Decision Support System in Determining Structural Position Mutations Using Simple Additive Weighting (SAW) Method

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Abstract. Mutations are needed in a company to improve the quality of workers. mutations are based on the capabilities of individual workers in the company. HRD assesses the abilities of workers from various aspects. manually the accuracy of mutations based on the value of the criteria is only 38%. with a low value of accuracy resulting in mutations of workers not as expected. the criteria given are FFB Production (C1), Core CPO Production (C2) and Field Care (C3). Range of mutation decision weights are 10-30% Giving First Warning Letter, 31 - 70% Position setting and 71 - 100% Giving promotion. with the SAW method the analysis is done by computerization. after testing the criteria obtained. HRD assesses that the accuracy of workers reaches 85%. and better and in accordance with what the company wants.

1. Introduction

Along with the development of technological capabilities today makes large companies look for and sort out employees who have quality human resources and developing capabilities to be placed in the company. Likewise for companies that have long stood and developed and continue to make assessments on employees in the company so that performance continues to run well. In determining the assessment of the employee is not easy because of the large number of employees and parts in the work at the company. If the assessment of the structural mutations of employees is done manually, it

will take a lot of time and lack of efficiency in the results, because not necessarily all employees are known and known to be certain by their leadership.

So from that this decision support system was formed to facilitate leaders in making decisions. If the decision is aided by a computerized Decision Support System (SPK), subjectivity in decision making is expected to be reduced and replaced with the implementation of all criteria for all employees. Thus, it is the employee with the best ability (and other considerations) who will be expected to be elected. Basically, the decision making process is to choose an alternative.

2. Theoretical Basis

a. Software Engineering

Software engineering is a profession that explores the ways in which software development includes manufacturing, maintenance, management of software development organizations, and so on[1]. software process (software process) is a set of activities that have the purpose of developing or changing software[2]. Software development life cycle, also known as System Development Life Cycle, is a process of developing or changing a software system using models and methodologies that people use to develop previous software systems based on best practice or proven methods [3].

b. Decision Support System

Basically a decision support system is a system that can not be separated from computer technology is almost impossible when the decision support system does not involve technology in the decision-making process that is the computer, in general the decision support system serves to assist in making effective decisions where later the problems faced can be with quickly get the solution[4].

c. Divide And Conquer

The computer was originally created as a device to perform calculations automatically and accurately. Although initially only focusing on numerical calculations, modern computers found today have calculated many things, such as text or images. Various calculations and analyzes performed by computers are usually implemented through software. With the increasing scope of things done by computers, the software developed also becomes increasingly complex. Algorithms, as part of processing software, also require a variety of new techniques. For example, to calculate the total number of numbers in a list, we can use a simple loop[5]. The looping algorithm used in the above code is indeed simple and gives the correct results, but there are several problems in the code, namely the calculation is done linearly, which results in the complexity O (n) O (n). This is certainly quite ideal for small list sizes, but if the list size becomes large (several billion elements) then the calculation will be very slow. A divide and conquer algorithm (hereinafter referred to as D & C) has three steps, namely:

a) **Divide**: in this step we solve the problem or data in the same form, but in a smaller size. Breaking steps is usually done using a recursive algorithm, until the data size becomes very small and can be solved by a simple algorithm.
b) **Conquer**: In this step we try to solve the problem or data that has been solved in the first step, using a simple algorithm.
c) **Combine**: after running the conquer step, of course we have to recombine the results of each fraction, to get the final calculation result. Step combine trying to achieve this.

The D & C algorithm, if implemented using the right library or language, will improve the efficiency of the algorithm logarithmic.[6]

d. *Simple Additive Weighting (SAW)*

SAW Method The SAW method is often also known as the weighted sum method. The basic concept of the SAW method is to find a weighted sum of performance ratings on each alternative on all attributes. The SAW method requires the process of normalizing the decision matrix (X) to a scale that can be compared with all available alternative ratings. where rij is the normalized performance rating of the alternative Ai in the attributes Cj; i = 1,2, ..., m and j = 1,2, ..., n. The preference value for each

alternative (Vi) is given as: A higher Vi value indicates that the alternative Ai is more chosen[7]. The basic concept of the method of Simple Additive Weighting (SAW) is to find a weighted sum of performance ratings on each alternative on all attributes. The SAW method requires the process of normalizing the decision matrix to a scale that can be compared with all available alternative ratings[8].

3. Data Analysis

For analysis, the data taken for example is ten employee data. There are three assessment sections. Namely the Target Goals, Attitude and Achievement. Each target will analytic using the concept of divide and conquer.

a. Divide And Conquer

Based on data from the table above, each assessment is broken down into the following:

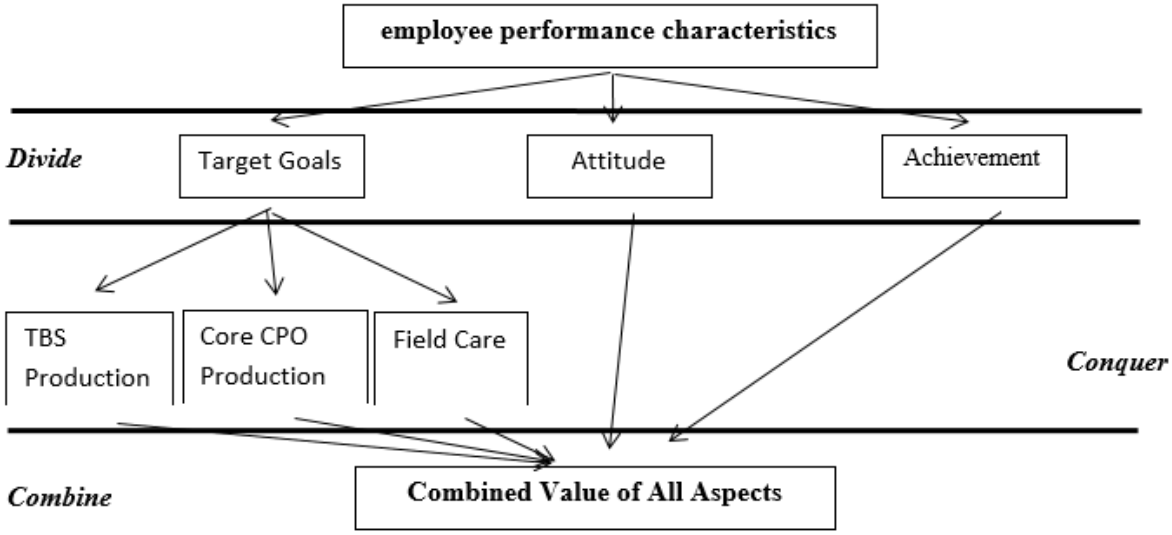

Figure 1. Divide And Conquer Concept Diagram

b. SAW Method

The basic concept of the SAW method is to find a weighted sum of performance ratings on each alternative on all attributes. The SAW method requires the process of normalizing the decision matrix (X) to a scale that can be compared with all available alternative ratings.

Steps to Settle SAW as follows:

1) Determine the criteria that will be used as a reference in making decisions, namely Ci.
2) Determine the suitability rating of each alternative on each criterion.
3) Make a decision matrix based on criteria (Ci), then normalize the matrix based on equations adjusted for the type of attribute (attribute gain or cost attribute) so that the normalized R.
4) The final results are obtained from the ranking process, namely the sum of multiplications of normalized matrices R with weight vectors so that the largest value is chosen as the best alternative (Ai) as a solution.

c. *Conquer Concept*

After the data from the analysis uses SAW, then combine the data from the analysis with other data, as seen below:

Table 1. Combine Table

NO	Name	Point	Attitude	Achievement
1	Rizki Adrianto	0,56	Average	High
2	Fitrizal	0,46	Poor	Low
3	Heri Bintoro	0,48	High	High
4	Zulfan Hairi	0,58	Average	Low
5	Ilwan kasri	0,48	Average	Low
6	Junaidi	0,39	Average	Low
7	Yusrizal	0,49	Poor	Low
8	Almizni S.P	0,47	High	High
9	Bibin M	0,18	Poor	Low
10	Fao Amizendrato	0,37	Average	Low

For the attitude assessment, the next is to change the attitude value into decimal. With the conditions below:

If Attitude Is High Then Decimal Value Is Equal To 2
If Attitude is Average Then Decimal Value Is Equal to 1
If Attitude Is Low Then Decimal Value Is 0

For the achivement, the next is to change the attitude value into decimal. With the conditions below:

If Achievement Is High Then Decimal Value Is Equal To 1
If Achievement is Low Then Decimal Value Is Equal to 0

With the conditions below:

Table 2. Divide and Conquer Table

NO	Name	Point	Attitude	Achievement	Attitude Transform	Achievement Transform
1	Rizki Adrianto	0,56	Average	High	1	1
2	Fitrizal	0,46	Poor	Low	0	0
3	Heri Bintoro	0,48	High	High	2	1
4	Zulfan Hairi	0,58	Average	Low	1	0
5	Ilwan kasri	0,48	Average	Low	1	0
6	Junaidi	0,39	Average	Low	1	0
7	Yusrizal	0,49	Poor	Low	0	0
8	Almizni S.P	0,47	High	High	2	1
9	Bibin M	0,18	Poor	Low	0	0
10	Fao Amizendrato	0,37	Average	Low	1	0

4. Results

a. Final Scoring And Ranking

after all data has been obtained, the final stage of the decision is ranking. as seen in the table below:

Table 3. Final Promotion Table

NO	Name	Point	Attitude	Achievement	Attitude Transform	Achievement Transform	Final Score	Ranking of structural promotions
1	Rizki Adrianto	0,56	Average	High	1	1	2,56	3

2	Fitrizal	0,46	Poor	Low	0	0	0,46	9
3	Heri Bintoro	0,48	High	High	2	1	3,48	1
4	Zulfan Hairi	0,58	Average	Low	1	0	1,58	4
5	Ilwan kasri	0,48	Average	Low	1	0	1,48	5
6	Junaidi	0,39	Average	Low	1	0	1,39	6
7	Yusrizal	0,49	Poor	Low	0	0	0,49	8
8	Almizni S.P	0,47	High	High	2	1	3,47	2
9	Bibin M	0,18	Poor	Low	0	0	0,18	10
10	Fao Amizendrato	0,37	Average	Low	1	0	1,37	7

All analysis results have been tested on the system. so that the implementation can be done with the system that has been built. This can facilitate the head or HRD in analyzing the data.

5. Conclusions

Based on the analysis that has been done, the decision can be taken as follows:

a. With Decision support system the leader can know the best decision easily on the assessment of each employee who will be structurally transferred
b. Data from the assessment of mutations of each employee will be stored properly in the system.
c. Assessment is more transparent and accurate.
d. The system is built so that it can be developed by the company both in the design of the display and analysis of the assessment according to the desired needs

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