Decision support systems in the acceptance of new administrative staff using the SAW method

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***Abstract*—** **Human resource is one very important factor in an organization or companies, both public and private companies. The success of a company's work has a big influence on the management of human resources (HR) a company. If human resources are not good enough, it will have less impact good the sustainability of that part of the company. Therefore, in the management of HR the company is very important, especially in accepting the best academic administration employees to maximize performance. Many companies have difficulty accepting prospective academic administration staff following the wishes of the company. For that, we need a decision support systems that can assist decision making to facilitate acceptance of new academic administration staff. The purpose of this study is to assist top management in making the best decisions in recruiting new staff. This study uses the SAW method (Simple Additive Weighting) using the criteria set by the company namely administrative requirements, written tests, computer literacy, communication, and work experience. The result of this research is V3 = 0.95 which is the 3rd staff candidate gets the score is very high, V4 = 0.89 which is a candidate for staff 4 gets a high score, V1 = 0.68 who is a candidate for staff 1 gets a moderate score and V2 = 0.67 who is a candidate for staff 2 scores very low.**

***Keywords—*** ***Simple Additive Weighting, Academic Administration Staff, Criteria***

***Abstrak*— Sumber daya manusia merupakan salah satu faktor yang sangat penting dalam suatu organisasi atau perusahaan, baik perusahaan publik maupun swasta. Keberhasilan kerja suatu perusahaan yang besar mempunyai pengaruh yang besar terhadap pengelolaan sumber daya manusia (SDM) suatu perusahaan. Apabila sumber daya manusia tidak cukup baik maka akan berdampak pada kurang baiknya keberlangsungan bagian perusahaan tersebut. Oleh karena itu dalam pengelolaan SDM suatu perusahaan sangatlah penting terutama dalam menerima pegawai administrasi akademik yang terbaik sehingga dapat memaksimalkan kinerja. Banyak perusahaan yang mengalami kesulitan dalam menerima calon tenaga administrasi akademik sesuai dengan keinginan perusahaan. Untuk itu diperlukan suatu sistem pendukung keputusan yang dapat membantu pengambilan keputusan untuk memudahkan penerimaan tenaga administrasi akademik baru. Tujuan penelitian ini adalah untuk membantu manajemen puncak dalam mengambil keputusan terbaik dalam merekrut staf baru. Penelitian ini menggunakan metode SAW (Simple Additive Weighting) dengan menggunakan kriteria yang telah ditetapkan oleh perusahaan yaitu persyaratan administrasi, tes tertulis, literasi komputer, komunikasi, dan pengalaman kerja. Hasil dari penelitian ini adalah V3 = 0.95 yang merupakan calon staf 3 mendapat skor sangat tinggi, V4 = 0.89 yang merupakan calon staf 4 mendapat skor tinggi, V1 = 0,68 yang merupakan calon staf 1 mendapat skor sedang dan V2 = 0,67 yang merupakan calon staf 2 skor sangat rendah.**

***Kata Kunci—SAW, Staff Administrasi Akademik, Kriteria***

#  Introduction

Human Resource is an organizational resource that needs to be managed efficiently and effectively [1]. Currently, competition in the world of work is growing rapidly. Companies are competing to improve their business fields. The company also does not accept employees carelessly. Of course, the quality of employees or staff takes precedence concerning the success and progress, as well as the future of the company. In a company, both government agencies or private, human resources are very important. There are skilled human resources who have expertise certain and a lot of experience that will support the progress and quality of the company in achieving its goals which are desired. Good HR management will contribute to improving organizational performance and The implementation of HRIS will increase the effectiveness of the human resource management function[1]. The use of information systems has become an absolute necessity for various companies. One of the most important assets that can be owned by a company is its human resources, by having qualified and loyal human resources to the company can ensure a company will always grow and develop. To produce that HR loyal and qualified, HRD must be able to carry out its functions properly so that the rights owned by the workforce are work within the company can be guaranteed. By ensuring the rights of the workforce, it will produce good human resources qualified and loyal to the company. Due to this, HRD is an important factor in this aspect of the success of a company[2].

In the process of admitting academic administration staff at ISB Atma Luhur, it is still based on the leadership's decision. This will be a problem because of the lengthy time the decision results come out so that prospective staff will wait a long time. This study selects several criteria that have been made by top management, namely based on qualifications, written tests, computer literacy, communication, and work experience. Based on the above problems, the purpose of this study is to assist top management in making decisions using the SAW method to accept academic administrative staff new to be placed anywhere based on the criteria and weights that have been determined quickly, precisely, and accurately.

# LITERATUR REVIEW

There are several references that the authors took in compiling this research paper both national and international references, including:

First research by Chou Shuo Yan, et al, “Expert system for problem of facility location selection”. Says that the combination of the three fuzzy (FST), factor rating system (FRS), and simple additive weighting can evaluate the alternative location of the facility. With this proposed system, facility location selection can be done quickly.”[3].

Fifth research by Chen Ting Yu, this paper presents SAW-based and TOPSIS-based MCDA methods and conducts a comparative study through computational experiments. Comprehensive discussions have been made on the influence of score functions and weight constraints, where the score function represents an aggregated effect of positive and negative evaluations in performance ratings and the weight constraint consists of the unbiased condition, positivity bias, and negativity bias. The correlations and contradiction rates obtained in the experiments suggest that evident similarities exist between the interval-valued fuzzy SAW and TOPSIS rankings”[4].

Sixth research by Abrams William, et al. Says that The SAW and AHP maps were deemed valid with an agreement to moderate or greater potential zones for wells at 98% and 92% and springs at 63% and 86% respectively, and all field observation locations for both maps. Based on the SAW and AHP maps, the highest GWP is located in the Dubai/Sharjah emirates due to optimal runoff accumulation, infiltration conditions, and subsurface storage capacity. Findings of this study demonstrate the integration of remote sensing data with the adopted geospatial techniques is a practical method of groundwater prospecting in similarly data-scarce, arid environments”[5].

The eighth research by Brandl M, et al. The chirp signals are generated by SAW devices which are triggered by a low power consumption pulse generator based on an avalanche transistor. The performance of position estimation under AWGN conditions was simulated and compared with common methods. An improvement in the mean square position error in the range of the chirp compression gain was found”[6].

Eleventh research by Buyukozkan Gulcin, et al. Says that This paper first showcases an integrated HFL Simple Additive Weighting (SAW)-HFL Additive Ratio Assessment (ARAS) method. The framework’s functionality is then illustrated in a case study about SW assessment. The originality of the paper is based on its evaluation framework using an integrated SAW-ARAS approach in the hesitant fuzzy environment, its research method, and case application in the logistics sector. This approach can guide managers and practitioners for an effective SW selection process”[7].

Research conducted by Hamidah et al, with the title "Application of the SAW (Simple Additive Weighting) Method in selecting favorite web-based lecturers" explains that the selection of favorite lecturers in a university can be done with several criteria based on student assessments, JJA, research, PKM, and discipline. . From several lecturers, there is one best lecturer in the ranking calculation”[8].

Subsequent research was carried out by Shinta Siti Sundari, and yofi Firman Taufik with the title "Decision Support System for New Employee Admissions Using the Simple Additive Weighting (Saw) Method" explaining that the use of the Simple Additive Weighting (SAW) method in the application of the decision support system for recruitment of new employees. will get different selection results, because it uses the priority value or weight determined by each division that requires new employees into the system”[9].

Another research conducted by Alex Rikki et al with the title "The decision support system for hiring employees with the saw method at pt. Karya sahata medan "explains that the application of the best employee selection decision support system has been successfully made using the Simple Additive Weighting (SAW) method at PT ISS Indonesia and requires high understanding and accuracy in its use. In the application of the Simple Additive Weighting (SAW) method at PT ISS Indonesia Medan must meet the four criteria being processed, namely, attendance, SOP, Discipline, and Grooming. Then the system succeeds in determining the best employee according to the criteria and weights previously determined before calculation”[10].

Research conducted by Yasni Djamain and Herlinda De Christin with the title "Decision Support System for New Employee Admissions of PT. PLN (Persero) Head Office Using the Simple Additive Weighting (SAW) Method which explains that a Decision Support System that can be made to help make decisions in recruiting new employee candidates at PT PLN (Persero) Head Office based on the results of the analysis according to the specified criteria. Admission is carried out following the results of the administrative selection, General Aptitude Test (GAT), Academic and English Language, Psychological Test and FGD, Health and interviews the prospective new employee has. The criteria that have been determined in the interview selection stage are Discipline (C1), Period of informal/formal experience (C2), Obedience in carrying out tasks (C3), Skills (C4), Leadership (C5), Skills (C6), obtained (C7), Moral and behavior (C8), Cooperation (C9), Creativity and innovation (C10). The model used for the decision support system is the Multiple Attribute Decision Making (MADM) model with the Simple Additive Weighting (SAW) method. This method was chosen because this method determines the weight value for each attribute, then it is followed by a ranking process that will select the best alternative”[11].

The research was conducted by Fitri Saraswati and Yuri Fitrian with the title "Decision Support System for Btm Amanah Bangunrejo Employee Recruitment Using the Simple Additive Weighting (Saw) Method" explaining that the Decision Support System can be made to help make decisions in the recruitment of BTM Amanah employees based on the results of the appropriate analysis. with the specified criteria. Acceptance is carried out following the results of Administrative selection and interviews with the prospective new employee. The criteria that have been determined in the interview selection stage are Physical Category (C1), Personality (C2), Work Experience (C3), Age (C4), Education (C5), and Religion (C6). The model used for decision support systems is the Multiple Attribute Decision Making (MADM) model with the Simple Additive Weighting (SAW) method. This method was chosen because this method determines the weight value for each attribute, which will select the best alternative. The research was conducted by looking for the weight value for each criterion”[12].

(2)

Research conducted by Desi Pebriana with the title "Implementation of Simple Additive Weighting (SAW) Method in Employee Recruitment Decision Making at PT. ABC "explained that the calculation results resulted from the application of the Simple Additive Weighting (SAW) method can be used as a reference for the HRD department at PT. ABC to determine prospective employees who pass the administrative selection process and are entitled to go through the next process in the employee recruitment stage, namely the interview process by the leader[13].

The research was conducted by Hamidah et al entitled "SAW Method in Supporting the Process of Admission of New Junior High School Students which explains that the SAW method can help decision making in quickly and accurately admitting new students. Indonesian, mathematics scores, science scores, number of regency level competition certificates, provincial level competition certificates, national and zoning competition certificates. Of the 4 samples of students taken, there is 1 student who has the highest score, namely student C with a score of 0,8 and the student with the lowest score was student A with a value of 0,35”[14].

# RESEARCH METHOD

The Simple Additive Weighting (SAW) method is often known as the method of adding weights. The basic concept of the SAW method is to find the weighted sum of the performance ratings for each alternative on all attributes[15][16][17]. The SAW method requires a decision matrix normalization process (X) to a scale that can be compared with all available alternative ratings. Here's the SAW formula:

$\_{r\_{ij}= \left\{\begin{array}{c}\begin{array}{c}X\_{ij}\\\\_\\_\\_\\_\\_\\_\\_\\_\\_\\_\\Max X\_{ij}\\i\end{array}\\\\\\\begin{array}{c}Min X\_{ij}\\i\\\\_\\_\\_\\_\\_\\_\\_\\_\\_\\_\\X\_{ij}\\\end{array}\\\end{array}\right.}$

(1)

If j is cost attribute (cost)

If j is the benefit attribute

Information:

rij: normalized performance rating value

xij: the attribute value that each criterion has

Max xij: the greatest value of each criterion ᵢ

Min xij: the smallest value of each criterion ᵢ Benefit: if the greatest value is the best Cost: if the smallest value is best where rij is the normalized performance rating of the alternative Ai on attribute Cj; i = 1,2, ..., m and j = 1,2, ..., n. The preference value for each alternative (Vi) is given as:

$$V\_{i}= \sum\_{j=1}^{n}W\_{j}r\_{ij} $$

Information:

Vi = ranking for each alternative

wj = weight value of each criterion

rij = normalized performance rating value A larger

Vi value indicates that the alternative Ai is preferred. This SAW method determines the weight value on each criterion to determine the optimal alternative, namely the best choice that meets the requirements and which is worthy of consideration for acceptance by the school.

The stages of research in SAW (*Simple Additive Weight*) are as follows:



# RESULT AND DISCUSSION

## Fuzzy SAW Analysis Method

Several SAW stages will be carried out in analyzing the SAW method, namely as follows:

* + 1. *Defining Criteria*

To determine the highest ranking of the number of candidates for academic administration staff who enroll in the process processing the admission of new academic administration staff candidates, several criteria are needed, namely:

1. CRITERIA TabLE

|  |  |
| --- | --- |
| **Criteria** | **Name Criteria** |
| c1 | Qualification |
| c2 | Written Tests |
| c3 | Computer Ability |
| c4 | Communication |
| c5 | Work Experience |

* + 1. *Determine the Weight*

After determining the criteria, the next step is to determine the weights for each criterion. As for the determination of the weight obtained from experts, namely the Atma Luhur Foundation as top management.

1. DETERMINE WEIGHT TabLE

|  |  |
| --- | --- |
| **Criteria** | **Weight** |
| C1: Qualification | 25% |
| C2: Written Tests | 20% |
| C3: Computer Ability | 20% |
| C4: Communication | 10% |
| C5: Work Experience | 25% |

From each weight, a variable will be made. Where a variable will be converted into fuzzy numbers. Below is the fuzzy weight of C1 to C5:

1. Very Low (SR) = 0
2. Low (R) = 0,25
3. Fairly High (CT) = 0,50
4. Height (T) = 0,75
5. Very High (ST) = 1

The weight value of each criterion is taken based on the recruitment regulations for ISB Atma Luhur employees. The next step is to determine the interval value for each criterion C1 to C5. The determination of the interval value can be seen as follows:

* + - 1. *Qualification Criteria*

This criterion is taken from the value of the qualification then converted into crips numbers.

1. QUALIFICATION CRITERIA

|  |  |
| --- | --- |
| **value** | **interval** |
| SMP | 0 |
| SMA | 0,25 |
| D3 | 0,50 |
| D4 | 0,75 |
| S1 | 1 |

* + - 1. *Written Tests Criteria*

In determining the appropriate candidates for admission of academic administration staff, it is necessary to pay attention to the written test criteria. The following are the written test criteria that have been converted into crips numbers.

1. WRITTEN TESTS CRITERIA

|  |  |
| --- | --- |
| **value** | **interval** |
| 0-20 | 0 |
| 21 - 40 | 0,25 |
| 41 - 60 | 0,50 |
| 61 - 80 | 0,75 |
| 81 -100 | 1 |

* + - 1. *Computer Ability Criteria*

In determining candidates for admission of appropriate academic administration staff, it is necessary to pay attention to the criteria for computer skills. The following are the criteria for computer capabilities that have been converted into crips numbers.

1. COMPUTER ABILITY CRITERIA

|  |  |
| --- | --- |
| **value** | **interval** |
| 0-20 | 0 |
| 21 - 40 | 0,25 |
| 41 - 60 | 0,50 |
| 61 - 80 | 0,75 |
| 81 -100 | 1 |

* + - 1. *Communication Criteria*

In determining suitable candidates for admission of academic administration staff, communication criteria need to be considered. The following are the communication criteria that have been converted into crips numbers.

1. COMMUNICATION CRITERIA

|  |  |
| --- | --- |
| **value** | **interval** |
| 0-20 | 0 |
| 21 - 40 | 0,25 |
| 41 - 60 | 0,50 |
| 61 - 80 | 0,75 |
| 81 -100 | 1 |

* + - 1. *Work Experience Criteria*

In determining suitable candidates for admission of academic administration staff, it is necessary to pay attention to the criteria of work experience. The following work experience criteria have been converted into crips numbers.

1. WORK EXPERIENCE CRITERIA

|  |  |
| --- | --- |
| **value** | **interval** |
| 0-20 | 0 |
| 21 - 40 | 0,25 |
| 41 - 60 | 0,50 |
| 61 - 80 | 0,75 |
| 81 -100 | 1 |

 The following is a manual calculation based on a case example to calculate the value of several prospective employees who have the following data:

1. WEIGHT CALCULATION

|  |  |
| --- | --- |
| **Alternative** | **Criteria** |
| ***C1*** | ***C2*** | ***C3*** | ***C4*** | ***C5*** |
| Staff A (A1) | SMA | 75 | 85 | 80 | 75 |
| Staff B (A2) | SMA | 82 | 80 | 80 | 75 |
| Staff C (A3) | S1 | 80 | 85 | 85 | 81 |
| Staff D (A4) | D3 | 85 | 80 | 85 | 81 |

Based on the data above, a decision matrix (X) can be formed which has been converted to the Simple Additive Weighting number as follows:

1. DECISION MATRIX

|  |  |
| --- | --- |
| **Alternative** | **Criteria** |
| ***C1*** | ***C2*** | ***C3*** | ***C4*** | ***C5*** |
| Staff A (A1) | 0.25 | 0.75 | 1 | 0.75 | 0.75 |
| Staff B (A2) | 0.25 | 1 | 0.75 | 0.75 | 0.75 |
| Staff C (A3) | 1 | 0.75 | 1 | 1 | 1 |
| Staff D (A4) | 0.75 | 1 | 0.75 | 1 | 1 |

## Decision Matrix

 Where A1, A2, A3 dan A4 are samples taken as calculation material to determine the highest score in the admission of academic administration staff, namely:

* 1. Staff A (Alternative 1/A1)
	2. Staff B (Alternative 2/A2)
	3. Staff C (Alternative 3/A3)
	4. Staff D (Alternative 4/A4)

Based on the compatibility rating table above it will get the X matrix table as following:

 C1 C2 C3 C4 C5

 0,25 0,75 1 0,75 0,75

 X = 0,25 1 0,75 0,75 0,75

 1 0,75 1 1 1

 0,75 1 0,75 1 1

## Nornalized Matrix (X)

Matrix normalization is carried out based on each alternative with the following formula:

*rij =* $\frac{xij}{Max (xij)}$ (3)

Then the result of normalization (rij) forms a normalized matrix (R).

 0,25 0,75 1 0,75 0,75

 R = 0,25 1 0,75 0,75 0,75

 1 0,75 1 1 1

 0,75 1 0,75 1 1

The criteria used in determining the weight are education, written tests, computer skills, communication, and work experience. Next, determine the weight of each of the above criteria which will be used for the ranking process of each criterion.

 Weight Vector *(W)* = {0,25 0,20 0,20 0,10 0,25}

 The next process is to rank alternatives (Vi). To get the ranking process, that is by multiplying the weight vector (W) by the normalized matrix (R). The results obtained from multiplying the weight vector with normalized matrix (R) are calculated using the following formula:

Vi = $∑Wj.Rij$ (4)

Then the ranking results are as follows:

V1 = 0,68

V2 = 0,67

V3 = 0,95

V4 = 0,89

The results obtained are as follows:

1. RANKING RESULT

|  |  |  |
| --- | --- | --- |
| **OPTIONAL ALTERNATIVE** | **value** | **rating** |
| Calon Staff C (Alternatif 3/A3) | 0,95 | 1 |
| Calon Staff D (Alternatif 4/A4) | 0,89 | 2 |
| Calon Staff A (Alternatif 2/A1) | 0,68 | 3 |
| Calon Staff B (Alternatif 1/A2) | 0,67 | 4 |

From the results above, it can be seen that V3 = 0.95 which is a candidate for staff 3 gets a very high score, V4 = 0.89 which is a candidate for staff 4 gets a high score, V1 = 0.68 which is a candidate for staff 1 gets a moderate score and V2 = 0.67 which is a candidate staff 2 scores very low.

Based on the results of the table ranking above, a graph can be made by looking at the values of several sample choices which can be seen in Figure 1.

Fig .1. Ranking Graph

##### conclusion

A decision support system can be created to help stakeholders take decisions quickly to accept academic administration staff at their respective universities based on the results of the analysis with predetermined criteria. The criteria used are education (C1), written tests (C2), computer skills (C3), communication (C4), and work experience (C5). The model used is Simple Additive Weighting (SAW). Based on the results of the calculation of each criterion and weighting of the criteria, a decision matrix is ​​made with the final result, namely V3 = 0.95 which is a candidate for staff 3 who gets a very high score, V4 = 0.89 which is a candidate for staff 4 who gets a high score, V1 = 0.68 which is prospective staff 1 gets a moderate score and V2 = 0.67 which is a very low score for prospective staff 2. The contribution of the results of this study is that it can provide convenience and speed for top management in making decisions and prospective registrants do not have to wait too long for an announcement to be received or not accepted.

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