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Decision Support System in Determining the Optimal Raw Material Supplier Using a Combination of Entropy and MOORA

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Abstract

The selection of the right raw material supplier plays a crucial role in ensuring the efficiency and sustainability of supply chain management. However, the decision-making process is often complex due to the multiple criteria that must be considered simultaneously, such as quality, price, delivery timeliness, production capacity, and flexibility. To address this challenge, this study applies a decision support system that integrates the Entropy method for objective weighting of criteria and the MOORA method for ranking alternatives. Entropy weighting provides an unbiased determination of the importance of each criterion based on data variation, while MOORA delivers a systematic ranking of suppliers by combining benefit and cost criteria into a comprehensive performance score. The results of the analysis on eight supplier alternatives show that Supplier S8 achieves the highest ranking, followed by Supplier S3 and Supplier S6, indicating their superior ability to meet the defined criteria, especially in capacity and flexibility. Meanwhile, Supplier S4 ranks the lowest, reflecting its relatively weaker performance across several aspects. These findings demonstrate that the combination of Entropy and MOORA provides a reliable, objective, and transparent framework to support decision-making in supplier selection.

Introduction

Choosing the right raw material supplier is a key factor in maintaining a smooth supply chain. A reliable supplier not only ensures consistent availability of raw materials but also guarantees the quality of products according to the standards set by the company[1], [2]. This is very important because the quality of raw materials has a direct impact on the quality of the final product produced. Furthermore, suppliers that are competitive in pricing and efficient in delivery can help companies reduce operational costs, increase productivity, and strengthen their competitive position in the market. Furthermore, the selection of the right supplier can create long-term mutually beneficial business relationships. Good collaboration with suppliers can support innovation, production flexibility, and quick responses to changes in market demand or supply chain disruptions. Conversely, mistakes in choosing suppliers can pose risks such as delays in distribution, increased production costs, and damage to the company's reputation. Therefore, the process of evaluating and selecting suppliers needs to be carried out systematically, considering aspects of quality, price, timeliness, capacity, and commitment to sustainability.

Determining the best supplier is not a simple matter as it involves many criteria that must be considered simultaneously[3]. Companies do not only assess based on price, but must also pay attention to the quality of raw materials, timeliness of delivery, flexibility in meeting demand, and the after-sales service offered. Furthermore, factors such as sustainability, compliance with regulations, and the financial stability of suppliers are also important aspects that influence the decision. This complexity increases when companies have many alternative suppliers, so the decision-making process needs to be more careful and structured. Another challenge that arises is how to balance each criterion that often contradicts each other. For example, a supplier with a low price does not necessarily have the best quality or high delivery punctuality. Likewise, a supplier that excels in quality might offer a higher price. This condition requires companies to use an objective and systematic evaluation approach, often with the help of multi-criteria decision-making (MCDM) methods[4]–[6], to assess suppliers fairly and comprehensively. Thus, the main challenge lies in how to set the priority of criteria that align with the strategic needs of the company while minimizing risks in the supply chain.

Decision Support Systems (DSS) play a very important role in assisting multi-criteria decision-making, especially in complex situations such as supplier selection, employee recruitment, and performance evaluation[7]–[9]. DSS enables decision-makers to process various data and information from multiple criteria in a more systematic, objective, and structured manner. With the presence of DSS, the evaluation process does not solely rely on intuition or experience, but is based on quantitative methods that can minimize subjectivity and enhance the accuracy of decision outcomes. In addition, DSS also provide flexibility for decision-makers to conduct simulations and sensitivity analyses, allowing them to see how changes in the weights or priorities of criteria affect the final outcomes[10]. This enables decision-makers to better understand the consequences of each chosen alternative. Thus, DSS not only helps accelerate the decision-making process but also improves the quality of decisions by considering various aspects comprehensively.

Developing a DSS for the optimal selection of raw material suppliers is a strategic step for companies in strengthening their supply chain. This system is designed to integrate various important criteria, such as product quality, price, timeliness of delivery, production capacity, flexibility, and commitment to sustainability. With the presence of the DSS, the supplier evaluation process can be conducted more transparently, objectively, and measurably, allowing the company to choose the partner that best fits its operational needs and long-term strategic goals. In addition, the DSS can also be equipped with MCDM methods such as AHP, TOPSIS, or objective weighting methods like Entropy and CRITIC, which can systematically process data to produce supplier rankings. This system not only aids in the initial selection but can also be used as a tool for continuously monitoring supplier performance. Thus, the development of the DSS for optimal raw material supplier selection can minimize risks, enhance cost efficiency, and ensure that the quality of the supply chain remains consistently maintained.

The Entropy Method is one of the objective approaches in weighting criteria that is widely used in decision support systems[11]–[13]. The main concept of this method is to measure the level of uncertainty or variation of information in each criterion. The greater the variation in the values of a criterion among alternatives, the more significant the contribution of that criterion is considered to be, and it will be given a higher weight. Conversely, if the values of a criterion are relatively uniform, then its contribution is small and the weight assigned is lower. Thus, the Entropy Method helps reduce subjectivity in determining criterion weights, as weighting is entirely based on existing data. The results of the entropy weighting are then used in the multi-criteria decision-making method to produce a more objective and accurate ranking of alternatives. In this way, the Entropy method plays an important role in ensuring that each criterion is evaluated according to its contribution to the differences among alternatives.

Multi-Objective Optimization based on Ratio Analysis (MOORA) is a simple yet effective technique in MCDM for ranking suppliers. The advantage of the MOORA method lies in its simplicity, flexibility, and accuracy in solving multi-criteria decision-making problems[5], [14]. This method is easy to understand and implement because its calculation process is relatively simple, starting from data normalization, weighting, to calculating the final value to determine the ranking of alternatives. In addition, MOORA is capable of accommodating criteria with both benefit and cost characteristics in a balanced manner, resulting in a ranking that is more realistic and in accordance with actual conditions. Compared to other methods, MOORA is also known to be efficient in processing data with a large number of alternatives and criteria, without compromising the accuracy of its results. Another advantage is the transparency of the calculation results which allows decision makers to easily trace the assessment process, making this method often chosen in various decision support system studies, including supplier selection, performance evaluation, and business strategy determination.

The combination of Entropy and MOORA is an effective approach in decision support systems, particularly for supplier selection or evaluating other alternatives involving multiple criteria. The Entropy method is used in the early stages to determine the weights of criteria objectively based on the variation of data among alternatives. Thus, each criterion is assigned a weight according to its level of contribution to the differences in alternative values, minimizing subjectivity in weighting. The weights derived from Entropy are then used in the MOORA method to provide a more accurate and measurable assessment of each alternative. The integration of Entropy and MOORA can produce more comprehensive, fair, and reliable decisions in supplier selection and other multi criteria decision-making contexts.

The purpose of implementing the combination of Entropy and MOORA methods is to produce a decision support system that is more objective, accurate, and efficient in the raw material supplier selection process, by ensuring that the weight of criteria is determined based on variations of real data through Entropy and that the ranking of alternatives is carried out transparently using MOORA. The main contribution of this research or the implementation of this method is to provide an approach that can minimize subjectivity in weighting, simplify the complex multi-criteria evaluation process, and produce more fair and reliable ranking results. Thus, the combination of Entropy and MOORA not only assists companies in selecting the best suppliers but also strengthens supply chain efficiency and enhances sustainable competitiveness.

Research Method

The stages of research are defined as a series of systematic steps arranged in a sequential manner to achieve research objectives and answer the established problem formulation[15], [16]. Each stage generally includes problem identification, setting research objectives, collecting relevant data, selecting and applying methods or analysis models, processing data, interpreting results, and drawing conclusions and making recommendations. With the existence of structured research stages, the research process becomes more directed, objective, and accountable, so that the results obtained have high validity and reliability. The stages of the research conducted are shown in Figure 1.

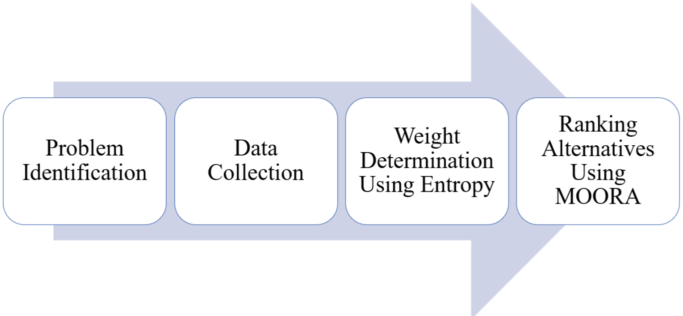

Figure 1. Research Stage

The research stages in Figure 1 begin with problem identification, namely the need for companies to determine the best raw material suppliers objectively and measurably to maintain quality and supply chain efficiency. Next, data collection is conducted in the form of supplier performance assessments based on relevant criteria, such as quality, price, timeliness, and capacity. This data is then analyzed by determining weights using the Entropy method, which calculates the degree of variation in each criterion, allowing weights to be determined objectively without being influenced by the subjectivity of decision-makers. The final stage involves ranking alternatives using the MOORA method, where the weighted data is processed to calculate the performance value of each supplier, thus obtaining a priority order of the best suppliers that can be used as a basis for decision-making.

A. Entropy Method

The Entropy method is an objective weighting technique in MCDM based on the concept of information theory. The main principle of this method is to measure the level of uncertainty or diversity of data in each criterion. Criteria that have more varying values among alternatives are considered more influential in distinguishing one alternative from another, thus they will have a larger weight. Conversely, if the values of a criterion are relatively uniform, then the information produced is small and the weight is lower. Thus, the Entropy method can reduce subjectivity in determining criterion weights.

The first step is to create a decision matrix that contains the evaluation data of alternatives against the criteria. This decision matrix serves as the basis for further calculations.

$$X\left[x_{11} \ \cdots \ x_{n1} \ \vdots \ \ddots \ \vdots \ x_{1m} \ \cdots \ x_{nm}\right] \quad (1)$$

The values in the decision matrix are then normalized so that each criterion is on the same scale. This is done to avoid unfairness due to differences in measurement units among criteria.

$$k_{ij} \frac{x_{ij}}{\sum_{j=1}^{n} x_{ij}} \quad (2)$$

From the normalized data, the Entropy value is calculated for each criterion. This value indicates the level of uncertainty or diversity of information from that criterion.

$$E_j - \frac{1}{\ln ln\, m} \sum_{i=1}^{n} k_{ij} \ln ln\, (k_{ij}) \quad (3)$$

Entropy value is used to determine the degree of differentiation of each criterion, which describes how much the criterion contributes to distinguishing alternatives.

$$D_j 1 - E_j \quad (4)$$

The final stage is to calculate the criterion weights based on the degree of differentiation obtained. These weights are then used in multi-criteria decision-making methods.

$$w_j \frac{D_j}{\sum_{j=1}^{n} D_j} \quad (5)$$

The Entropy Method can be concluded as an objective criterion weighting approach because all of its calculations are based on existing data variations, not on the subjective assessment of decision-makers. The Entropy Method provides a strong and transparent basis for determining criterion weights that can then be used in other multi-criteria decision-making methods, resulting in outcomes that are more fair, accurate, and reliable.

B. MOORA Method

The MOORA method is one of the MCDM techniques used to evaluate and rank alternatives based on multiple criteria. MOORA is known for being simple, easy to understand, and efficient in data processing, yet still capable of producing accurate decisions.

The first step is to create a decision matrix that contains the evaluation scores of each alternative against the established criteria using equation (1).

The data in the decision matrix is then normalized so that all criteria have a comparable and fair scale for comparison.

$$x_{ij}^{*} = \frac{x_{ij}}{\sqrt{\left[\sum_{i=1}^{j} x_{ij}^{2}\right]}} \quad (6)$$

The normalized value is then multiplied by the criterion weights to account for their relative importance. Next, the optimization value is calculated by summing the weighted values of the benefit criteria and subtracting the weighted values of the cost criteria. The result of this calculation yields a performance value for each alternative.

$$y_i \sum_{j=1}^{n} w_j * x_{ij}^{*} - \sum_{j=g+1}^{n} w_j * x_{ij}^{*} \quad (7)$$

The MOORA method provides a simple yet effective approach in the multi criteria decision-making process. The main advantage of this method is its simplicity in calculations and its ability to accommodate both benefit and cost criteria in a balanced way, resulting in decisions that are more objective, accurate, and can serve as a strong basis for strategic decision-making.

Result and Discussion

DSS plays an important role in helping companies face the complexities of decision-making, especially in selecting raw material suppliers. Optimal supplier selection does not focus solely on one aspect, but must consider various criteria such as quality, price, delivery timeliness, flexibility, and production capacity. This complexity poses challenges for managers in determining the most appropriate choice, hence a systematic and measurable approach is needed that can process information objectively and produce reliable recommendations. The combination of Entropy and MOORA methods emerges as an effective solution. The Entropy method is used to determine the weights of criteria objectively based on data variation, thus reducing subjectivity in the evaluation process. Meanwhile, the MOORA method plays a role in the ranking stage, where supplier alternatives are evaluated simply yet transparently to determine the best priority. The integration of these two methods provides advantages in the form of more accurate, fair, and easily understood decisions, making it highly relevant to support companies in determining optimal raw material suppliers to maintain the smoothness of the supply chain and enhance competitiveness in the market.

A. Problem Identification

In the process of supply chain management, companies often face challenges in determining the optimal raw material suppliers. This challenge arises because there are many criteria that must be considered simultaneously, ranging from the quality of raw materials, price, delivery timely, production capacity, to flexibility in meeting the company's needs. The complexity increases when there are many supplier alternatives, each with its own strengths and weaknesses. This situation makes the decision-making process difficult if it relies solely on intuition or experience, as it risks leading to inaccuracies in supplier selection that can impact the quality of the final product as well as operational efficiency. In addition, another issue that arises is the determination of criterion weights which is often done subjectively by decision-makers. This can potentially lead to bias and reduce the objectivity of the evaluation results. On the other hand, traditional evaluation systems that only emphasize certain aspects, such as price or quality, have not been able to provide a comprehensive picture of supplier performance. Therefore, a decision support system approach is needed, with methods that can objectively determine criterion weights and transparently rank alternatives. This approach is expected to help companies identify the best suppliers more accurately and comprehensively.

B. Data Collection

The Data Collection stage in supplier selection research is an important step to obtain relevant and accurate information as a basis for analysis. At this stage, data is collected regarding alternative suppliers and the assessment criteria used, such as the quality of raw materials, price, timely delivery, production capacity, and flexibility in meeting demands. Data can be obtained from various sources, including the company's internal documents, records of previous supplier performance, interviews with procurement managers, or assessment surveys from related parties. Thus, the collected data will represent the actual conditions that can be used in the decision-making process. In addition to collecting supplier performance data, this stage also includes a validation process to ensure that the data used is consistent, complete, and error-free. Validation is necessary so that the analysis results are not biased and truly reflect the performance of each supplier. The results of the assessment data collection are displayed in Table 1.

Table 1. Assessment Data

Supplier	Criteria				
	Quality of Raw Materials	***Price***	***Delivery Punctuality***	***Production Capacity***	***Flexibility***
S1	8.6	9.8	92	520	8
S2	7.9	9.2	88	480	7
S3	9.1	10.5	95	600	9
S4	8	8.9	85	450	6
S5	7.5	8.3	80	430	7
S6	8.8	9.9	90	560	8
S7	8.2	9	86	500	7
S8	8.9	10.2	93	610	9

This research gathers evaluation data of eight raw material suppliers based on five main criteria, namely the quality of raw materials, price, on-time delivery, production capacity, and flexibility in meeting demand. Of these five criteria, only Price is cost criterion, as the lower the value, the better it is for the company. This is different from the other criteria which are benefit criteria, such as the quality of raw materials, on-time delivery, production capacity, and supplier flexibility, where a higher value reflects better supplier performance. The data used in this research is sourced directly from the company that is the object of the study. The data was obtained through internal documents and management's assessment of the performance of raw material suppliers. Thus, the data used is real and relevant to the company's operational conditions, so the analysis results reflect the actual situation on the ground. This approach also strengthens the validity of the research because the decisions derived from the combination of Entropy and MOORA methods are based on actual data that is truly used in the company's decision-making process.

C. Weight Determination Using Entropy

Weight Determination Stages Using Entropy, the analysis process focuses on determining the criteria weights objectively based on the variation of supplier assessment data. Unlike subjective methods that rely on the intuition or preferences of decision-makers, Entropy measures the level of information from each criterion to assess how much it contributes to differentiating alternatives. Criteria with high value differences among suppliers will receive a higher weight as they are considered more informative, while criteria with relatively uniform values will have a lower weight. With this approach, the weights produced truly reflect the characteristics of the data, thus reducing bias in decision-making.

The first step is to create a decision matrix that contains the evaluation data of alternatives against the criteria. This decision matrix serves as the basis for further calculations using equation (1).

$X[8.6\ 9.8\ 92\ 7.9\ 9.2\ 88\ 9.1\ 9.5\ 95\ \ 520\ 8\ 480\ 7\ 600\ 9\ \ 8\ 8.9\ 85\ 7.5\ 8.3\ 80\ 8.8\ 9.4\ 90\ \ 450\ 6\ 430\ 7\ 560\ 8\ \ 8.2\ 9\ 86\ 8.9\ 9.5$

The values in the decision matrix are then normalized so that each criterion is on the same scale. This is done to avoid unfairness due to differences in measurement units among criteria using equation (2).

$$k_{11} \frac{x_{11}}{\sum_{j=1}^{8} x_{1j}} \frac{8.6}{8.6+7.9+9.1+8+7.5+8.8+8.2+8.9} \frac{8.6}{67}\ 0.1284$$

The overall results of the normalization values using the entropy method are shown in Table 2.

Table 2. Normalization Value of Entropy Method

Supplier	Criteria				
	Quality of Raw Materials	***Price***	***Delivery Punctuality***	***Production Capacity***	***Flexibility***
S1	0.1284	0.1332	0.1298	0.1253	0.1311
S2	0.1179	0.1250	0.1241	0.1157	0.1148
S3	0.1358	0.1291	0.1340	0.1446	0.1475
S4	0.1194	0.1209	0.1199	0.1084	0.0984
S5	0.1119	0.1128	0.1128	0.1036	0.1148
S6	0.1313	0.1277	0.1269	0.1349	0.1311
S7	0.1224	0.1223	0.1213	0.1205	0.1148
S8	0.1328	0.1291	0.1312	0.1470	0.1475

From the normalized data, the Entropy value is calculated for each criterion. This value indicates the level of uncertainty or diversity of information from that criterion using equation (3).

$$E_1 - \frac{1}{\ln ln\ 8} \sum_{i=1}^{8} k_{1j} \ln ln\ (k_{1j})\ \ - 0.4809 * (- 2.0775)\ 0.9991$$

The overall results of the entropy values that have been calculated using the entropy method are shown in Table 3.

Table 3. Entropy Values

	Criteria				
	Quality of Raw Materials	***Price***	***Delivery Punctuality***	***Production Capacity***	***Flexibility***
E_i	0.9991	0.9995	0.9994	0.9965	0.9959

Entropy value is used to determine the degree of differentiation of each criterion, which describes how much the criterion contributes to distinguishing alternatives using equation (4).

$$D_1 1 - E_1 1 - 0.9991\ 0.0009$$

The overall results of the degree of differentiation of each criterion using the entropy method are shown in Table 4.

Table 4. Degree of Differentiation of each Criterion

	Criteria				
	Quality of Raw Materials	***Price***	***Delivery Punctuality***	***Production Capacity***	***Flexibility***
D_j	0.0009	0.0005	0.0006	0.0035	0.0041

The final stage is to calculate the criterion weights based on the degree of differentiation obtained. These weights are then used in multi-criteria decision-making methods using equation (5).

$$w_1 \frac{D_1}{\sum_{j=1}^{5} D_j} \frac{0.0009}{0.0097} 0.0975$$

The overall results of the criterion weights using the entropy method are shown in Table 5.

Table 5. Criterion Weights

	Criteria				
	Quality of Raw Materials	***Price***	***Delivery Punctuality***	***Production Capacity***	***Flexibility***
w_j	0.0975	0.0564	0.0668	0.3576	0.4216

The results of applying the Entropy method on the evaluation data of eight raw material suppliers show a diverse weight distribution for each criterion. Production capacity and flexibility have the highest weights because the variation in their data is more pronounced compared to other criteria, thus playing a significant role in differentiating supplier performance. In contrast, quality and timeliness have relatively smaller weights, indicating that these criteria tend to be uniform among the evaluated suppliers. These findings affirm that the Entropy method is capable of highlighting the most important aspects in supplier evaluation, which will later serve as a basis for the ranking stage using the MOORA method.

D. Ranking Alternatives Using MOORA

The application of the MOORA method in this research was carried out to rank eight alternative suppliers based on five predetermined criteria, namely raw material quality, price, on-time delivery, production capacity, and flexibility in meeting demand. Through this stage, the MOORA method is able to provide objective, transparent, and easily understandable rankings, thus serving as a basis for making strategic decisions related to the selection of the most suitable raw material suppliers for the company's needs.

The first step is to create a decision matrix that contains the evaluation scores of each alternative against the established criteria using equation (1).

$$X[8.6\ 9.8\ 92\ 7.9\ 9.2\ 88\ 9.1\ 9.5\ 95\ \ 520\ 8\ 480\ 7\ 600\ 9\ \ 8\ 8.9\ 85\ 7.5\ 8.3\ 80\ 8.8\ 9.4\ 90\ \ 450\ 6\ 430\ 7\ 560\ 8\ \ 8.2\ 9\ 86\ 8.9\ 9.5$$

The data in the decision matrix is then normalized so that all criteria have a comparable and fair scale for comparison using equation (6).

$$x^*_{11} = \frac{x_{11}}{\sqrt{\left[\sum_{i=1}^{8} x^2_{1j}\right]}} = \frac{8.6}{\sqrt{563.32}} = \frac{8.6}{23.7344} = 0.3623$$

The overall results of the normalization values using the MOORA method are shown in Table 6.

Table 6. Normalization Values of MOORA Method

Supplier	Criteria				
	Quality of Raw Materials	***Price***	***Delivery Punctuality***	***Production Capacity***	***Flexibility***
S1	0.3623	0.3762	0.3665	0.3519	0.3678
S2	0.3329	0.3532	0.3506	0.3248	0.3219
S3	0.3834	0.3647	0.3785	0.4060	0.4138
S4	0.3371	0.3416	0.3386	0.3045	0.2759
S5	0.3160	0.3186	0.3187	0.2910	0.3219
S6	0.3708	0.3608	0.3586	0.3789	0.3678
S7	0.3455	0.3455	0.3426	0.3383	0.3219
S8	0.3750	0.3647	0.3705	0.4128	0.4138

The normalized value is then multiplied by the criterion weights to account for their relative importance. Next, the optimization value is calculated by summing the weighted values of the benefit criteria and subtracting the weighted values of the cost criteria using equation (7), the results of the final MOORA value calculations are displayed in table 7.

Table 7. Final MOORA Values

Supplier	Final Value
S1	0.3195
S2	0.2878
S3	0.3618
S4	0.2615
S5	0.2739
S6	0.3304
S7	0.2938
S8	0.3629

The results of applying the MOORA method show a clear difference among suppliers in meeting the established criteria. Out of the eight alternative suppliers analyzed, some rank at the top due to their superior performance, especially in terms of production capacity and flexibility, which are the criteria with the largest weights. Several other suppliers are in the mid-range with their respective strengths and weaknesses, while the rest rank at the bottom due to their relatively lower performance scores on most criteria.

The Alternative Ranking Stage Using MOORA is a continuation after determining the criteria weights using the Entropy method. At this stage, all supplier assessment values are normalized so they can be compared proportionally, and then multiplied by the respective weights of the criteria that have been predetermined. MOORA combines benefit and cost type criteria by calculating the difference between the total weighted benefit values and the total weighted cost values for each alternative. The results of this calculation yield performance values that indicate to what extent a supplier can optimally meet all criteria, and the ranking results are displayed in Figure 2.

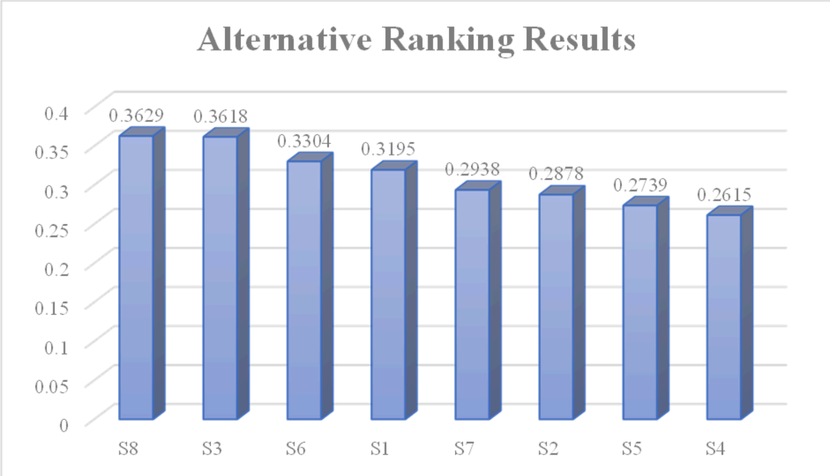

Figure 2. Alternative Ranking Results

The ranking result graph shows that Supplier S8 has the highest score of 0.3629, followed by Supplier S3 with a score of 0.3618. These two suppliers occupy the top positions and can be considered as the best alternatives in the selection of raw material suppliers. Next, S6 is in the third position with a score of 0.3304, followed by S1 with a score of 0.3195, indicating that both still have strong performance even though they are not as excellent as S8 and S3. In the middle ranking, S7 has a score of 0.2938, slightly higher than S2 with 0.2878, and S5 with 0.2739. All three can be considered as alternatives if certain conditions need to be taken into account. Meanwhile, S4 occupies the last position with a score of 0.2615, indicating that its performance is relatively the lowest among all alternatives. These results show a significant variation among suppliers, thus providing a strong basis for the company in determining the best partners to support the sustainability of the supply chain.

This finding confirms that the MOORA method can provide a comprehensive overview of the relative position of each supplier in an objective and transparent manner. The ranking results produced can serve as a strong basis for companies in determining the most optimal raw material suppliers, ensuring that the decisions made consider not only one aspect but also all the important criteria that affect the sustainability of the supply chain.

Conclusion

The analysis results using a combination of the Entropy method for criterion weighting and MOORA for ranking alternatives successfully provide an objective overview of the performance of eight raw material suppliers. The ranking results show that Supplier S8 ranks first with the highest score, followed by Supplier S3 in second place, and Supplier S6 in third place. These three suppliers have proven to be superior in meeting the established criteria, particularly in terms of production capacity and flexibility, which have the highest weights. Meanwhile, Supplier S1 ranks fourth, followed by S7, S2, and S5, which are in the medium category. Supplier S4 ranks last due to having the lowest score compared to the other alternatives. The findings of this study emphasize that the application of a decision support system based on the Entropy and MOORA method can assist companies in selecting suppliers in a more systematic, objective, and transparent manner. The combination of these two methods not only reduces subjectivity in the weighting process but also provides ranking results that are clear and easy to understand. Thus, this research contributes to improving the quality of decision-making in supply chain management, particularly in the aspect of optimal raw material supplier selection.

In this study, the decision support system built using a combination of Entropy and MOORA methods was able to provide objective and systematic results in determining the optimal raw material supplier. However, there are some limitations that need to be addressed, namely the relatively small number of respondents in the evaluation process, which can affect the level of validity and the generalization of the research results. Future research is expected to address these limitations through several development approaches, including involving more respondents or experts in the evaluation process to make the weights and ranking results more representative. Integration with other analytical methods such as fuzzy logic could be a step to improve the accuracy and flexibility of the system.

References

[1] R. R. Oprasto, “Decision Support System for Selecting the Best Raw Material Supplier Using Simple Multi Attribute Rating Method Technique,” *J. Ilm. Comput. Sci.*, vol. 2, no. 1, pp. 10–18, 2023, doi:

10.58602/jics.v2i1.12.

[2] I. P. Wahyu and F. Pulansari, “Analisis Pemilihan Supplier Bahan Baku Tas Gitar dengan Metode Fuzzy Analytical Hierarchy Process (FAHP) di PT. True Indonesia,” *Ekon. J. Econ. Bus.*, vol. 8, no. 1, p. 126, Mar. 2024, doi: 10.33087/ekonomis.v8i1.1278.

[3] V. S. Gunawan and Y. Yunus, “Sistem Penunjang Keputusan dalam Optimalisasi Pemberian Insentif terhadap Pemasok Menggunakan Metode TOPSIS,” *J. Inform. Ekon. Bisnis*, pp. 101–108, Mar. 2021, doi: 10.37034/infeb.v3i3.86.

[4] M. Baydaş, M. Yılmaz, Ž. Jović, Ž. Stević, S. E. G. Özuyar, and A. Özçil, “A comprehensive MCDM assessment for economic data: success analysis of maximum normalization, CODAS, and fuzzy approaches,” *Financ. Innov.*, vol. 10, no. 1, p. 105, Mar. 2024, doi: 10.1186/s40854-023-00588-x.

[5] T. E. Teddy, Muhammad Luthfi Akbar, Nola Dita Puspa, and Mesran, “Penerapan Metode MOORA dan Pembobotan ROC Dalam Pemilihan Alat KB,” *J. Comput. Informatics Res.*, vol. 2, no. 2, pp. 37–43, Mar. 2023, doi: 10.47065/comforch.v2i2.524.

[6] M. Reza Mehrpour, S. Kheybari, J. Singh Srai, and A. Rohani, “Integration of strategic and operational attributes to calculate the optimal cultivation of crops,” *Expert Syst. Appl.*, vol. 236, p. 121238, 2024, doi: https://doi.org/10.1016/j.eswa.2023.121238.

[7] A. R. Mishra, P. Rani, F. Cavallaro, I. M. Hezam, and J. Lakshmi, “An Integrated Intuitionistic Fuzzy Closeness Coefficient-Based OCRA Method for Sustainable Urban Transportation Options Selection,” *Axioms*, vol. 12, no. 2, p. 144, Jan. 2023, doi: 10.3390/axioms12020144.

[8] M. Gheibi *et al.*, “A Sustainable Decision Support System for Drinking Water Systems: Resiliency Improvement against Cyanide Contamination,” *Infrastructures*, vol. 7, no. 7, p. 88, Jun. 2022, doi: 10.3390/infrastructures7070088.

[9] B. Abell *et al.*, “Identifying barriers and facilitators to successful implementation of computerized clinical decision support systems in hospitals: a NASSS framework-informed scoping review,” *Implement. Sci.*, vol. 18, no. 1, p. 32, 2023.

[10] M. Bagir, M. Sanwasih, A. Arisantoso, and J. Rahmadian, “Sistem Pendukung Keputusan Menggunakan Metode WASPAS Untuk Pemilihan Software Developer,” *Format J. Ilm. Tek. Inform.*, vol. 14, no. 1, p. 24, 2025, doi: 10.22441/format.2025.v14.i1.003.

[11] S. Zeng, W. Chen, J. Gu, and E. Zhang, “An Integrated EDAS Model for Fermatean Fuzzy Multi-Attribute Group Decision Making and Its Application in Green-Supplier Selection,” *Systems*, vol. 11, no. 3. 2023. doi: 10.3390/systems11030162.

[12] A. Elsayed, “TrS-RAM:Leveraging Novel MCDM Techniques for Evaluating Sustainability of Fuel Cell Vehicles Based on Tree Soft Technique,” *HyperSoft Set Methods Eng.*, vol. 1, pp. 46–58, Jan. 2024, doi: 10.61356/j.hsse.2024.18450.

[13] Z. Mousa Saad, N. J. Al-Chaabawi, and S. A. H. Hassan, “A novel adaptive noise cancellation method based on minimization of error entropy for electrocardiogram denoising,” *Indones. J. Electr. Eng. Comput. Sci.*, vol. 32, no. 1, p. 185, Oct. 2023, doi: 10.11591/ijeecs.v32.i1.pp185-196.

[14] P. Rani, A. R. Mishra, D. Pamucar, J. Ali, and I. M. Hezam, “Interval-valued intuitionistic fuzzy symmetric point criterion-based MULTIMOORA method for sustainable recycling partner selection in SMEs,” *Soft Comput.*, 2023, doi: 10.1007/s00500-023-08189-7.

[15] A. D. Putra, A. T. Priandika, D. Alita, C. Mario, A. D. Wahyudi, and Setiawansyah, “Implementations of the Entropy and Complex Proportional Assessment Methods in Determining the Best Independent Student Exchange,” in *2024 International Conference on Informatics, Multimedia, Cyber and Information System (ICIMCIS)*, 2024, pp. 247–252. doi: 10.1109/ICIMCIS63449.2024.10957397.

[16] A. Pramuditya, D. Darwis, and S. Setiawansyah, “Kombinasi Logarithmic Percentage Change-Driven Objective Weighting dan Complex Proportional Assessment Dalam Penentuan Supplier Perlengkapan Olahraga,” *J. Comput. Syst. Informatics*, vol. 5, no. 3, pp. 660–669, 2024, doi: 10.47065/josyc.v5i3.5160.