International Journal of
Islamic Business and Management Review

Vol.2, No.2, 2022
pp. 163-173
e-ISSN: 2808-0939

Istianingsih[1]Determination of MSMES Competitiveness Attributes Using the Analytical Hierarchy Process Method

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DOI: https://doi.org/10.54099/ijibmr.v2i2.369

ARTICLE INFO

Research Paper

Article history:
Received: 8 October 2022
Revised: 9 Desember 2022
Accepted: 18 December 2022

Keywords: competitiveness, AHP, MSME

ABSTRACT

Purpose – This study aims to determine the competitiveness attributes of MSMEs in Bungo Regency.. **Methodology/approach** – By using Analytical Hierarchy Processes (AHP), criteria are determined to be seen to support the competitiveness of MSMEs. **Findings** - The results are that the criteria for labor productivity are the most important criteria to be improved because the nature of MSMEs in Bungo Regency is still classified as labor-intensive, so the industry needs to provide training to employees to become skilled and productive. **Practical implications:** The AHP method is able to prove that the criteria set can be a guide for the industry in decision making **Social implications:** The results of this study can be applied to the industry in decision making so that it becomes right on target and has an impact on improving the performance of the industry in general.
Novelty/value – This research is different from the previous research because the criteria used are to find solutions in determining the priority of MSME competitiveness.

INTRODUCTION

Micro, Small and Medium Enterprises (MSMEs) have a strategic role in Indonesia's economic growth, especially in the midst of the current Covid-19 pandemic situation. The number of MSMEs in Indonesia reaches 62.92 million business units or 99.92% of the total business units in the country. The contribution of MSMEs to GDP reaches 60% and employment of 116.73 million people or 97.02% of the total working force(Radyanto & Prihastono, 2020).

According to Indonesian Ministry of SMEs there are around 37,000 MSMEs who reported that they were very seriously affected by this pandemic, which was marked by around 56 percent reporting a decline in sales, 22 percent reporting problems in the financing aspect, 15 percent reporting problems with distribution of goods, and 4 percent reporting difficulties in getting raw material(Amri, 2020).

Another problem faced by MSMEs in Indonesia is that only 7.7% of SMEs are registered using online marketing technology on e-Commerce platforms, whereas the government targets 12.8% of SMEs to be technology-based. This has an impact on Indonesia's competitive position in the world which is at number 40 and lower than other ASEAN countries such as Singapore, Malaysia and Thailand.(OECD Secretary General, 2020).

In Jambi Province, the number of MSMEs before Covid 19 increased, recorded in 2016 as many as 98,105 units, in 2017 as many as 100,898 units, in 2018 as many as 110,773 units and in 2019 there were 121,288 units. However, when the covid pandemic hit MSMEs in Jambi Province, there was a decrease of 104,155 units in 2020. The data on MSMEs in Bungo Regency experienced a drastic decline from 2016 and 2017

which was recorded at 6,448, then decreased in 2018 to 6,000 units and decreased again in 2019 recorded 4,000 units. When the COVID-19 pandemic hit, an anomaly occurred to the growth of MSMEs in Bungo Regency where there were 4,283 active MSME units. Although in terms of numbers there has been an increase, only 10% or around 428 units have been recorded using digital marketing (Ministry of Industry and Trade, March, 2010).

The objectives to be achieved in this study are to apply the AHP method as a decision support system to determine the competitiveness attributes of SMEs that have the potential to be developed in Bungo Regency and to build a decision-making model using AHP to determine priorities for developing small and medium industries.

LITERATURE REVIEW (if any)

Competitiveness of SMEs

Competitiveness Concept of Porter (1980) suggests that there are 3 Generic Strategies that can be used in winning the competition, namely: Cost Leadership: namely excellence in costs as reflected in the scale of production, thereby creating efficiency and decreasing unit costs. Differentiation: by creating a product that is unique or different from competitors, the uniqueness can be created from the design, appearance, packaging or function of the product that exceeds that of rival products. Focus Strategy: namely by specializing in services to certain market shares that are considered feasible or take advantage of market niches/market niches that are there so that they managed to get a profit without having to deal with market leaders.

Another reference model that can be used to assess competitiveness is the diamond model (Porter, 1990), namely condition factors, demand conditions, supporting and related industries, corporate strategy and competition, the role of government, and opportunities by adding social capital variables (Kotler 1997). Furthermore, these dimensions are used to measure the competitiveness of industrial clusters. Based on the main dimensions of the conceptual model, it was developed into an operational model. The condition factor dimension is built by elements of human resources, natural resources (raw material), and capital.

The demand condition dimension is constructed by the elements of demand source, quantity of demand, product marketing, product quality, product design, and product variety. The dimensions of supporting and related industries are built by elements of geographical location, procurement process, quality of supporting materials, training in the use of supporting materials. The dimensions of corporate strategy and competition are built by elements of new products, reductions in product prices and production costs, and new technologies. The dimensions of the government's role are built by elements of facilitation, training, and policy programs. The opportunity dimension is constructed by elements of technological tools and political conditions. The dimensions of social capital are built by elements of communication and interaction, kinship, honesty, cooperation, and regulations. While the measure of competitiveness used is the value of exports and export volume.

MSME Challenges

Currently, Indonesian MSMEs have very serious challenges and problems, different from the previous economic crises that occurred in Indonesia. This is different from the two previous crises where MSMEs were still relatively able to operate normally. The crisis that is happening in 2020 now starts from the health sector. The instructions to comply with the health protocol to maintain social distancing and not to gather that were implemented by the government to reduce the spread of the corona virus have narrowed the opportunity for MSME actors to operate. Based on data from *Google COVID-19 Community Mobility Report*(2020) which tracks human movement based on recorded location traces, on a national average at the end of July the movement of people to retail and recreation places decreased by 18%. Public transport such as buses and trains also decreased by 33%.

It is undeniable that before the Covid 19 outbreak hit, the Industrial Revolution 4.0 had an impact on the erosion of traditional MSMEs or often called disruptive. There is an unavoidable shift from the digitization movement that characterizes the industrial revolution 4.0 to a much more complicated form of innovation with so many new combinations of technology. The situation has forced companies to re-examine the way they do business and take new forms of innovation(Gamage et al., 2020).

MSME Cluster Concept

The cluster concept builds on traditional localization theory and integrates other concepts such as industrial estates, growth poles, production systems, regional innovation systems, or regional creativity. The original

concept of a territorially concentrated company was founded by Marshall. The concept was developed by researchers emphasizing the results of interactions between participants that increase innovation capacity, increase the level of competitiveness and help achieve profitable incomes.(Ketels, 2017).

By definition, a cluster is a geographically interrelated, competitive, competitive group of companies, specialized suppliers, service providers, and finally, companies operating in the related sector and related institutions. Academics highlight that clusters as networks generate benefits for companies located in these structures, for example, easier and affordable access to production, distribution channels, human resources, or knowledge and innovation (Derlukiewicz et al., 2020). The benefits to companies and institutions in a cluster consist of increased profits due to lower costs incurred by companies operating in the network, increased exports, higher innovation, better knowledge expansion and technological advancement, increased competitive advantage, higher productivity growth. faster associated with the concentration of resources capacity of innovation absorption. The existence of the network also ensures risk sharing, joint analysis of ideas and initiatives, cost sharing to introduce innovations, availability and possibility to exchange experienced and specialized employees.(Rodríguez et al., 2020).

METHOD

Analysis was carried out on data and reports related to MSMEs, RT/RW and regional economic development in Bungo Regency, the dynamics of regional mapping, as well as the information system model to be developed. The data obtained were then analyzed using the Analytical Hierarchy Process (AHP) method. The AHP method is a method of selecting alternatives by conducting a simple pairwise comparative assessment that is used to develop overall priorities based on rankings. The decision-making process in principle is to choose an alternative. AHP is a functional hierarchy with the main input being human perception(Supriadi, 2018).

AHP can also be used for qualitative and quantitative methods of making the same decision based on the discussion, recording, and evaluation of the elements of the decision. This method uses a hierarchy of goals, sub-goals or factors and alternatives(Muhidin, 2017). The stages in using the AHP method include:

1. *Structuring*. Determine the objectives, criteria variables and available alternatives and arrange them into three levels.
2. *Assessment*. That is the stage of giving weight to the criteria and alternatives. The weighting uses a pairwise comparison scale, and a number of priorities are generated which are the relative influence of a number of elements on the elements in the level above. The next step is to determine the ranking and priority of each criterion.
3. Determination of the priority of each criterion and alternative by conducting pairwise comparisons which are then processed to determine the ranking of alternatives from all available alternatives.
4. Logical consistency where all elements are grouped and ranked consistently according to logical criteria.

The competitiveness of SMEs is determined by the attributes contained in the Variable operational definition, which can be seen in Table 2 below:

Table 2 Definition of Operational Variables

Variable	Definition	Attributes
MSME Competitiveness	Perceptions about the ability of an MSME to be able to produce a product of goods and services that meet global	1. Price 2. Product quality 3. Service quality

	market standards and have a high level of income even though the situation and industrial structure are in a less favorable position.(Hariandi et al., 2019)	4. Labor productivity 5. Frequency of new product launches

The determination of the cluster strategy was carried out using the Analytic Hierarchy Process (AHP) method based on the results of the FGD of each cluster. The weighting is carried out by 4 experts consisting of representatives of MSMEs, Head of Cooperatives and MSMEs, Business and MSME Experts and Senior Lecturers in Entrepreneurship and Business.

RESULT AND DISCUSSION

Weighting with Analytical Hierarchy Process (AHP) to find out which indicators are the priority in measuring performance. The weighting is carried out using the Analytical Hierarchy Process (AHP) method through a pairwise comparison questionnaire given to four respondents (expert practitioners and academics).

Based on the criteria and the intensities of each of these criteria, the hierarchical order can be described as shown in Figure 1.

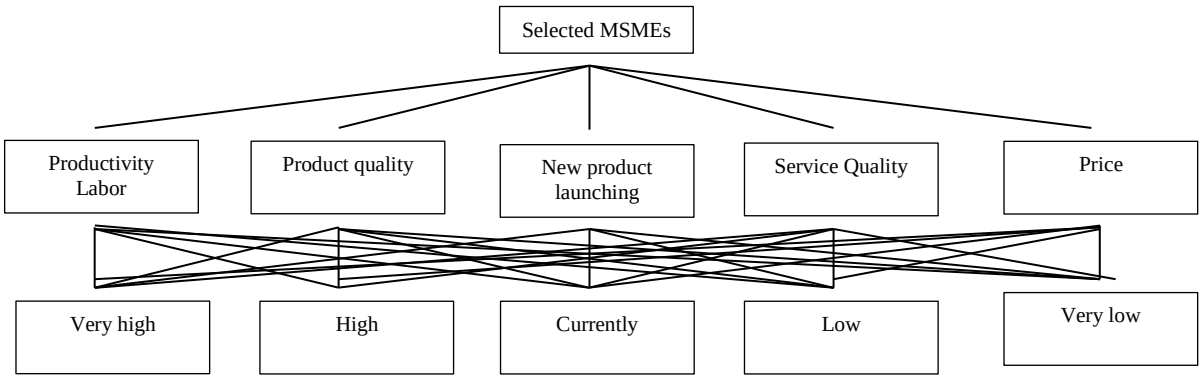

Figure 1 Order of Priority Determination Hierarchy

MSME Development After compiling a hierarchy of problems faced, the next step is to determine pairwise comparisons between the criteria in the form of a matrix. After the matrix element values are known, the next step is to calculate the priority value of each criterion, with the following steps:

a. Sums the element values of each matrix column.
b. Divide each element in the column by the appropriate number of columns.
c. Calculate the priority value of the criteria by adding up each row and dividing the result by the number of elements (n=5).

After obtaining the priority value for each criterion, then check the consistency of the comparison between these criteria with the following steps:

a. Multiply the elements in the matrix column by their corresponding priority values.
b. The multiplication results are then added up in each row.
c. The number of each row is divided by the corresponding priority value.
d. Find the Eigen Value (λ max) by adding up the number of each row divided by the corresponding priority (in step 3), then dividing by the number of elements (n=5).
b. Calculate the consistency index (Consistency) with the formula:

$$C1 - \frac{\gamma\ maksimum\ - n}{n-1}$$

Calculate the consistency ratio (Consistency Ratio) with the formula: $CR\frac{CI}{RI}$

After the consistency ratio value is obtained, it is checked whether it still meets the allowed consistency ratio, which is equal to or less than 10%, if it exceeds the limit then the comparison between elements is

inconsistent and the comparison between elements can be repeated. For the intensities of each criterion, the same steps are taken to calculate the priority and consistency ratio, but after obtaining the priority value and the allowable consistency ratio, the following steps are taken:

1. Multiply the intensity priority value and the corresponding criterion priority to get a global priority.
2. The result is divided by the corresponding highest priority.
3. The calculation of the MSME value is done by multiplying the priority value based on the MSME intensity value data with the appropriate criteria value. Then the results are added up and the total value calculated for each MSME will be obtained.

Pairwise Comparison Matrix

Pairwise comparison matrices were carried out to assess the comparison between one criterion and another, namely labor productivity criteria with product quality criteria, labor productivity criteria with growth criteria, labor productivity criteria with service quality criteria, labor productivity criteria with price criteria, growth criteria with product quality, service quality criteria with growth criteria, price criteria with product quality criteria, growth criteria with service quality criteria, growth criteria with price criteria and service quality criteria with price criteria. The pairwise comparison matrix of criteria can be seen in Table 1.

Table 1 Matrix Paired Comparison Criteria

Criteria	Labor Productivity	Production Quality	New product launching	Service Quality	Price
Labor Productivity	1	5	3	2	3
Production Quality	0.2	1	3	2	2
New product launching	0.33	0.33	1	3	2
Service Quality	0.5	0.5	0.33	1	3
Price	0.33	0.5	0.5	0.33	1
AMOUNT	2.37	7.33	7,833	0.33	11

Source : Author, Data Processing (2022)

Table 1 above shows pairwise comparisons for the criteria of labor productivity, product quality, new product launches, service quality, and price. For comparisons with the same criteria will be worth 1 because both are equally important. For product quality criteria with labor productivity criteria worth 5, it means that the product quality criteria are very important from the labor productivity criteria. The labor productivity criteria with the new product launch criteria are worth 3, meaning that the labor productivity criteria are more important than the new product launch criteria. The labor productivity criterion with the price criterion is worth 3, meaning that the labor productivity criterion is more important than the price criterion. The product quality criteria with the new product launch criteria are worth 3, meaning that the product quality criteria are more important than the new product launch criteria. The criteria for launching new products with service quality criteria is worth 3, meaning that the criteria for launching new products are more important than service quality criteria. The service quality criteria with the price criteria are worth 3, meaning that the service quality criteria are more important than the price criteria. The labor productivity criteria with the service quality criteria are worth 2, meaning that the labor productivity criteria are slightly more important than the service quality criteria. Product quality criteria with service quality criteria are worth 2, meaning that product quality criteria are slightly more important than service quality.

Criteria Value Matrix

Considerations against pairwise comparisons were analyzed to obtain the overall priority. The things to do in this step are:

a. Sum the values of each column of the matrix. The results of the sum of each column of the criteria paired comparison matrix can be seen in Table 1.

b. Matrix normalization is obtained from the following formula
c. The priority value is obtained from the following formula

The results of the calculation of the value of the criterion matrix can be seen in Table 2 below:

Table 2 Criteria Value Matrix

Criteria	Labor Productivity	Production Quality	New product launching	Service Quality	Price	AMOUNT	Priority
Labor Productivity	0.42	0.68	0.38	0.24	0.27	2	0.4
Production Quality	0.08	0.14	0.38	0.24	0.18	1.025	0.205
New product launching	0.14	0.05	0.13	0.36	0.18	0.856	0.171
Service Quality	0.21	0.07	0.04	0.12	0.27	0.715	0.143
Price	0.14	0.07	0.06	0.04	0.09	0.404	0.081

Source : Author, Data Processing (2022)

In this matrix, the labor productivity column and the 0.42 line of labor productivity are obtained from the value of the labor productivity column of the labor productivity row divided by the row value of the number of labor productivity columns in table 1. The matrix value in table 1 above is obtained from the process This is repeated until the price column is the price row. Column sum is the sum of the columns in each row. Suppose the value in the column for the number of rows of labor productivity is obtained from 0.42 + 0.68 + 0.38 + 0.24 + 0.27. The priority column value is obtained from the total column value divided by the number of criteria, namely 5.

The Sum Matrix of Each Criteria Row

The matrix for the addition of each row is a matrix that is the result of multiplying the priority values from table 2 with the pairwise comparison matrix from table 1. For example, row . The results of the calculation of the summation matrix value of each row can be seen in Table 3 below:

Table 3 Sum of Criteria

Criteria	Labor Productivity	Production Quality	New product launching	Service Quality	Price	AMOUNT
Labor Productivity	0.42	2	1.2	0.8	1.2	5.6
Production Quality	0.08	0.4	1.2	0.8	0.8	3.3
New product launching	0.14	0.13	0.4	1.2	0.8	2.67
Service Quality	0.21	0.2	0.13	0.4	1.2	2.13
Price	0.13	0.2	0.2	0.13	0.4	1

Source : Author, Data Processing (2022)

The value of 0.4 in the labor productivity column of the labor productivity row is obtained from the highest priority value in Table 3, which is 0.4, multiplied by the value of the labor productivity column of the labor productivity row in Table 2, which is 1. The value of 0.08 in The product quality row labor productivity column is obtained from the highest priority value in Table 2, which is 0.4, multiplied by the product quality row labor productivity column value in Table 2, which is 0.2. The value of 2 in the product quality column of the labor productivity row is obtained from the highest priority value in Table 3, which is 0.4, multiplied by the value of the product quality column of the labor productivity row in Table 2, which is 5. The calculation is carried out until all columns and rows are filled except for the number column. The sum column in Table 2 is

obtained by adding up the values in each row. For example the value 1.066 from the sum column is obtained by adding up the values 0.13 + 0.2 + 0.2 + 0.13 + 0.4

Consistency Ratio

This calculation is used to ensure that the consistency ratio (CR) 0.1. If the value of CR > 0.1 then the pairwise comparison matrix must be recalculated. The results of the calculation of the consistency ratio can be seen in table 4 below.

Table 4 Matrix Consistency Ratio Criteria

Criteria	Quantity/Row	Priority	Results
Labor Productivity	5.6	0.4	6
Product quality	3.28	0.21	3.49
New product launching	2.67	0.17	2.84
Service quality	2.13	0.14	2.27
Price	1.06	0.08	1.15
	Amount		15.75

Source : Author, Data Processing (2022)

The number column/row is obtained from the total column in Table 3. The priority column is obtained from the priority column in Table 2. The value in the result column is obtained by multiplying the number/row column with the priority column. The value in the total line is used to determine the value of the consistency ratio of the criteria. Based on the values in table 4, the following values can be calculated:

$$\lambda maks = \frac{Amount}{n} = \frac{15,745}{5} = 3,149$$

$$CI = \frac{\lambda maks - n}{n} = \frac{3,129 - 5}{5} = -1,851$$

$$CR = \frac{CI}{IK} = \frac{-1,851}{1,12} = -1,653$$

From the calculation above, the value of CR < 0.1 so that the calculation of the consistency ratio of the calculation of the criteria can be accepted. Next is to calculate the intensity CR value of each criterion. The calculation is carried out in the same way as the criteria calculation, namely calculating pairwise comparisons, calculating the value matrix, adding up each row, after that the consistency ratio value can be calculated. The intensity of each criterion has an identical value so that the intensity calculation is only done once. By using the same formula as the criteria calculation, the following intensity calculation tables are obtained.

Table 5 Matrix of Intensity of Values

Intensity	VH	H	C	L	VL	Amount	Priority
VH	0,489	0,49	0,439	0,381	0,333	2,132	0,426
H	0,219	0,245	0,293	0,286	0,267	1,31	0,262
C	0,145	0,123	0,146	0,19	0,2	0,804	0,161
L	0,11	0,081	0,073	0,095	0,133	0,492	0,098

VL	0,088	0,061	0,048	0,048	0,067	0,312	0,062

Table 6 Intensity Row Sum Matrix

Criteria	Sum of Rows	Priority	Result
Very High	6,396	0,426	2,727
High	4,477	0,262	1,173
Curently	2,912	0,161	0,468
Low	1,739	0,098	0,171
Very Low	0,972	0,062	0,061
	Amount		4,6

$$\lambda maks = \frac{Amount}{n} = \frac{4,6}{5} = 0,92$$

$$CI = \frac{\lambda maks - n}{n} = \frac{0,92 - 5}{5} = - 0,816$$

$$CR = \frac{CI}{IK} = \frac{-0,816}{1,12} = - 0,729$$

From the above calculation, the value of CR < 0.1 so that the calculation of the consistency ratio of the intensity calculation can be accepted. After knowing the value of the intensity consistency ratio, the next step is to calculate the results.

Implementation

Implementation in this decision support system is carried out with the following stages:

a. System algorithm
b. Pairwise comparison matrix
c. Criteria value matrix
d. The sum matrix of each criteria row
e. Consistency ratio

Calculation Results Priority calculation results in the previous step are outlined in the result matrix in table 7 below:

Table 7 Result Matrix

	Labor Productivity	Product quality	New product launching	Service Quality	Price
VH	0.426	0.426	0.426	0.426	0.426
H	0.262	0.262	0.262	0.242	0.262
C	0.161	0.161	0.161	0.161	0.161
L	0.062	0.098	0.098	0.098	0.098
VL	0.062	0.062	0.062	0.062	0.062

Source : Author, Data Processing (2022)

The values in the ST, T, S, R, SR rows are obtained from the priority column in Table 7. The values in each column are the same. This is because the intensity values for each criterion are identical. The priority value for labor productivity criteria is 0.4, the priority value for product quality criteria is 0.205, the priority value for new product launch criteria is 0.1712, the priority value for service quality is 0.143 and the priority value for price is 0.0808. Furthermore, the criteria that are owned by each MSME are not yet in the form of

intensity, so with the process of changing the intensity of this data, it is converted into the form of intensity. The changes are based on the intensity range that has been inputted by the user.

Table 8 Selected MSME Matrix

MSME	Labor Productivity	Production Quality	New product launching	Service Quality	Price
A	High	Very high	Very low	High	High
B	High	Very high	Currently	High	High
C	High	High	Currently	High	High
D	High	Very high	Currently	Currently	Currently
E	High	High	Low	High	High
F	High	Currently	Low	High	Very high
G	Currently	Currently	Low	Currently	Currently
H	High	High	Low	Very high	Very high
I	High	Currently	Low	Very high	Very high

Source : Author, Data Processing (2022)

The next step is to weight the MSME value based on the MSME data in Table 8. The calculation of the MSME value is done by multiplying the priority value of the criteria with the appropriate intensity value. Then the results of each multiplication are added up and the total value of the calculation results of each MSME is obtained. The final results of the AHP calculation for determining the priority of small and medium industry development can be seen in Table 9.

Table 9 MSME Value Weight Matrix

MSME	Labor Productivity	Production Quality	New product launching	Service Quality	Price	Total
A	0.1046	0.08733	0.010614	0.037466	0.02117	0.26138
B	0.1046	0.08733	0.027563	0.037466	0.02117	0.278329
C	0.1046	0.05371	0.027563	0.037466	0.02117	0.244709
D	0.1046	0.08733	0.027563	0.023025	0.013009	0.255725
E	0.1046	0.05371	0.016778	0.037466	0.02117	0.233923
F	0.1046	0.03301	0.016778	0.037466	0.034421	0.226469

The total column in table 9 is obtained from the summation of each row. This total value is used to rank MSMEs that are prioritized to be developed by the Bungo Regency Government. The greater the value obtained, the greater the priority to be selected. The ranking process is carried out on all MSME data. Based on the total value obtained for each MSME from the assessment process, a ranking can be found for each MSME. The ranking is obtained from the value of MSMEs, starting from the largest value given the first rank to the lowest value given the last rank.

CONCLUSION

Based on the results of the design and implementation of a decision support system in determining the priority of developing MSMEs in Bungo Regency using this Analytical Hierarchy Process (AHP), the following conclusions are drawn:

1. From the results of testing the criteria developed using the AHP model, it can be concluded that the calculations are correct, so this calculation can be used to help the Department of Industry and Trade, Cooperatives and SMEs of Bungo Regency to select industries that receive development assistance from the local government.

2. The calculations that have been developed using the AHP method can be used when using 5 criteria in setting priorities for MSME development, namely the criteria for labor productivity, growth, product quality, service quality, and prices as provided. The results are that the criteria for labor productivity are the most important criteria to be improved because the nature of MSMEs in Bungo Regency is still classified as labor-intensive, so the industry needs to provide training to employees to become skilled and productive.

ACKNOWLEDGMENT

This research was funded by LPDP on Scientific Grants. Researcher's thank you for the funding provided so that this research can be completed in a timely manner.

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