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Integration of AHP and TOPSIS Methods for Small and Medium Industries Development Decision Making

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Abstract

Financial problems are one of the reasons why small and medium-sized industries (SMIs) in West Kutai have not developed optimally. Government assistance programs are one of the solutions. This program must be appropriate, so a decision-making tool is needed to help choose the right SMIs to be assisted later. The weight of the criteria was determined using the Analytical Hierarchy Process (AHP) technique, and the priority of the SMIs as the preferred proposal for the recipients of development assistance was determined using the Technique for Other Reference by Similarly to Ideal Solution (TOPSIS) approach. Labor, investment, production capacity, production value, and raw materials were used to determine the priorities of SMIs beneficiaries. Furthermore, TOPSIS prioritizes the development of alternative small and medium-sized industries with types of handicraft commodities. Integration of AHP and TOPSIS methods has been successfully used in the IKM Development Priority Determination Application, with 83.3% precision and 96.4% accuracy achieved by using a confusion matrix so that the IKM ranking can be known. The results of the study found that integration of the two methods was successfully used for Small and Medium Industries Development Decision Making.

Keywords: Decision Making, AHP, TOPSIS, Criteria, SMIs

1. Introduction

Small and medium-sized industries (SMIs) are one of the most significant sectors in the Indonesian economy [1]. SMIs are the Indonesian economy's backbone, supplying components and parts for major corporations and providing primary and secondary sources of income for many Indonesian households [2] [3]. Furthermore, SMIs play a vital role in promoting regional economic growth. The establishment of SMIs operations in the areas can produce jobs for small people. SMIs, as autonomous business entity, plays a vital part in a country's economic and industrial progress. The employment contribution of SMIs, both in developed and developing countries, including Indonesia, is critical in the fight against unemployment. However, the promise of SMIs is not balanced by expertise in competition management [4].

As a form of government support in efforts to develop SMIs, the regional government carries out a mentoring program by assisting in the form of production machines and equipment so that the products produced can remain of high selling value and the quality of the products made is good. However, the products produced by SMIs are mostly handmade, the manufacturing process takes a long time, and the selling price is expensive [5] [6]. In its implementation, the Office of Industry, Trade, and Small and Medium Enterprises Cooperatives of East Kalimantan Province (DISPERINDAGKOP KALTIM) considers several criteria, including the number of workers, production capacity, investment value, production value, and raw materials used. Because of the many underlying factors in consideration of determining development priorities and the limited amount of budget provided by the local government, it is necessary to have a method to find out which industries are entitled to be given this development priority assistance. This method is expected to make it easier for local governments to determine which SMIs are entitled to priority development assistance [7].

The West Kutai Regency is a regency in East Kalimantan with the fastest SMIs growth rate. According to the Office of Industry, Trade, and Small and Medium Enterprises Cooperatives of East Kalimantan Province, SMIs in 2017 were 1,401 units, in 2018, 1,451 units, and in 2019, as many as 1,483

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units. With this potential, SMIS needs to be developed so that the people's economy in the West Kutai Regency area is increasingly developed and prosperous. Moreover, West Kutai Regency has a lot of creative industry potential that can be developed through SMIs. The rapid development of science and technology, especially in the computer field, combines information systems that are now increasingly easy to obtain without knowing the limitations of time and location by utilizing the internet network [8], [9]. The author offers a decision support system (DSS) to solve the existing difficulties by utilizing the technology available today. It is due to the objective, fast, accurate, and computer-based decision support system, making it easier for local governments to determine the development priorities of SMIs [10] [11].

Analytical Hierarchy Process (AHP) and Technique for Other Reference by Similary to Ideal Solution (TOPSIS) were both applied in this study as an approach to the DSS approach [12]. Since it had to determine the weight of the criteria earlier to establish an alternate order of priority, AHP was applied in calculating the weight of the criteria. This approach to determining the weights between criteria involves the search for a pairwise comparison matrix that should make a comparison of one criterion with another, as well as a process for determining whether the weight values obtained are consistent [13]. TOPSIS, on the other hand, is used to determine alternative priority sequences. TOPSIS was chosen for its straightforward, easy-to-understand, and computationally efficient concept [14] [15].

2. Research Methods

2.1 Research Implementation Stage

The process of selecting different activities to achieve a specific goal or objective is known as decision-making. Collecting data into information and adding it to aspects that need to be considered in decision-making was carried out with a systematic approach to challenges [16]. Figure 1 shows the stages that must be completed in the decision-making process.

Figure 1 illustrates the process flow of a decision support system, which includes several stages such as understanding, design, selection, and implementation.

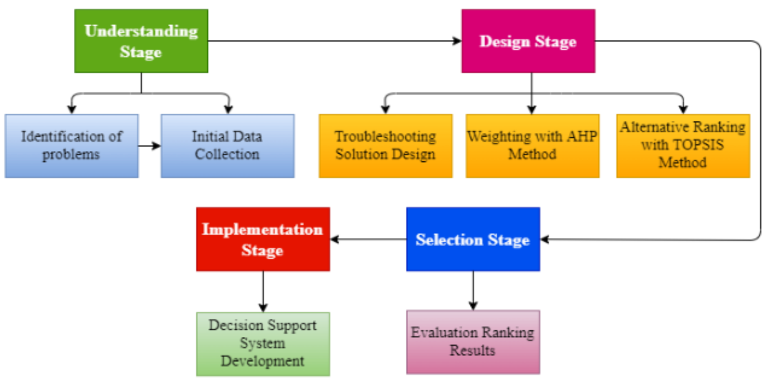

Figure 1. Decision support system process flow

2.2 Data Analysis

The selection result data was used to determine system inputs, simplifying the calculation process. Criteria and alternatives were two variables considered in this study. Table 1 shows the criteria used to select each SMI based on the data collected:

Table 1. Criteria for Small and Medium Industrial Enterprises

No	Criteria	Symbol	Desc
1	Workers	C1	The number of workers contained in the SMIS
2	Production Capacity	C2	The number of production capacities contained in SMIS
3	Investment Value	C3	The number of investment values contained in SMIS
4	Production Value	C4	The number of production values contained in the SMIS
5	Raw Materials	C5	The number of raw materials contained in SMIS

In Table 1, it can be concluded that five criteria were found in this survey to determine SMIs.

Table 2. Craft SMIs Data Alternatives

No	SMIs	C1	C2	C3	C4	C5
1	A1	15	3600	19500	78000	54000
2	A2	25	300	12500	81000	42000
3	A3	3	120	150	7380	4560
4	A4	1	180	150	960	780
5	A5	15	3000	6000	375000	66000
6	A6	10	144	6000	126960	11760
7	A7	2	156	300	68280	4680
8	A8	1	180	300	6480	2880
9	A9	3	900	1500	64800	27000
10	A10	38	3600	200	5400	960

In Table 2, there are ten alternatives to SMIS Handicraft data in West Kutai, namely Fashion Bags (A1), Doyo Woven Fabrics (A2), Anjat (A3), Seraung Manik (A4),

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Statues (A5), Traditional Clothes (A6), machetes (A7), Berangka (A8), Big Bead Wallets (A9) and Rattan Bracelets (A10). This data was a sample data of recommendations from DISPERINDAGKOP KALTIM.

2.3 Analytical Hierarchy Process (AHP) Method

AHP is a functional hierarchy with its main input of human perception [17]. Hierarchies allow for solving complex or unstructured problems in sub-sub-problems and then organizing them into a form of hierarchy [18]. The AHP work procedure is carried out with the following steps [19].

First, defined the problem and determined the desired solution, then implemented a hierarchical arrangement of the problem that occurs.

Second, made a matrix related to paired comparisons whose contents are in the form of numbers that represent the level of importance of each element to other elements, according to the scale of value of the importance of the criteria.

Third, sum the values of each column of the matrix.

Fourth, summed the values in each line and then divided them by the communion factor to find the average or relative priority.

Fifth, determined the λ max like formula 1.

$$\lambda = \sum \lambda_{max} \quad (1)$$

Sixth, did a Consistency Index (CI) calculation like formula 2.

$$CI = \frac{(\lambda_{max} - n)}{(n-1)} \quad (2)$$

Seventh calculated the related Consistency Ratio (CR) as formula 3.

$$CR = \frac{CI}{IR} \quad (3)$$

Where the *IR* commonly used for each matrix order is shown in Table 3.

Table 3. Index Random Consistency List

Ordo Matrix	RI	Ordo Matrix	RI	Ordo Matrix	RI
1	0	6	1,24	11	1,51
2	0	7	1,32	12	1,48
3	0,58	8	1,41	13	1,56
4	0,9	9	1,45	14	1,57
5	1,12	10	1,49	15	1,59

Eighth did a hierarchy consistency check. Again, if the value is more than 10%, then the data value must be corrected; however, if the consistency ratio (CI/IR) is less or equal to 0.1. then the result of the calculation can be declared correct [20].

2.4 Technique for Other Reference by Similarity to Ideal Solution (TOPSIS) Method

Technique for Order of Preference by Similarity to Ideal Solution (TOPSIS) is one of the multicriteria decision-making methods [21]. TOPSIS uses the principle that the selected alternative must have the closest distance to the positive ideal solution and the longest (furthest) distance to the negative ideal solution from a geometric point of view by using Euclidean distance (the distance between two points) to determine the relative proximity of an alternative to the optimal solution [22]. Based on the comparison of the relative distance, an alternative priority arrangement can be achieved. This method was widely used to solve problems of practical decision-making. Because the concept is simple and easy to understand, the computation is efficient, and it can measure the relative performance of alternative decisions. The steps of the TOPSIS algorithm are as follows [23].

First, determining the ranking of each TOPSIS alternative requires ranking the performance of each alternative A_i on each normalized C_j Criterion such as formula 4.

$$r_{ij} = \frac{x_{ij}}{\sqrt{\sum_{i=1}^{m} x_{ij}^2}} \quad (4)$$

With $i = 1,2 \ldots m$ and $j = 1,2 \ldots n$

Second, created a weighted normalized decision matrix like formula 5.

$$y_{ij} = w_i . r_{ij} \quad (5)$$

With $i = 1,2 \ldots m$ and $j = 1,2 \ldots n$

Third, determined the ideal solution of positive and negative. The positive ideal solution A^+ and the negative ideal solution A^- Can be determined based on the normalized weight rankings such as formula six and formula 7.

$$A^+ = (y_1^+, y_2^+ \ldots, y_n^+) \quad (6)$$

$$A^- = (y_1^-, y_2^- \ldots, y_n^-) \quad (7)$$

With conditions

$$y_i^+ = \begin{cases} \max y_{ij} ; if\ j\ is\ the\ profit\ attribute \\ \min y_{ij} ; if\ j\ is\ the\ cost\ attribute \end{cases}$$

$$y_i^- = \begin{cases} \max y_{ij} ; if\ j\ is\ the\ cost\ attribute \\ \min y_{ij} ; if\ j\ is\ the\ profit\ attribute \end{cases}$$

Fourth, calculated the distance with the ideal solution. Finally, the distance of the alternative with the positive ideal solution is calculated using formula 8.

$$D_i^+ = \sqrt{\sum_{i=1}^{n} (y_{ij}^+ - y_{ij})^2} \quad (8)$$

The distance of the alternative with the negative ideal solution was calculated using formula 9.

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$$D_i^- = \sqrt{\sum_{i=1}^{n}\left(y_{ij} - y_j^-\right)^2} \quad (9)$$

Fifth, determined the preference value for each alternative. The preference value for each alternative was given like formula 10.

$$Vi = \frac{D_i^-}{D_i^- + D_i^+} \quad (10)$$

The AHP method was used as the basis for the first process, whose input value comes from the user and gets the priority weight value of the criteria to be processed by calculation using the second method, namely the TOPSIS method [24] [25].

3. Results and Discussions

3.1 AHP Method Calculation

Manual calculations with the application of the AHP method to obtain the weight of the criteria by using input from the administrator in the form of several value scales for the benefit of the criteria, as given in Table 3.7, are described below. The following is the method used to obtain the weight of the criteria by using AHP calculations:

First, the criteria considered are labour (C1), production capacity (C2), investment value (C3), production value (C4), and raw materials (C5).

Second, creating a paired matrix, i.e. a paired matrix, is consulted by utilizing information from the admin in the form of a criteria importance value scale, shown in Table 4.

Table 4. Paired Matrix

Criteria	C1	C2	C3	C4	C5
C1	1	0,5000	0,1111	2	0,2500
C2	2	1	0,3333	3	0,3333
C3	9	3	1	8	5
C4	1	0,3333	0,125	1	0,3333
C5	4	3	0,2	3	1

The importance of the criteria grading scale that forms the paired matrix of the five criteria is calculated in Table 4.

Third, summing the column values in the matrix at this stage, the values of each paired matrix column in Table 4 are summed up to give the result presented in Table 5.

Table 5. Matrix Column Summation

Criteria	C1	C2	C3	C4	C5
C1	1	0,5000	0,1111	2	0,2500
C2	2	1	0,3333	3	0,3333
C3	9	3	1	8	5
C4	0,5000	0,3333	0,125	1	0,3333
C5	4	3	0,2000	3	1
Total	16,5	7,8333	1,7694	17	6,9167

Table 5 is the Sum of values of each paired matrix column of the five criteria.

Fourth, the calculation of Relative Priority at this stage, Relative Priority was calculated by dividing each column in Table 5 by the number of columns to regenerate the normalized matrix, which was further summed and divided by the number of criteria.

The calculation result shows the normalization matrix in and the Relative Priority C1 to C5 results detailed in Table 6.

Table 6. Relative Priority

Criteria	(C1)	(C2)	(C3)	(C4)	(C5)	Value Eigen	Relative Priority
(C1)	0,0606	0,0638	0,0628	0,1176	0,0361	0,3410	0,0682
(C2)	0,1212	0,1277	0,1884	0,1764	0,0482	0,6619	0,1324
(C3)	0,5455	0,3830	0,5651	0,4705	0,7229	2,6871	0,5374
(C4)	0,0303	0,0426	0,0706	0,0588	0,0482	0,2505	0,0501
(C5)	0,2424	0,3830	0,1130	0,1764	0,1446	1,0595	0,2119
Jumlah	16,5	7,8333	1,7694	17	6,9167		

The results of the normalization matrix and the relative priority of C1 to C5 are presented in Table 6.

Fifth, calculated the maximum calculation was carried out at this stage to determine in Table 6 using the formula of equation 1.

$$\lambda_{max} = \sum \lambda_{max}$$

$$\lambda_{max} = total\ colomn\ of\ C_i * relative\ priority\ of\ C_i, i = 1,2,\dots,n$$

Sixth, determined the consistency of the index using the formula of equation 2.

The results of the calculations presented in Table 7 were derived based on the procedures that had been carried out.

The result calculations to obtain the maximum lambda, consistency index (CI), and consistency ratio are shown in Table 8 (CR).

The weight of the criteria used for calculating the TOPSIS method is described in the Table 8.

3.2 TOPSIS Method Calculation

This section describes the procedure for applying TOPSIS in evaluating SMIS to obtain alternative priority rankings using the weighting criteria in Table VI Relative Priority, as follows:

Table 7. AHP results

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Criteria	(C1)	(C2)	(C3)	(C4)	(C5)	Eigen Value	Relative Priority
(C1)	0,0606	0,0638	0,0628	0,1176	0,0361	0,341	0,0682
(C2)	0,1212	0,1277	0,1884	0,1764	0,0482	0,6619	0,1324
(C3)	0,5455	0,383	0,5651	0,4705	0,7229	2,6871	0,5374
(C4)	0,0303	0,0426	0,0706	0,0588	0,0482	0,2505	0,0501
(C5)	0,2424	0,383	0,113	0,1764	0,1446	1,0595	0,2119
Total	16,5	7,8333	1,7694	17	6,9167		
			Lamda Max				5,4307
			CI				0,1077
			CR				0,0961

Table 8. Weighting Criteria

No.	Criteria	Weighting Criteria
1	C1	0,0682
2	C2	0,1324
3	C3	0,5374
4	C4	0,0501
5	C5	0,2119

This study forms a match rating matrix based on the type of commodity chosen. In this example of TOPSIS calculation filtered based on craft commodities, a match rating matrix for craft commodities is obtained, presented in Table 8.

Table 8. Craft Commodity Match Rating Matrix

No	SMIS	C1	C2	C3	C4	C5
1	A1	15	3600	19500	78000	54000
2	A2	25	300	12500	81000	42000
3	A3	3	120	150	7380	4560
4	A4	1	180	150	960	780
5	A5	15	3000	6000	375000	66000
6	A6	10	144	6000	126960	11760
7	A7	2	156	300	68280	4680
8	A8	1	180	300	6480	2880
9	A9	3	900	1500	64800	27000
10	A10	38	3600	200	5400	960

Table 8. is the result of calculating the match rating matrix on handicraft commodities.

Second, determined the matrix of ternormalisas decisions with steps to determine the normalized decision matrix using the formula of equation 4.

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

Table 9. Normalized Decision Matrix

No.	SMIs	C1	C2	C3	C4	C5
1	A1	0,2918	0,6005	0,7889	0,1847	0,5412
2	A2	0,4863	0,05	0,5057	0,1918	0,4209
3	A3	0,0584	0,02	0,0061	0,0175	0,0457
4	A4	0,0195	0,03	0,0061	0,0023	0,0078
5	A5	0,2918	0,5004	0,2427	0,8879	0,6615
6	A6	0,1945	0,024	0,2427	0,3006	0,1179
7	A7	0,0389	0,026	0,0121	0,1617	0,0469
8	A8	0,0195	0,03	0,0121	0,0153	0,0289
9	A9	0,0584	0,1501	0,0607	0,1534	0,2706
10	A10	0,7392	0,6005	0,0081	0,0128	0,0096

Third, calculated the weighted normalized decision matrix using the equation 5 formula, calculate the weighted normalized decision matrix. $y_{ij} = w_i . r_{ij}$

Table 10. Weighted Normalized Decision Matrix

No.	SMIS	C1	C2	C3	C4	C5
1	A1	0,0199	0,0795	0,4239	0,0093	0,1147
2	A2	0,0332	0,0066	0,2718	0,0096	0,0892
3	A3	0,004	0,0027	0,0033	0,0009	0,0097
4	A4	0,0013	0,004	0,0033	0,0001	0,0017
5	A5	0,0199	0,0663	0,1304	0,0445	0,1402
6	A6	0,0133	0,0032	0,1304	0,0151	0,025
7	A7	0,0027	0,0034	0,0065	0,0081	0,0099
8	A8	0,0013	0,004	0,0065	0,0008	0,0061
9	A9	0,004	0,0199	0,0326	0,0077	0,0573
10	A10	0,0504	0,0795	0,0043	0,0006	0,002

Fourth, looked for positive and negative ideal solutions to obtain positive and negative ideal solutions and used the formulas of equations 6 and 7 to calculate the maximum and lowest values for the column of the weighted normalized decision matrix, with the results shown in Table 11.

$$A^+ = (y_1^+, y_2^+ \ldots., y_n^+)$$

$$A^- = (y_1^-, y_2^- \ldots., y_n^-)$$

Table 11. Ideal Positive and Ideal Solutions to Negative Commodity Crafts

	C1	C2	C3	C4	C5
A Positif	0,0504	0,0795	0,4239	0,0445	0,1402
A Negatif	0,0013	0,0027	0,0033	0,0001	0,0017

Positive and negative ideal solutions for craft commodities are calculated in Table 11.

Fifth, determined the distance between positive and negative alternative values, that was, by using the formula of equation 8, determine the distance between positive and negative alternative values for each alternative.

$$D_i^+ = \sqrt{\sum_{i=1}^{n} (y_{ij}^+ - y_{ij})^2}$$

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Table 12. Distance of positive alternative values

No.	SMIs	C1	C2	C3	C4	C5	Distance
1	A1	0,0009	0	0	0,0012	0,0006	0,0531
2	A2	0,0003	0,0053	0,0232	0,0012	0,0026	0,1805
3	A3	0,0022	0,0059	0,177	0,0019	0,017	0,4516
4	A4	0,0024	0,0057	0,177	0,002	0,0192	0,4541
5	A5	0,0009	0,0002	0,0861	0	0	0,2954
6	A6	0,0014	0,0058	0,0861	0,0009	0,0133	0,3278
7	A7	0,0023	0,0058	0,1742	0,0013	0,017	0,4479
8	A8	0,0024	0,0057	0,1742	0,0019	0,018	0,4497
9	A9	0,0022	0,0036	0,1531	0,0014	0,0069	0,4087
10	A10	0	0	0,1761	0,0019	0,0191	0,4439

Determining the negative alternative distance using the formula of equation 9. $D_i^- = \sqrt{\sum_{i=1}^{n}\left(y_{ij} - y_j^-\right)^2}$

Table 13. Distance of negative alternative values

No.	SMIs	C1	C2	C3	C4	C5	Distance
1	A1	0,0003	0,0059	0,177	0	0,0131	0,4428
2	A2	0,001	0	0,0721	0	0,0079	0,2844
3	A3	0	0	0	0	0,0001	0,0085
4	A4	0	0	0	0	0	0,0013
5	A5	0,0003	0,004	0,0162	0,0017	0,0196	0,2043
6	A6	0,0001	0	0,0162	0,0001	0,0006	0,1307
7	A7	0	0	0	0	0,0001	0,0121
8	A8	0	0	0	0	0	0,0057
9	A9	0	0,0003	0,0009	0	0,0033	0,0658
10	A10	0,0024	0,0059	0	0	0	0,0912

Sixth, calculated the difference between positive and negative alternative values using the following formula to get the preference value on each option: the negative alternative distance divided by the sum of the positive and negative alternative distances.

$$Vi = \frac{D_i^-}{D_i^- + D_i^+}$$

The results of the preference calculation for each alternative were generated based on the stages completed and are presented in Table 14.

Table 14.Comparison of Handicraft Commodities

No.	SMIs	Preference Value (V)	*Ranking*
1	A1	0,89289	1
2	A2	0,611721015	2
3	A5	0,408805869	3
4	A6	0,285051209	4
5	A10	0,170426958	5
6	A9	0,138572234	6
7	A7	0,026217279	7
8	A3	0,018449724	8
9	A8	0,012557916	9
10	A4	0,002909202	10

Table 14 is the result of calculating the match rating matrix with reference values and rankings for handicraft commodities. The results of alternative rankings are: Fashion Bags (A1) is in the 1st, Doyo Woven Fabric (A2) is in the 2nd place, Statue (A5) is in the 3rd place, Traditional Clothing (A6) is in the 4th, Rattan Bracelet (A10) is in the 5th, Big Bead Wallet (A9) is in the 6th, Machete (A7) is in the 7th, Anjat (A3) is in the 8th, Berangka (A8) is in the 9th, and Bead Shell (A4) is in the 10th.

3.3 System Implementation

This study's AHP and TOPSIS decision support systems were website-based and used the PHP programming language and MySQL database. Therefore, this application can facilitate integrating the AHP and TOPSIS methods in prioritizing the development of small and medium-sized industries in West Kutai.

First, on the input page, the criteria importance scale on the criteria importance scale input page is presented in Figure 2.

In Figure 2, the user inputs the criteria importance scale to obtain the weight of the criteria.

Second, on the SMIS alternative selection page, the SMIS alternative selection is presented in Figure 3.

In Figure 3, the user chose an alternative SMIS craft that was processed for ranking.

Third, the user output page, i.e. on the user output page, is presented in Figure 5.

Figure 4 contains the acquisition of alternative rankings of handicraft SMIS along with information on the number of workers, production capacity, investment value, production value, and raw materials. The result of ranking the alternatives is displayed according to the value of the preference obtained. Furthermore, alternative ranking results can be printed.

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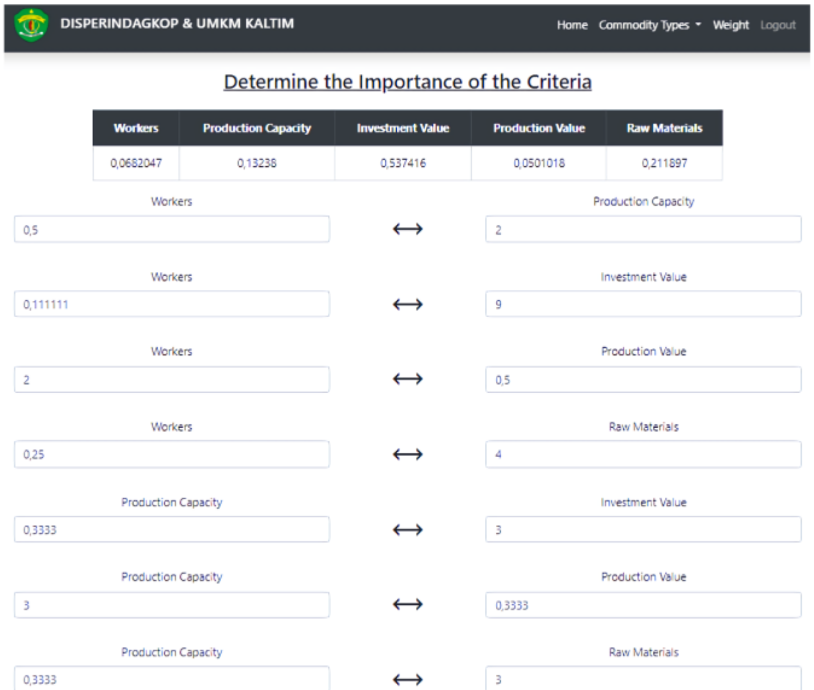


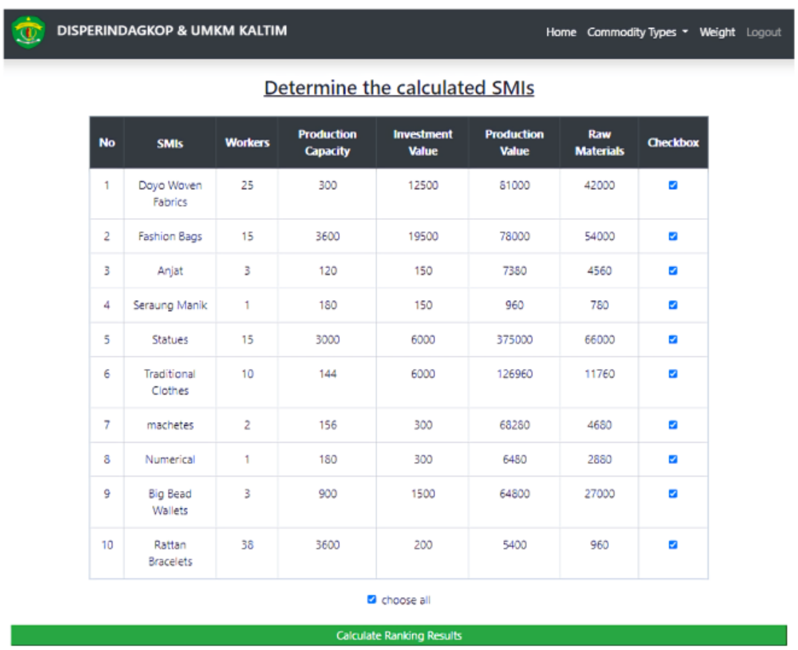
DISPERINDAGKOP & UMKM KALTIM — Home | Commodity Types | Weight | Logout

Determine the Importance of the Criteria

Workers	Production Capacity	Investment Value	Production Value	Raw Materials
0,0682047	0,13238	0,537416	0,0501018	0,211897

Criterion	Value		Criterion	Value
Workers	0,5	⟷	Production Capacity	2
Workers	0,111111	⟷	Investment Value	9
Workers	2	⟷	Production Value	0,5
Workers	0,25	⟷	Raw Materials	4
Production Capacity	0,3333	⟷	Investment Value	3
Production Capacity	3	⟷	Production Value	0,3333
Production Capacity	0,3333	⟷	Raw Materials	3

Figure 2. Criteria of Importance Scale Input Page



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Determine the calculated SMIs

No	SMIs	Workers	Production Capacity	Investment Value	Production Value	Raw Materials	Checkbox
1	Doyo Woven Fabrics	25	300	12500	81000	42000	☑
2	Fashion Bags	15	3600	19500	78000	54000	☑
3	Anjat	3	120	150	7380	4560	☑
4	Seraung Manik	1	180	150	960	780	☑
5	Statues	15	3000	6000	375000	66000	☑
6	Traditional Clothes	10	144	6000	126960	11760	☑
7	machetes	2	156	300	68280	4680	☑
8	Numerical	1	180	300	6480	2880	☑
9	Big Bead Wallets	3	900	1500	64800	27000	☑
10	Rattan Bracelets	38	3600	200	5400	960	☑

☑ choose all

Calculate Ranking Results

Figure 3. SMIs Alternative Selection Page

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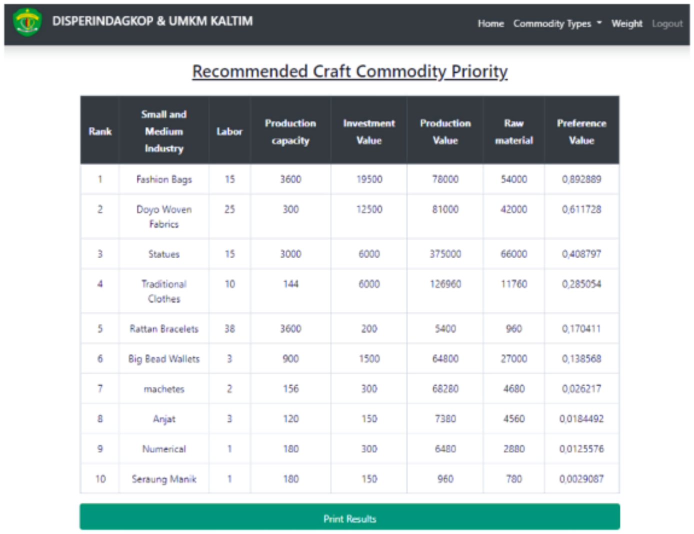

Rank	Small and Medium Industry	Labor	Production capacity	Investment Value	Production Value	Raw material	Preference Value
1	Fashion Bags	15	3600	19500	78000	54000	0,892889
2	Doyo Woven Fabrics	25	300	12500	81000	42000	0,611728
3	Statues	15	3000	6000	375000	66000	0,408797
4	Traditional Clothes	10	144	6000	126960	11760	0,285054
5	Rattan Bracelets	38	3600	200	5400	960	0,170411
6	Big Bead Wallets	3	900	1500	64800	27000	0,138568
7	machetes	2	156	300	68280	4680	0,026217
8	Anjat	3	120	150	7380	4560	0,0184492
9	Numerical	1	180	300	6480	2880	0,0125576
10	Seraung Manik	1	180	150	960	780	0,0029087

Figure 4. User Output Page

3.4 Precision and Accuracy Testing

The confusion matrix method was used in testing to rank results. A confusion matrix is a prediction matrix that will be compared with the original input data. This formula performs calculations with two outputs: precision and accuracy. Table 15 shows the values in the confusion matrix [26].

Table 15. Confusion Matrix

Real	Data		
	feasible	Non-feasible	Total
feasible	10	2	12
Non feasible	2	98	100

The values from Table 15 are the values that match the data in the TOPSIS method with the real data. Real data is feasible, and TOPSIS data is feasible to have similarities, namely as many as 10 data. If real data is feasible and TOPSIS data is not as feasible as 2, then real data is not feasible. If TOPSIS data is feasible as much as 2, and real data is not feasible, then TOPSIS data is not as much as 98 data. From Table 15, the following calculations of the values of precision and accuracy are carried out.

$$\text{Precision: } \left(\frac{TP}{TN+TP}\right) \quad (11)$$

$$Precision = \frac{(10)}{(10+2)} = \frac{10}{12} = 0{,}83333 = 83{,}3\ \%$$

$$\text{Accuracy: } \left(\frac{TP+FN}{FN+FP+TN+TP}\right) \quad (12)$$

$$Accuracy = \frac{(10+98)}{(10+2+98+2)} = \frac{108}{112} = 0{,}964286 = 96{,}4\ \%$$

The following are the results of the accuracy and Precision values in the AHP-TOPSIS method, which are presented in Table 16.

Table 16. Precision and Accuracy Values

Value	Result
Precision	0,8333
Accuracy	0,9642

In Table 16, a Precision value of 83.3% is obtained and the Accuracy value of 96.4%.

4. Conclusion

The results of the survey above conclude that the analysis of the decision support system by applying the Analytical Hierarchy Process (AHP) and the Technique for Other Reference by Similarity to Ideal Solution (TOPSIS) were successfully applied. The AHP approach obtained a CR score of 0.0961 or <0.1, which indicates that the hierarchy of the scale of importance of the criteria is said to be consistent, allowing the use of AHP paired matrices. The TOPSIS approach can be used to consult alternative rankings of small and medium-sized sectors, with the result alternative rankings, namely the results alternative rankings are: Fashion Bags (A1) is in the 1st, Doyo Woven Fabric (A2) is in the 2nd place, Statue (A5) is in the 3rd place, Traditional Clothing (A6) is in the 4th, Rattan Bracelet (A10) is in the 5th, Big Bead Wallet (A9) is in the 6th, Machete (A7) is in the 7th, Anjat (A3) is in the 8th, Berangka (A8) is in the 9th, and Bead Shell (A4) is in the 10th. The test result using the confusion matrix obtained a Precision value of 83.3% and an Accuracy value of 96.4%. The results showed that integration of AHP and TOPSIS methods was successfully applied in

Small and Medium Industries Development Decision Making.

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