Implementation of Moora's Multi Criteria Decision Making (MCDM) Method in Determining SMEs Indicators After the Covid-19 Pandemic

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A B S T R A C T

After the covid pandemic for almost 2 years, it has paralyzed the small and medium enterprise (SMEs) sector. Several government policies during the pandemic resulted in several SMEs experiencing bankruptcy and decline, especially with regard to production, marketing, and labor. After almost 2 years, SMEs began to slowly rise to organize its existence. This research is used to identify indicators that influence to SMEs after the COVID-19 pandemic. The problem of this research is there are many SMEs in Bangkalan Madura, many SMEs do not know about online marketing, marketplace, and lack of technological knowledge to accelerate production and marketing. The Moora method is used to determine the indicators that have the most influence on the sustainability of SMEs in the face of the Covid-19 pandemic.

Keywords:

SMEs indicators, Covid-19 Pandemic, Moora

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1. INTRODUCTION

Indonesia does not only depend on mining companies that take advantage of Indonesia's natural resources to be able to become the backbone of the Indonesian economy. On the other hand, Indonesia has Micro, Small and Medium Enterprises or SMEs, this is the basis of the people's economy. The concept of populist economy is the idea of the method, nature, and purpose of development with the main objective of improving the fate of the people who generally live in rural areas. This concept brings about an important change towards progress, especially towards breaking down the barriers that hold most of the Indonesian people in a state of complete deprivation and backwardness. Micro, Small and Medium Enterprises or SMEs are the basis of the people's economy, their role is very important in the economic development of the State of Indonesia, especially in facing the demographic bonus phase because this business will open up job opportunities, play a role in the process of equity and increase people's income, encourage economic growth, and play a role in achieving national stability.

Micro, Small and Medium Enterprises (SMEs) are small-scale business activities that encourage the movement of development and the Indonesian economy. A business or business can be referred to as an MSME if it meets the criteria for a micro-enterprise. According to statutory regulations No. 20 of 2008, SMEs are distinguished based on each type of business, namely micro, small, and medium enterprises [4]. In fact, as before, SMEs have proven to be resistant to crisis and able to survive because they do not have foreign debt, do not have much debt to banks because they are considered unbankable, use local inputs and are export-oriented. MSME (Micro, Small and Medium Enterprises) is an industry that drives welfare for local communities, it is also a business that can help small communities to get jobs as well as income for their lives. Factors that determine the success of SME development include Human Resources (HR), capital, machinery and equipment, business management, marketing, availability of raw materials, and information in order to have global access [1]. BPS data in 2014 showed that SMEs contributed greatly in providing employment opportunities of 96.99 percent of the GDP formation of 60.34 percent. SMEs also contributed to the addition of foreign exchange in the form of export revenues of 27.700 billion and created a role of 4.86% of total exports.

Seeing the importance of the role of SMEs in Indonesia, especially in terms of stabilizing the Indonesian economy and overcoming unemployment in Indonesia, the Government of Indonesia made a policy in terms of empowering SMEs in Indonesia which is stated in Law No. 20 of 2008 concerning Micro, Small and Medium Enterprises (SMEs) Law No. 20 of 2008 states that Micro, Small and Medium Enterprises need to be empowered

as an integral part of the people's economy that has a strategic position, role and potential to realize a more balanced, developing and just national economic structure. Empowerment of Micro, Small and Medium Enterprises needs to be carried out comprehensively, optimally, and continuously through the development of a conducive climate, providing business opportunities, support, protection and business development as widely as possible, so as to be able to improve the position, role, and potential of Micro, Small and Medium Enterprises. Medium in realizing equitable economic growth and increasing people's income, creating job opportunities, and alleviating poverty.

SMEs receive great attention from the central government and local governments. Because SMEs make a significant contribution in overcoming the problem of unemployment and reducing poverty. Therefore, more and more SMEs have been affected by Covid-19 [3]. The impact that occurs on SMEs is the inhibition of production activities and marketing activities [6]. In dealing with the current situation, namely the Covid-19 pandemic, it is hoped that all elements of society are aware and obedient to the handling of the Covid-19 pandemic so that it can end soon. In dealing with the problems that are being faced by MSME workers, the government continues to make various efforts to help SME's workers get through the pandemic [7].

In this study using the MCDM method, the MCDM algorithm is an algorithm for building a decision support system. The MCDM algorithm contains certain criteria that have been agreed upon and must Use Dijkstra's Algorithm for Various Problems: Mini Review Preprint – 7 is met by the system so that the existing criteria requirements are carried out by sorting from low to high level (ranking) (8). The MOORA method is a method introduced by Brauers and Zavadkas (2006). This relatively new method was first used by Brauers (2003) in a multi-criteria retrieval. The MOORA method has a level of flexibility and ease of understanding in separating the subjective part of an evaluation process into decision weight criteria with several decision-making attributes [13].

Multi-Objective Optimization by Ratio Analysis (MOORA) is one method that can be used to assist the decision-making process in DSS. The MOORA method was first developed by Brauers who applied it in the multi-criteria decision-making process [9]. One of the advantages of this method is its high flexibility and good selectivity. This is because MOORA is able to determine the goals of conflicting criteria, where the criteria can be profitable (benefit) or unfavorable (cost). In addition, MOORA also has the ability to easily separate subjective elements from an evaluation process into decision weight criteria which have several attributes of decision makers [10]. MOORA in this study was used to determine the most influential indicators for SMEs during the Covid-19 pandemic.
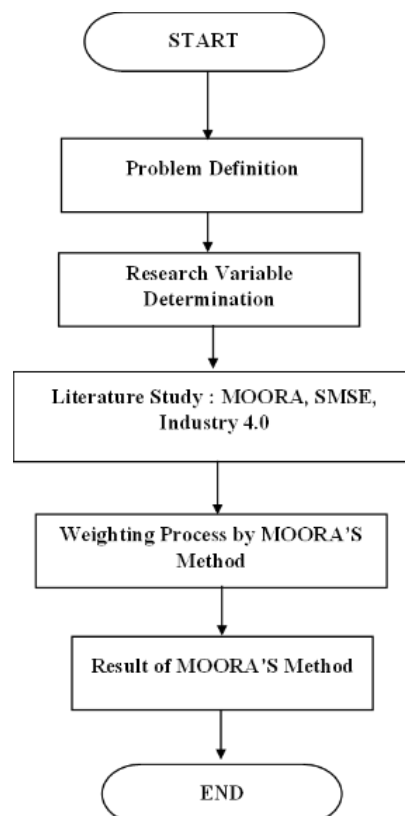
2. RESEARCH METHODOLOGY

Fig.1. Research Methodology

The research method is the research steps that have been carried out, can be seen in Figure 1. The steps of this research are as follows:

2.1. Defining the Problem

Defining the problem is the first step of research to determine the problems faced by SMEs. This stage consists of determining the problem, research objectives, research benefits, and determining research data. SMEs are productive economic businesses that can be carried out individually, in groups or by households and small businesses. The classification of SMEs can be based on annual turnover, total wealth or assets and number of employees [11] [12].

Multi-Objective Optimization on The Basic of Ratio Analysis (MOORA) is a system with multi-objectives, which has two or more conflicting attributes. MOORA optimizes these attributes by applying complex mathematical calculations, so that the desired output is obtained in the form of problem solving [9]. This method separates the subjectivity of an assessment process into the form of weighted criteria with several decision-making attributes in a way that is easier to understand. This method also has a high degree of flexibility in processing the variables [10]

a. Step 1

The first step to be taken is to determine the direction of the goal and identify the attributes of the evaluation concerned

b. Step 2

Displays all available information for an attribute so that it can form a matrix in a decision. The data given by equation 1 is represented as a matrix x. where Xij indicates the I-th size of the alternatives on the j attributes, m indicates the number of alternatives and n indicates the number of attributes. Then the ratio system is developed on each result of an alternative which is compared to a denominator that represents all alternatives regarding the attribute as in equation 1.

$$x_{ij} = \begin{matrix} x_{11} & x_{12} & x_{1n} \\ x_{21} & x_{22} & x_{2n} \\ \vdots & \vdots & \vdots \\ x_{m1} & x_{m2} & x_{mn} \end{matrix} \qquad (1)$$

c. Step 3

Brauers et al. (2008) concluded that the denominator, the best choice of the square root of the sum of the squares of each alternative per attribute. This ratio can be expressed in equation 2.

$$x_{\bar{i}j} = \frac{x_{ij}}{\sqrt{\sum_{j=1}^{m} x_{ij}^2}} \qquad (2)$$

Where Xij is the value of the dimension that has the interval [0,1] in the presentation of the normalized results of the i-th alternative on the jth attribute.

d. Step 4

for multi-objective optimization, the result of normalization is the addition in terms of maximization (of favorable attributes) and subtraction in terms of minimization (of unfavorable attributes). Then the optimization problem becomes like equation 3

$$y_i = \sum_{j=1}^{g} x_{ij} - \sum_{j=g+1}^{n} x_{ij} \qquad (3)$$

Where g is the value of the criteria to be maximized, (n-g) is the value of the minimized criteria, and Yi is the value of the alternative normalization assessment of i for all attributes. In some cases, often observe some other more important criteria. order to give more importance to the attribute, it is carried out with the appropriate weight (significant coefficient). When the weight of this criterion is considered, the Yi equation is in equation 4

$$y_i = \sum_{j=1}^{g} w_j x_{ij} - \sum_{j=g+1}^{n} w_j x_{ij} \qquad (4)$$

Where Wj is the weight of the attribute j.

e. Step 5:

The value of Yi can be positive or negative depending on the maximum (favorable criteria) and minimum (unfavorable criteria) in the decision matrix.

This study uses SMEs data in Bangkalan Madura in 2020, with indicator data for measuring SMEs criteria : (B1) having a marketplace, (B2) online payment facilities, (B3) number of consumers, (B4) number of consumer complaints, (B5) online marketing, (B6) production costs, (B7) ownership [14].

4. RESULT AND DISCUSSION

This research was conducted on SMEs in Bangkalan Madura using the following criteria: (B1) having a marketplace, (B2) online payment facilities, (B3) number of consumers, (B4) number of consumer complaints, (B5) online marketing, (B6) production costs, (B7) ownership. The steps in determining the criteria that most influence SMEs against the Covid-19 pandemic using MOORA are as follows:

   a.   Step 1

Decision Matrix Xij

$$
Xij = \begin{vmatrix}
5 & 4 & 3 & 3 & 4 & 3 & 4 \\
5 & 5 & 3 & 3 & 5 & 3 & 3 \\
3 & 4 & 3 & 4 & 4 & 3 & 4 \\
4 & 4 & 2 & 3 & 5 & 3 & 5 \\
5 & 5 & 3 & 4 & 5 & 4 & 4 \\
5 & 3 & 2 & 5 & 3 & 3 & 2 \\
4 & 5 & 3 & 3 & 5 & 5 & 2 \\
5 & 4 & 2 & 3 & 4 & 3 & 3 \\
5 & 5 & 3 & 4 & 5 & 3 & 4 \\
5 & 3 & 2 & 3 & 3 & 3 & 3
\end{vmatrix}
$$

Fig.2. Decision Matrix

   b.   Step 2

Normalization

Divide	14.6969	13.4907	8.3666	11.2694	13.8203	10.6301	11.1355

$$
Xij = \begin{vmatrix}
0.3402 & 0.2965 & 0.3586 & 0.2662 & 0.2894 & 0.2822 & 0.3592 \\
0.3402 & 0.3706 & 0.3586 & 0.2662 & 0.3618 & 0.2822 & 0.2694 \\
0.2041 & 0.2965 & 0.3586 & 0.3549 & 0.2894 & 0.2822 & 0.3592 \\
0.2722 & 0.2965 & 0.2390 & 0.2662 & 0.3618 & 0.2822 & 0.4490 \\
0.3402 & 0.3706 & 0.3586 & 0.3549 & 0.3618 & 0.3763 & 0.35921 \\
0.3402 & 0.2224 & 0.2390 & 0.4437 & 0.2171 & 0.2822 & 0.17961 \\
0.2722 & 0.3706 & 0.3586 & 0.2662 & 0.3618 & 0.4704 & 0.1796 \\
0.3402 & 0.2965 & 0.2390 & 0.2662 & 0.2894 & 0.2822 & 0.2694 \\
0.3402 & 0.3706 & 0.3586 & 0.3549 & 0.3618 & 0.2822 & 0.3592 \\
0.3402 & 0.2224 & 0.2390 & 0.2662 & 0.2171 & 0.2822 & 0.2694
\end{vmatrix}
$$

Fig.3. Normalization Matrix

c. Step 3

Atribut value optimization

WEIGHT	0.10	0.1	0.10	0.20	0.20	0.15	0.15
Atribut Optimization	0.0340	0.0296	0.0359	0.0532	0.0579	0.0423	0.0539
	0.0340	0.0371	0.0359	0.0532	0.0724	0.0423	0.0404
	0.0204	0.0296	0.0359	0.0710	0.0579	0.0423	0.0539
	0.0272	0.0296	0.0239	0.0532	0.0724	0.0423	0.0674
	0.0340	0.0371	0.0359	0.0710	0.0724	0.0564	0.0539
	0.0340	0.0222	0.0239	0.0887	0.0434	0.0423	0.0269
	0.0272	0.0371	0.0359	0.0532	0.0724	0.0706	0.0269
	0.0340	0.0296	0.0239	0.0532	0.0579	0.0423	0.0404
	0.0340	0.0371	0.0359	0.0710	0.0724	0.0423	0.0539
	0.0340	0.0222	0.0239	0.0532	0.0434	0.0423	0.0404

Fig.4. Atribute Optimization

d. Step 4

Determine Yi value

ALTERNATIF	MAXIMUM	MINIMUM	Yi(MAX-MIN)	RANKING
A1	0.2645	0.0423	0.2222	6
A2	0.2730	0.0423	0.2306	4
A3	0.2687	0.0423	0.2263	5
A4	0.2737	0.0423	0.2314	3
A5	0.3042	0.0564	0.2477	2
A6	0.2393	0.0423	0.1969	7
A7	0.2527	0.0706	0.1821	9
A8	0.2391	0.0423	0.1968	8
A9	0.3042	0.0423	0.2618	1
A10	0.2172	0.0423	0.1749	10

Fig.5. Moora Result

5. CONCLUSION

The MOORA method can be used to determine the analysis of factors or indicators that affect SMEs when facing Covid-19. The results of Moora calculations show that the marketplace (B4), online marketing (B2) and the amount of production (B5) are the best indicators that affect SMEs during the Covid-19 pandemic. This research can be developed using a hybrid method

6. ACKNOWLEDGMENTS

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