.

Nations.

UNCTAD. (1983). Steps to effective equipment maintenance. (Monograph No. 3)


67
# APPENDIX 2

## SYSTEM AND PROCEDURE SERVICE OF SHIP AND CARGO (NEW)
**AT PORT TANJUNG PRIOK**

<table>
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<th>ACTIVITIES</th>
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Source: Port of Tanjung Priok

**NOTE**
- PPKB A: Original document of ship and cargo service request
- PPKB D: Ship and cargo service request establishment
- PPKB T: Copy document of Ship and Cargo service request establishment
- SIB: Sailing Permit
- PBM: Stevedoring Company
APPENDIX 2

SYSTEM AND PROCEDURE SERVICE OF SHIP AND CARGO (NEW) AT PORT TANJUNG PRIOK

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Source: Port of Tanjung Priok

NOTE
PPKB A : Original document of ship and cargo service request
PPKB D : Ship and cargo service request establishment
PPKB T : Copy document of Ship and Cargo service request establishment
SIB : Sailing Permit
PBM : Stevedoring Company
ORGANIZATION STRUCTURE OF PORT OF TANJUNG PRIOK

APPENDIX 3
### I. PORT TRAFFIC

#### A. SHIP CALL (UNIT)

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source: compiled from operational data Port of Tanjung Priok 1990 - 1999
### II. PORT PERFORMANCE

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### B. SHIP OUT PUT

#### Tonnage Per Ship

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#### Tonnage Per Ship Hour In Port (Ton/Hour)

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#### Tonnage Per Ship Hour At Berth (Ton/Hour)

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### C. GANG OUTPUT

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#### TON/GANG/HOUR (T/G/H)

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## D. UTILIZATION OF FACILITIES

### BERTH OCCUPANCY RATIO

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### SHED OCCUPANCY RATIO

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## E. THROUGHPUT

### STORAGE THROUGHPUT

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### BERTH THROUGHPUT

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Source: compiled from operational data Port of Tanjung Priok 1990 - 1999