

## **Combination of Analytic Hierarchy Process (AHP) Method and Profile Matching Method with Matrix Decomposition in Determining Olympiad Candidates**

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### **ABSTRACT**

*One of the government's programs in improving the quality of human resources is by organizing the selection of candidates for the Olympics which aims to improve general knowledge. To be able to take part in the selection of prospective participants for the Olympics, the participants have general knowledge, achievements, behavior and experience in following closely at the high school level. There are several problems in the selection of students at the school level, including teachers or principals in selecting students only based on the value of the lessons obtained, even though the Olympics are held at the district, provincial and national levels, other factors are needed including knowledge, achievement and experience in participating in the competition. previous olympics so the results were not optimal. Therefore, it is necessary to design a decision support system using the AHP (Analytical Hierarchy Process) and Profile Matching methods which are expected to assist decision makers in obtaining information for selecting the right students to participate in the Olympics. After testing and analysis involving manual calculations, it can be seen that the results obtained from system calculations are the same as manual calculations. So that this system can be used to help schools or teachers to select students in participating in the Olympics at the High School (SMA) level.*

**Keywords :** *Olympiad, Decision Support System, Analytical Hierarchy Process (AHP), Profile Matching*

### **INTRODUCTION**

This AHP method helps solve complex problems by structuring a hierarchy of criteria. This method also combines the power of feelings and logic involved in various problems, then synthesizes various considerations that are diverse into results that match human estimates intuitively as presented in the judgments that have been made (saaty, 1993). The concept of a decision support system was first introduced by Michael S. Scott Morton in the 1970s with the term Management Decision System (Sprague, 1982). DSS is designed to support all stages of decision making, from identifying problems, selecting relevant data, and determining the approach used in the decision-making process, to evaluating alternative choices using logical concepts. The AHP method aims to rank decision alternatives and choose the best one for a multi-criteria case that combines qualitative and quantitative factors in the evaluation of existing alternatives (saaty., 2008). The process of giving teacher bonuses followed by the

availability of more than one option that meets certain criteria includes problems with the AHP method, works based on linguistic rules and has an algorithm that provides an approximation to enter into mathematical analysis. One of the multivariate decision-making/optimization techniques used in policy analysis. In essence, AHP is a comprehensive decision-making model that takes into account qualitative and quantitative aspects. In the decision-making model with AHP basically trying to cover all the shortcomings of the previous models. AHP also allows to structure a system and its environment into interacting components and then unite them by measuring and managing the impact of system fault components (saaty, 2001). The main tool of this model is a functional hierarchy with the main input is human perception. So the striking difference between the AHP model and other models lies in the type of input. Fuzzy AHP can only be used for assessments whose truth values are not known or are still vague, such as the value of discipline, the value of neatness, and others (Putra, et al. 2011). The decision-making system using the Analytical Hierarchy Process (AHP) method has helped the school in determining the selection of outstanding teacher performance (Artika., 2013). One of the government's programs in improving the quality of human resources is by organizing the selection of candidates for the Olympics which aims to improve general knowledge. To be able to take part in the selection of prospective participants for the Olympics, the participants have general knowledge, achievements, behavior and experience in following closely at the high school level. There are several problems in the selection of students at the school level, including teachers or principals in selecting students only based on the value of the lessons obtained, even though the Olympics are held at the district, provincial and national levels, other factors are needed including knowledge, achievement and experience in participating in the competition. previous olympics so the results were not optimal.

Therefore, it is necessary to design a decision support system using the AHP (Analytical Hierarchy Process) and Profile Matching methods which are expected to assist decision makers in obtaining information for selecting the right students to participate in the Olympics. After testing and analysis involving manual calculations, it can be seen that the results obtained from system calculations are the same as manual calculations. So that this system can be used to help schools or teachers to select students in participating in the Olympics at the High School (SMA) level

## **METHODS**

The steps that will be carried out in this research are:

1. Determine the main problem, namely determining the selection of olympic candidates
2. Determining the criteria used in the selection of Olympic candidate participants includes 3 aspects, namely: Intelligence, attitude or behavior and results.
3. Perform data collection and entry
4. Perform gap calculations

5. Doing grouping of value weights
6. Compile a pairwise comparison matrix
7. Calculate the eigenvalues of each
8. Calculating the priority weight of each criterion
9. Calculate the maximum eigen
10. Conduct consistency test through index (CI) and consistency ratio (CR)

### **Calculation of Profile Matching Method**

Profile matching is a decision-making mechanism by assuming that there is an ideal level of predictor variables that must be met by the subject under study, not a minimum level that must be met or passed. (Kusrini, 2007).

According to Rachma (2003:101), Profile matching is a very important process in HR management where the competence (ability) required by a position is determined first. These competencies/capabilities must be fulfilled by the holder/prospective position holder. In the profile matching process, broadly speaking, it is a process of comparing individual competencies into position competencies so that differences in competence (also called gaps) can be seen. The smaller the resulting gap, the greater the value weight, which means that there are greater opportunities for potential participants to occupy the position.

To analyze suitable candidates, the profile matching method is used, which in this process first determines the competencies (capabilities) required by a position. In general, the profile matching process is a process of comparing individual competencies into job competencies so that differences in competencies can be known (also called gaps). Evaluation of the selection of prospective participants to take part in the Olympics taken from 6 students who will be selected. One best person will be selected based on predetermined criteria. The concept is to find people whose profile is as close as possible to the vacant position.

### **Determination of Assessment Aspects**

What is very important in using the Profile Matching method is determining what aspects will be used for comparison. In this case, 3 aspects of the assessment used are exemplified, namely:

1. Aspect of Intelligence (30% weight, comparison of core factor: secondary factor = 65%: 35%) which has 10 factors:
  - a. Common Sense
  - b. Idea Verbalization
  - c. Systematic Thinking
  - d. Real Reasoning and Solutions
  - e. Concentration
  - f. Practical Logic
  - g. Thinking Flexibility

- h. Creative Imagination
    - i. Anticipation
    - j. Potential Intelligence
  2. Aspects of Attitude or Behavior (30% weight, comparison of core factor: secondary factor = 55% : 45%) which has 6 factors:
    - a. Psychic Energy
    - b. Accuracy and responsibility
    - c. Caution
    - d. Feeling Control
    - e. Achievement Drive
    - f. Vitality and Planning
  3. Result aspect (weight 40%, comparison of core factor: secondary factor = 55% :45%) which has 4 factors:
    - a. Dominance (Power)
    - b. Influences
    - c. Steadiness
    - d. Compliance

### **Target Value Determination**

Based on the previously determined aspects and factors, the next step is to determine the target value for each of the assessment points. The amount of the specified target value may vary depending on the needs and position of the candidate selection of the Olympic participants offered. Assessment is measured in a predetermined rating scale.

### **Candidate Selection**

The next stage is the selection of candidates to be assessed. Each candidate is assessed based on factor points in predetermined aspects.

For example, candidate data and their assessments are obtained in the following tables:

Table 1. Table of Values for Aspects of Intelligence

No	Name	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10
1	Lia Al Hasanah	5	3	2	4	2	2	4	2	3	4
2	Latifah	3	5	4	3	4	4	3	5	4	3
3	M.Irwan	3	3	3	1	2	5	3	2	5	4
4	Suci Wheli	3	4	3	3	2	3	4	2	4	4
5	Fitri	2	4	3	3	2	2	2	3	2	3
6	Dewi Vivi	4	4	3	3	4	3	2	3	3	2

Description :

C1 : Common Sense

C2 : Idea Verbalization

C3 : Systematic Thinking

C4 : Reasoning And Real Solution

C5 : Concentration

C6 : Practical Logic

C7 : Flexibility of Thinking

C8 : Creative Imagination

C9 : Anticipation

C10: Potential Intelligence

### Calculation of the Analytical Hierarchy Process Method

The steps in this research are as follows:

1. Determine the types of criteria for prospective participants in the olympics. In this research, the criteria needed by Olympic participants are Intelligence, Attitude or Behavior and Results.
2. Arrange the criteria for selecting the Olympic participants in a paired matrix as shown in the following table.

## RESULTS AND DISCUSSION

The calculation menu for the profile matching method is a process of comparing individual competencies into the assessment competencies of prospective participants so that differences in competence can be known. By using three aspects of the assessment used, namely: Aspects of Intelligence, Aspects of Attitude or Behavior and Aspects of Results. While the AHP displays the process of pairwise comparison matrix, relative priority matrix, eigenvalue matrix and the final calculation of the criteria data. The criteria submenu displays the competency gap calculation process and gap mapping based on aspects.

- a. Gap calculation is the most important factor in calculating the eligibility of the specified criteria. The calculation process is carried out with the competency standards of prospective participants by taking the highest score in each aspect.

The following is a web-based joint account main page display that displays the available features.

Table 3. Gap mapping value for intelligence aspect

Nama	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10
Lia	5-3=2	3-3=0	2-4=-2	4-4=0	2-3=-1	2-4=-2	4-4=0	2-5=-3	3-3=0	4-4=0
Latifah	3-3=0	5-3=2	4-4=0	3-4=-1	4-3=1	4-4=0	3-4=-1	5-5=0	4-3=1	3-4=-1
M. Irvan	3-3=0	3-3=0	3-4=-1	1-4=-3	2-3=-1	5-4=1	3-4=-1	2-5=-3	5-3=2	4-4=0
Suci	3-3=0	4-3=1	3-4=-1	3-4=-1	2-3=-1	3-4=-1	4-4=0	2-5=-3	4-3=1	4-4=0
Fitri	2-3=-1	4-3=1	3-4=-1	3-4=-1	2-3=-1	2-4=-2	4-4=0	3-5=-2	2-3=-1	3-4=-1
Dewi	4-3=1	4-3=1	3-4=-1	3-4=-1	4-3=1	3-4=-1	2-4=-2	3-5=-2	3-3=0	2-4=-2

- b. Gap mapping is to determine the values for each aspect of the assessment. The smaller the difference, the bigger the gap. The difference from the value in question is as follows:

### Weighting

After obtaining the Gap for each employee, each employee profile is given a weighted value according to the provisions in Table 4 Gap Value Difference.

Table 4. Weighting for intelligence aspect

Nama	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10
Lia	3	5	3	5	4	3	5	2	5	5
Latifah	5	3	5	4	4	5	4	5	4	4
M. Irvan	5	5	4	2	4	4	4	2	3	5
Suci	5	4	4	4	4	4	5	2	4	5
Fitri	4	4	4	4	4	3	5	3	4	4
Dewi	4	4	4	4	4	4	3	3	5	3

### Matrix Calculation Results

Table 5. Intelligence Aspect Comparison Matrix

	Penalaran	Kosentrasi	Sistematika Berpikir
Penalaran	1	9	8
Kosentrasi	0,111111	1	9
Sistematika Berpikir	0,125	0,111111	1
$\Sigma$ Kolom	1,236111	10,11111	18

### CONCLUSION

The influence of the AHP method on the weights generated by the profile matching method in the application for selecting candidates for Olympic participants produces more objective decisions in terms of attitudes or behavior so that the ranking value is obtained. Based on the priority weights on aspects by making a model using the profile matching and AHP methods so that the results of the selection of different Olympic participants can occur because they are influenced by policy considerations from the school.

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