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Position Based Job Promotion Using Multi-Criteria Elimination VIKOR Method

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Abstract. Job promotion is the best action of a company to improve the progress of the company itself, thus it must be done objectively and responsibly respectfully. There are a number of benchmarks for carrying out the promotion process which as a whole can be recognized as an honorable action for someone selected through this promotion process, in this study called criteria, the benchmark consists of seven criteria that can represent strength that can be recognized based on company provisions. This rule has two understandings that are interpreted differently and are quite difficult for mathematical calculation processes. For criteria that are meaningful and related to time have the meaning that the weight of the smallest value is the best, or different meanings that bear the weight of the greatest value are the best. For this promotion process, a combination of the Analytic Hierarchy Process (AHP) method and the VIKOR index elimination system is used, both of which have far different functions, namely AHP is intended to determine the preference weighting scale while VIKOR is intended to determine the ranking of each alternative over the alternative. The decision on the outcome of the best promotion is the fifth employee (K5) with a score index of 0.00 and followed sequentially (K2), (K3), (K1), (K4) sequentially with a score index of 0.62 ; 0.66; 0.75 and 0.93. This result is used as a benchmark for the best decisions.

Keywords: Position Base, Job Promotion, Elimination, Multi-Criteria, AHP, VIKOR.

1. Introduction

In the form of any type of company, of course promotion is the spearhead to determine every individual who has superior ability in terms of authority and responsibility for the company's progress [1]. Not only is the benchmark benchmark assessing a person, but expertise in the field of work is also needed in accordance with the company's vision and mission for the future progress of the company [1].

This study provides a clear view of how to determine the best decision in assessing the performance of employees who are able to give the greatest contribution to the company's progress in harmony with the company's vision and mission with a combination of Multi-Criteria Decision Making (MCDM) -AHP and VIKOR methods. In the work action, it takes good behavior that is owned by someone to be a role model for promotion and a decision that produces optimal weight in carrying out the promotion process which can be made the best decision [2]. The best way to do this promotion is to use the MCDM-AHP method which is intended to analyze and determine preferences for a number of established criteria [3], in contrast to the VIKOR method used to determine indexed ranks from a number of alternatives [4]. of course the VIKOR method acts to adjust the modeling hierarchy arranged structurally in comparison to the AHP. Structured models are explained through hierarchies to provide an overall understanding of the problems at hand. Problems that have many criteria are part of the settlement with the MCDM-AHP concept, indeed there are many ways that can be done to do the comparison process in the AHP method, but it is important to know that AHP by iteration is rarely used by AHP experts, iteration stages can occur due to the difference in the difference between the last eigenvector value and the previous eigenvector value has to be done until there is no difference value with the eigenvector, thus AHP can be said to be a decision solution

with a rating system [5]. The rating results obtained need to be evaluated on the decisions taken whether it is feasible or not, of course there are standards set in testing results by testing vector consistency, consistency of index and consistency of ratios that must meet the applicable rules must be less than ten percent of each level known as the number of criteria and the third level known as the number of alternatives from a hierarchical model [6], [7], [8]. The VIKOR method is a major challenge for the development of rankings by specifying the index size as a continuation of collaboration rankings against preferences that have been met through the AHP method [9], [10], [11].

There are a number of techniques that can be used to determine the ranking system, very careful to understand such as determining the criteria group and further understanding of linear travel or having a reversal of a number of these criteria, this study has the use of inversion meaning, so that requires a more mature understanding the issue raised so that finding the term such as the smallest is the best or the biggest is the best. this occurs in the initial stage, namely the process stage specifies the normalization dataset from the master data. This is very important because it will cause errors in setting the final decision [10], [11].

2. Methods

In the method section, it will provide a basic concept and understanding to facilitate understanding of job promotion, where preference weighting is processed by the AHP method, while decision making can be explained by the VIKOR elimination method and slowly to be able to easily understand it.

2.1. Preference of Job Promotion.

For further explanation about job promotion, namely by paying attention to the most important elements in the form of performance in work, responsibility in carrying out the position, and the quality of the results of the work that has been done [3]. To measure all of course, clear and measurable parameters are needed with weighted values that are objective, meaning that there is no game in determining the value weights of each criterion. In setting criteria and alternatives a hierarchical model must be made that can be used as the rationale for making promotions in a company. All criteria must be included in the hierarchy model including Knowledge of Job, Quantity of Work, Failed Jobs, Reaction Behavior, Dependability, Planning, and Intelligence along with alternatively there are five employees in the form of first employees to fifth employees as decision-making ratings. As already explained, a number of criteria have a different understanding of meaning in carrying out mathematical processes on the weight of their values, especially in the stages of normalization [12], [13].

$$R_{ij} = \frac{(X^*j - Xij)}{(X^*j - X'j)} \quad (1)$$

R_{ij} : Dataset VIKOR Normalization,
 X_{ij} : Sample data [i] from criteria [j].
 X^*j : The biggest value of the criteria,
 $X'j$: The Smallest value of the criteria,
 i : Employee position (K1 ... K5),
 j : Number of criteria that can be used.

2.2. The Analytic of Hierarchy Process (AHP).

Implementation of hierarchical modeling is to create paired matrices, with the aim of setting the optimum eigenvector to be used as a preference reference in the use of the VIKOR method, the eigenvector value in AHP describes a rating that can measure the strong quantities of criteria and alternatives, in this study only refers to the determination strong than criteria [14]. Actually, there are many functions that are used with the AHP method especially specifically for ranking with paired matrix models that can be calculated mathematically with algebraic matrix [15], and not only quantitative problems, but qualitative problems can also use AHP especially once. again for the ranking context [16], both in simple linkup space even able to handle complex problems [17], with the final process all components must be related to each other in the determination of synthesis as the final decision determinant [18]. This is a very remarkable thing obtained from the benefits of the AHP method in determining decision priorities [18], [26].

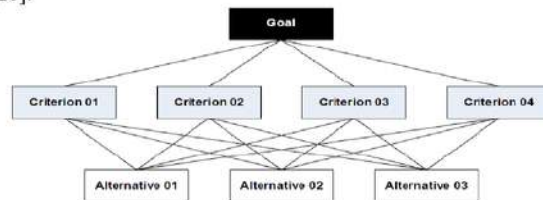


Figure 1. Hierarchy Modeling

2.3. Multi-Criteria Decision Making (MCDM)

Algoritma is able to provide an overview of the stages of a scientist process so that it can be accepted logically by anyone. This is a very clear difference in the use of the MCDM method because it has a special characteristic in determining the weight of the multi criteria hierarchy [19], thus many benefits that can be obtained from MCDM especially for supporters in terms of decision making by looking at the weights generated by other words eigenvector in AHP [5], [10], [21], [22], [23]. By utilizing the VIKOR method to be superior in determining the final decision as another alternative for ranking through indexed systems, in the index system rules by taking the smallest index value as the highest ranking and vice versa the largest index value becomes the smallest level preliminary decision. VIKOR will be linearly protective which removes functions that are reflected in the criteria it carries that are applied in the AHP method. These are the basic and unique differences from the VIKOR method [5]. So the combination of MCDM-AHP and VIKOR becomes an ideal closeness.

Table 1. Pairwise matrices

1	a_{12}	a_{1n}
a_{21}	...	a_{2n}
...	$a_{ji} = 1/a_{ij}$...
a_{ni}	...	1

Perhatikan pada (tabel 1) suatu hal yang dapat dipahami garis diagonal bernilai satu sebagai lipatan terhadap pasangan matrix yang mengandung makna segitiga terbalik berupa resiprocal yang selalu berbanding terbalik dengan matrik segitiga atas contoh matrix $A_{(1,2)}$ memberikan nilai keterbalikan dengan matrik $A_{(2,1)}$. Penggunaan ini dalam metode VIKOR akan dihilangkan secara linier, sehingga penggunaan seperti diatas tidak dapat diteruskan dengan metode VIKOR, sehingga diperlukan kolaborasi diantara kedua metode tersebut untuk mendapatkan solusi yang ideal.

2.4. VIKOR.

Vise Kriterijumska Optimizacija I Kompromisno Resenje (VIKOR) can be grouped into MCDM, because its use utilizes many criteria in determining synthesis of decision making even though it has very different differences with AHP method [25], [26], the ideal solution is only obtained in the VIKOR method where rank the result is seen from the magnitude of the index obtained from the results of the maternal calculation through the determination of each dataset in normalization, taking note (equation 1).

$$R_{ij} = \frac{(X+j-X'j)}{(X+j-X'j)} \quad (1)$$

Following the algorithm in VIKOR, after determining the normalization of the next dataset is to do the multiplication process between normalized data and preferences obtained from AHP which is called the normalization weight using (equation 2) and then specifies the weight of each dataset using (equation 3).

$$S_i = \sum_{j=1}^n w_j \times (R_{ij}) \quad (2)$$

$$R_i = \text{Max}_j [w_j \times R_{ij}] \quad (3)$$

Thus the amount of weight for each row is known, then the largest value determination has been obtained from each row of the dataset, the last step is to find the VIKOR index amount using (equation 4).

$$Q_i = \left[\frac{S_i - S^*}{S^* - S^-} \right] \times v + \left[\frac{R_i - R^*}{R^* - R^-} \right] \times (1-v) \quad (4)$$

Determining the value of the VIKOR index uses the meaning of backwardness where the pronunciation of the biggest is the best or the pronunciation of the lowest is the best, this should not be interpreted incorrectly in each criterion, paying close attention to the criteria related to timing and which are not related. If this can be done correctly, the results of the VIKOR index value will give a very perfect meaning to the value of the decision to be taken. Thus the ranking of each employee can be fully recognized based on the VIKOR index value.

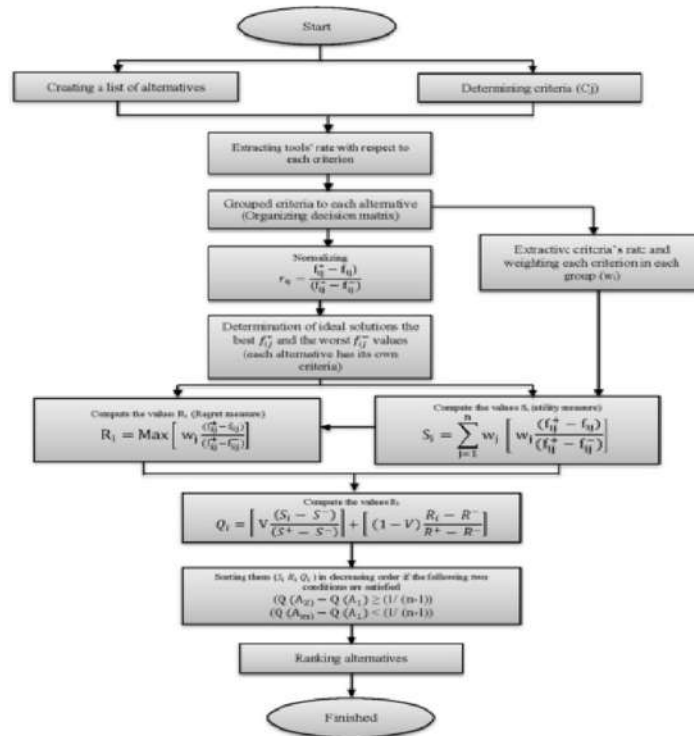


Figure 2. Algorithm of VIKOR [27], [8]

3. Implementation and Result

The first step that must be taken to compile a promotion case is to determine the criteria and make a modeling of the promotion case, of course it must be in accordance with the rules of the game that exist in making the AHP hierarchy. Determine the objectives of the problems raised, make the arrangement of criteria which are used as parameters to measure each alternative which is the object of the problem in determining the final decision through the synthesis stage. Using the VIKOR method, it has been said that the resulting decision is somewhat different from AHP, meaning that the decision is linear in nature through the weight normalization stage, which finally ranks that it already uses an indexed system in VIKOR.

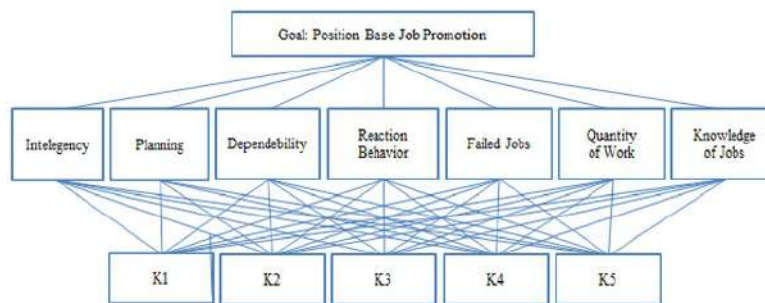


Figure 3. Hierarchy of position based promotion model

To determine the preference quantity to be processed through the VIKOR method, of course it requires processed results from MCDM-AHP by referring to the weight of each criterion specified in the eigenvector of each criterion used as a parameter to measure cases in promotion in the company, preference results can be seen in (Table 2).

Table 2. Preference using AHP

Criteria	IG	PL	DP	RB	FJ	QW	KJ
Value	0.23	0.16	0.19	0.15	0.07	0.11	0.09

by observing (Table 2) giving the value of each criterion of the promotion issue, the total number of preferences is no more than no less than 100 percent. The seven criteria consist of knowledge of jobs, quantity of works, failed jobs, reaction behavior, dependability, planning, and Imagination.

Table 3. Observation data

	IG	PL	DP	RB	FJ	QW	KJ
K1	74.05	64.67	73.94	84.33	14.02	18.59	9.63
K2	88.03	94.23	84.23	73.25	13.45	97.81	15.04
K3	66.73	83.18	94.67	48.85	27.84	30.59	27.65
K4	99.50	60.75	75.22	64.84	15.92	22.43	99.52
K5	43.18	76.35	62.45	56.52	16.58	61.77	45.27

The dataset obtained based on the results of observations can provide a simple sample especially in understanding the data itself, where by paying attention to how to determine the range, and determining the position of the values of seven criteria used for each of the five employees the actual values that can be seen on (table 3), so that by reference the existing dataset can calculate mathematically over normalization, pay attention (Table 4).

Table 4. Normalization with VIKOR

	LB	HB	LB	LB	LB	HB	HB
	IG	PL	DP	RB	FJ	QW	KJ
K1	0.55	0.88	0.36	1.00	0.04	1.00	1.00
K2	0.76	0.00	0.68	0.69	0.00	0.00	0.94
K3	0.42	0.33	1.00	0.00	1.00	0.85	0.80
K4	1.00	1.00	0.40	0.45	0.17	0.95	0.00
K5	0.00	0.53	0.00	0.22	0.22	0.45	0.60

From the results of normalization in (Table 4), then determine the magnitude of each dataset by summing each row, thus the weighting normalization criteria can be known as the weight of normalization, attention (table 5).

Table 5. Weight Normalization

Weight	0.24	0.15	0.18	0.16	0.06	0.10	0.11
Employee	IG	PL	DP	RB	FJ	QW	KJ
K1	0.132	0.132	0.064	0.160	0.002	0.100	0.110
K2	0.183	0.000	0.122	0.110	0.000	0.000	0.103
K3	0.100	0.050	0.180	0.000	0.060	0.085	0.088
K4	0.240	0.150	0.071	0.072	0.010	0.095	0.000
K5	0.000	0.080	0.000	0.035	0.013	0.045	0.066

The next step is to determine the number of rows of each dataset normalized weight that will be stored in the Si dimension, while the maximum value of each normalized weight dataset will be stored in the Ri dimension, note the data in (Table 6).

Table 6. The value of Si & Ri

Alternative	Si	Ri
K1	0.70	0.16
K2	0.52	0.18
K3	0.56	0.18
K4	0.64	0.24
K5	0.24	0.08

the last step that must be done is to determine the amount of the VIKOR index, the rank of each employee promotion issue is derived from the total number of each row and the largest value of each dataset, with a composition of 0.5 resulting in the VIKOR method index with results (Table 7).

Table 7. The value of Q and ranking

Alternatives	Si	Ri	Q	Ranking
K1	0.70	0.160	0.75	4
K2	0.52	0.183	0.62	2
K3	0.56	0.180	0.65	3
K4	0.64	0.240	0.93	5
K5	0.24	0.080	0.00	1

4. Conclusion

An advanced combination technique for results obtained through the collaboration of the MCDM-AHP method with the VIKOR method is able to provide optimal results in ranking the selection process from five employees with seven criteria through the index system using the VIKOR method. The protection system in the VIKOR method is able to make clear differences with the MCDM-AHP method. Spectacular results from promotion can be determined according to the results obtained sequentially from the first rank to the fifth rank, starting from Employee-5 (K5), Employee-2 (K2), Employee-3 (K3), Employee-1 (K1), and Employee-4 (K4) with index weights in a sequence of 0, 00; 0.52; 0.56; 0.70; and 0.93. This proves that the collaboration of the MCDM-AHP method with the VIKOR method is able to provide optimal final decision results.

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