International Journal Of Artificial Intelegence Research
Vol 1, No 1, Juny 2017, pp. 21 - 25

ISSN: **2579 - 7298**

Decision Support System For Election Of Members Unit Patients Pamong Praja

Febri Haswan

Departement of Computer Engineering, Universitas Islam Kuantan Singingi, Jl. Gatot Subroto KM 7 Kebun Nenas, Teluk Kuantan (29562), Indonesia
febri.haswan88@gmail.com

ARTICLE INFO

Article history:
Received : 05/16/2017
Revised : 06/05/2017
Accepted : 06/30/2017

Keywords:
Decision Support Systems
DSS
Fuzzy Multiple Attribute Decision Making
FMADM
Simple Additive Weighting
SAW

ABSTRACT

Civil Service Police Unit (municipal police) is part of the area in the enforcement of legislation and arrangements for public order and public tranquility . Decision Support System or DSS (Decision Support System) is a computer -based information systems whose main goal is to help decision -making utilize data and models to solve the problems that are unstructured and semi- structured . In accepting prospective members of the previous municipal police PSDM section sorting and selecting applicants one by one entering the data so that the data obtained is not clear didapt results of each participant. By using Fuzzy Multiple Attribute Decision Making (FMADM) is used to find an alternative from a number of alternatives to optimize certain criteria , while the Simple Additive Weighting method (SAW). SAW method is often also known term weighted summation method . The basic concept is to find a method SAW weighted summation of the performance ratings of all the attributes of each alternative.

I. Introduction

The Civil Service Police Unit (Satpol PP) is part of the regional apparatus in enforcing the law and maintaining public order and public order. Satpo PP is good and meets the qualification standards obtained through effective recruitment efforts. Selection of candidate members of Satpol PP is done to get good quality human resources and most in accordance with the requirements required by the Agency[1].

In the selection stage should not be done with the family system, commission or in other words bribe bribe. To handle that, a valid Decision Making System is required. Decision Support System or DSS (Decision Support System) is a computer-based information system whose primary purpose is to help decision making utilize data and models to solve unstructured and semi-structured problems. DSS is designed to support all stages of decision-making, starting from the stages of identifying problems, selecting relevant data, determining the approach used in the decision-making process to evaluating the selection of alternatives [2]

A valid decision should be made by the Human Resources Development (PSDM) section. So far in the acceptance of candidates for Satpol PP members, the PSDM divides and selects one by one applicant data entry. After sorting and selecting the data of incoming applicants, the PSDM section invites applicants to perform selection tests.

The PSDM section should conduct the selection objectively and accurately and can take place in a short period of time. Overcoming it then designed an application that will simplify and speed up the selection process Satpol PP members. Fuzzy Multiple Attribute Decision Making FMADM is a method used to find alternative optimize from a number of alternatives with certain criteria, while Simple Additive Weighting (SAW) method. The SAW method is often also known as the weighted summing

method. The basic concept of the SAW method is to find a weighted sum of performance ratings on each alternative of all attributes [2]. These aspects of the Decision Support System's assessment are designed in such a way that the user in this case is the manager of the human resources department can define aspects of the self-assessment dynamically so that the decision support system can be used more widely [2]

Selection of FMADM and SAW method is due to give weight value for each criterion, then proceed with ranking process which will select best alternative from some alternative. With this method of ranking, it is expected to facilitate the decision maker in selecting and selecting the participants, while the final decision will be determined by the user based on further consideration. This is because so many criteria (multicriteria) must be considered in the selection process of new members of Satpol PP.

II. Theory

a. Basic Concepts of Multiple Attribute Decision Making (MADM)

Basically, the MADM process is done through 3 stages, namely the preparation of components of the situation, analysis, and synthesis of information. At the component compilation stage, the component of the situation, an estimate table will be formed which contains the identification of alternatives and objectives specifications, criteria and attributes. One way to specify the purpose of the situation | Oi, i = 1, ..., t | Is to list the possible consequences of an identified alternative | Ai, i = 1, ..., n |. In addition there are also set of attributes that will be used | ai, k = 1, ..., m |.

Most of the MADM approaches are conducted through two steps: first, aggregating responses to all goals on each alternative. Second, ranking the alternative decisions based on the results of decision aggregation.

Thus, it can be said that, the problem of multiple attribute decision making (MADM) is evaluating m alternative Ai (i = 1,2, ..., m) to a set of attributes or criteria Cj (j = 1,2, ..., N), where each attribute is independent of each other. The decision matrix of each alternative depends on each other. Alternative matrix of each alternative there are each attribute, X, given as:

$$X = \begin{pmatrix} X_{11} & X_{12} & \dots & X_{1n} \\ X_{21} & X_{22} & \dots & X_{2n} \\ : & : & : & : \\ X_{m1} & X_{m2} & \dots & X_{mn} \end{pmatrix} \quad (1)$$

Where Xij is the i-th alternative performance rating of the jth attribute, the weight value indicating the relative importance of each attribute, is given as, W:

W = {w1, w2, ..., wm}

The performance rating (X), and weighted value (W) are the primary values that represent the absolute preferences of decision makers (Sri Kusumadewi, 2006).

b. Simple Additive Weighting (SAW)

One method of solving MADM problem is by using Simple Additive Weighting (SAW) method. The SAW method is often also known as the weighted summing method. The basic concept of the SAW method is to find a weighted sum of performance ratings on each alternative of all attributes. The SAW method requires the process of normalizing the decision matrix (X) to a scale comparable to all alternative ratings (Destriyana Darmastuti, 2013). Given the following equation:

$$r_{ij} = \begin{cases} \dfrac{x_{ij}}{\max\limits_{i} x_{ij}} & \text{Jika j atribut keuntungan (\textit{benefit})} \\ \dfrac{\min\limits_{i} x_{ij}}{x_{ij}} & \text{Jika j atribut biaya (\textit{cost})} \end{cases} \quad (3)$$

Information :

Rij = normalized performance rating value
Xij = attribute value owned by each criterion
Max xij = the largest value of each criterion
I
Min xij = the smallest value of each criterion
I
Benefit = if the greatest value is best

Cost = if the smallest value is best

Where rij is the normalized performance rating of the alternative Ai on the attribute Cj; I = 1,2, ..., m and j = 1,2, ..., n. The preference value for each alternative (Vi) is given as follows:

$$V_i = \sum_{j=1}^{n} w_j r_{ij} \quad (4)$$

Information :
Vi = rank for each alternative
Wj = weighted value of each criterion
Rij = normalized performance rating value

A larger value of Vi indicates that Ai's alternatives are preferred. (Destriyana Darmastuti, 2013). The steps of SAW method are:

1) Determine the criteria that will be used as a reference in decision making, namely C.
2) Determine the match rating of each alternative on each criteria.
3) Create a decision matrix based on criterion (C), then normalize the matrix based on the equation that is adjusted to the type of attribute (attribute gain or cost attribute) to obtain a normalized matrix R.
4) The final result obtained from the ranking process is the sum of the matrix multiplication normalized R with the weight vector to obtain the largest value selected as the best alternative (A) as a solution.

The advantages of the Simple Additive Weighting (SAW) model compared to other decision-making models lie in its ability to conduct judgments more precisely because they are based on predetermined criteria and preference values. In addition, SAW can also select the best alternative from a number of alternatives Because of the ranking process after determining the weight value for each attribute.

III. Analysis and System Design

a. System Requirement Analysis

In the process of making a decision support system for the selection of new members of Satpol PP, it takes a system need to consider on each criteria to be used. To determine the new members of Satpol PP there are 6 criteria to be used. Where criterion C1 to C6 is profit criterion (Benefit). The criteria are:

1. C1 = Educational Value
2. C2 = Value of Comulative Achievement Index (GPA)
3. C3 = Age Weight
4. C4 = Personal Characteristic Testing Value
5. C5 = General Intelligence Test Scores
6. C6 = National Insight Value Score

From the 6 criteria above it can be explained that the criterion with symbol C1 is the value of education, the criteria of educational value is taken with the reason to make it easier in determining the position of placement available in the vacancy Satpol PP.

Criteria with symbol C2 is the value of the index of achievement komulatif (GPA) is also taken dikarnakan with high index of cumulative achievement then the value in the weight of the assessment is also higher.

The criterion with the symbol C3 is age, this age is intended to know the age limit, the age limit has been determined by the HR department as low as 18 years and as high as 35 years from the date specified by the HR section.

The criterion with the C4 symbol is the value of the personal characteristic test, the criteria for the personal characteristic test are taken to determine the personality assessment for each examineee. While the C5 is a common intelligence test scores, this general intelligence test is used to obtain general insight assessments of each pesertra and C6 is the value of nationality insight test, this nationality insight test is also taken to obtain an assessment of national insight on each participant.

b. Criteria and Weighing

In the process of making a decision support system to determine the new members Satpol PP required weighting on any predetermined criteria. There are 6 (Six) criteria to be used in determining new members of Satpol PP. The criteria and fuzzy numbers used in determining the selection of new members of Satpol PP are:

A. Education Value Criteria is converted to fuzzy numbers below:

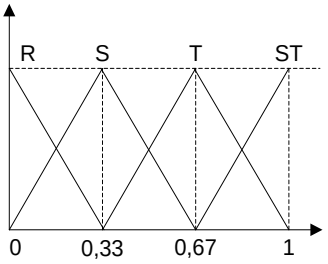

Figure 4.1 Fuzzy Value of Education

Table 4.1 Education Value

No.	Value Educational	Fuzzy Numbers	Value
1.	<D3	Low (R)	0
2.	D3	Medium (S)	0.33
3.	S1	High (T)	0.67
4.	S2	High Stake (ST)	1

B. Criteria The grade point average (GPA) is converted to the following fuzzy numbers:

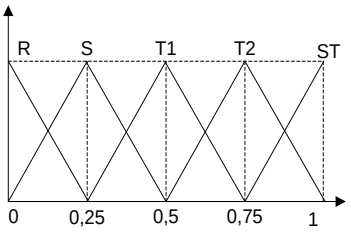

Figure 4.2 Fuzzy Value of Comulative Achievement Index (GPA)

Table 4.2 Cumulative Achievement Index Value (GPA)

No.	Value GPA	Fuzzy Numbers	Value
1.	<2.75	Low (R)	0
2.	2.75 - 3.00	Medium (S)	0.25
3.	3.01 - 3.25	Middle (T1)	0.5
4.	3.26 - 3.50	Height (T2)	0.75
5.	3.51 - 4	High Stake (ST)	1

C. Age Weight Criteria are converted to fuzzy numbers below:

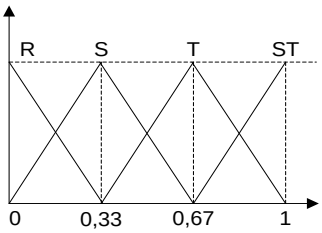

Figure 4.3 Fuzzy Age Weight

Table 4.3 Age Weight

No.	Weight Age	Fuzzy Numbers	Value
1.	< 18 and> 35	Low (R)	0
2.	31 - 35	Medium (S)	0.33
3.	25 - 30	Height (T)	0.67
4.	18 - 24	High Stake (ST)	1

D. Personal Characteristic Value Test Criteria (TKP) are converted with fuzzy numbers below:

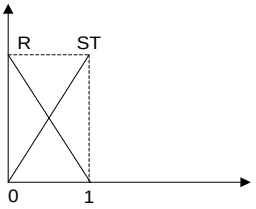

Figure 4.4 Fuzzy Value of Personal Characteristic Test (TKP)

Table 4.4 Tests of Personal Characteristics

No.	Value TKP	Fuzzy Numbers	Value
1.	<108	Low (R)	0
2.	> 107	High Stake (ST)	1

E. The General Intelligence Test (TIU) Test Criteria are converted to the following fuzzy numbers:

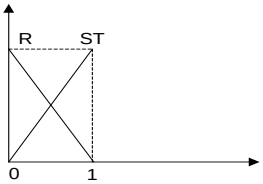

Figure 4.5 Fuzzy Value of General Intelligence Tests (TIU)

Table 4.5 General Intelligence Test Scores

No.	Value TIU	Fuzzy Numbers	Value
1.	< 70	Low (R)	0
2.	> 69	High Stake (ST)	1

F. Criteria of National Insight Score Test (TWK) is converted to fuzzy numbers below:

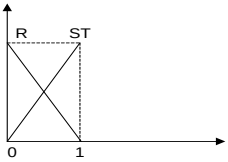

Figure 4.6 Fuzzy Value of Nationality Insight Test (TWK)

Table 4.6 Value of Insight Score Nationality

No.	Value TWK	Fuzzy Numbers	Value
1.	< 64	Low (R)	0
2.	> 63	High Stake (ST)	1

Table 4.7 Minimum Weight Assumption of Variable Selection Variables

Decision	Standard Criteria Expected (Weight)					
	C1	C2	C3	C4	C5	C6
Passed	< D3	< 2,75	< 18 dan > 35	> 107	> 69	> 63

Table 4.9 Alternative Table and Participant Criteria

No	Alternative	Criteria					
		C1	C2	C3	C4	C5	C6
1.	Syamsoni	S1	3,15	23	125	70	70
2.	Taufiq Febrino	S1	3,1	22	95	70	60
3.	Beni Aprianto	D3	3,26	19	103	80	58
4.	M. Daud	D3	2,98	20	135	90	80
5.	Indra	D3	3,55	21	140	100	115
6.	Koko Mahyudi	S1	3,45	25	110	135	60
7.	Jondrawadi	S2	3	27	100	115	110

Real data 7 above participants, will be converted into fuzzy that have been determined in the previous discussion:

Table 4.10 Alternative Table and Participant Criteria with Fuzzy Value

No	Alternative	Criteria					
		C1	C2	C3	C4	C5	C6
1.	Syamsoni	0,67	0,5	1	1	1	1
2.	Taufiq Febrino	0,67	0,5	1	0	1	0
3.	Beni Aprianto	0,33	0,75	1	0	1	0
4.	M. Daud	0,33	0,25	1	1	1	1
5.	Indra	0,33	1	1	1	1	1
6.	Koko Mahyudi	0,67	0,75	0,67	1	1	0
7.	Jondrawadi	1	0,25	0,67	0	1	1

Based on table 4.10 above, a decision X can be formed by using formula (1) the following data:

$$X = \begin{pmatrix} 0,67 & 0,5 & 1 & 1 & 1 & 1 \\ 0,67 & 0,5 & 1 & 0 & 1 & 0 \\ 0,33 & 0,75 & 1 & 0 & 1 & 0 \\ 0,33 & 0,25 & 1 & 1 & 1 & 1 \\ 0,33 & 1 & 1 & 1 & 1 & 1 \\ 0,67 & 0,75 & 0,67 & 1 & 1 & 0 \\ 1 & 0,25 & 0,67 & 0 & 1 & 1 \end{pmatrix}$$

Based on the calculation of normalization of X matrix, then can be determined normalized matrix R as follows:

$$R = \begin{pmatrix} 0,67 & 0,5 & 1 & 1 & 1 & 1 \\ 0,67 & 0,5 & 1 & 0 & 1 & 0 \\ 0,33 & 0,75 & 1 & 0 & 1 & 0 \\ 0,33 & 0,25 & 1 & 1 & 1 & 1 \\ 0,33 & 1 & 1 & 1 & 1 & 1 \\ 0,67 & 0,75 & 0,67 & 1 & 1 & 0 \\ 1 & 0,25 & 0,67 & 0 & 1 & 1 \end{pmatrix}$$

After the normalization process is done or the normalized matrix has been obtained, the next step is to determine the importance of each criterion determined by the decision maker, symbolized by (W). From the criteria that have been determined, then made a level of importance criteria based on the value of weight that has been determined into the fuzzy number with the formula that is the n-n-1 variable. Twice match each alternative on each criteria as follows:

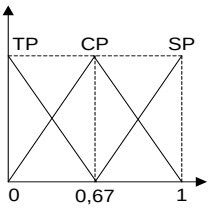

Figure 4.7 Fuzzy Interests Each Criteria

Table 4.11 Level of Interest of Each Criteria

Criteria	Number of Fuzzy	Wight
C1	Important (CP)	0,67
C2	Important (CP)	0,67
C3	Very Important (SP)	1
C4	Very Important (SP)	1
C5	Very Important (SP)	1

C6	Very Important (SP)	1

The weighting of the fuzzy number is:

W = [0.67 0.67 1 1 1 1]

All V1-V7 rank values of multiplication result with normalization are combined in table 4.12, so the result of ranking in the table below:

Table 4.12 Total Value Overall

No	Alternative	Criteria						Results
		C1	C2	C3	C4	C5	C6	
1.	Syamsoni	0,67	0,5	1	1	1	1	4,7839
2.	Taufiq Febrino	0,67	0,5	1	0	1	0	2,7839
3.	Beni Aprianto	0,33	0,75	1	0	1	0	2,7236
4.	M. Daud	0,33	0,25	1	1	1	1	4,3886
5.	Indra	0,33	1	1	1	1	1	4,8911
6.	Koko Mahyudi	0,67	0,75	0,67	1	1	0	3,6214
7.	Jondrawadi	1	0,25	0,67	0	1	1	3,5075

Table 4.13 Results of Ranking of New Members of Satpol PP

No	Alternative	Criteria						Results	Ranking
		C1	C2	C3	C4	C5	C6		
1.	Indra	0,33	1	1	1	1	1	4,8911	1
2.	Syamsoni	0,67	0,5	1	1	1	1	4,7839	2
3.	M. Daud	0,33	0,25	1	1	1	1	4,3886	3
4.	Koko Mahyudi	0,67	0,75	0,67	1	1	0	3,6214	4
5.	Jondrawadi	1	0,25	0,67	0	1	1	3,5075	5
6.	Taufiq Febrino	0,67	0,5	1	0	1	0	2,7839	6
7.	Beni Aprianto	0,33	0,75	1	0	1	0	2,7236	7

For example, in Table 4:13 there is a decision result that the 3 participants who passed the race said that 3 participants meet the minimum value standard that has been determined by Kuantan Singingi Regency Government. The minimum standard score can be seen in criteria C4, C5, and C6. If the 3 criteria meet the minimum value standard then the participant is declared Passed and accepted as new member of Satpol PP with record of decision fixed by firmly by leader.

IV. Conclusions

After analyzing and designing the decision support system of new Satpol PP member selection using Fuzzy Multiple Attribute Decision Making (FMADM) using Simple Additive Weighting (SAW) method, it can be concluded as follows:

1. With the decision support system in the selection of new Satpol PP members using Fuzzy Multiple Attribute Decision Making (FMADM) using Simple Additive Weighting Method (SAW) can help or as a reference for the user in determining the selection of new members of Satpol PP.
2. The built system can facilitate the selection, this is evidenced by the comparison between manual system with computerized system using Fuzzy Multiple Attribute Decision Making (FMADM) model using Simple Additive Weighting (SAW) method.
3. Fuzzy Multiple Attribute Decision Making (FMADM) selection using Simple Additive Weighting (SAW) method because this model can choose the best alternative from several alternatives by using each criterion.

References

[1] Asep, H., R., and Dini, D., and Andri, I. (2012). "Supervisor of Selection of New Student Selection Selection at SMA Negeri 3 Garut" Journal of Garut High School Algorithm Volume 09, Number 21 (2012), ISSN 2302 – 7339.

[2] Candra, S. (2012). "Fuzzy Multiple Attribute Decision Making (FMADM) Using Simple Additive Weighting (SAW) Method In Private Universities Selection" Thesis Master of Computer UPI "YPYK", Padang.

[3] Jogiyanto. (2009). "Information Technology System" Issue III, Andi. Yogyakarta.

[4] Nandang, H. (2012). "Decision Support System Using Simple Additive Weighting (SAW) Method to Determine Department at SMK Bakti Purworkerto" Seminar on National Information and Communication Technology Semarang, June 23, 2012, ISBN 979 - 26 - 0255 – 0.

[5] Noferianto, S. (2012). "Simple Additive Weighting Method In Determining Number Of Teaching At The Institute Of Tutoring" Thesis Magister Computer UPI "YPTK", Padang.

[6] Nurdin, B., and Helmie, A., W., and Sukmawati, N., E., and Sutiko. (2012). "Decision Support System, Computing and Simulation" National Seminar of Computer Science Diponegoro University, September 15, 2012, ISBN 978 - 979 - 756 - 843-6.

[7] Sri, E. (2011). "Design of Supporting System of Decision Making for Scholarship Acceptance Using Simple Additive Weighting Method" Journal of Information Technology DYNAMIC Volume 16, Number 2 (2011) Page 171-176, ISSN 0854 – 9524.

[8] Sugiyono, and Nazori, A. (2012). "Digital Map Modem Prone to Lightning Strikes Using Simple Additive Weighting Method" Journal of M. Telematics Volume 4, Number 1 (2012), ISSN 2085 - 725X.

[9] Heri Nurdiyanto, Hermanto Hermanto, “Signature Recognition using Neural Network Probablisitc”, International Journal of Advances in Intelligent Informatics, Vol. 2, Issue 1, pp. 46-53, 2016