Productivity Improvement Through Innovation of Production Facilities in MSMEs

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Abstract. Sakura cake is a traditional food from District Cangkiang, Agam Regency, West Sumatra. This cake has been marketed to Bukittingi, Padang and has been used as a typical food from West Sumatra. In Cangkiang there are a number of similar Sakura cake micro-businesses and still use coconut shell as a moulding cake. However, the production capacity with coconut shell is still low even unable to meet demand. In addition, the use of coconut shell can risk injury to workers. So an innovation is made on the tools that are already on the market and can be used as a substitute for it. In research on productivity calculation using the Objective Matrix (OMAX) method by using production data for six periods. The productivity criteria measured are the use of raw materials, the use of working hours, fuel consumption and electricity use. The results of this study found that achieving the highest score was found in the criteria for use of working hours, at level 9, which was reached at the end of the survey period.

1. Introduction
One of the potential for micro, small and medium enterprises is to be able to open employment opportunities and improve people's lives better [1]. The Small Scale Industry sector plays an important role in the development of industry in any country. The Importance of the Small-Scale Industry Sector is recognized throughout the world because of its significant contribution to satisfying various socioeconomic objectives, such as higher employment growth, output, export promotion and entrepreneurship building [2]. Micro, Small and Medium Enterprises (MSMEs) are productive businesses owned by individuals or individual business entities that have annual sales of between 300 million and 50 billion rupiahs [3]. These small, micro, small and medium enterprises (MSMEs) also contribute to the increase in gross domestic product [4].

The MSME sector is a populist economic activity in which the products produced are usually in the form of daily necessities needed by the community [5]. MSMEs become the backbone of the populist economic system to reduce the problem of poverty and its development is able to expand the economic base and can make a significant contribution in improving the regional economy and national economic resilience [6]. For this reason, it is necessary to increase the productivity of MSMEs that aim to keep these MSMEs through various supporting fields. Increased productivity can be done from all directions. As an example of 5S implementation for area preparation, in the end it can compile an effective and efficient work area so that it minimizes time as one of waste. Another example can also make improvements to work methods that will also minimize work risks, work activities, defects which will

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later reduce production costs. One of the disadvantages and needs to be corrected from this micro business is the work facilities or technology used are not ergonomic [7]. Using low process technology will make it difficult for MSMEs to increase productivity [8]. The thing that becomes the main driver in the source of increasing productivity besides the scale of efficiency is technological change [9]. SMEs in Indonesia consider technology investments important to increase productivity and cost efficiency will be better with the use of technology [10]. Technology improvements in SMEs for snacks are needed so as not to be left behind by current technological developments [11].

Cangkiang is one of the agricultural areas in Agam. Cangkiang is famous for making Sakura cakes. This cake is a traditional cake that must exist when there are traditional events such as weddings and so on. At present the market has reached West Sumatra and has entered into modern markets or souvenir shops [12]. The equipment used to make sakura cakes is "batok kelapa" which is perforated as a tool for moulding. Batok kelapa which is currently still being used with consideration and maintaining this simple technology is to maintain the distinctive shape of the product produced. One of the production processes for making sakura cakes is the stage of moulding it. This process takes a long time, which is around 8 (eight) hours. Currently MSMEs have replaced batok kelapa with existing technology, namely innovation from meat grinder [13]. In this study, we will observe the production that can be produced by the Sakura cake moulding using the innovative technology of meat grinder in the mould section. Conduct performance testing by comparing the time of printing the cherry cake manually using a printer that has been made. The use of this technology will be able to increase the productivity of MSMEs.

One method that can be used in productivity measurement is Objective Matrix (OMAX). The OMAX method is a partial productivity analysis developed to monitor productivity in each part of the company. The OMAX method measures productivity by objectively assessing the performance of each part of the company while looking for factors that cause a decrease in productivity.

The tools used in data retrieval are stationery, camcorder videos, stopwatches and observation sheets. Primary data collection is obtained by direct observation and recording in the field and interviews with MSME owners. The production data used in this study is data for 6 months starting from May 2019 to October 2019. This OMAX productivity calculation uses tools that have been innovated. The old printing tool is to use coconut shell as shown in Figure 1 and the printing tool used now is as shown in Figure 2.

2. Methodology

The productivity criteria to be measured are:
(a) Criteria I is productivity of raw material usage;
(b) Criteria II is the productivity of working hours (man hour.);
(c) Criteria III is the productivity of fuel consumption and
(d) Criteria IV is productivity of electricity consumption
The criteria for measuring productivity used are in accordance with the conditions of MSME actors. Calculate performance ratio

Performance is the level of productivity which is the ratio of each criterion per measurement period. Performance values are obtained by dividing the ratio of input to output in each criterion. The value of the performance of each criterion can be seen in Table 1 which shows the value of fluctuating performance.

| Period    | Performance Productivity Criteria |
|-----------|-----------------------------------|
|           | Raw material usage | Man hour consumption | Use of fuel | Electrical Energy |
| Mei       | 1022                | 2242                 | 9276        | 21455             |
| Juni      | 1073                | 1896                 | 9549        | 21711             |
| Juli      | 1106                | 1766                 | 10091       | 24811             |
| Agustus   | 1081                | 1698                 | 9128        | 22187             |
| September | 1105                | 1777                 | 9262        | 21058             |
| Oktober   | 1133                | 2489                 | 5052        | 18504             |

Determine the average productivity value (level 3) Level 3 value (μ) is obtained from the average value of company performance during the measurement period. Level 3 values obtained for each productivity criterion can be seen in Table 2 whose values are obtained using a formula:

$$\mu = \frac{1}{n} + \sum_{i=1}^{n} x_i$$  \hspace{1cm} (1)

Description: $\mu = $ Average ratio of each criterion measured

$n= Amount of data$

$x_i = i$-criteria ratio

Determine the highest value of productivity (level 10)

Every company must have a target to be achieved in a certain time according to the company's ability. The company target is described at level 10. Level 10 can be seen in Table 2 obtained by using the formula:

$$BKA = \mu + k \cdot \sigma$$  \hspace{1cm} (2)

$$\sigma = \sqrt{\frac{\sum (x_i - \mu)^2}{n}}$$  \hspace{1cm} (3)

$$DA = (\sigma/\mu) \times 100\%$$  \hspace{1cm} (4)

$$CL = 100\% \times DA$$  \hspace{1cm} (5)

Description: $BKA = Limit of Control over DA = degree of accuracy CL = confident level \mu = Average ratio of each criterion n = Number of data \sigma = Standard Deviation k = Constants$
Determine the lowest productivity value (level 0)

The lowest productivity value is a value that must be avoided by companies because this value is the worst achievement. This level 0 is obtained by using the Lower Control Limit (BKB). The lowest score is in Table 2 obtained by using the formula:

\[ BKB = \mu - k \cdot \sigma \] (6)

Determine the value of actual productivity (levels 1-2 and 4-9).

The actual productivity value is a possible value before the final goal. Levels 1-2 and 4-9 on each criterion can be seen in Table 3 obtained by using the formula:

\[ \text{Interval } (1-2) = \frac{\text{level } 3-\text{level } 0}{(3-0)} \] (7)

\[ \text{Interval } (4-9) = \frac{\text{level } 10-\text{level } 3}{(10-3)} \] (8)

Determine score, weight, and value, calculate performance indicators.

Scores are levels that indicate the value of productivity (performance) at the time of measurement. Each criterion has a different level of importance for increasing productivity. Therefore, it is necessary to weight on each criterion. In this study, weighting is done by pairwise comparison method.

Value is the result of multiplication between scores and weights on each criterion measured. The sum of value values of all criteria is used to determine the total productivity value of the company. After the score, weight, and value values obtained, the next step is to determine the value of performance indicators. Calculation of performance indicators consists of three, namely: (a) Current, which is the result of current period productivity measurements obtained from the sum of the value of each criterion; (b) Previous, namely the results of previous productivity measurements; and (c) Index, which is an indication of productivity changes that occur in the company. The index productivity (IP) value is obtained by the formula:

\[ IP = \frac{(\text{Current}-\text{Previous})}{\text{Previous}} \times 100\% \] (9)

3. Result and discussion

| No | Productivity Criteria | Level (3) | Level(10) | Level(0) |
|----|-----------------------|-----------|-----------|----------|
| 1  | Raw material usage    | 1004      | 1322      | 802      |
| 2  | Man hour usage        | 1986      | 2535      | 1438     |
| 3  | Use of fuel           | 8870      | 10610     | 7131     |
| 4  | Electrical Energy     | 20148     | 26871     | 1454     |

Table 3. Levels 1-2 and 4-9 for Each Criteria

| Raw material usage | Raw material usage | Use of fuel | Electrical Energy | Level |
|--------------------|--------------------|-------------|-------------------|-------|
| 1178               | 2458               | 10361       | 25956             | 9     |
Based on the results of questionnaire data processing, the value of Consistency Ratio (CR) ≤ 0.1 was obtained, which was 0.019 so that the results of the Consistency Ratio (CR) were consistent. The weight for each criterion is shown in Table 4. The criteria that have the highest weight are the criteria for raw materials. According to respondents, raw materials are very influential in the production process to produce cake products because raw materials can affect the number of products (output) and quality produced. Criteria that has the lowest weighting value is the fuel criterion. This is because the fuel used is always available and almost never experiences interference so the level of importance is smaller than the other criteria.

### Table 4. Weighting Results for Each Productivity Criteria

| No | Productivity Criteria | Bobot | %   |
|----|-----------------------|-------|-----|
| 1  | Raw material usage    | 0.446 | 44.6|
| 2  | Man hour consumption  | 0.333 | 33.3|
| 3  | Use of fuel           | 0.070 | 7.0 |
| 4  | Electrical Energy     | 0.151 | 15.1|
|    | Total                 | 1.00  | 100 |

Partial productivity evaluation is based on achieving the productivity level of each criterion. Each criterion has different influences in achieving productivity. These changes can be evaluated through a level that shows the level of productivity achieved in each measurement period. The level of achievement of productivity can be seen in Table 5.

In the raw material usage criteria, achievement of levels in October was high because the level of efficiency of raw material use was better in October, while the lowest level that occurred in September and October was due to improper processing and incompatibility of raw materials received by the company. On the criteria for use of working hours (man hour), the level of productivity that is below the average level is due to lack of motivation and supervision of the workforce in the processing process so that the company cannot reach the predetermined target. On the criteria for fuel use and electricity, achievement of productivity levels continues to decline until October with a score of 0. The level of productivity decreases to below average due to inaccuracies in determining the fuel to be used for the production process so that more attention and repairs are needed so that the productivity achieved can be even better. In October, there was a very high increase in productivity. This is because the level of the criteria for the productivity of raw materials, man hours of the production process runs smoothly, there are no obstacles in terms of receipt of raw materials and processing so that the company is able to produce cakes more than demand.
Table 5. Achievement Levels of Productivity

| Level | Performance Productivity Criteria | Raw Material Usage | Raw Material Usage | Use of Fuel | Level |
|-------|-----------------------------------|--------------------|--------------------|-------------|-------|
| Mei   |                                   | 3                  | 8                  | 4           | 4     |
| Juni  |                                   | 5                  | 2                  | 5           | 4     |
| Juli  |                                   | 6                  | 1                  | 7           | 7     |
| Agustus |                                 | 5                  | 1                  | 4           | 4     |
| September |                               | 6                  | 1                  | 4           | 3     |
| Oktober |                                | 7                  | 9                  | 7           | 2     |

This total productivity evaluation is carried out to determine the level of total productivity achieved by the company. Evaluation is also done by looking at the productivity index value on performance indicators in the OMAX. Identification of problems is done by direct interviews with the part of workers or MSMEs actors. The results of the interview obtained information that there are 2 factors that become productivity problems, namely material, human, machine and environmental factors. This is an internal factor of MSMEs, while external factors are influenced by funding, entrepreneurship training, business assistance and partnerships [14]. In material factors, the cause of low productivity is the raw material received is not in accordance with the company's demand and the quality of raw materials of sticky rice is not good sometimes the process of rice milling is not perfect. The printer tool causes low productivity because it is still manual. Another factor that results in low productivity is the environment. Environmental inconveniences that occur in the production sector are equated with the kitchen where SMEs are cooking. Productivity improvements are proposed after knowing the productivity achieved by the company and after identifying productivity problems. Improvements are made based on the average achievement of productivity in the period January-June 2019. Data on proposed improvements can be seen in Table 6. Waste occurs on all criteria. In the criteria of raw materials, waste is caused by improper processing so that it can cause damage to raw materials, many raw materials that fall during the printing process, as well as raw materials attached to the production machine.

Table 6. Productivity Improvements

| No | Productivity Criteria | Performance before improvement | Performance after improvement |
|----|-----------------------|-------------------------------|------------------------------|
| 1  | Raw material usage    | 1004                          | 1567                         |
| 2  | Man hour consumption  | 1986                          | 2005                         |
| 3  | Use of fuel           | 8870                          | 8976                         |
| 4  | Electrical Energy     | 20148                         | 21567                        |

4. Conclusion
Productivity achievements in the 2019 period fluctuated greatly. The highest score achievement is in the criteria for using working hours, namely 9, which was achieved in October. The highest total productivity index level achieved during the measurement in the 2019 period was in October at 84.69%.

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