

A Decision Model To Support The Selection Of Senkom Personnel Using The Profile Matching Method With The Capability of Cyber Security

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The very rapid development of information technology has brought tactical and strategic advantages, but it can also be a potential attack from opposing parties on the information and communication systems and networks used, thus opening the way for the emergence of a new war, namely cyber warfare. Cyber attacks are a new threat to Adisutjipto Air Base, which targets vital parts that can impact the organization and make the command and control system ineffective and inefficient. One of the important elements of Adisutjipto Lanud in facing cyber attacks is the readiness of data and communication network security personnel. In the direct or conventional personnel selection process, it is not possible to see the abilities possessed by prospective data security personnel, both in terms of skills, management aspects, analytical aspects, competency weight, and so on. A decision support system can be used to assist decision-making based on existing criteria. So this research is limited to only considering the selection of personnel who will become members of komlek or senkom who are responsible for data security and communications networks at Adisutjipto Air Base. In this research, the method used is the profile matching method. The concept of the profile matching method is to compare the selection using the conventional method with the decision support system method in selecting komlek/senkom personnel as cyber security personnel so that differences in competency can be identified, also called GAP (Gross Across Product). The smaller the GAP produced, the greater the weight of the value. large, this means that personnel who meet the requirements have a greater chance of someone occupying that position. The final result of this research is to obtain ranking information for each cyber security candidate based on profile matching calculations to be able to carry out tasks optimally in securing data and networks at Adisutjipto Air Base.

KeyWords: Decision support system, Profile Matching method, determination of complex personnel and human resources

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1 Introduction

The Indonesian National Army Air Force, as an integral part of the TNI, carries out TNI air force duties in the field of defense, enforces the law and maintains the security of national jurisdictional airspace in accordance with the provisions of national law and international law, carries out the construction and development of air force forces, and carries out empowerment air defense area. When selecting cyber security personnel, conventional methods are still

used, namely direct appointment.

In previous research conducted by Mariskhana et al. 2021 [1], filling positions is discussed. In this journal, the application of a decision support system created by applying the profile matching method has a difference of 63% in searching for core factor and secondary factor values. Because the results of previous research have proven to be accurate, this thesis research will use a decision support system using the profile matching method.

Research conducted by Pazri Primadani et al. 2022[2] discusses course education services at the LKP SRH Training Center. In this journal, the main problem is students who experience difficulties in learning because it does not match their abilities. So the research implements a web-based decision support system application with the aim of finding majors that suit the abilities of prospective students.

In contrast to previous journals, which focused more on the use of the profile matching method for selection based on general criteria or as information, this research specializes in its use in the context of cyber security. This research extends the application of the profile matching method to non-profit organizations, namely the Senkom section, providing insight into the potential of this method in various organizational contexts.

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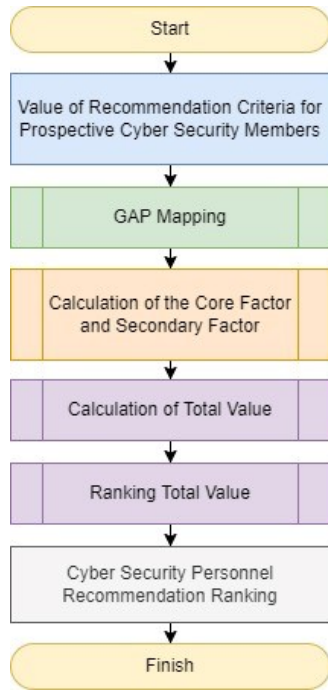


Fig. 1 Profile Matching Calculation Process Flow

2 Methodology

2.1 Research Stages. The process flow of the profile matching calculation system in research on the placement of complex personnel in cyber security starts with selecting the criteria needed to select personnel, and a list of prospective personnel. In the process, the GAP mapping value G is determined for the specified GAP value, then the weight value of each result from the GAP value will be converted into a GAP weight value, then the core factor and secondary factor values will be calculated with the GAP weight value for each personnel, followed by finding the total value by multiplying the core factor by a weight of 60% and the secondary factor by a weight of 40%. The core factor and secondary factor will then be added to get the total value. From each participant's total score, the one with the highest will get the highest rank. The following flowchart of the profile matching calculation flow is shown in Figure 1.

2.2 Decision Support System. Decision support systems (DSS) are part of computer-based information systems, including knowledge-based systems, that are used to support decision-making in a company, organization, or institution [3]. Meanwhile, according to Sholihaningtias, D. et al. (2018) [4], a decision support system is not a decision aid but a system that helps decision makers equip them with information from data processed by relevant parties and is needed to make decisions about a problem more quickly and accurately, so the system is not intended to replace decisions in the decision-making process [5]. The decision support system as a recommendation tool for senkom personnel has cyber security capabilities in protecting the organization from cyber threats and plays a key role that senkom personnel must play in maintaining the security of information technology infrastructure [6].

To produce good decisions in a decision-making system [7], [8], [9], [10], it needs to be supported by quality information and facts, including:

- (1) Accessibility: This attribute relates to the ease of obtaining information. Information will be more meaningful to users if it is easy to obtain because it will relate to information-value activities.

- (2) Completeness: This attribute relates to the completeness of the information content; in this case, the content is not only about data (volume) but also conformity with user expectations, so this completeness is often difficult to measure quantitatively.
- (3) Accuracy: This attribute relates to the suitability of the resulting information for user needs. Like completeness, accuracy is very difficult to measure quantitatively.
- (4) Punctuality of time: The quality of information is also very much determined by its delivery time and actualization.
- (5) Clarity: This attribute relates to the form or format of delivering information. For a leader, the information presented in the form of graphs, histograms, or pictures will usually be more meaningful than information presented in the form of long words.
- (6) Flexibility: This attribute relates to the degree of adaptation of the resulting information to the needs of the various decisions to be taken and a different group of decision-makers.

In this research, the decision support system chose to use the profile matching method, a method that is included in the analysis criteria for multi-criteria decision support systems. The profile matching method uses a qualitative approach, namely comparing the criteria desired by the decision maker (section head) with competencies that match the personnel profile [11], [12]. The decision-maker will give a score for each selected criterion, and then the scores will be added up to produce a total score for each personnel. The personnel with the highest total score will be selected as the best personnel.

2.3 Profile Matching. Profile matching is a decision-making mechanism that assumes that there is a level of predictor variables that must be met by the subject under study, not a minimum level that must be exceeded. Profile matching is a very important process in human resource management, where it is first determined through the competency or ability required by personnel in their field of work [13], [14], [15]. These competencies and abilities must be fulfilled by personnel who will be placed in the field of data and network security. In general, the profile matching process is a process of comparing individual competencies in a specific task so that differences in competency can be identified, which is called GAP (Gross Across Product) [16]. The smaller the GAP value produced, the greater the weight of the value, which means that the opportunity for that person to get a special assignment will of course be greater [17], [18], [19]. Profile matching, which is used for analysis, certainly has advantages and disadvantages, including the following:

- (1) Lack
 - (a) Profile matching cannot solve problems encountered in the form of multiple objects and multiple criteria based on a comparison of the preferences of each element in the hierarchy.
 - (b) Profile matching does not take into account the robustness of the decision-making sensitivity analysis output.
- (2) Excess
 - (a) Profile matching is a method that is very suitable for making decisions related to the presentation value of selecting personnel capabilities and competencies because the calculations are carried out by weighting and calculating the GAP (Gross Across Product).
 - (b) Profile matching considers logical consistency in the assessment used to determine priorities to produce few alternatives.
 - (c) Profile matching is the most appropriate method used in the comparison process between individual competencies in a competency selection of personnel capabilities.

The calculation process using profile matching begins by determining the minimum value for each research variable [20],[21]. The difference between each resulting value and the minimum value for each variable will be calculated based on the core factor (CF) and secondary factor (SF) variables [21],[22]. The composition of CF and SF is 100% dependent on the interests of the user of this method, so the final stage of this method is the process of accumulating CF and SF values [23]. The stages of calculations using profile matching are as follows:

- (1) Determine the value of each aspect of the assessment.
- (2) Determining the determination of GAP (Gain Across Product).
- (3) Perform weight value calculations.
- (4) Perform calculations of Core Factor and secondary factor.

Factor by using the following formula:
Core factor calculation formula:

$$NCF = \frac{\sum NC}{\sum IC} \quad (1)$$

Information:

NCF = Average value of the core factor

NC = The total value of the core factor.

IC = Number of core factor items

Secondary factor calculation formula:

$$NSF = \frac{\sum NS}{\sum IS} \quad (2)$$

Information:

NSF = Average secondary factor value

NS = Total number of secondary factor values

IS = Number of secondary factor items

Perform calculations to get the Total Value using the formula:

$$NT = (x)\% \times NCF + (y)\% \times NSF \quad (3)$$

Information:

NT = Total Value

(x)% = 70% core factor percent value

(y)% = Secondary factor percent value 30% Perform calculations for determining to rank using the formula

$$Rank = \frac{NT^1 + NT^2 + NT^3 + NT^{n...}}{NT^{n...}} \quad (4)$$

Information: NT = Total value of each aspect

3 RESULTS AND DISCUSSION

3.1 Implementation. This study uses data obtained from the Senkom personnel service at the Adisutjipto Air Force Base and a proposed selection of personnel who will oversee data and network security. Furthermore, the data is input using the SPK (Decision Support System), so that the results of inputting the data become the Kasenkom's proposal to the Kadispers to place personnel who meet the criteria to carry out duties as Cyber Security.

3.2 Algorithm calculation. The calculation process for determining Senkom personnel begins with several stages based on calculations using the profile-matching method. These stages are the assessment of the expertise aspect, the assessment of the leadership aspect, and the assessment of the analytical aspect. The assessment carried out on prospective TNI personnel includes three aspects that are assessed, as shown in Table 1

- (1) Assessment of Aspects of Expertise or Proficiency.

Table 1 Target Assessment Aspects of Expertise

Category	Description	Score	Weight
PAK 1	Value Knowledge of Cyber Security	1	15%
PAK 2	Value: Knowledge of Network Security	2	10%
PAK 3	Value Knowledge of Cyber Security Risk Analysis	3	25%

The determination of the value of the weight in the assessment of the aspect of expertise is obtained from a total weight of 50%. The score is obtained by determining the assessment of each aspect.

- (2) Management Aspect Assessment (Individual Assessment)The following values for each aspect are shown in Table 2

Table 2 Management Aspect Assessment Targets

Category	Description	Score	Weight
PAM 1	Score Ability to lead	2	6%
PAM 2	Value Ability to inspire	3	2%
PAM 3	Score Ability to manage a team	4	12%

- (3) Assessment of Analytical Aspects (Minimum 5 years of service assessment) The following values for each aspect are shown in Table

Table 3 Target Assessment Aspects of Expertise

Category	Description	Score	Weight
PAA 1	Score Minimum tenure of 5 years	5	10%
PAA 2	Value of Integrity	4	5%
PAA 3	Value of Discipline	3	2%
PAA 4	The Value of Teamwork	2	2%
PAA 5	Commitment Valu	3	5%
PAA 6	Devotion Value	4	6%

The determination of the value of the weight on the assessment of the aspect of expertise is obtained from a total weight of 30%. The score is obtained by determining the assessment of each aspect.

By using the profile matching method, the first step that needs to be taken is to determine an assessment of each aspect, with an assessment of each aspect as follows:

Value:

Score 1 = Very Poor

Score 2 = Less

Score 3 = Enough

Score 4 = Good

Score 5: Very Good

The assessment was carried out by interviewing each of its aspects, as shown in the following table.

- (1) Assessment of Expertise Aspects (PAK), in Table 4, as follows.

Table 4 Assessment of Expertise Aspects (PAK)

No	Personnel Name	Expertise Aspect Assessment		
		PAK 1	PAK 2	PAK 3
1	Personel 1	2	3	4
2	Personel 2	2	2	3
3	Personel 3	4	2	3
4	Personel 4	2	2	4
5	Personel 5	3	3	4
...
...
...
19	Personel 19	2	4	2
20	Personel 20	3	4	5

Description:

PAK 1: Value Knowledge of Cyber Security

PAK 2: Value of knowledge about network security

PAK 3: Value of knowledge about cyber security risk analysis

- (2) The assessment of Management Aspects (PAM) in Table 5 is as follows

Table 5 Assessment of Management Aspects (PAM)

No	Personnel Name	Assessment of Management Aspects		
		PAM 1	PAM 2	PAM 3
1	Personel 1	2	3	4
2	Personel 2	2	2	3
3	Personel 3	4	2	3
4	Personel 4	2	2	4
5	Personel 5	3	3	4
...
...
...
19	Personel 19	2	4	2
20	Personel 20	3	4	5

Information:

PAM 1: Assess the ability to lead

PAM 2: Assess the ability to inspire

PAM 3: Score ability to manage the cyber security division team

- (3) Assessment of Analytical Aspects (PAA), in Table 6, as follows

Table 6 Value Aspects of TNI Personnel

Name	PAA 1	PAA 2	PAA 3	PAA 4	PAA 5	PAA 6
Personel 1	4	3	4	1	2	2
Personel 2	3	4	4	1	2	3
Personel 3	4	2	2	4	1	2
Personel 4	3	5	3	3	2	2
Personel 5	3	3	4	3	4	4
...
...
...
Personel 19	3	2	5	3	1	3
Personel 20	4	3	4	3	3	4

3.3 Implementation of Profile Matching. Steps taken:

- (1) Look for the GAP by mapping the competency weight values in tabular form according to predetermined standards in the form of Table 7 as follows

Table 7 Standard GAP values

GAP	Weight Value	Description
0	5	Competence as needed
1	4,5	Competency over 1 level
-1	4	Competence is less than 1 level
2	3,5	Competency over 2 levels
-2	3	Competency less than 2 levels
3	2,5	Competency over 3 levels
-3	2	Competency lacks 3 levels
4	1,5	Competency over 4 levels
-4	1	Competence lacks 4 levels

And the conversion table is shown at Table , as follows.

Table 8 Conversion of GAP Values and Weights for Assessment of Expertise Aspects

Personnel Name	PAK			PAM			PAA					
Standard Value	3	2	4	3	3	1	3	3	2	2	3	4
Personel 1	0	1	-2	0	1	-2	0	0	2	-1	-1	-2
Personel 2	-2	2	0	-2	2	-2	-2	1	1	1	-1	-1
Personel 3	2	-1	-2	2	-1	-2	2	-2	0	2	-2	-2
Personel 4	-1	-1	-1	1	0	-1	-1	-1	-1	-1	-1	-2
Personel 5	0	2	-1	0	1	2	-2	0	0	1	1	0
...
...
...
...
Personel 19	0	1	-2	1	0	4	-1	-1	1	1	-1	-1
Personel 20	0	0	1	2	-1	1	-2	1	2	1	0	0
							Convert to weights					
Personel 1	5	4,5	3	5	4,5	3	5	5	3,5	4	4	3
Personel 2	3	3,5	5	3	3,5	3	3	4,5	4,5	4,5	4	4
Personel 3	3,5	4	3	3,5	4	3	3,5	3	5	3,5	3	3
Personel 4	4	4	4	4,5	5	4	4	4	4,5	4	4	3
Personel 5	5	3,2	4	5	4,5	3,5	3	5	5	4,5	4,5	5
...
...
...
Personel 19	5	4,5	3	4,5	5	1,5	4	4	4,5	4,5	4	4
Personel 20	5	5	4,5	3,5	4	4,5	3	4,5	3,5	4,5	5	5

From the values that have been standardized, look for the GAP value using the following formula.

$$GAP = Personnel\ data - Personnel\ Target\ Value \quad (5)$$

- (2) Then calculate the value of the core factor (CF) and second factor (SF) using the profile matching method, giving a weight of 60% for the core factor and 40% for the second factor.

To perform calculations on the core factor and secondary factor values, you must first determine the criteria for each aspect in Table 9 below.

Table 9 Determination of Aspects and Criteria

No	Aspects and Criteria	Factor
1	Expertise Aspect	
	a) The value of knowledge about cyber security	Core Factor
	b) Value knowledge of network security	Core Factor
2	Management Aspects	
	a) Assess the ability to lead	Core Factor
	b) Assess the ability to inspire	Core Factor
3	Analytical Aspect	
	a) The value of the minimum service period of 5 years	Core Factor
	b) Integrity value	Core Factor
	c) Discipline value	Core Factor
	d) The value of teamwork	Secondary Factor
	e) Commitment value	Secondary Factor
	f) Devotion value	Secondary Factor

The results of the calculation of the core factor and secondary factor values by using the converted values into weights for each aspect, the results of the core factor and secondary factor values for the Assessment of Expertise Aspects are obtained as shown in Table 10 below.

Table 10 Value of Core Factors and Secondary Factors

Personnel Name	PAK		PAM		PAA	
	CF	SF	CF	SF	CF	SF
Personel 1	4,75	3	4,75	3	4,50	3,67
Personel 2	3,25	5	3,25	3	4,00	4,17
Personel 3	3,75	3	3,75	3	3,83	3,17
Personel 4	4	4	4,75	4	4,17	3,67
Personel 5	4,1	4	4,75	3,5	4,33	4,67
...
...
...
Personel 19	4,75	3	4,75	1,5	4,17	4,17
Personel 20	5	4,5	3,75	4,5	3,67	4,83

The results of the calculation of the core factor and secondary factor values for each aspect of the assessment will be entered into the table to determine the total value of all aspects of each individual as a candidate. The result is shown in Table 11 below

Table 11 Results of Calculating the Total Value (NT)

No	Personnel Name	Total Value of Aspects of Expertise (NT)	Management Aspect Total Value (NT2)	Total Value of Analytical Aspects (NT3)
1	Personel 1	4,05	4,05	4,17
2	Personel 2	3,95	3,15	4,07
3	Personel 3	3,45	3,45	3,57
4	Personel 4	4	4,45	3,97
5	Personel 5	4,06	4,25	4,47
...
...
...
19	Personel 19	4,05	3,45	4,17
20	Personel 20	4,8	4,05	4,13

After getting the total value of the research for each aspect, it can determine the ranking of each candidate for each position. using formula 6

$$\begin{aligned}
 NT = & (NT^1 \times 20\% \text{ of Total Aspects of Expertise}) + \\
 & (NT^2 \times 30\% \text{ of Total Management Aspects}) + \quad (6) \\
 & (NT^3 \times 50\% \text{ of Total Analytical Aspects})
 \end{aligned}$$

Information: NT = Total value of each aspect
The results of the ranking calculations can be seen in Table 12 as follows.

Table 12 Ranking of Profile Matching

Personnel Name	Total Value	Ranking
Personel 1	4,11	5
Personel 2	3,77	7
Personel 3	3,51	9
Personel 4	4,12	4
Personel 5	4,32	1
...
...
...
Personel 19	3,93	6
Personel 20	4,24	2

4 Conclusions and Recommendations

4.1 Conclusions. The results obtained from implementation using the profile matching method showed recall, precision, and accuracy of 0.4. While the profile matching method is relatively easy to use and produces fairly accurate data, it takes longer to collect data and create profiles of potential candidates. The scores in profile matching do not use percentages for each criterion, so that flexibility in evaluating and comparing candidates can determine one candidate for cyber security personnel. From this method, we conclude that the profile matching decision support system method can determine the personnel appointed as cyber security in order to support the duties of Adisutjipto Air Base against cyber attacks. From this method, we conclude that the profile matching decision support system method can be a tool for determining appropriate personnel for cyber security in order to support the duties of Adisutjipto Air Base against cyber attacks.

4.2 Suggestions. The suggestions that can be used as input for leaders to determine complex personnel who have data and network security capabilities are as follows:

- (1) For this method, it is necessary to consider the factors that are important for determining candidates in order to maximize the three methods.
- (2) It is necessary to consider comparing with other methods so that the data will have more variants to test.
- (3) To improve the accuracy and precision of the profile matching method, it is necessary to consider more detailed criteria weights to enable a more precise assessment of a candidate's ability to make more accurate decisions.

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