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Published Online on Journal Page: https://journal.uvers.ac.id/index.php/greeners

Journal of Green Engineering for Sustainability

ISSN (Online) 3025-6895

Manufacturing Processes and Manufacturing Systems

Increasing Production Productivity at UMKM Kaca Berkah using the OMAX Method

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ARTICLE INFO

Received 06 May 2025
Received in revised form 12 May 2025
Available Online 15 May 2025

KEYWORDS

Productivity
Ratio
Objective Matrix
Fishbone
5W + 1H

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A B S T R A C T

UMKM Kaca Berkah found a decrease between the monthly target and output, in the measurement period from October 2020 to March 2021 UMKM Kaca Berkah targeted 4 buffet units per day, but in reality only got 2 to 3 units per day and only 1 month was on target. The productivity index in October 2020 was 14.8%, in November 2020 was 33.3%, in December 2020 was 33.3%, in January 2021 was 18.5%, in February 2021 was 7.4% and in March 2021 was 33.3%. It is necessary to find solutions to increase productivity in UMKM Kaca Berkah especially in their production sector. These obstacles are overcome by knowing the level of productivity which is equipped with data on the manpower ratio and machine working hours ratio. Then the data is analyzed and processed with the method that will be used, Objective Matrix Method (OMAX) by weighting to obtain the total productivity, the Fishbone Method to analyze the causes of the problems obtained and the 5W+1H Method to find solutions that will then be suggested to handle problems. After making improvements in April 2021 and May 2021, the productivity index in April reached 100% and in May also reached 100%.

1. INTRODUCTION

The rapid growth of the industry today has intensified competition among companies. Consequently, the company needs to evaluate their business processes to maintain a competitive edge. This evaluation involves systematically monitoring productivity achievements to ensure that activities are aligned with the company's strategic plans and objectives.

A company's competitive ability is measured not only by the superiority of its products but also by the performance of its industrial system. To ensure that the company remains competitive, it is essential to pay attention to the productivity level in each part of the company. Productivity is an indicator of a company's success in leveraging its resources to produce products according to targets. [1]. Productivity is closely related to efficiency in the production process, which is expressed in the form of a comparison between the output produced and the resources used [2]. This ratio indicates a company's productivity level and can serve ass a foundation for management to assess and evaluate ongoing operational processes, aiming to enhance the effectiveness and efficiency of company activities [2]. The definition of productivity can change based on the context. Generally, there are three key categories of productivity: (1) total productivity or multi-factor productivity, refers to the comparison between the output produced and all the inputs utilized; (2) partial productivity or single-factor productivity, is the ratio of output to a specific type of input. An example is labor productivity (the ratio between output and material input); (3) total factor productivity is the ratio of net output to total inputs, including labor and capital. Net output refers to total output after subtracting the value of goods or services purchased from outside [2].

UMKM Kaca Berkah is a small business that produces cabinets, display cases, and buffets made of wood, glass and aluminum. This study only focuses on one product: buffets. The buffet produced by UMKM Kaca Berkah is the only product that is produced continuously every day and is not made-to-order, which means productivity can be impacted if production targets are not met, affecting distribution to sales partners. UMKM Kaca Berkah has experienced failures in meeting its production targets. It can therefore be concluded that the actual percentage figures fluctuate. In fact, many of the actual percentage figures are far from the monthly target percentage. This is evident based on the following data:

Table 1. Target Data Not Achieved

Months	Year	Daily target (unit)	Monthly target (unit)	Production per day (unit)	Monthly output (unit)	Persentase	
						Target	Actual
October	2020	4	109	3	81	100%	75%
November	2020	4	104	2	52	100%	50%
December	2020	4	108	3	81	100%	75%
Januari	2021	4	108	4	108	100%	100%
February	2021	4	96	2	48	100%	50%
March	2021	4	108	2	54	100%	50%

Source : (UMKM Kaca Berkah)

First, this obstacle must be overcome by knowing the level of productivity which is equipped with ratio data. Then the data is analyzed and processed using the Objective Matrix Method (OMAX), this method is used to identify the causes of decreased productivity. The effectiveness of this method is reflected in the determined ratio, which can serve as a foundation for future productivity planning [3].

2. LITERATURE REVIEW

2.1. Productivity

Productivity was recognized in the early 20th century as the relationship between the output or production result achieved and the input or resources used to create finished products[4].

2.1.1. Productivity Measurement

Productivity measurement can be done with various measures, both at the company level and unit or activity level. Some experts take different approaches to measuring productivity. One of the productivity measurement models is the Objectives matrix (OMAX).

2.1.2. Productivity Cycle

In 1984 David J. Sumanth introduced a formal concept known as the productivity cycle, often referred to as the MEPI cycle, aimed at continuously enhancing productivity[5]. Essentially, the productivity cycle comprises four stages:

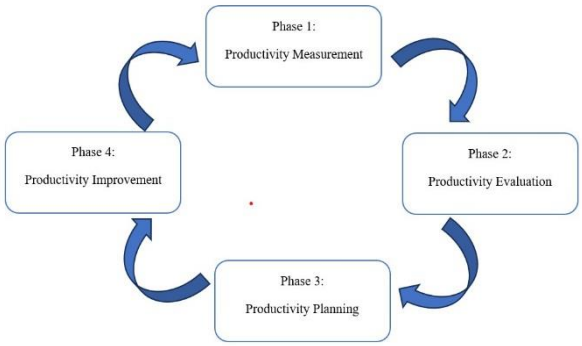

Figure 1. Productivity cycle (Sumanth,1984: 47-48)

2.2. Objective Matrix (OMAX)

OMAX is a partial productivity measurement system designed to monitor productivity in various parts of the company using criteria that are suitable for each specific area (objective). OMAX integrates productivity criteria into a cohesive and interrelated framework. This model involves all levels in the company, from subordinates to superiors.

OMAX asserts that productivity depends on performance factors, each with unique dimensions and measuring productivity involves evaluating the factors that affect it. OMAX can measure work units both on a small scale and for the entire company, but performance measurement result of individual units cannot be added together to reflect the performance ofmain units. To assess the entire company, a weighting process must be applied to the related units[1].

2.2.1. Form and Composition of the Objective Matrix (OMAX) Method

Productivity measurement using OMAX is conducted on an objective matrix. The structure of the matrix is as follows [1]*:*

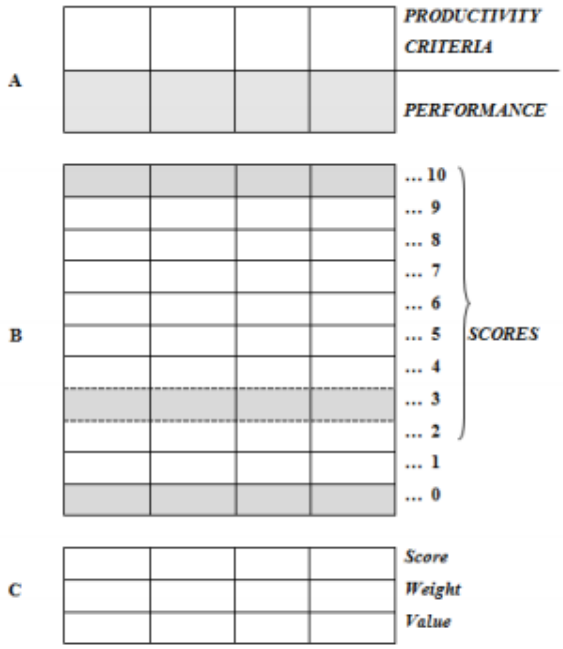

Figure 2. Model structure *OMAX* (Setiowati, R. (2020))

Description :

A. Definition Block
B. Quantification Block
C. Productivity Assessment Block

3. METHODOLOGY

3.1. Determination of Criteria

The process of determining these criteria is carried out through the results of interviews with those responsible for production to determine the forms of criteria needed for this research.

3.2. Determination of Criteria Values

Current achievement value refers to the productivity level determined by the most recent measurement.

3.2.1. Efficiency Criteria

Shows the level of use of company resources such as the number of workers, working hours, etc. as concisely as possible.

$$\text{Manpower} = \frac{available\ operator\ working\ \ (hours)}{total\ machine\ breakdown\ \ (hours)} \quad (1)$$

3.2.2. Inferential Criteria

Shows a criterion that does not directly impact productivity. However, when included in the matrix it can help account for variables that affect major factors such as machine breakdowns and operational machine hours.

$$\text{Machine productivity} = \frac{total\ normal\ machine\ (hours)}{total\ machine\ breakdown\ (hours)} \quad (2)$$

3.3. Determination of Scale Value

The scale consists of eleven levels ranging from 0 to 10. A higher score on the scale indicates better productivity. The levels are devided into three sections:

a. Level 0, which is the worst possible productivity value.
b. Level 3, which is the current performance productivity value
c. Level 10, which is the expected productivity value for a certain period.

To increase the productivity value, it is adjusted by interpolation as follows:

$$\text{Level 1 and 2 upgrades} = \frac{level\ 3 - level\ 0}{3-0} \quad (3)$$

$$\text{Level 4 to 9 increase} = \frac{level\ 10 - level\ 3}{10-3} \quad (4)$$

3.4. Determination of Weight, Value and Score

3.4.1. Weight

The importance of criteria can be assessed using a likert scale: 1 = important, 2 = less important, 3 = important, 4 = very important, 5 = absolutely important. For that, it is necessary to include a weight that states the degree of importance (in percentage) which shows the relative influence of the criteria on the productivity of the work unit being measured. The total weight of the criteria is 100

$$\frac{x\ ratio\ weight}{total\ weight\ of\ all\ ratios}\ x\ 100 \quad (5)$$

3.4.2. Score

Score is a level that shows the productivity value (performance) at the time of measurement. In the score row (bottom of the matrix), the magnitude of performance achievement is changed into the appropriate score. This is done by matching the magnitude of performance realization with the existing matrix cells and equivalent to a certain level.

3.4.3. Value

The value is the multiplication of each score by its weight.

$$\text{Value} = \text{score x weight} \quad (6)$$

3.5. Productivity Indicators

The productivity indicator is calculated by summing all ratio values for each month.

$$\text{Productivity Indicator} = \text{ratio value x} + \text{ratio value x} \quad (7)$$

3.6. Productivity Index

Productivity index measurement is used to determine the increase or decrease in productivity over a specific measurement period. In a certain period, the total value of each criterion is recorded in the achievement indicator box. The initial indicator value is 300 because all criteria get a score of 3 when the matrix beginis operating.

$$\text{IP} = \frac{current\ productivity\ value - 300}{300}\ x\ 100\% \quad (8)$$

3.7. Fishbone

The fishbone diagram is method used to analyze the causes of a problem or condition. It is also known as a cause-effect diagram. This technique was developed by Professor Kaoru Ishikawa a Japanese scientist and alumnus of the University of Tokyo's chemical engineering program in 1943. So, it is often also called the Ishikawa diagram. These factors represent the six primary "bones" of the fishbone diagram. Which are: Method, Manpower, Material, Machine, and Mother Nature [6].

4. RESULTS AND DISCUSSION

4.1. Model Objective Matrix (OMAX)

This research writing takes samples from actual data from October.

Table 2. OMAX Model April 2021

Ratio 1	Ratio 2	Performance ratio
2.33	11.00	
2.33	12.50	10
3.83	11.45	9
3.58	11.38	8
3.33	11.30	7
3.08	11.23	6
2.83	11.15	5
2.58	11.08	4
2.33	11.75	3
2.33	11.00	2
2.33	11.00	1
2.33	11.00	0
10	1	Score
55.6	44.4	Weight
556	44	Value
Performance Indicator	Indicator Index	600 100.00

(Source: Research data processing)

4.1.1. Criteria

The productivity criteria are presented as a comparison ratio in this data processing. There are two criteria: manpower productivity (ratio 1) and machine productivity (ratio 2)

4.1.2. Criteria Value

To determine the value of the four criteria above, it can be obtained by dividing the input ratio of each period from October 2020 to March 2021 by each criterion:

a. Ratio 1 (April) $= \frac{available\ operator\ working\ (hours)}{total\ machine\ breakdown\ (hours)}$ (1)

$= \frac{154}{66} = 2.33$ jam

Ratio 2 (April) $= \frac{total\ normal\ machine\ (hours)}{total\ machine\ breakdown\ (hours)}$ (2

$= \frac{110}{10} = 11$ jam

4.1.3. Scale Value

Ratio 1

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

$= \frac{2.33-2.33}{(3-0)} =$

Level 1 = 2.33 dan level 2 = 2.33

Scale (4-9) $= \frac{level\ 10 - level\ 3}{(10-3)}$ (4)

$= \frac{2.33-2.33}{(10-3)} = 0$

Level 4 = 2.58, level 5 = 2.83, level 6 = 3.08, level 7 = 3.33, level 8 = 3.58, level 9 = 3.83.

Ratio 2

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

$= \frac{11.75-1.00}{(3-0)} = 0.25$

Level 1 = 11.00 dan level 2 = 11.00

Scale (4-9) $= \frac{level\ 10 - level\ 3}{(10-3)}$ (4)

$= \frac{12.50-11.75}{(10-3)} = 0.075$

Level 4 = 11.08, level 5 = 11.15, level 6 = 11.23, level 7 = 11.30, level 8 = 11.38, level 9 = 11.45.

4.1.4. Weight, Value, Score

a. Weight

Weight ratio 1 $= \frac{weight\ ratio\ 1}{weight\ total\ all\ ratio} x\ 100$ (5)

$= \frac{5}{12} x\ 100 = 55.6\%$

Weight ratio 2 $= \frac{weight\ ratio\ 1}{weight\ total\ all\ ratio} x\ 100$ (5)

$= \frac{4}{12} x\ 100 = 44.4\%$

From the calculations above, the weight values for each criterion are as follows:

Table 3. Criteria weight

Criteria	Level of importance	Criteria weight
1	5	55.6
2	4	44.4
Total	9	100

Source: (Research data processing)

The level of importance of the criteria weight is obtained from the Likert scale in the literature review in determining the weight, 4 = Very important, 5 = Absolutely important.

b. Score

The score is obtained by looking at the performance of the ratio of each criterion that approaches the number at level 0 – level 10:

Ratio 1 = April period score = 10

Ratio 2 = April period score = 1

c. Value

The value is the result of multiplying the weight and score to obtain the value.

Ratio 1 = score x weight = 3 x 55.6 = 556 (6)

Ratio 2 = score x weight = 4 x 44.4 = 44 (6)

4.1.5. Productivity Indicators

The productivity indicator is calculated by summing the values of all ratios in each month. Below are the productivity indicators based on actual data:

Productivity indicators = Ratio value 1 + ratio value 2 (7)

= 556 + 44 = 600

4.1.6. Productivity Index

The productivity index is used to identify the increase or decrease during the period. The calculation refers to the standard with:

IP $= \frac{current\ productivity\ value - 300}{300}\ x\ 100\%$ (8)

$= \frac{600-300}{300}\ x\ 100\% = 100\%$

4.1.7. Fishbone

a. Cause and effect diagram (fishbone) of manpower productivity

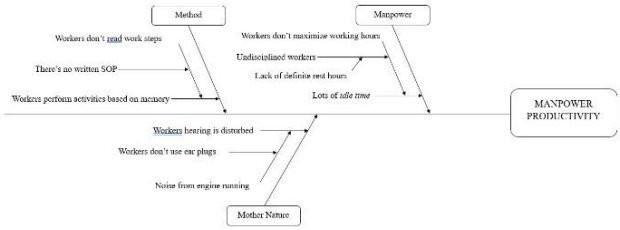

Figure 3. Manpower Productivity Fishbone

Figure 3 illustrates that the instability of manpower productivity is affected by three factors: manpower, mother nature and methods to produce products at the Kaca Berkah UMKM.

b. Cause and effect diagram (fishbone) of machine productivity

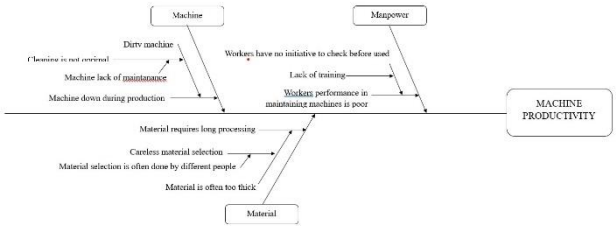

Figure 4. Fishbone Machine Productivity

Figure 4 shows that the instability of machine productivity is influenced by three factors: manpower, materials and machine use at the Kaca Berkah UMKM.

4.1.8. 5W+1H

Table 4. 5W+1H Manpower Productivity

Type	5W+1H	Description	Action
The main purpose	What ?	What causes the productivity of the workforce at UMKM Kaca Berkah to be unstable?	Lack of definite rest periods for workers, no written SOPs for work methods, and workers not using earplugs to avoid machine noise.
Reasons for Use	Why ?	Why is labor productivity important for Kaca Berkah UMKM?	For the progress of UMKM Kaca Berkah
Location	Where ?	In which part of the Kaca Berkah UMKM does the instability of workforce productivity occur?	In the production section of UMKM Kaca Berkah
Sequence (order)	When ?	When will the improvement plan be implemented?	April 2023-May 2023
People	Who ?	Who will work on the improvement plan?	Employee
Method	How ?	How will the improvements be made?	Provide efficient break time for employees to maintain concentration, create written SOPs to maximize methods manufacture and procurement of earplugs for workers to use so that their hearing is not disturbed

Source : (Brainstorming)

Table 5. 5W+1H Machine Productivity

Type	5W+1H	Description	Action
The main purpose	What ?	What causes the machine productivity at UMKM Kaca Berkah to be unstable?	Lack of simulation of machine maintenance implementation for workers, lack of maintenance on machines, and material selection is often done by different people.
Reasons for Use	Why ?	Why is machine productivity important for Kaca Berkah UMKM?	For the progress of UMKM Kaca Berkah
Location	Where ?	In which part of the Kaca Berkah UMKM does the instability of workforce productivity occur?	In the production section of UMKM Kaca Berkah
Sequence (order)	When ?	When will the improvement plan be implemented?	April 2023-May 2023
People	Who ?	Who will work on the improvement plan?	Employee
Method	How?	How will the improvements be made?	Conducting machine maintenance training for workers, maintaining machines regularly and scheduling them, material selection is done by the same person and knowing the material

	quality standards.

Source : Brainstorming

5. Conclusion

There are corrective actions that can be taken for UMKM Kaca Berkah after the problem factors are known. In terms of labor productivity, efforts are made to provide efficient rest time for employees so that concentration is maintained, create written SOPs to maximize work methods and procure earplugs for workers to use so that hearing is not disturbed. In terms of machine productivity, efforts are made to hold machine maintenance training for workers, maintain machines regularly and make schedules, material selection is carried out by the same person who knows the quality standards of the material. In terms of production effectiveness, efforts are made to provide efficient rest time so that worker concentration is maintained, material selection is carried out by the same person and knows the quality of the material needed, add air conditioning or fans and provide sufficient air circulation in the room, create SOPs and under supervision, make machine maintenance schedules and maintain machines regularly. There was an increase in the improvement period, namely April-May 2021 with a productivity index of 100% and 100%. With these data, it shows an increase in the productivity index that did not decrease in the 2 months of the trial.

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