

# Evaluation of Stevedoring Operational Trial from Manual Planning to System at PTXYZ

Eri Septyawardani, Syamsul Maarif, Joko Affandi

Business Management, Bogor Agricultural University, Indonesia

**Abstract-** Evaluation of operational trial from manual planning stevedoring to system at PTXYZ can provide recommendations for company's strategy related to its terminal operations in the future. A major factor leads to the success of the new system is training for the company members. As age, education and working experience are not the major factors contributing to the success of operational system, training becomes a factor affecting company success since operator can be more expert in controlling the operational system.

**Index Terms-** Evaluation Stevedoring Trial, Stevedoring Planning

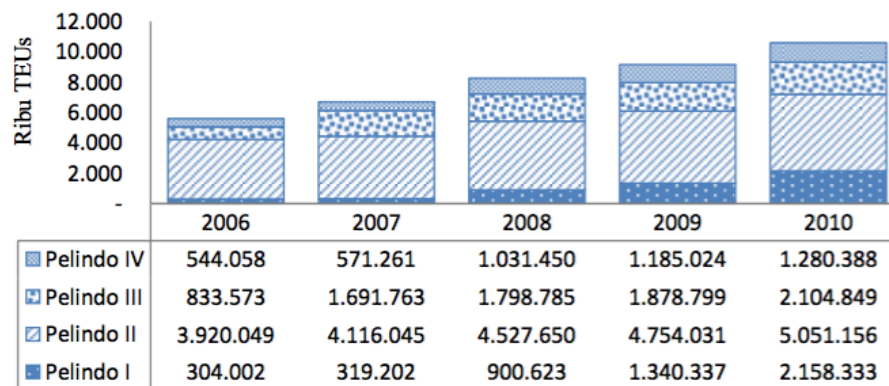
## I. INTRODUCTION

Marine transportation plays an important role in the trading system. Various kinds of goods all over the world move from one place to another place by the sea. The movements of goods in the import and export processes are also need to be in good control. In this case, the port plays a crucial role. Trading activity both services and goods is one element of the country's economic development. Therefore, to facilitate the movement of goods and services to support trading activities, proper

transportation facilities, both on land, sea and air are required.

Stevedoring activities including: stevedoring, cargo doring, receiving and delivery which indirectly help to improve the economy and create public services and security for the smooth flow of goods at the port. Work activities in the port are complex activity starting from the simple to the international scale. For example, inter-island and delivery of goods for export and import of goods from foreign country. Therefore, the port is the main gateway of a country connecting to other countries. It is said as the main gate because the port not only provides service for passenger in and out of a country but also a means of entry and exit of goods between countries. Indonesia ranked sixth after Hong Kong, Singapore, Republic of Korea, Malaysia, and the United Arab Emirates during the years of 2002-2004 in terms of container port traffic (United Nations Conference on Trade and Development, 2006).

Management of container in di Indonesia is performed by PT (Persero) Pelabuhan Indonesia (Pelindo) I-IV.



Source: Ministry of Transportation, Statistics of Transportation, 2010, processed

**Figure 1 Container flow of PT Pelindo, 2006 – 2010 (TEU's)**

Based on the data obtained from Indonesian Ministry of Transportation during the year 2010 it was noted that PT Pelindo ports in Indonesia served container flow of more than 20 million TEU's by the current stevedoring of about 450 million tonnes (MoT 2010). Pelindo II is a port with the highest level of stevedoring of 22,368,931 TEU's compared with Pelindo I of 5,022,497 TEU's, Pelindo III as much as 8,307,769 TEU's, and

Pelindo IV as much as 4,612,181 TEU's. The high flow rate of stevedoring at Pelindo II possibly due to the location of Pelindo II, that is in Java island, precisely Jakarta as the capital city.

Container port is one special type of port that serves the shipping logistics that have been packaged in a container (Wibowo 2010). The existence of the port, in particular, a container port, is very important for economic development in

the region, even to the country. There are three main components in the framework of the process of stevedoring that should be kept interactions, namely: input, process, and output. In a container port, input is the arrival of container ships and the arrival container itself. The input process is in the form of services to ships and process of container stevedoring. While the output is the number of containers transported (Haryanto 2005).

The process of container stevedoring has an indicator that serves to measure productivity as well as indicators of container service quality. In general, the service quality of container is measured to know how long the process of stevedoring is carried out. Faster implementation of stevedoring will make the shipping part be more satisfied. The performance of the port operators and also stevedoring equipment is a major factor in the process of stevedoring. Unloading operations prioritize operator working position because of the speed of stevedoring cranes (stevedoring equipment) entirely within the control of the operator. With the burden and risk of heavy work, the operator is required to always optimally and minimize errors in each job.

PTXYZ is a world-class container terminal company in cooperation with an international port manager. The container terminal is a major project of Pelabuhan Indonesia Company (Pelindo II) to realize the construction of an international port in Indonesia. Equipped with a capacity of 4.5 million TEUs, (twenty-foot equivalent unit) to enable the Triple E class container ships passing through Indonesia without transshipment at other ports. Until now Triple-E ship is the largest class of container ships with a carrying capacity of up to 12,000-15,000 TEUs. Amenities of existing port terminal at the Port of TanjungPriok only serve vessels with a maximum capacity of 6,000 TEUs, while the growing trend of the use of container ships in the world to use vessels with a capacity of > 10,000 TEUs in order to reduce logistics costs per TEU, so as to serve aboard Direct Call with large size must be prepared adequate facilities.

The container terminal is built because of the background of increasing container traffic growth of more than 20% in the last 3 years (2009-2013) and an increase of approximately 5% in the last 10 years (2002-2012). The capacity of Container Terminal in TanjungPriok port originally is only able to accommodate 4.5 million TEUs, after the restructuring program, the expansion, and reconfiguration of the port, the capacity increased to 7-8 million TEUs. Total throughput realization in TanjungPriok container in 2011 amounted to 5.6 million TEUs, increased to 6.2 million TEUs in the year 2012/2013. This indicates that we need to make additional facilities to accommodate the traffic growth of container in the coming years (IPC 2014).

Due to the high activity of stevedoring hence careful planning is needed through three operational experiments (simulation) of stevedoring at PT XYZ before operational execution begins officially. Therefore, this study discusses how was the trial evaluation of stevedoring operation and the best recommendation for PTXYZ in the operational process in the future.

## II. RESEARCH ELABORATION

The purpose of this study was to analyze the experimental conditions including stevedoring operations at PT XYZ currently, analyze the differences in the results of the three trials

of stevedoring operations at PT XYZ and determine the best recommendations to the trial process of stevedoring operations at PT XYZ. The research was conducted within the scope of PT XYZ located in Tanjung Priok, North Jakarta. The data collection was performed for 3 months from May to August 2016. The study used the quantitative approach with descriptive and comparative design. Quantitative approaches relied on the figures as a basis for analysis. The descriptive method was used to describe the condition of the variables, the results of experiments unloading operations at PT XYZ. While the comparative design was used to compare three (3) times of experimental results of stevedoring operations in May, July and August 2016. The data used in this study were primary data and secondary data. The primary data were the data from direct observation in the form of operational trial data loading and interview respondents using the help of a questionnaire. The secondary data were staffing, organizational structure, job description, and regulations.

The selection of respondents were done by non-random sampling technique (purposive sampling) which according to Arikunto (2006) is a technique of taking samples with not based on random, local or strata, but based on the consideration that focuses on a particular goal. The selection of respondents was based on considerations of expertise, experience and knowledge of respondents to the operator as well as the respondent is the same person to load and unload the field from the beginning of the experiment begins until the finish. The number of respondents as many as 15 people from a total population of 28. Determination of respondent number was based on the opinions of Gay and Diehl (1992), which assumes that the more samples are taken the more representative those are and the results can be generalized. However, the sample size accepted will depend on the type of research. If the research is descriptive, then the minimum sample is 10% of the population. Data processing techniques carried out in accordance with the framework, namely by:

1. Collecting data from trials of unloading of XYZ was done in May, July and August 2016.
2. Analyzing the results of these experiments with non-parametric statistical analysis to test Sign Test.
3. Comparative Testing (difference test) by using ANOVA test (F test) to determine the significant differences in the results of the experiment unloading.
4. Performing distribution of questionnaires to obtain more detailed information and in-depth research related to the results.
5. Conducting cross tab to see the condition of the characteristics of the respondent (operator) in relation to the impact of loading and unloading operations experiment perceived by respondent (operator).

## III. RESULT

### Description of Data

The information and data in this study were collected based on the results of the experiment of unloading at PTXYZ conducted in May, July and August 2016 and were equipped with the answers from the questionnaire. Respondents were employees of PTXYZ who worked as heavy equipment operators. Their main job was as container operator in the groove

loading and unloading containers and responsible for operating heavy equipment (crane). The test result of loading and unloading operations in May, July and August are presented as follows:

**Table 1 Results of experiments of loading and unloading operations**

Respondent	Result of Experiment		
	May	July	August
1	11	18	20
2	10	17	19
3	12	16	18
4	10	17	18
5	9	17	21
6	11	15	21
7	12	18	22
8	10	16	21
9	11	17	19
10	11	16	20
11	12	17	21
12	9	15	18
13	8	15	21
14	12	17	19
15	11	18	20
Average	11	17	20

The experimental results of loading and unloading operations at PT XYZ shows that there was increased from May (average = 11 boxes per hour), July (average = 17 boxes per hour), and August (average = 20 boxes per hour), yet these achievements have not met the target set by the company, which was 27-30 per box per hour.

**Sign Test Results**

Sign test on trial data of loading and unloading operations in May, July and August 2016 shows the following results:

**The period of May -July 2016**

The result of sign test for the period May-July 2016 is presented in Table 2 below:

**Table 2 Result of Sign test on May-July 2016 Test Statisticsa**

July - May	
Exact Sig. (2-tailed)	0,000b
a. Sign Test	
b. Binomial distribution used.	

Based on those results, Exact Sig. (2-tailed) amounts to  $0,000 < 0,05$ , thus it can be concluded that there was difference in trial result of loading and unloading operations during May-July 2016.

**The period of July-August 2016**

Sign test result for the period July-August 2016 is presented in Table 3 below:

**Table 3 Result of Sign Test for period of July – August 2016 Test Statisticsa**

Agustus – Juli	
Exact Sig. (2-tailed)	0,000b
a. Sign Test	
b. Binomial distribution used.	

From these results, as the value of Exact Sig. (2-tailed) is  $0.000 < 0.05$ , it can be concluded that there was difference in the test result of loading and unloading operations in July-August 2016.

Summary of sign test result in the period of May to July and July-August 2016 are presented in Table 4 as follows:

**Table 4 Summary of Sign Test Result**

Period	Period I	Period II	
	(May – July)	(July – August)	
Result	0,000	0,000	
Conclusion	Significant	Significant	Significant

From the summary in Table 4, it appears that the trial of loading and unloading operations at the first period of May to July 2016 and the period between July and August 2016 showed a significant result (meaningful). Therefore, there was increase in the test results from the period of May, July until August 2016.

**Anova Test Results**

Anova test on trial data of loading and unloading operations in May, July and August 2016 shows the following results:

**Table 5 Result of Anova Test**

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	28.500	12	2.375	50.667	.000
Within Groups	1.500	32	.047		
Total	30.000	44			

From the ANOVA test results, F value = 50.667 with the sig. 0,000 is shown. This indicates that there was significant difference between the experimental loading and unloading operations conducted in May, July and August 2016. This meant that the results of experiments of unloading operations conducted by PT XYZ in May, July and August experienced a significant improvement.

**Results of Cross Tab**

Cross Tab Analysis is intended to show the characteristics of the respondent to the impact of unloading test. The results of cross tabulation (cross tab) between the characteristics of respondents to the impact of test of loading and unloading operations perceived by the respondent (operator) aims to examine the relationship between both. Characteristics of respondents to the impact of test of loading and unloading operations are presented in Table 6 below

**Table 6 Results of cross tab**

No	Pernyataan	Jawab	Usia								Pendidikan Terakhir				Lama Bekerja					
			≤ 25 tahun		26-30 tahun		31-35 tahun		≥ 36 tahun		SMA		Diploma		≤ 5 tahun		6-10 tahun		11-15 tahun	
			F	%	F	%	F	%	F	%	F	%	F	%	F	%	F	%	F	%
1	Keterampilan untuk melakukan aktivitas bongkar muat lebih baik dibandingkan sebelumnya	S	5	33,3	1	6,7	5	33,3	1	6,7	13	86,7	1	6,7	7	46,7	3	20	3	20
		KS	2	13,3	0	0	1	6,7	0	0	1	6,7	0	0	2	13,3	0	0	0	0
		TS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	Lebih fokus dalam melakukan aktivitas bongkar muat	S	6	40	1	6,7	4	26,7	1	6,7	11	73,3	1	6,7	8	53,3	2	13,3	2	13,3
		KS	1	6,7	0	0	2	13,3	0	0	3	20	0	0	1	6,7	1	6,7	1	6,7
		TS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	Kegiatan bongkar muat menjadi lebih mudah	S	7	46,7	1	6,7	5	40	1	6,7	12	80	1	6,7	6	40	3	20	2	13,3
		KS	0	0	0	0	1	6,7	0	0	2	13,3	0	0	3	20	0	0	1	6,7
		TS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	Waktu bongkar muat menjadi lebih singkat	S	5	33,3	1	6,7	4	26,7	1	6,7	14	93,3	0	0	4	26,7	3	20	3	20
		KS	2	13,3	0	0	2	13,3	0	0	0	0	1	6,7	5	33,3	0	0	0	0
		TS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	Daya adaptasi terhadap persoalan bongkar muat lebih tinggi	S	4	26,7	1	6,7	3	20	1	6,7	8	53,3	1	6,7	7	46,7	2	13,3	3	20
		KS	3	20	0	0	2	13,3	0	0	6	40	0	0	2	13,3	1	6,7	0	0
		TS	0	0	0	0	1	6,7	0	0	0	0	0	0	0	0	0	0	0	0
6	Antisipasi terhadap masalah bongkar muat lebih baik	S	5	33,3	1	6,7	4	26,7	1	6,7	10	66,7	1	6,7	8	53,3	3	20	2	13,3
		KS	2	13,3	0	0	2	13,3	0	0	4	26,7	0	0	1	6,7	0	0	1	6,7
		TS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	Penyesuaian terhadap alat bongkar muat lebih memadai	S	6	40	0	0	5	33,3	1	6,7	12	80	0	0	6	40	2	13,3	3	20
		KS	1	6,7	1	6,7	1	6,7	0	0	2	13,3	1	6,7	3	20	1	6,7	0	0
		TS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8	Lebih optimis dapat melakukan kegiatan bongkar muat dalam waktu yang lebih cepat	S	7	46,7	1	6,7	5	33,3	1	6,7	11	73,3	1	6,7	8	53,3	3	20	2	13,3
		KS	0	0	0	0	1	6,7	0	0	3	20	0	0	1	6,7	0	0	1	6,7
		TS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

In those cross-tab results, it can be seen that the agree answers dominating the results showed a greater percentage at age ≤ 25 years with high school education level/equivalent and work experience ≤ 5 years old. So that the eight variables described in the questionnaire are related to skills, work focus, easier loading and unloading operations, shorter time in performing loading and unloading operations, adaptability to complex problem, better anticipation, adjustment of more adequate equipment, and be more optimistic and quick in doing activities, yet those are not influenced by older senior, higher education and longer work experience.

**Manual Processes of Loading and Unloading Operations to System**

In previous, implementation of the operational processes of loading and unloading at PT XYZ was conducted manually. Thus, manual planning was done before the experiment of operations started on May 2016, from the planning process of ship arrival, placement of container in yard, load and unload process, until the delivery of the container to the customer. Those trials were conducted on January 2016, with a total of 50 empty containers. The process involved several operational staffs. In addition to the operator as key factor in the process of loading and unloading of containers, there was also supporting parties which also played important role in the process of loading and unloading. Among them were the ship planner, yard planner, watchtower and planners in setting cargo ship planner. Good cooperation between operator and operational staff is needed to produce a good productivity in the settlement process of loading and unloading.

Currently, PTXYZ is already using system in operating the loading and unloading process. Terminal Operating System (TOS) is a system application that is used in the operation of container terminals which generally has a function of managing the flow of containers at the terminal with precise planning to: 1) obtain the efficiency of loading and unloading process; 2) plan a schedule of loading and unloading process as well as yard transfers by referring to the information sent by the shipping companies explaining the position of containers on the ship to be docked; 3) process container shipping information sent by the terminal towards transportation companies and provide information to the shipping companies and trucking companies on where to place the container. By using the system, the process of loading and unloading will be more effective and efficient since the field operator can immediately know the exact location of containers concerning the properties and delivery schedule of container, thus loading and unloading time will be shorter.

**IV. CONCLUSION**

Several conclusions can be drawn from these results, among others:

1. Experiment of loading and unloading operations conducted by PT XYZ showed a significant increase, from an average of 11 boxes per hour in May to an average of 17 boxes per hour in July and an average of 20 boxes per hour in August 2016, yet this result have not met the target set by the company (27-30 boxes per hour). In addition, the test results of loading

and unloading operations were not related to the characteristics of the operator (respondent) both in terms of age, education and duration of work experience.

2. There is significant difference in the results of the three trials of loading and unloading operations conducted at PT XYZ. For both professional training and group activity training conducted routinely resulted in the improvement in the ability in operating equipment.

3. The best recommendation toward further operational process is to do regular training every three months to facilitate the use and management of the TOS (Terminal Operating System), the need to improve communication between departments concerning the terminal operations and performing own job description are also suggested. Characteristics of operator, including age, the level of education and work experience are not need to be taken into account in further operational process. The follow-up experiment requires regular and considerable training in order operator will be able to control the system and equipment better for the reason that training is a short-term educational process that uses systematic and organized procedure where non-managerial employees learn the knowledge and technical skills in the limited purposes (Mangkunegara 2011).

#### REFERENCES

- [1] Arikunto S. 2006. *Prosedur Penelitian Suatu Pendekatan Praktik*. Jakarta (ID): Rineka Cipta
- [2] Gay LR, Diehl PL. 1992. *Research Methods for Business and Management*. New York (US) : MacMillan Publishing Company
- [3] Haryanto. 2005. *Analisis Sistem Pelayanan Bongkar Muat Peti Kemas dengan Menggunakan Model Antrian (Studi Kasus Di Pelabuhan Tanjung Emas Semarang)*. [tesis] Semarang (ID) : Universitas Diponegoro Semarang.
- [4] [IPC] Indonesia Port Corporation. 2014. *Annual Report IPC 2014: Committed To Progress*. Jakarta (ID).
- [5] [Kemenhub] Kementerian Perhubungan Laut. 2010. *Statistik Perhubungan Laut*. [Internet]. [diunduh pada 3 September 2016]. Tersedia pada: <http://dephub.go.id>  
<http://ppid.dephub.go.id/index.php?page=viewdmDocuments&kategori=Statistik-Perhubungan>
- [6] Mangkunegara AA, Anwar P. 2011. *Perencanaan dan Pengembangan Manajemen Sumber Daya Manusia*. Bandung (ID): PT Refika Aditama
- [7] [UNCTAD] United Nations Conference on Trade and Development. Chapter 5-Port Development. 2006. [Internet]. [download on 3 September 2016]. Tersedia pada: <[http://unctad.org/en/docs/rmt2006ch5\\_en.pdf](http://unctad.org/en/docs/rmt2006ch5_en.pdf)>
- [8] Wibowo H. 2010. *Analisis Faktor- Faktor yang Mempengaruhi Waktu Tunggu Kapal di Pelabuhan Tanjung Emas Semarang*. [tesis] Semarang (ID): Universitas Diponegoro Semarang.

#### AUTHORS

**First Author** – EriSeptawardani, Business Management, Bogor Agricultural University,  
[eriseptya@gmail.com](mailto:eriseptya@gmail.com)  
**Second Author** – SyamsulMaarif, Business Management, Bogor Agricultural University  
**Third Author** – JokoAffandi, Business Management, Bogor Agricultural University