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STUDY ON THE PRODUCTIVITY OF FISHING SHIPYARDS IN LAMPULO VILLAGE, BANDA ACEH

Dicho Alfalah[1], Thaib Rizwan[1*], Rahmat Rizqi[1] , Makwiyah A. Chaliluddin[1], Ilham Zulfahmi[1] , Husaini[2].

[1]Program Studi Pemanfaatan Sumberdaya Perikanan, Fakultas Kelautan dan Perikanan, Unversitas Syiah Kuala Darussalam, Banda Aceh.
[2]Program Studi Teknik Mesin, Fakultas Teknik, Unversitas Syiah Kuala Darussalam, Banda Aceh.
*email: rizwanthaib@unsyiah.ac.id

ABSTRACT

Banda Aceh City is a city in Aceh located at the end of Aceh Province. The vast sea area makes the waters of Aceh Province have great potential in the marine and fisheries sector, one of which is in the waters of Lampulo, Aceh Province. The shipyard located in Lampulo Village is active in serving repair and maintenance activities for fishing vessels, both fiber and wooden vessels. Research on productivity studies of shipyards in Lampulo Village, Banda Aceh was carried out for three months from December 2021 to February 2022. This study aims to examine productivity levels and factors that affect productivity at shipyards in Lampulo Village, Banda Aceh. The method used in this research is a survey by direct observation by making direct observations in the field, data analysis is carried out using the objective matrix (omax) method. The results showed that the productivity level of shipyards was 49.00%, with the factors that affect productivity, namely the number of absent employees with an importance weighting of 30%, the use of labor with an interest weight of 21%, effective working hours with an interest weight of 21. %, the use of machines with a weight of importance of 14% and actual working hours with a weight of importance of 14%.

Keyword: Objective Matrix method, productivity, shipyard

1. Introduction

Banda Aceh City is a city in Aceh located at the end of Aceh Province. The area of Banda Aceh City is 61.36 km2 with a total population of 270,328 people and a population density of 4,405.60/km2 which is directly adjacent to Aceh Besar District. The city of Banda Aceh consists of 9 sub-districts including Baiturrahman, Kuta Alam, Meuraxa, Syiah Kuala, Lueng Bata, Kuta Raja, Banda Raya, Jaya Baru and Ulee Kareng districts. The vast sea area makes Aceh Province waters have great potential in the marine and fisheries sector, one of which is in the Lampulo waters of Aceh Province (DKP Aceh 2008).

Shipyards in Aceh are still classified as traditional shipyards and shipyard ownership is also passed down from generation to generation. The wooden shipyard management system is still family-friendly and sometimes the workforce also comes from the family. The technology used by the shipyard still uses knowledge and experience that has been passed down from our ancestors for years (Nofrizal et al., 2014).

The shipyard located in Lampulo Village is active in servicing the repair and maintenance of fishing boats, both fiber and wooden boats. The fishing shipyard in Lampulo is actively carrying out repair activities during the day. The fishing shipyard in Lampulo is an open shipyard because it does not have a roof to protect the ship from bad weather. This shipyard does not yet have an organizational structure because there are no permanent workers and this affects operational management which can hamper work (Rafika et al., 2021). There is also no measurement of productivity that can tell how productive the shipyard has been so far. Therefore it is necessary to measure productivity in shipyards in Lampulo Village, Banda Aceh City.

The state of the industry in a place determines its economic growth. Industries that utilize local origins play an important role in absorbing labor and changing economic structures and investment.

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Therefore, the state of the industry in a place is usually used as an acum in predicting its future prospects. In the manufacturing industry, the most important thing that must always be maintained is production efficiency, but most industries only pay attention to the efficiency aspects of their production activities without paying attention to the human aspects of working in the industry. Continuous development in terms of increasing work performance and efficiency, the majority of which lead to the development of work skills, work enthusiasm, work motivation, and the work environment of each employee. Shipbuilding and ship design are the most important activities in a shipyard. Furthermore, the time, place and input resources required for shipbuilding are determined according to production planning and shipyard productivity is determined by the quality of production planning.

Productivity is related to the effectiveness and efficiency of resource (input) utilization in producing output. The factors of production in the input are people, money, machines, materials, methods and the environment, which affect the course of the production process in achieving product quality. Productivity measurement is the most important thing for the shipbuilding industry which aims to find out whether the shipyard is progressing or failing in carrying out ship repairs and also in building new ships. Therefore, research on productivity measurement in shipyards was carried out in order to determine the productivity that has been achieved and also to determine the increase in productivity in the future.

OMAX was introduced in the 1980s by James L. Riggs PE from Oregon University. OMAX is a partial productivity measurement system developed to monitor productivity in each part of the company with productivity criteria that match the existence of that part (objective). OMAX combines productivity criteria into an integrated form and relates to one another. This example involves all levels of the company, from subordinates to superiors. The objective matrix is based on the statement that productivity is a function of the origin of performance factors, where each unit has different specific dimensions and the way to measure productivity is to measure the factors that influence it. The objective matrix (OMAX) can be used to measure work units both on a small scale and for the company as a whole. but because the performance measurement of the original units cannot be linked in an addictive way to represent the performance of the parent units. To measure the entire organization, it is necessary to carry out a weighting process for the linked units.

2. Methodology

This research was carried out from December 2021 to February 2022 at the shipyard in Lampulo Village, Banda Aceh. The method used in this study is a survey method by direct observation in the field. The data used in this study are primary data and secondary data. Primary data obtained from direct observation to the shipyard by collecting criteria to be processed mathematically. Secondary data is obtained from literature studies by reading or studying journals and reports as research guidelines.

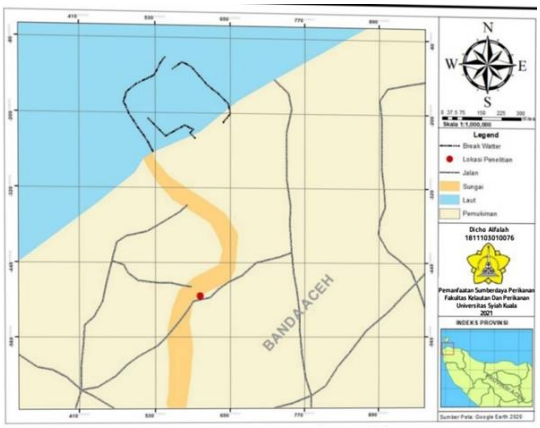

Figure 1. Map of research locations

3. Data Analysis

In this study using descriptive analysis which aims to present a descriptive classification of the variables to be studied. The analytical method used is the objective matrix (OMAX) analysis method where the criterion data that has been obtained from the shipyard will be processed using the Objective Matrix (OMAX) method to determine how productive the shipyard is. The following are the steps to determine productivity using the objective matrix (OMAX) method:

3.1 Identification of Productivity Criteria

The initial stage in measuring productivity using the objective matrix (OMAX) method is to determine productivity criteria. Determination of productivity criteria must be in accordance with the work unit where this measurement is carried out. The process of determining productivity criteria should have more than one criterion because it represents the overall productivity of the work unit. The productivity criteria to be measured on the production floor are the criteria for utilization of labor resources, machinery,

energy and the criteria for the effectiveness of production output.

3.2 Data Collection and Processing

The data collection stage is based on the needs of the productivity criteria to be measured. The data obtained from the shipyard are data on the number of workers, data on machine usage, data on working hours, and data on absence.

3.3 Productivity Value Measurement of Each Criterion

The productivity criteria in the shipyard that will be measured are converted into ratios, the results of this measurement will show the level of efficiency and effectiveness in the use of labor, machinery, energy, and production output resources. Below is a measurement formulation of each criterion regarding labor, machinery, energy, and production output.

a. Labor Criteria (%)
Labor
$= \frac{\text{(Labor used (people}}{\text{Workforce available (people}} x\ 100\%$

b. Machine Usage Criteria (%) = $\frac{\text{Total machine hours}}{\text{available hours}} x\ 100\%$

c. Criteria for Actual Production Working Hours (%)
$= \frac{\text{Jam kerja aktual produksi (Jam)}}{\text{Working Hours (Hours)}}$ x 100%

d. Effective Working Hours (%)
Effective Working Hours
$= \%\ \frac{\text{Operating hours (Hours)}}{\text{Working Hours (Hours}}$ x 100

e. Absence Criteria (%)
Absence = (Number of absent workers (days))
$= \frac{\text{Number of workers}}{\text{number of working days (days}}$ x100%

3.4 Determination of Targets and Weights

Measuring productivity with the OMAX method in shipyards requires setting targets and weights for each criterion. The target is the value to be achieved by the company, the target to be achieved must be realistic with the current state of the company. Weight is the degree of importance of the criteria expressed in units of percent (%), the total weight of all criteria is 100%. The process of determining the weight and target was obtained from the results of interviews with the shipyard.

Determination of weighting is very important, because each predetermined criterion has a different effect on the level of productivity of the criteria being measured. Therefore, it is necessary to have a weighting expressed in percent. To simplify weighting, can divide 100% for the percentage of efficiency, effectiveness and inferential. Like :

Effectiveness: B 35%
Inferential : C 30 %
Total : 100 %

From the distribution of the efficiency, effectiveness and inferential percentages, then the weighting is divided according to the number of important criteria contained therein, such as:

a. Efficiency criteria
- Labor usage: 60%
- Machine usage: 40%

Total : 100 %

b. Effectiveness criteria
- Actual working hours : 40 %
- Effective working hours : 60 %

Total : 100 %

c. Inferential criteria
- Number of absences
- employee : 100 %

Total : 100 %

3.5 Determination of Performance Standards and Performance Scales

At this stage, the standard performance value is obtained from the average calculation results for each performance ratio and is placed at level 3. The next step is to determine the smallest scale obtained from the smallest value in the calculation of the ratio and written at level 0. Meanwhile for level 10 it is obtained from the target what the company wants to achieve. After level 0, level 3, and level 10 are filled, the next step is to determine level 1 to level 3 and level 3 to level 10, which is called calculating the performance scale. Calculations to determine the scale of each level between level 1 to level 3 using the formulation: Meanwhile, to calculate the scale between level 3 to level 10 using the formulation:

Level 1 – Level 2 = $\frac{(level\ 3 - level\ 0)}{3-0}$

Meanwhile, to calculate the scale between level 3 to level 10 using the formulation:Level 4 – Level 10 = $\frac{(level\ 10 - level\ 3)}{10-3}$

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3.6 Measurement of Productivity Index

Measuring the productivity index can be done if the calculation of the ratio has been done, and the targets and weights have been determined by the company's staff. Before calculating the productivity index, the steps that must be taken are to calculate the values and performance indicators. Below is an explanation of the calculation of values and performance indicators as well as the calculation of the productivity index.

a. Calculation of Performance Scores and Indicators

The score, namely the selected level, is obtained by looking at the performance measurement data and determining which level the measurement performance is currently at, then the level of performance is written in the score column, which is written is the level of performance not the performance value. If the score is known, the next step is to calculate the value, the value is obtained by multiplying the score by the weight. To calculate performance indicators, obtained from the sum of the values of the overall criteria ratio.

b. Calculation of Productivity Index

The productivity index is measured to determine whether there has been an increase or decrease during that period. Calculations referring to the previous month using the formulation:

$$\frac{Measurement\ results\ for\ the\ current\ period - 300}{300}\ x\ 100\%$$

Kriteria	Efiiensi		Efektivitas		Inferensial		
Rasio-rasio	Rasio 1	Rasio 2	Rasio 3	Rasio 4	Rasio 5	Skor	Keterangan
Nilai Aktual							
Target						10	Sangat Baik
						9	
						8	
						7	
						6	
						5	
						4	
						3	Sedang
						2	
						1	
						0	Sangat Buruk
Skor Aktual							
Bobot							
Nilai Produktivitas							

Indikator Performansi	Saat ini	Periode Dasar	Index

4. Results And Discussion

4.1 Shipyard Productivity Levels in Lampulo Village, Banda Aceh

Productivity values are obtained from measuring each ratio of each performance indicator. Data used in calculations using the OMAX method include :

Criteria1. Labor
Criteria 2. Machine usage
Criteria 3. Actual working hours
Criteria 4. Effective working hours
Criteria 5. Employee absence

Table 2. the value of the ratio of each creation

Month	criteria 1	criteria 2	criteria 3	criteria 4	criteria 5
Desember	100	13,33	13,33	80	2,78
Januari	88,89	13,33	13,33	80	2,08
Februari	100	13,33	13,33	80	1,67

4.2 Initial Achievement of Performance Indicators (Score 3)

The initial achievement value is the level of achievement obtained when this matrix begins to operate placed at a score of 3. The initial achievement value is the average value of performance indicators (labor usage, machine usage, effective working hours, actual working hours and number of employee absences). at the time of measurement during December to February.

Table 3. Initial achievement value (score 3)

No	Work indicator	unit	Initial Value
1	Labor	%	96,30
2	Machine usage	%	13,33
3	Hours actual	%	13,33
4	Efective working hours	%	80
5	Total absence	%	2,18

4.3 Realistic Target Value (Score 10)

Realistic target values are targets that the shipyard wants to achieve in the future for each performance indicator measured. The target to be achieved will be included in a score of 10 for each indicator. The target is determined by the shipyard, because the shipyard knows the actual state of the shipyard so that the progress to be achieved by the shipyard can be determined.

Table 4. Realistic target values (score 10)

No	Work indicator	unit	Initial value
1	Labour	%	100
2	Machine usage	%	33,33
3	Hours actual	%	33,33
4	Effective working hours	%	80
5	Total absence	%	0,67

Lowest Performance Indicator (Score 0)

The lowest value is the lowest rating for each indicator during the measurement process in the shipyard. In the measurement score of 0, it was found that labor was 88.89%, machine usage was 13.33%, actual working hours was 13.33%, effective working hours was 80% and the number of employee absences was 1.67%.

Table 5. The lowest value of performance indicators (score 0)

No	Work indicator	Satuan	Nilai Awal
1	Labor	%	88,89
2	Machine usage	%	13,33
3	Hours actual	%	13,33
4	Efective working hours	%	80
5	Total absence	%	1,67

4.4 Performance Indicator Weights

The criteria contained in the performance indicators do not have the same effect on work unit productivity. So to see how much the degree of importance of each performance indicator criterion is given a weight. Weighting is an important step. Weighting provides an opportunity to pay attention directly to those activities with the greatest potential for increased productivity. The total weighting for all criteria must equal 100 %.

Table 6. Weighting values

No	Work indicator	Satuan	Nilai Awal
1	Labor	%	21
2	Machine usage	%	14
3	Hours actual	%	14
4	Efective working hours	%	21
5	Total absence	%	30

4.5 Measuring Shipyard Productivity Levels Using the Objective Matrix (OMAX) Model

Measuring the productivity of the existing shipyard in Lampulo Village, Banda Aceh using the Objective Matrix (OMAX) analysis method.

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Table 7. Objective matrix table (OMAX)

Criteria	Eficiency		Efectivity			Inferential		
Rasio-rasio	Rasio 1	Rasio 2	Labor	Rasio 3	Rasio 4	Rasio 5	Score	Desription
Actual Value	100	13,33	Machine usage	13,33	80	2,78		
Target	100	33,33	Hours actual	33,33	80	0,67	10	Very good
	99,47	30,47	Efective working hours	30,47	80	0,89	9	
	98,94	27,62	Total absence	27,62	80	1,10	8	
	98,41	24,76		24,76	80	1,32	7	
	97,89	21,90		21,90	80	1,53	6	
	97,36	19,04		19,04	80	1,75	5	
	96,83	16,19		16,19	80	1,96	4	
	96,30	13,33		13,33	80	2,18	3	Medium
	93,83	13,33		13,33	80	2,01	2	
	91,36	13,33		13,33	80	1,84	1	
	88,89	13,33		13,33	80	1,67	0	Poor
Actual score	10	3		3	3	3		
weight	21	14		14	21	30		
Produktivity Value	210	42		42	63	90		

rformance Indicator	Now	Basic Perode	Index
	447	300	49,00

After processing the data and compiling the objective matrix (Omax) table then discussing and analyzing the results of the research. The thing that needs to be discussed is all the existing performance indicators when measuring productivity using the objective matrix measurement model. As well as analyzing each performance achievement index for each measurement period and all total performance values in production units.

Analyzing every performance indicator that exists in the shipyard performance measurement process is carried out to get pictures of the results of each performance indicator, so that shipyard management can measure the performance that has been carried out and henceforth the shipyard can take action to improve and improve performance. at the shipyard. As revealed by Sinungan (2008), the benefits of measuring productivity at the company level are used as a management tool to analyze and encourage production efficiency and will increase worker awareness and interest in carrying out production levels and series. The following is the result of measuring the performance indicators that have been achieved by the shipyard, for each measurement period. This analysis is based on the results of processing performance measurement tables in each measurement period. The table of processing results can be seen in Table 7. Table of Objective matrix (OMAX)

The measurement results for 3 months starting from December to February obtained a shipyard productivity value of 49.00%. This value is the basic productivity measurement value, which means that this value cannot be compared because there is no previous measurement value. As a basis for assessing the index, the productivity value is less than 100%, the value is smaller than the previous period, the productivity value is equal to 100%, the value is the same as the base period value, the productivity value is greater than 100%, then the value is greater than previous period.

As a whole, the shipyard's performance has not yet received a good performance score. The measurement results for each performance indicator greatly influence the results of the productivity value. The greater the value of each performance indicator that is measured, the better the value of productivity and vice versa.

Factors Affecting Shipyard Productivity Levels

The factors that affect the level of productivity in this shipyard using the OMAX method are employee absences, labor, effective working hours, machine usage, and actual working hours. The importance of the level of influence is determined from the weight of each performance indicator. The number of employee absences with an importance weight of 30%, workforce of 21%, effective working hours of 21%, machine usage of 14% and actual working hours of 14%.

The number of employee absences has the highest weighting value, because the presence of employees greatly affects performance with only ten employees, work can be delayed if employees are not present. This will have an impact on production activities, and will ultimately reduce the value of productivity. The workforce working at the shipyard during the last measurement consisted of 10 people. The workforce has different tasks depending on the directions from the head builder. The more workers, the better and more efficient in carrying out ship repairs. Effective working hours per day set at this shipyard is 8 hours. Effective working hours get the second high weight because effective working hours are the hours used by workers to work outside of rest hours.

Machine usage and actual working hours get the same and smaller importance weight than other indicators because the influence of these two indicators still depends on other indicators. Machine usage depends on the number of ships being repaired and the presence of employees. The more ships that are repaired and the more employees are present, the more efficient the use of machines and repair activities will be. Actual working hours depend on the number of vessels, workforce and employee attendance. The more ships being repaired, the more manpower and the less employee absenteeism, the more effective actual working hours will be. this can result in a smaller comparison between working time and actual working hours.

5. Conclusion

The conclusions obtained from the results of data processing and analysis that have been obtained, the following conclusions can be drawn:
1. The productivity level at the shipyard is 49.00%. The productivity value is still far below the productivity index criteria which is 100%.
2. Factors that affect the level of productivity are

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