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IMPLEMENTATION OF AHP-TOPSIS AS A SUPPORT FOR MAKING DECISIONS ON MICRO BUSINESS FUNDING IN SAMBAS REGENCY

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ABSTRACT

The economy is one of the fields affected by the Covid-19 pandemic in the world, including Indonesia. One of the drivers of the economy in Indonesia is Micro, Small and Medium Enterprises (MSMEs). Among the three types of businesses, micro-enterprises contribute the most to Indonesia's Gross Domestic Product. Therefore, an analysis of the decision support system for financing micro-enterprises in Indonesia is carried out. This study aims to determine the application of decision support methods in selecting micro-enterprises that are entitled to receive grants and appreciation for developing their business. The choice of Sambas Regency as the case study location was due to the good development of micro-enterprises and one of the front lines in exporting products to other countries. The method used is a collaboration between the Analytical Hierarchy Process (AHP) method and the Technique for Order Preference by Similarity to Ideal Solution (TOPSIS). Through the process of weighing the criteria with AHP and several stages with TOPSIS, the results are obtained in the form of preference values and sequences of micro businesses that are eligible to receive funds. For the category of grants, it was found that the most feasible business to be financed was Roemah Jamoer Ikram, while for the category of appreciation funds, the most feasible business to be financed was Amplang 9. Thus, the analysis of supporting micro business financing using the AHP-TOPSIS method was successfully carried out with the output in the form of micro business rating results.

Keywords: AHP, TOPSIS, Decision Support, Micro-Enterprises, Funding

INTRODUCTION

The COVID-19 pandemic has managed to unsettle all levels of society in every aspect of life, including the economic aspect. Data for 2020 records that Indonesia is experiencing a contraction in economic growth of -2.07% (Central Statistics Agency, 2021). A myriad of economic actors have been successful in being affected by the impact of the pandemic, including MSMEs (Micro, Small and Medium Enterprises) as the most affected parties and whose business resistance has been tested, are now embarking on a recovery period and contributing to boosting post-pandemic national economic growth.

Indonesia is a country with an abundance of MSME actors in it. This is because the existence of MSMEs as the majority holder of all Indonesian business units, where 99.9% of the total

Indonesian business units are filled by MSMEs (Ministry of Cooperatives and UKM RI, 2019). In addition, the Asean Investment Report records Indonesia as the owner of the largest number of MSMEs in Southeast Asia with a total of 65.46 million units in 2021, while other ASEAN countries only number a few hundred thousand to 3 million (Databoks Indonesia, 2022). In addition, the large contribution of MSMEs in restoring the national economy through their share of 60.34% of the Gross Domestic Product (GDP), 14.4% of national exports, and absorbing up to 97% of the workforce (Fawahan & Marianingsih, 2022).

If analyzed in more detail, the contribution of MSMEs to GDP in 2019 is filled with a contribution of 61.72% by micro businesses, 15.75% by small businesses, and the remaining 22.53% by medium businesses (Ministry of Cooperatives and MSMEs in the Central Bureau of Statistics, 2021). Not surprisingly, a contribution of this magnitude can be made accompanied by the large quantity of micro businesses reaching 64.6 million, compared to small and medium enterprises which only amounted to 789.7 and 65.5 thousand units respectively in 2019 (Databoks Indonesia, 2021). However, unfortunately, the existence of micro-enterprises that are facing challenge after challenge should be a concern for the nation's children, given the large role of micro-enterprises in driving economic growth. Micro-enterprises as a group of businesses that are predominantly in the middle to lower class of society and tend to have a low level of education,

Policies in the form of attention to the development and resilience of MSMEs in Indonesia, especially micro-enterprises, have been launched by the government, one of which is through the National Economic Recovery (PEN) program. Unfortunately, the realization of strategies and other assistance was deemed not optimal in achieving the intended target. For this reason, a support system is needed in making decisions on the escalation of business unit funds so that the distribution of funds can be channeled on target and optimal use of funds according to the needs of state business actors to support national economic growth can be achieved. Mathematical calculations are initiated as support for decision making in empowering MSMEs in Indonesia through the distribution of grants and appreciation.

This study applies the AHP-TOPSIS algorithm in its work system. The combination of the analysis of the AHP and TOPSIS methods was carried out to obtain a more objective final decision result compared to other methods. The application of AHP-TOPSIS produces test products with optimal accuracy after going through the criteria weighting stage, calculating with AHP, and obtaining output recommendations with TOPSIS (Santika & Handika, 2019). The selection of case studies for micro-enterprises in Sambas district, West Kalimantan is based on the recapitulation of data on the scale of Sambas micro-enterprises in 2019 which occupy the second largest position in West Kalimantan (Central Bureau of Statistics, 2021). Ten samples from the Sambas micro business data population were used to demonstrate the suitability of the ranking system and the AHP-TOPSIS algorithm recommendations. Therefore,

METHOD

The research was conducted by collecting secondary data related to the research topic. Secondary data comes from a collection of literature data sources including government publications, journals and articles that can be accounted for. These data are analyzed in such a way as to produce an output in the form of an answer that will be implemented in a decision support system for granting business assistance funds to micro-enterprises in Sorong City, Indonesia. The analytical method to be tested for its application is the collaboration of the Analytical Hierarchy Process (AHP) and Technique for Others Reference by Similarity to Ideal Solution (TOPSIS) methods. The results of the analysis of the decision support method are then compared with the actual value so that the accuracy of the results obtained can be known.

The Analytical Hierarchy Process or better known as (AHP) is a method of modeling complex data into a hierarchical form where each hierarchical element has an assessment weight (Nugroho et al., 2018). Meanwhile, TOPSIS (Technique for Order Preference by Similarity to Ideal Solution) is a method of measuring the relative performance of decision alternatives with a solution in the form of choosing the best alternative that approaches the positive ideal solution and stays away from negative ideal solutions (Muthmainah & Yunita, 2021). In other words, this research was conducted by applying the AHP method first in determining the weight of the criteria, followed by applying the TOPSIS method to choose the best alternative that has the farthest distance from the negative ideal solution and has the shortest distance to the positive ideal solution.

In more detail, the weighting stages with the AHP method are carried out by comparing priorities between criteria through the following steps (Santika et al., 2018)

a. Determine the criteria to support the best alternative decision making
b. Determine the comparison value between criteria
c. Create a criteria comparison matrix with a relative priority table of criteria
d. Determine the criteria weight () by creating a normalization matrix in the form of a normalized criteria value table.w_i

Next, a TOPSIS analysis is carried out with the following steps (Doni, et al, 2019).

a. Determine the weight on each sub-criteria
b. Describe the data, by giving value to the alternatives based on the weighting of each criterion
c. Create a normalized decision matrix

To find the normalized value of the decision matrix, each element value can be calculated using the following formula.

$$r_{ij} = \frac{x_{ij}}{\sqrt{\sum_{i=1}^{m} x_{ij}^2}} \quad (1)$$

d. Create a weighted normalized decision matrix

To find the value of the normalized weighted decision matrix, the value of each element in the normalized decision matrix is multiplied by each criterion weight that has been determined by the AHP method, or by the following formula.

$$y_{ij} = w_i r_{ij} \quad (2)$$

e. Determine the matrix for the positive ideal solution and the matrix for the negative ideal solution, where the positive ideal solution (yi+) is the maximum value of each criterion and the negative ideal solution (yi–) is the minimum value of each criterion

f. Determine the distance between the values of each alternative with the positive ideal solution matrix and the negative ideal solution matrix, wherepositive alternative distance is calculated by the following formula.

$$D_i^+ = \sqrt{\sum_{j=1}^{n}\left(y_i^+ - y_{ij}\right)^2} \quad (3)$$

Meanwhile, the negative alternative distance is calculated by the following formula.

$$D_i^- = \sqrt{\sum_{j=1}^{n}\left(y_{ij} - y_i^-\right)^2} \quad (4)$$

g. Determine the preference value for each alternativewith the following formula

$$V_i = \frac{D_i^-}{D_i^- - D_i^+} \quad (5)$$

RESULTS AND DISCUSSION

Analytical Hierarchy Process(AHP) is a method of modeling complex data into a hierarchical form where each element of the hierarchy has a weight of judgment (Nugroho, et al, 2018). Meanwhile, TOPSIS (Technique for Order Preference by Similarity to Ideal Solution) is a method of measuring the relative performance of decision alternatives where the solution is in the form of choosing the best alternative that leads to positive ideal solutions and avoids negative ideal solutions (Muthmainah & Yunita, 2021) where solutions is obtained by weighting the criteria and ranking.

The case study in this research was carried out by taking sample data of 10 micro business profiles in Sambas Regency which were published by the Office of Cooperatives, Small and Medium Enterprises of West Kalimantan Province in 2020. This data is used as an alternative in providing business escalation funds with detailed data that can be seen in Table1.

Table1. Sample Data of 10 Micro Enterprises in Sambas Regency as of 2020

Nama Usaha	Penghasilan Kotor (Juta Rupiah)	Tenaga Kerja (Orang)	Lama Usaha (Bulan)	Kapasitas Produksi
Liber.co (A1)	180	1	48	1200 kg
Roemah Jamoer Ikram (A2)	30	2	48	250 kg
Azman Songket (A3)	360	15	264	300 helai
Pertiwi Songket (A4)	120	5	264	100 helai
Barkat Songket (A5)	360	13	360	300 helai
Desqy Madu (A6)	600	1	84	2500 kg
Dodol Nanas Gapura (A7)	500	1	48	5000 kg
Kerupuk Kulit Sapi Mas Bro (A8)	180	3	72	1000 kg
Medina Fresh (A9)	125	1	48	5000 botol
Amplang 9 (A10)	300	3	84	3000 kg

1. Criteria Weighting with AHP Method

In the analysis of weighing the decision to grant escalation funds for micro-enterprises, there are several criteria that the government can use. These criteria are weighted by the AHP method and are used as a reference for calculating the TOPSIS method. These criteria can be seen in Table 2.

Table2. Assessment criteria

Kriteria	Keterangan
K1	Penghasilan (Juta Rupiah)
K2	Tenaga Kerja (Orang)
K3	Lama Usaha (Bulan)
K4	Kapasitas Produksi per Tahun

The weighting of each criterion using the AHP method is carried out by comparing the priorities of importance between criteria. Details of the comparative assessment between criteria can be seen in Table 3.

Table3. Assessment Comparison Criteria

Nilai	Keterangan
1	Kriteria A sama pentingnya dengan kriteria B
2	Kriteria A mendekati sedikit lebih penting dari kriteria B
3	Kriteria A sedikit lebih penting dari kriteria B
4	Kriteria A mendekati lebih penting dari kriteria B
5	Kriteria A lebih penting dari kriteria B
6	Kriteria A mendekati sangat penting dari kriteria B
7	Kriteria A sangat penting dari kriteria B
8	Kriteria A mendekati mutlak sangat penting dari kriteria B
9	Kriteria A mutlak sangat penting dari kriteria B

The assessment of the priority comparison of interests between criteria is determined by referring to Table 3. The assessment of criteria is made in the form of a table of relative priority of the criteria determined by the researcher based on an analysis of the interests and goals to be achieved. Assessment criteria can be seen in Table 4.

Table4. Relative Priority of Criteria

Kriteria	K1	K2	K3	K4
K1	1,00	5,00	5,00	3,00
K2	0,20	1,00	1,00	0,33
K3	0,20	1,00	1,00	0,33
K4	0,33	3,00	3,00	1,00
Total	1,73	10,00	10,00	4,67

Furthermore, the weighting of the criteria is determined by the normalization matrix which is obtained by dividing the value of each element column by the total of each criterion column. The results of the elements of each row of the criteria are averaged to get the weight of the importance of the criteria that will be used as a reference in the calculation of the TOPSIS method. The weighting can be seen in Table5.

Table5. Criteria Value Normalization

	K1	K2	K3	K4	Bobot
K1	0,577	0,500	0,500	0,643	0,555
K2	0,115	0,100	0,100	0,071	0,097
K3	0,115	0,100	0,100	0,071	0,097
K4	0,192	0,300	0,300	0,214	0,252

From the normalization matrix, the weights for each criterion are determined by the AHP method, with details of the weights that can be seen in Table 6.

Table6. Criteria Weight

Kriteria	Keterangan	Bobot
K1	Penghasilan (Juta Rupiah)	0,555
K2	Tenaga Kerja (Orang)	0,097
K3	Lama Usaha (Bulan)	0,097
K4	Kapasitas Produksi per Tahun	0,252

Based on the table, the preference criteria weight values are obtained as follows.

$$w_i = (0{,}555; 0{,}097; 0{,}097; 0{,}252)$$

2. TOPSIS Algorithm as Supporting Decision Making

In implementing TOPSIS in this application, there are two decisions to be achieved, namely the provision of appreciation funds and assistance funds. The two decisions are analyzed by weighting the sub-criteria according to the goals to be achieved.

The sample data is described by giving a value to each micro business as an alternative and its criteria. The assessment is based on previously determined criteria by dividing the criteria into sub-criteria with cumulative weighting. In this case study, the criteria used to apply the TOPSIS method are based on the results of the weighting of the criteria from the AHP method.

2.1 The TOPSIS Algorithm as a Support for Appreciation Funding

The decision to grant appreciation funds is given if the development of micro-enterprises is better than other micro-enterprises in one line of business. The first stage for this decision is dividing the criteria into sub-criteria then giving the cumulative weight. For production capacity criteria, a normalization process is carried out first to equate the units to pcs or items. The sub-criteria and their weight in appreciation funds can be seen in the following table.

Table7. Income Criteria Weight for Appreciation Funds

Penghasilan	Bobot
0-75 Juta Rupiah	0,4
75-150 Juta Rupiah	0,6
150-225 Juta Rupiah	0,8
225-300 Juta Rupiah	1,0
>300 Juta Rupiah	0,2

Table8. Labor Criteria Weight for Appreciation Funds

Jumlah Pekerja	Bobot
1-3 Orang	0,4
4-6 Orang	0,6
7-9 Orang	0,8
10-12 Orang	1,0
>12 Orang	0,2

Table9. Length of Business Criteria Weight for Appreciation Funds

Lama Usaha	Bobot
1-75 Bulan	0,2
76-150 Bulan	0,4
151-225 Bulan	0,6
226-300 Bulan	0,8
>300 Bulan	1,0

Table10. Production Capacity Criteria Weight for Appreciation Funds

Kapasitas Produksi	Bobot
1-1250 pcs	0,2
1251-2500 pcs	0,4
2501-3750 pcs	0,6
3751-5000 pcs	0,8
>5000 pcs	1,0

Ten samples of micro businesses as an alternative are weighted according to the weighting of the sub-criteria. The alternative assessment can be seen in Table 11.

Table11. Appreciation Fund Alternative Assessment

Usaha Mikro	K1	K2	K3	K4
A1	0,80	0,40	0,20	1,00
A2	0,40	0,40	0,20	0,40
A3	0,20	0,20	0,80	0,20
A4	0,60	0,60	0,80	0,20
A5	0,20	0,20	1,00	0,20
A6	0,20	0,40	0,40	0,40
A7	0,20	0,40	0,20	1,00
A8	0,80	0,40	0,20	0,20
A9	0,60	0,40	0,20	0,80
A10	1,00	0,40	0,40	0,60

To find the value of the normalized decision matrix, each element can be calculated using the following formula (Pribadi, et al, 2020).

$$r_{ij} = \frac{x_{ij}}{\sqrt{\sum_{i=1}^{m} x_{ij}^2}} \quad (1)$$

The results of the normalized decision matrix can be seen in Table 12.

Table12. Normalized Decision Matrix for Appreciation Funds

Usaha Mikro	K1	K2	K3	K4
A1	0,439	0,320	0,120	0,536
A2	0,220	0,320	0,120	0,214
A3	0,110	0,160	0,478	0,107
A4	0,329	0,480	0,478	0,107
A5	0,110	0,160	0,598	0,107
A6	0,110	0,320	0,239	0,214
A7	0,110	0,320	0,120	0,536
A8	0,439	0,320	0,120	0,107
A9	0,329	0,320	0,120	0,429
A10	0,549	0,320	0,239	0,322

To find the normalized and weighted decision matrix values, the values of the normalized decision matrix elements are multiplied by each weight of the criteria determined by the AHP method (, with the following formula.

$$y_{ij} = w_i r_{ij} \quad (2)$$

with:

$$w_i = (0{,}555;\ 0{,}097;\ 0{,}097;\ 0{,}252)$$

The results of the normalized and weighted decision matrix can be seen in Table 13.

Table13. Weighted Normalized Decision Matrix for Appreciation Funds

Usaha Mikro	K1	K2	K3	K4
A1	0,244	0,031	0,012	0,135
A2	0,122	0,031	0,012	0,054
A3	0,061	0,015	0,046	0,027
A4	0,183	0,046	0,046	0,027
A5	0,061	0,015	0,058	0,027
A6	0,061	0,031	0,023	0,054
A7	0,061	0,031	0,012	0,135
A8	0,244	0,031	0,012	0,027
A9	0,183	0,031	0,012	0,108
A10	0,305	0,031	0,023	0,081

From the normalized and weighted decision matrix, it can be determined that the positive ideal solution is obtained from the maximum value of each criterion and the negative ideal solution is obtained from the minimum value of each criterion. Positive and negative ideal solutions can be seen in Table 14.

Table14. The Ideal Solution Matrix for Appreciation Funds

Solusi	K1	K2	K3	K4
Positif	0,305	0,046	0,058	0,135
Negatif	0,061	0,015	0,012	0,027

After determining the ideal solution matrix, the distance between the weighted values of each alternative and the ideal solution is calculated. Positive alternative distances are calculated using the following formula (Windarto, 2017).

$$D_i^+ = \sqrt{\sum_{j=1}^{n}\left(y_i^+ - y_{ij}\right)^2} \quad (3)$$

Negative alternative distance is calculated by the following formula.

$$D_i^+ = \sqrt{\sum_{j=1}^{n}\left(y_{ij} - y_i^-\right)^2} \quad (4)$$

Alternative distances to solutions can be seen in Table 15.

Table15. Alternative Distance to Appreciation Funding Solutions

Usaha Mikro	D_i^+	D_i^-
A1	0,07802	0,21279
A2	0,20572	0,06840
A3	0,26852	0,03467
A4	0,16316	0,13040
A5	0,26828	0,04623
A6	0,25954	0,03319
A7	0,24848	0,10902
A8	0,13317	0,18339
A9	0,13397	0,14708
A10	0,06598	0,25030

The last step in the TOPSIS method is to make a preference value for each alternative, with the highest preference being the best alternative that can be selected as a consideration for decision making. The preference value is calculated by the following formula.

$$V_i = \frac{D_i^-}{D_i^- - D_i^+} \quad (5)$$

The preference value of each alternative can be seen in Table 16.

Table16. Alternative Preferences for Giving Appreciation Funds

Usaha Mikro	Preferensi	Ranking
A1	0,73171	2
A2	0,24951	7
A3	0,11436	9
A4	0,44419	5
A5	0,14700	8
A6	0,11337	10
A7	0,30496	6
A8	0,57933	3
A9	0,52333	4
A10	0,79138	1

Based on the TOPSIS method, the 3 micro businesses with the highest value that are entitled to receive appreciation funds are Amplang 9, Liber.co, and Mas Bro Cowhide Crackers.

2.2 The TOPSIS Algorithm as a Support for Granting Grants

The decision to grant grants is given if the development of micro-

enterprises is not good compared to other micro-enterprises in one line of business. The first stage for this decision is dividing the criteria into sub-criteria and given cumulative weights. The division of sub-criteria and their weight in aid funds can be seen in the following table.

Table17. Income Criteria Weight for Grants

Penghasilan	Bobot
0-75 Juta Rupiah	1,0
75-150 Juta Rupiah	0,8
150-225 Juta Rupiah	0,6
225-300 Juta Rupiah	0,4
>300 Juta Rupiah	0,2

Table18. Labor Criteria Weight for Grants

Jumlah Pekerja	Bobot
1-3 Orang	1,0
4-6 Orang	0,8
7-9 Orang	0,6
10-12 Orang	0,4
>12 Orang	0,2

Table19. Length of Business Criteria Weight for Assistance Funds

Lama Usaha	Bobot
1-75 Bulan	1,0
76-150 Bulan	0,8
151-225 Bulan	0,6
226-300 Bulan	0,4
>300 Bulan	0,2

Table20. Production Capacity Criteria Weight for Aid Funds

Kapasitas Produksi	Bobot
1-1250 pcs	1,0
1251-2500 pcs	0,8
2501-3750 pcs	0,6
3751-5000 pcs	0,4
>5000 pcs	0,2

In accordance with the weight of these criteria, each alternative is given a weighting value which can be seen in Table 21.

Table21. Assessment of Alternative Aid Funds

Usaha Mikro	K1	K2	K3	K4
A1	0,60	1,00	1,00	0,20
A2	1,00	1,00	1,00	0,80
A3	0,20	0,20	0,40	1,00
A4	0,80	0,80	0,40	1,00
A5	0,20	0,20	0,20	1,00
A6	0,20	1,00	0,80	0,80
A7	0,20	1,00	1,00	0,20
A8	0,60	1,00	1,00	1,00
A9	0,80	1,00	1,00	0,40
A10	0,40	1,00	0,80	0,60

To find the value of the normalized decision matrix, each element is calculated using formula (1) as in the appreciation fund analysis, with the results of the normalized decision matrix shown in Table 22.

Table22. Normalized Decision Matrix for Grants

Usaha Mikro	K1	K2	K3	K4
A1	0,329	0,360	0,388	0,082
A2	0,549	0,360	0,388	0,330
A3	0,110	0,072	0,155	0,412
A4	0,439	0,288	0,155	0,412
A5	0,110	0,072	0,078	0,412
A6	0,110	0,360	0,310	0,330
A7	0,110	0,360	0,388	0,082
A8	0,329	0,360	0,388	0,412
A9	0,439	0,360	0,388	0,165
A10	0,220	0,360	0,310	0,247

Like the calculations performed in the analysis of the decision to provide appreciation funds, the weights in the decision to provide grants are as follows.

$$w_i = (0{,}555;\ 0{,}097;\ 0{,}097;\ 0{,}252)$$

The results of the normalized and weighted decision matrices can be seen in Table 23.

Table23. Weighted Normalized Decision Matrix for Grants

Usaha Mikro	K1	K2	K3	K4
A1	0,183	0,035	0,038	0,021
A2	0,305	0,035	0,038	0,083
A3	0,061	0,007	0,015	0,104
A4	0,244	0,028	0,015	0,104
A5	0,061	0,007	0,008	0,104
A6	0,061	0,035	0,030	0,083
A7	0,061	0,035	0,038	0,021
A8	0,183	0,035	0,038	0,104
A9	0,244	0,035	0,038	0,042
A10	0,122	0,035	0,030	0,062

From the normalized and weighted decision matrices, positive and negative ideal solutions can also be determined, which can be seen in Table 24.

Table24. Matrix of Ideal Solutions for Relief Funds

Solusi	K1	K2	K3	K4
Positif	0,305	0,035	0,038	0,104
Negatif	0,061	0,007	0,008	0,021

After determining the ideal solution matrix, the distance between the weighted values of each alternative and the ideal solution is calculated using formulas (3) and (4) in the appreciation fund decision analysis. Alternative distances to solutions can be seen in Table 25.

Table25. Alternative Distance to Solutions for Granting Funds

Usaha Mikro	Di^+	D_i^-
A1	0,14743	0,12852
A2	0,02076	0,25479
A3	0,24627	0,08336
A4	0,06531	0,20194
A5	0,24707	0,08302
A6	0,24465	0,07183
A7	0,25741	0,04095
A8	0,12183	0,15301
A9	0,08711	0,18842
A10	0,18755	0,08195

The last step in the TOPSIS method is to make a preference value for each alternative as in determining the feasibility of giving appreciation funds using formula (5).Preference values can be seen in Table 26.

Table26. Alternative Preferences for Providing Aid Funds

Usaha Mikro	Preferensi	Ranking
A1	0,46575	5
A2	0,92468	1
A3	0,25289	7
A4	0,75561	2
A5	0,25151	8
A6	0,22696	9
A7	0,13724	10
A8	0,55673	4
A9	0,68385	3
A10	0,30409	6

Based on this analysis, the 3 micro businesses with the highest scores that are entitled to receive grants are Roemah Jamoer Ikram, Pertiwi Songket, and Medina Fresh.

CONCLUSION

Decision support methods can be applied in selecting micro-enterprises that are entitled to appreciation funds and assistance funds in developing their businesses. The method used in this study is a collaboration between the AHP and TOPSIS methods. The

stages of completing the method start from weighting the criteria with AHP to ranking with TOPSIS. With this research, it can be an easier alternative in determining which businesses are eligible for development funding.

The decision support system provides results in the form of alternative selection of micro-enterprises that are entitled to receive appreciation funds and assistance funds based on predetermined criteria. Based on the established criteria, the results are in the form of preference values and ratings of micro-enterprises that are eligible to receive funds. Micro-enterprises entitled to receive appreciation funds are Amplang 9, while micro-enterprises entitled to receive assistance funds are Roemah Jamoer Ikram. These results can be seen for further accuracy by comparing the results of manual calculations with the system formed.

Suggestions for further research are to review the decision-making criteria, add criteria for selecting micro-enterprises eligible to receive funds and involve sample data and a more diverse range of decision-variable indicators.

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