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# Election Of The Head Of The Study Program By Applying The SAW Method (Case Study STMIK Pelita Nusantara)

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**Abstract**

The election of the Head of the Study Program is very important to consider the maximum results of services to students. In the process of selecting the Head of the Study Program at STMIK Pelita Nusantara, they usually directly appoint those who occupy the position with several elements. Determination of the Head of the Study Program is very necessary by making some general and specific criteria and expertise in their fields. The system that is needed is the Decision Support System for the Head of Study Program Decision. The variables specified in this study are 1) General which includes: Functional Position, Status, Expertise. 2) Specifically covering: Attitude Value, General Knowledge Test Value, Field Knowledge Test Value, and Interview. This system was built by applying the web-based Simple Additive Weighting (SAW) method and MySQL as the database.

Keywords: Head of study Program, SPK, Simple Additive Weighting method

## 1. Introduction

Information technology that is increasingly developing at this time is very supportive of the needs of the campus. Good to realize the effectiveness and efficiency of work and in improving services to the community. The performance of employees, especially the head of study programs on campus, is demanded to be faster in completing work because it is related to student services so that it can satisfy students. Information technology can also help manage or structural officials in making decisions so that decisions issued by institutions are more relevant and acceptable to all parties.

On each campus, the head of the study program is a very important resource for determining the success of a work unit. Basically, the quality of human resources is one of the factors needed to increase the productivity of an agency. Qualified staff will facilitate work units in achieving their goals, both in terms of service and service. One of the techniques used by the management of an organization/work unit in improving the quality of human resources is by selecting who is fit to occupy the work position. With this election, the employee with the best performance will get the position as well as encouragement to further improve work performance and service.

STMIK Pelita Nusantara is one of the best high nominations in North Sumatra which has five study programs namely 1) Informatics Engineering (S1); 2) Software Engineering (S1); 3) Information Technology (S1); 4) Computer Network Engineering Technology (D4 / S1); and 5) Informatics Management (D3). The vision of STMIK Pelita Nusantara is STMIK Pelita Nusantara to be a superior highcalcator and computer education center that produces National Competitive Graduates in 2024.

In the selection of the head of the study program at STMIK Pelita Nusantara, ordinary people still directly appoint who will occupy the position by considering several elements so that it can cause errors in the selection of the head of the study program. In the age of technology, it should have been the head of the study program that has been used with a computerized decision support system by applying one method of mathematical calculation such as the Simple Additive Weighting (SAW) method.

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Decision Support System (DSS) is a computer-based information system that is flexible, interactive, and adaptable, which was developed to support solutions to specific unstructured management problems. Decision Support Systems use data, provide an easy user interface, and can incorporate decision making thoughts (Turban, Sharda & Delen, 2011). One method of solving problems in a decision support system is to use the Simple Additive Weighting (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 the performance ratings for each alternative of all attributes (Fishburn, 1967). [7] The SAW method requires the decision matrix normalization process (X) to a scale that can be compared with all existing alternative ratings (Kusumadewi, 2006).

## 2. Method

The steps taken in this study consisted of several steps, namely:

a) Data Collection
   At this stage, the researcher collected data relating to the selection of study program heads in the STMIK Pelita Nusantara environment by examining the problems and shortcomings in the selection process of study program heads.
b) Determination of the problem
   After the data is collected, the researcher determines the problem for further research.
c) Data Analysis
   Data analysis is performed from the data that has been collected and the problem has been determined. At this stage, the researcher also analyzed the data with books relating to the problem. The determination of criteria is also carried out at the stage of data analysis.
d) Application of the SAW Method
   After the data and criteria have been analyzed, the researchers then apply the Simple Additive Weighting method to solve the problems that have been determined.
e) Determine the results
   From the application of the method, the calculation of the data using the Simple Additive Weighting method, the results of the study program head election are obtained.

## 3. Results and Discussion

### 3.1 Analysis of the data obtained

This analysis phase is carried out directly at STMIK Pelita Nusantara. Based on the results of the analysis that has been carried out using observation and interviews, there is not yet a system to obtain valid data in the selection of study program heads.

After observing the ongoing system of STMIK Pelita Nusantara, an idea was obtained to develop an application for the selection of the head of the study program using the SAW method. The SAW (Simple Additive Weighting) method is often also known as the weighted sum method. The basic concept of the SAW (Simple Additive Weighting) method is to find the weighted sum of the certification ratings for each alternative on all attributes. The SAW (Simple Additive Weighting) method requires a decision matrix normalization process (x) to a scale that can be compared with all available alternative ratings.

$$Rij = \begin{cases} \dfrac{X\,ij}{Max\ I\ Xij} & Benefit \\ \dfrac{Min\ i\ x\ ij}{X\ i} & Cost \end{cases}$$

Information :
Rij = normalized performance reting value
Xij = attribute value owned by each criterion
Max i Xij = the biggest value of every criteria
Min i Xij = the smallest value of each criteria
Benefit = if the biggest value is the best
Cost = if the smallest value is the best where Rij is the normalized Certification rating of alternative AI in the attribute Cj i = 1,2 .....,m dan j = 1,2.....,n perfection value for each alternative (Vi) is given as :

$$Vi = \sum_{j=1}^{n} wj\ Rij$$

Information :
Vi = rating for each alternative
Wj = the weight value of each criteria
Rij = Normalized Certification rating value

A greater Vi value indicates that the Ai alternative is preferred.

In choosing the head of the study program using the Simple Additive Weighting method, criteria, and weight is needed to do the calculations so that the best alternative will be obtained.

In the Simple Additive Weighting method, there are criteria needed for the selection of the head of the study program. The criteria are as follows:

Table 1. Criteria Table

| *No.* | *Kreteria* | *Keterangan* |
|---|---|---|
| *1* | C1 | Experience |
| *2* | C2 | Expertise |
| *3* | C3 | Field test scores |
| *4* | C4 | Functional |

From each of these criteria, weights will be determined. The weight consists of six SAW numbers, which are less (k), enough (C), good (B), very good (SB). From the captivity above the SAW, numbers can

be converted into certain weights which will be used to calculate each criterion. For clearer data weights are formed in table 2.

Table 2. Weight Table

| *No.* | *SAW Numbers* | *Score* |
|---|---|---|
| *1* | Less | 2 |
| *2* | Enough | 3 |
| *3* | Well | 4 |
| *4* | Very good | 5 |

Table 3. Experience

| *No.* | *Experience c1* | *SAW Numbers* | *Score* |
|---|---|---|---|
| *1* | C1>=0 s/d c2<=3 | Less (k) | 2 |
| *2* | C1>=4 s/d c2<=6 | Enough (c) | 3 |
| *3* | C1>6 s/d c2<=9 | Well (b) | 4 |
| *4* | C1>9 | Very good (a) | 5 |

Table 4. Decision

| *No.* | *Score* | *Decision* |
|---|---|---|
| *1* | 0≤ 5 ≤ | Not feasible |
| *2* | 6 ≤ 9 ≤ | Worthy |

### 3.2. Application of the SAW Method

Table 5. Assessment Results From Candidates

| *No* | *Candidate* | *Nilai* | | | |
|---|---|---|---|---|---|
| | | *Experience* | *Expertise* | *Field test scores* | *Functional* |
| *1* | Agustina Simangunsong, M.Kom | 8 | 7 | 8 | 9 |
| *2* | Fristi Riandari, M.Kom | 9 | 8 | 7 | 8 |
| *3* | Penda Sudarto Hasugian, M.Kom | 8 | 8 | 9 | 9 |
| *4* | Roy Fahri Siahaan, M.Kom | 7 | 6 | 7 | 7 |

From the results of the assessment, the percentage is equaled to 100% so that the results obtained as the table below.

Table 6. Expertise

| *No* | *Value of Expertise c2* | *SAW Numbers* | *Score* |
|---|---|---|---|
| *1* | C2>=0 s/d c2<=3 | Less (k) | 2 |
| *2* | C2>=0 s/d c2<=3 | Enough (c) | 3 |
| *3* | C2>6 s/d c2<=9 | Well (b) | 4 |
| *4* | C2>9 | Very good (a) | 5 |

Table 7. Field test scores

| *No* | *Field test scores c3* | *SAW Numbers* | *Score* |
|---|---|---|---|
| *1* | C3 >-= 0 s/d | Less (k) | 2 |

| | | | |
|---|---|---|---|
| *2* | C3 > 2 s/d | Enough (c) | 3 |
| *3* | C3 > 4 s/d | Well (b) | 4 |
| *4* | C3 > 6 | Very good (a) | 5 |

Table 8. Functional

| *No* | *Field test scores c4* | *SAW Numbers* | *Score* |
|---|---|---|---|
| *1* | C4 >= 0 s/d c4<=2 | Less (k) | 2 |
| *2* | C4 >2 s/d c4 <=4 | Enough (c) | 3 |
| *3* | C4 >= 4 s/d c4<=6 | Well (b) | 4 |
| *4* | C4 > 6 s/d c4 = 8 | Very good (a) | 5 |

To make it more clear for example the first Candidate from the above table is Candidate 1 = A1, Candidate 2 = A2, and Candidate 3 = A3. The table below shows the matching rating of each alternative on each criterion.

Table 9. Match rating of each alternative in each criteria

| *No* | *Alternative* | *Criteria* | | | |
|---|---|---|---|---|---|
| | | *C1* | *C2* | *C3* | *C4* |
| *1* | A1 | 2 | 2 | 2 | 2 |
| *2* | A2 | 4 | 3 | 5 | 5 |
| *3* | A3 | 5 | 2 | 3 | 3 |
| *4* | A4 | 2 | 2 | 3 | 3 |

From the above table is converted into the decision X matrix with data:

$$X = \begin{vmatrix} 2 & 2 & 2 & 2 \\ 4 & 3 & 5 & 5 \\ 5 & 2 & 3 & 3 \\ 2 & 2 & 3 & 3 \end{vmatrix}$$

Provide weight values (W) to determine the certification weight rating are formed in the table below.

Table 10. Weight for rating candidates

| *No* | *Criteria* | *Weight* | *Score* |
|---|---|---|---|
| *1* | C1 | Medium (S) | 3 |
| *2* | C2 | Very High (ST) | 6 |
| *3* | C3 | Height (T) | 5 |
| *4* | C4 | Medium (S) | 3 |

From table 3. 10 we obtained the weight value (W) with data W = [3 6 5 3].
Normalize the matrix X to R based on the equation:

a. For experience

So :

$$R11 = \frac{2}{\text{Max}\,[\,2:3:4:5\,]} = \frac{2}{1} = 2$$

$$R21 = \frac{4}{\text{Max}\,[\,2:3:4:5\,]} = \frac{4}{1} = 4$$

$$R31 = \frac{5}{\text{Max}\,[\,2:3:4:5\,]} = \frac{5}{1} = 5$$

b. For the amount of expertise

So :

$$R12 = \frac{2}{\text{Max}\,[\,2:3:4:5\,]} = \frac{2}{1} = 2$$

$$R22 = \frac{3}{\text{Max}\,[2:3:4:5]} = \frac{3}{1} = 3$$

$$R32 = \frac{5}{\text{Max}\,[2:3:4:5]} = \frac{5}{1} = 5$$

c. For field test scores

So :

$$R13 = \frac{2}{\text{Max}\,[2:3:4:5]} = \frac{2}{1} = 2$$

$$R23 = \frac{3}{\text{Max}\,[2:3:4:5]} = \frac{3}{1} = 3$$

$$R33 = \frac{2}{\text{Max}\,[2:3:4:5]} = \frac{2}{1} = 2$$

d. For Functional Positions

So :

$$R14 = \frac{2}{\text{Max}\,[2:3:4:5]} = \frac{2}{1} = 2$$

$$R24 = \frac{5}{\text{Max}\,[2:3:4:5]} = \frac{5}{1} = 5$$

$$R34 = \frac{3}{\text{Max}\,[2:3:4:5]} = \frac{3}{1} = 3$$

Matriks R :

$$R = \begin{matrix} 2 & 2 & 2 & 2 \\ 4 & 3 & 3 & 5 \\ 5 & 2 & 2 & 3 \\ 2 & 2 & 3 & 3 \end{matrix}$$

$$V1 = \frac{(3^2)+(6^2)+(5^2)+(3^2)}{3+6+5+3} = \frac{34}{17} = 2$$

$$V2 = \frac{(3^4)+(6^3)+(5^3)+(3^5)}{3+6+5+3} = \frac{60}{17} = 3{,}5$$

$$V3 = \frac{(3^5)+(6^2)+(5^2)+(3^3)}{3+6+5+3} = \frac{46}{17} = 2{,}7$$

The greatest value is in V2 so Alternative A2 (candidate 2) is the alternative chosen as the best alternative. For more details, see table 11:

Table 11. Process Results

| *No* | *Name* | *Score* | | | | |
|---|---|---|---|---|---|---|
| | | *Experience* | *Expertise* | *Field test scores* | *Profesional* | *The final result* |
| *1* | Agustina Simangunsong, M.Kom | 2 | 2 | 2 | 2 | 2 |
| *2* | Fristi Riandari, M.Kom | 4 | 3 | 5 | 5 | 3,5 |
| *3* | Penda Sudarto Hasugian, M.Kom | 5 | 2 | 3 | 3 | 2,7 |
| *4* | Roy Fahri Siahaan, M.Kom | 2 | 2 | 3 | 3 | 2,47 |

From the process table, a decision table will be obtained. For more details, see table 12.

Table 12. Decision Table

| *No* | *Candidate Name* | *Score* | *Decision* |
|---|---|---|---|
| *1* | Agustina Simangunsong, M.Kom | 8.00 | Not elected |
| *2* | Fristi Riandari, M.Kom | 8,20 | Selected |
| *3* | Penda Sudarto Hasugian, M.Kom | 8,00 | Not elected |
| *4* | Roy Fahri Siahaan, M.Kom | 7,60 | Not elected |

**4. Conclusions**

By applying the Simple Additive Weighting method in the selection of heads of study programs in the STMIK Pelita Nusantara environment, with the following criteria: 1) Experience; 2) Expertise; 3) Field test scores; 4) Professional. Of the four candidates who have been determined, namely 1) Agustina Simangunsong, M.Kom; 2) Fristi Riandari, M.Kom; 3) Penda Sudarto Hasugian, M.Kom; 4) Roy Fahri Siahaan, M.Kom. Then the result of the chosen process is Fristi Riandari, M.Kom with a value of 8.2.

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