INCREASING PRODUCTIVITY WITH OBJECTIVE MATRIX METHOD CASE STUDY ON BUILDING MAINTENANCE MANAGEMENT PIO PT. XXX

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ABSTRACT

In order to solve the problems at the completion of maintenance requests at the Building Management needed improvement of labor productivity to achieve the target of his work. By collecting data from each output value of productivity (output) compared to the value of production inputs (input) on the work process Building Management and processed using the method of productivity measurement tools Objective Matrix, then the value of the index of labor productivity in the Building Management defined. The ratio of productivity improvements that result in low productivity rate, which is due to the use of working methods and the allocation of labor that is not quite right, then after repair, the value of productivity at each measurement of this ratio could rise to 20%, which gives the effect of these improvements increase in total productivity by 16%. This result to productivity increment, lower operational cost and high efficiency.

Keywords*: *building maintenance management, Objective matrix method.

1. INTRODUCTION

Customer satisfaction is the target to be achieved in the work section Building Management (BM), the timely completion of Maitenance Request (MR) and also part of the building maintenance must be responsive in meeting the operational needs of the division support included in the maintenance section of the building, especially in the building installation of car accessories parts, part installation Operation (PIO), which is the heart of PT. XXX engaged in the field of automobile distributor.

In fact the work of building maintenance section in PT. XXX is still not in accordance with the work target given by the company.

So that the background of the writer wanted to do research on existing problems. Namely how to improve the performance of the section relating to the resolution MR BM on the care and maintenance of the building, namely by providing recommendations in the form of proper maintenance methods applied to support production activities PIO building in PT. XXX.

2. THEORETICAL BACKGROUND

Objective Matrix Method (Omax) developed by James L. Riggs PE, a professor of productivity of the Department Of Industrial Engineering at Oregon University, which was introduced in the 80s in the United States. Omax is a partial productivity measurement system developed to monitor productivity in each part company with the criteria of productivity in accordance with the existence of a part of the (objective). The concept of this measurement, namely the incorporation of several working groups of the performance criteria into a matrix. The end result of this measurement is a single value for a working group. A large organization requires a number of factors greater performance when compared to a smaller organization. (a)

While the purpose of measuring productivity by using objective of this matrix are:

- By using Omax, the management can easily determine what criteria will be used as a measure of productivity.
- In the end, the management can determine the productivity of organizational units which they are responsible is based on the weights and scores for each criterion.
- In addition, the management may also make a schematic plan of productivity in the area

Calculation scheme with Omax formulations can be briefly described as follows:

- Productivity measurement standard is to determine the value of the initial phase, in which the Target Matrix will be placed on the third level, to determine the value of the initial phase is averaging the value of the ratio of each period. The final target / targets to be achieved is based on the provisions of the company
- Weighting of the initial value of productivity is determined by the amount of value that is important or not, fatal or not and the level of influence on firm performance ratio.
- In uniform weighting criteria required both in the calculation of scores and scale productivity. Weighting in productivity performed as a percentage to see the changes the increase / decrease of the Elmen (ratio) Seatu other.
- The next step is to interpolate or extrapolate from existing data to complete all the elements of the score per ratio respectively. Formulation and ekstrakpolasi interpolation is shown as follows:

$$Y_3 = \frac{(X_3 - X_1) * (Y_2 - Y_1)}{(X_2 - X_1)} + Y_1 \quad \text{(a)}$$

Y1 = value the actual average current performance
Y2 = value targets expected productivity management
Y3 = value productivity performance interpolation / extrapolation.
X1 = mean score level position - the actual average performance in Objective analysis matrix
X2 = the position of the target score level expected productivity management
X3 = the score level position that will be interpolated / extrapolation.

- Calculate the value of the productivity of each ratio is done by multiplying the score level productivity initially determined by weighting analysis. The score level selected based approach most possible value to the data elements of the score. Productivity value=Score * Weighting
- The value of the total productivity is the amount of any value ratio of productivity in the time frame runs.
- The productivity of each ratio indicates specific information to each other. A high level of repeatability and can be categorized bad implement a mediocre performance. The ratio of the levels of bad level requires management to really focus in these areas in order to optimize the value of productivity and performance levels can be increased. (b)

3. RESEARCH METHOD

Research will be conducted research depicted in the flow chart depicted in Figure 1 as follows:

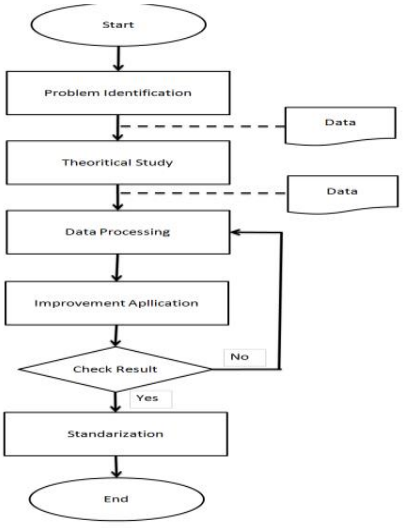


Figure 1. Research Flowchart

The research was conducted on the Building Management (Maintenance) PT. XXX with the period of data collection was done on January 1, 2012 - June 30, 2014.

4. RESULT AND DISCUSSION

In this research the authors used Omax method for measuring productivity, using criteria - criteria that will be used as a means of measuring productivity as follows:

1. Criteria Efficiency
   The criterion relating to the use of labor, materials, capital, as economical as possible.

$$\text{Ratio 1} = \frac{\text{Maintenance Request Qty}}{\text{Man Power}}$$

   explanation:This ratio shows how much the amount of maintenance requests can be completed by each of the existing workforce in the maintenance section.

$$\text{Ratio 2} = \frac{\text{Maintenance Request Cost}}{\text{Maintenance Request Qty}}$$

   explanation:
   This ratio shows how much the cost of any maintenance requests are resolved.
2. Criteria for Effectiveness

$$\text{Ratio 3} = \frac{\text{Mean time to repair}}{\text{Maintenance Request Qty}}$$

   explanation:
   This ratio describes the deviation of the processing time of each request maintenance of existing

$$\text{Ratio 4} = \frac{\text{Maintenance Request Qty}}{\text{Man Hour}}$$

   explanation:
   This ratio indicates the number of maintenance requests will be done compared to the amount of time working there.

$$\text{Ratio 5} = \frac{\text{Mean time to repair}}{\text{Man Hour}}$$

   explanation:
   This ratio shows the deviation of maintenance work requests than the existing working time.

   Once set ratio - the ratio of what will be measured and calculated in this thesis. The next step is the author of collecting data from the production line to be processed further as follow:

Table 1. Data of Production Building Management

Tahun		Mtn. Req (case)	Man Power (Mp)	Cost (Rpx1000)	Deviasi (%)	Man Hour (Hour)
2012	Jan	18	7	38,550	20	8
	Feb	18	7	38,900	19	8
	Mar	15	7	32,000	18	8
	Apr	22	7	45,340	25	8
	May	20	7	42,356	19	8
	Jun	18	7	39,500	15	8
	Jul	22	7	43,742	25	8
	Aug	17	7	40,890	16	8
	Sep	18	7	39,450	18	8
	Oct	19	7	44,750	17	8
	Nov	23	7	43,250	24	8
	Dec	20	7	44,765	16	8
2013	Jan	17	7	42,750	18	8
	Feb	19	7	45,598	15	8
	Mar	16	7	40,236	19	8
	Apr	15	7	41,000	13	8
	May	20	7	47,608	20	8
	Jun	16	7	42,053	18	8
	Jul	18	7	42,899	20	8
	Aug	19	7	47,890	25	8
	Sep	23	7	49,725	21	8
	Oct	22	7	48,560	11	8
	Nov	18	7	43,400	19	8
	Dec	19	7	44,750	18	8
2014	Jan	25	7	49,673	25	8
	Feb	25	7	48,250	24	8
	Mar	26	7	49,325	23	8
	Apr	23	7	52,287	25	8
	May	22	7	47,703	27	8
	Jun	28	7	50,800	20	8

Where is the data that will be used in this thesis is the data obtained during the 2.5 years of data are grouped into quarters, so that the productivity criteria on maintenance work activities PT. XXX which has been modified in the form of ratio, obtained by the measurement data is presented in table 2 below, the productivity ratio table maintenance as follows:

Table 2. Productivity Ratio Maintenance PT. XXX

Year	Ratio 1 case/mp	Ratio 2 Rp/case	Ratio 3 %/case	Ratio 4 case/hour	Ratio 5 %/hour
Three month 1	2.43	2145.37	1.12	2.13	2.38
Three month 2	2.86	2124.38	0.97	2.50	2.46
Three month 3	2.71	2195.08	1.03	2.38	2.46
Three month 4	2.95	2157.98	0.91	2.58	2.38
Three month 5	2.48	2476.45	1.01	2.17	2.17
Three month 6	2.43	2580.68	1.00	2.13	2.13
Three month 7	2.86	2355.25	1.11	2.50	2.75
Three month 8	2.81	2324.55	0.83	2.46	2.00
Three month 9	3.62	1938.01	0.95	3.17	3.00
Three month 10	3.48	2085.32	1.01	2.88	3.00
Avr	2.86	2238.31	0.99	2.49	2.47
Best	3.62	2580.68	1.12	3.17	3.00
Worst	2.43	1938.01	0.83	2.13	2.00

After calculating the value of the productivity of each quarter of the existing ratio. The next stage in the data processing section are making matrix Omax table, for

which the ratio megetahui causing a decline in labor productivity Building Maintenance section.

To create a table Omax, the authors conducted a step - step table creation Omax simply as follows:

1. The value of the performance criteria using quarterly data on 10
2. The level 0 using the worst value, the value of level 3 using the value - average, and the value of level 10 to use the best value
3. Value for levels 1 and 2 are calculated using interpolation methods as follows:

$$level\ 1 = level\ 3 + \frac{(level\ 3 - level\ 0)}{level\ 0}\ x\ (level\ 3 - level\ 0)$$

Value for levels 4-9 are calculated using interpolation methods as follows:

$$level\ 4 = level\ 10 + \frac{(level\ 10 - level\ 3)}{Level\ 3}\ x\ (level\ 10 - level\ 3)$$

(c)

4. As for weighting the data processing, the writer uses the prioritization of the value of each comparison criteria as follows:

Table 3. Score Weighting Each Ratio

	1	2	3	4	5
1	0,05	0,05	0,05	0,05	0,05
2	0,4	0,4	0,2	0,4	0,2
3	0,25	0,25	0,4	0,25	0,4
4	0,1	0,05	0,1	0,1	0,1
5	0,2	0,25	0,25	0,2	0,25

Specification:

Far very important	0.4
It is imperative	0:25
More importantly	0.2
Important bit	0.1
Equally importantly	0:05

This weighting is based on the concept of the balanced scorecard PT. XXX where the preparation of decisions to be aware of the financial (expenses arising from the activities of maintenance request) and customer satisfaction (maintenance requests are resolved and maintenance turnaround time deviation request). (d)

From the comparison of these criteria then calculated the value of its weight. The calculation of the weight values calculated from the average - average of each row there in order to obtain the results of the weights as follows:

Ratio	1	2	3	4	5
Weight	5	32	31	9	23

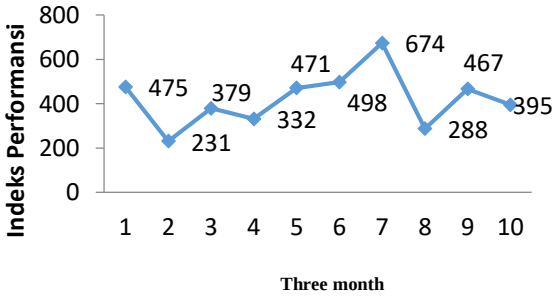
From the calculation of each component to create a matrix Omax, then briefly can be obtained by partial productivity calculation results, can be described in Table 4 below, the performance indicator matrix table:

Table 4. Matrix Performance Indicator

		OMAX				
Performance criteria		Ratio 1	Ratio 2	Ratio 3	Ratio 4	Ratio 5
Performansi		3,48	2085,32	1,01	2,88	3,00
Target	10	3,62	2580,68	1,12	3,17	3,00
	9	3,51	2531,77	1,10	3,07	2,92
	8	3,40	2482,86	1,09	2,97	2,85
	7	3,29	2433,95	1,07	2,88	2,77
	6	3,19	2385,04	1,05	2,78	2,70
	5	3,08	2336,13	1,03	2,68	2,62
	4	2,97	2287,22	1,01	2,58	2,55
	3	2,86	2238,31	0,99	2,49	2,47
	2	2,72	2138,21	0,94	2,37	2,31
	1	2,57	2038,11	0,89	2,25	2,16
	0	2,43	1938,01	0,83	2,13	2,00
Score		8	0	2	7	10
Weight		5	32	31	9	23
Value		40	0	62	63	230

Performance Indicator	395

From the results of the OMAX later authors measure the value of the performance of each quarter for which data is being tested. From the results of testing 10 quarters of data available, we can see the graph of the performance indicator data obtained by the authors is shown in Figure 3 below:



Picture 3. Performance Index Before Improvement

The next step after knowing the value of each quarterly performance indicators exist, the authors conducted a survey of scores of each ratio in 10 quarterly observed data, the score of each ratio data collection can be seen in Table 5 below:

Table 5. Tabel Result Of Score Each Ratio

	Ratio 1	Ratio 2	Ratio 3	Ratio 4	Ratio 5
Three month 1	0	3	10	0	3
Three month 2	3	3	3	3	0
Three month 3	2	3	6	2	3
Three month 4	3	4	3	3	3
Three month 5	1	8	5	1	2
Three month 6	0	9	5	1	2
Three month 7	3	6	9	3	7
Three month 8	3	6	1	3	1
Three month 9	8	1	3	8	10
Three month 10	8	0	2	7	10

From the available data, the authors make the categorization score, to be processed and is known as the low-value ratio so that the ratio can be improved to increase the productivity. Grouping score is as follows:

Score 0-2: Very bad (SBU)
Score 3-4: Poor (BU)
Score 5-6: Medium (S)
Score 7-8: Good (BA)
Score 9-10: Very Good (SBA) (a)

The categorization of values that have been made, the authors conducted a breakdown of the results of the categorization score data, this data is made by classifying as many (frequency) of each ratio in a single category, can be briefly described in table 6 below:

Table 6. Scoring Ratio Frequent

	Ratio 1	Ratio 2	Ratio 3	Ratio 4	Ratio 5
SBU	4	2	2	4	4
BU	4	4	3	4	3
S		2	3		
BA	2	1		2	1
SBA		1	2		2

5. RESULT ANALYSIS

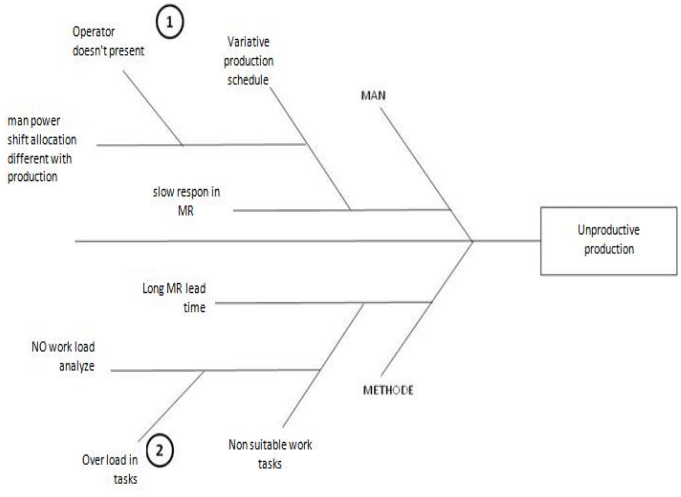
From the results of the collection and processing of data which have been obtained in chapter 7, in Section 8, the results of the data obtained in the data processing of the frequency distribution of the results of the scoring of each ratio, the result that the ratio is 1 and the ratio 4 is the ratio most often have bad grades , briefly can be seen in Table 5.1 below:

Table 7. Ratio Identification Result

	Ratio 1	Ratio 2	Ratio 3	Ratio 4	Ratio 5
SBU	4	2	2	4	4
BU	4	4	3	4	3
S		2	3		
BA	2	1		2	1
SBA		1	2		2
Freq	8	6	5	8	7
Rank	1	4	5	2	3

From the above data obtained results that the decrease in productivity is due to the low value of the ratio of 1 and a ratio of 4 is on completion of the maintenance request, the amount of maintenance requests are compared with working time and labor to complete the maintenance request.

In this thesis the author uses a causal diagram to find the root cause of productivity decline described in Figure 4 below:



Picture 4. Cause and Effect Diagram Decreased Productivity PT. XXX

Of cause and effect diagram has been created, it can increase the productivity of labor for maintenance section in PT. XXX authors provide a qualitative improvement suggestions for each root of the problem, which is briefly described in the explanation of the improvement suggestions below:

1. ADVICE 1

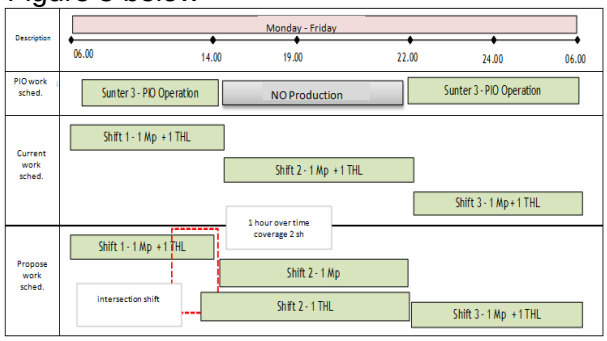
The root of the problem:

Operators do not standby time of production

Suggestions for improvement:

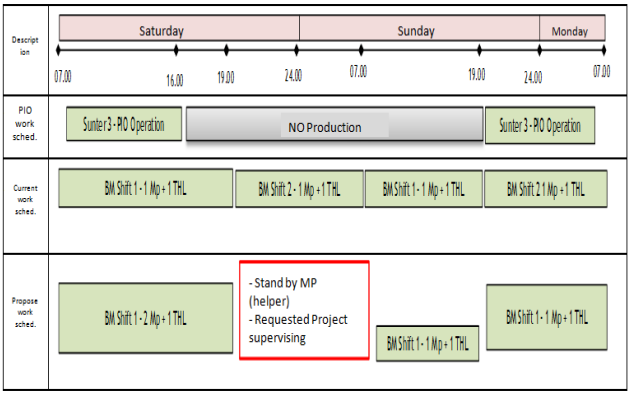
Do the job scheduling maintenance section adapted to the production schedule in the area PIO. (e)

For weekdays Monday - Friday, in accordance with the conditions of dense PIO production in shift 1, it takes 3 people to work, so that the working day is made hanging shift to support these needs, which are described in the figure proposed improvement weekdays Monday - Friday, in Figure 5 below



Picture 5. Proposed Improvement Work Schedule Monday - Friday

As for Saturday and Sunday, because that is operational only in the area in the production area only (office holiday), then made the following schedule settings in accordance with figure 6:



Picture 6. Proposed Improvement Work Schedule Saturday - Sunday

2. ADVICE 2

The root of the problem:

Operators overwhelmed finish the job

Suggestions for improvement:

Make the division of labor in accordance with the existing manpower competency in BM and also classify jobs according to the weight of time and work, this can be done in the following way:

a. Grouping types of maintenance work based on roles and responsibilities of BM (f)

Briefly illustration grouping BM type of work related to the PIO operations can be categorized according to the following table 8:

Table 8 Maintenance Work Grouping

Job Scope	PIC	Freq
COE maintenance	Mtc Staff & Mtc helper	monthly
Building & facilities check list	Mtc Staff	daily
External service vendor supervise	Mtc Staff	by project
Job order report	Mtc Staff	daily & monthly
Trouble shooting maintenance request	Mtc Staff & Mtc helper	daily
Maintenance request execution	Mtc Staff & Mtc helper	daily
Emergency operation support	Mtc Staff	by case
Repair check list	Mtc helper	daily
Repair check list reporting	Mtc Staff	daily

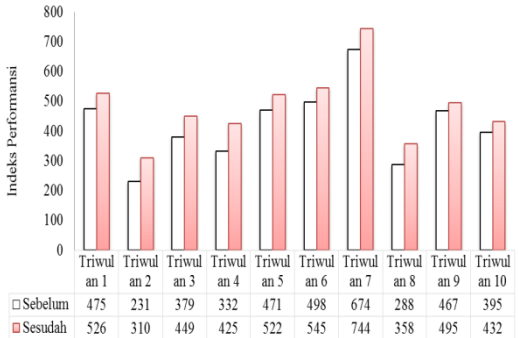
b. Categorize the types of problems in the maintenance request, for example divided between work mechanic, electric, civil, and plumbing, which PIC job divided by the risk and workload, so it can be used as a standard work.

In brief illustration of grouping types of problems in maintenance requests can be described in a standard table maintenance workload, table 9 below:

Table 9. Standard Workload Maintenance

Job Scope	Work Load	Work Risk	MP
Mechanical			
- Office equipment component	Low	Low	1
- Machineries component replacement	High	High	2
Electrical			
- Electrical panel, Generator and	High	High	2
- Lamp PIO stall replacement < 3 meter	Low	Low	1
- Lamp PIO stall replacement > 3 meter	High	High	2
- Electrical trouble shooting. i.e compesor malfunction	Medium	Medium	1
Civil			
- Building repair and keep up	Low	Low	1
Plumbing			
- Water installment Repair	Low	Low	1
- PIO Car wash installment repair			

Of the proposed improvements that have been made by the authors to improve the quality of work BM, after the timing and methods of work, increased productivity in the ratio 1 and 4 are expected to rise by 20% according to the expected value of the target company after repair of performance indicators can be increased. (g)
So if the data before and after improvement compared, the value of performance indicators will be seen in Figure 7 below:



Picture 7. Performance Index Comparation

From the above figure 7, it can be seen together, that by improving the ratio of 1 and 4 in the section Building Maintenance work fairly significant increase, which if taken average - average, then the total by improving productivity in the ratio of 1 and 4 can affect productivity increase in total by 16%.

6. CONCLUSION

The conclusion that can be drawn from this final project are:

- Results of productivity measurement was done using methods Omax, the value of performance on the Building Maintenance stands at 395, with a value - average score of each ratio, its acquisition is worth 5.
- The decline in labor productivity in part due to the latest Building Maintenance maintenance problem resolution request, which is caused by factors working time (method - the ratio 1) and labor (man - in the ratio of 4).
- improvement strategies that can be run on the Building Maintenance associated with this problem is to do with working time arrangements adapted to the production schedule PIO and also perform the categorization of work in accordance with the time and his weight.
- From the results of the improvements made, the value of the productivity ratio of 1 and 4 increased by 20% and affects the overall increase in productivity values for Building Maintenance work process by 16%.

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