JITK (JURNAL ILMU PENGETAHUAN DAN TEKNOLOGI KOMPUTER)

VOL. 6. NO. 2 FEBRUARY 2020
P-ISSN: 2685-8223 | E-ISSN: 2527-4864
DOI: 10.33480/jitk.v6i2.1740

DETERMINATION OF PERMANENT LECTURERS IN IBM ASMI INFORMATION SYSTEM PRODUCT WITH SAW AND ARAS METHOD

Rendi Septian[1*]; Istiqal Hadi[2]; Ridwansyah[3]; Windu Gata[4]; Widiastuti[5]; Muhammad Iqbal[6]

Computer Science Study Program[1,2,4,5,6], Informatics Engineering Study Program[3]
STMIK Nusa Mandiri[1,2,3,4,5,6]
www.nusamandiri.ac.id[1,2,3,4,5,6]
14002348@nusamandiri.ac.id [1*]; 14002343@nusamandiri.ac.id [2]; ridwansyah.rid@nusamandiri.ac.id [3]; windu@nusamandiri.ac.id [4]; 14002380@nusamandiri.ac.id [5]; 14002390@nusamandiri.ac.id [6]

(*) Corresponding Author

Abstract— *Determining the quality standards of lecturers refers to the criteria of education, research, and community service. The campus can carry out the first process for selecting permanent lecturers effectively by looking at several criteria. By using a Decision Support System (DSS), the four categories can be used as guidelines for decision-makers to choose permanent lecturers. The goal of writing this journal is to support the effectiveness of the time for decision-makers to choose permanent lecturers in the early stages by combining the Additive Ratio Assessment (ARAS) and Simple Additive Weighting (SAW) methods. Where the SAW method has the advantage of accurate assessment because the value of criteria and weights have been determined, while the ARAS method compares each criterion value to each optimal alternative as a whole to get an ideal alternative. The result of combining the two methods can describe the prospective lecturers who are suitable to be used as permanent lecturer criteria. Judging from the ranking results in calculations, the values obtained are 0.146341, 0.134146, and 0.121951. These results prove that ranking with an assessment using the combination of SAW and ARAS methods results in an effective, accurate, and efficient assessment.*

Keywords: *Additive Ratio Assessment, Decision Support Systems, Permanent lecturer, Simple Additive Weighting.*

Abstrak— *Menentukan standar kualitas dosen mengacu kepada kriteria pendidikan, penelitian, dan pengabdian kepada masyarakat. Pihak kampus dapat melakukan proses pertama untuk pemilihan dosen tetap secara efektif dengan melihat beberapa kriteria. Dengan menggunakan Sistem Penunjang Keputusan (SPK), keempat kategori tersebut bisa dijadikan pedoman bagi pengambil keputusan untuk memilih dosen tetap. Tujuan penulisan jurnal ini adalah untuk membantu keefektifan waktu bagi pengambil keputusan untuk memilih dosen tetap tahap awal dengan penggabungan metodeAdditive Ratio Assessment (ARAS) dan Simple Additive Weighting (SAW).Dimana metode SAW mempunyai keunggulan penilaian akurat karena untuk nilai kriteria dan bobot telah ditentukan, sementara metode ARASmelakukan perbandingan setiap nilai kriteria terhadap masing alternatif optimal secara keseluruhan untuk mendapatkan alternatif yang ideal. Hasil penggabungan dua metode tersebut dapat menggambarkan calon dosen yang sesuai untuk dijadikan kriteria dosen tetap.Dilihat dari hasil perangkingan dalam perhitungan, nilai yang didapat 0,146341 ,0,134146 dan 0,121951. Hasil ini membuktikan bahwa perangkingan dengan penilaian menggunakan penggabungan metode SAW dan ARAS menghasilkan penilaian yang efektif, akurat dan efisien..*

Kata Kunci: *Additive Ratio Assessment, Sistem Penunjang Keputusan, Dosen Tetap, Simple Additive Weighting.*

INTRODUCTION

Education is a learning process activity carried out by a nation and a country. Educational instruments are in an important spotlight because they support quality in an educational institution. The quality supporting instruments include teaching staff, one of which is the lecturer. Lecturers are professional educators assigned to disseminate knowledge and technology as well as community service [1].

However, in determining lecturers, of course, there are several factors to be an assessment including the involvement of lecturers in the teaching, research, and community service process. The main problem in previous research was that decision making was still done manually so that it was difficult to conduct research and evaluate data to consider the final result as a

decision making. By doing this manually, it is feared that there will be decisions that are not right on target. For that, we need a method of decision support systems that can help in making decisions that are right on target and accurate.

Related research conducted by Nadeak Application of the ARAS Method to assess the best teachers, that with the Additive Ratio Assessment (ARAS) Method, it is hoped that this decision-making will be able to select teacher performance effectively. The decision-making criteria are expected to be able to choose teacher performance effectively [2]. Previous related research was also carried out by Guterres, namely by implementing SAW and TOPSIS so that it could produce an output in the form of priority provision of livable housing assistance to the poor, especially those in East Kupang District, Kupang Regency [3]. Research conducted by Rahmat et al, shows the SAW and TOPSIS methods are two methods that can be applied in finding new locations because the SAW and TOPSIS methods can produce a better decision support system than using one of them [4]. Further research conducted by Halimah et al, used the ARAS and Shannon Entropy methods for weighting based on the weight value criteria generated from the calculation of alternative data and the ARAS method carried out a ranking process based on utility functions [5]. The next research conducted by Dadang and Sri is using the ARAS method to provide the best teacher recommendations by determining the highest ranking based on Pedagogic, Personality, Social, Professional, and responsibility [6]. The research literature used is as follows:

Table 1. Research Literature

Research Problem (RP1)		Literatur Supports
RP1	Manual determination results in not being on target in determining decisions	The work is still manual for recruitment so that it is difficult to do research and evaluate data [7].
		The assessment process in determining teacher performance is still done manually and is not yet detailed [2].
		Uncomputed processing is still done manually so that it can cause errors in determining decisions [8].
RP2	The determination process is less than optimal so it takes a lot of time in making decisions	Activities in determining decisions are still carried out randomly and are not fully computerized with the application [3].
		The work carried out is not optimal because it is not optimal in determining decisions [9].
		The process of determining the lecturer is not appropriate and takes a lot of time so that it can experience errors in making decisions [10].
RP3	Subjective determination of the assessment causes social jealousy and is not transparent in making decisions	Decisions are made based on subjectivity so that there is a concern that social jealousy towards abilities is not much different from the others [11].
		Assessment is subjective in nature based on distributing questionnaires so that it should not be used as a reference for decision making [12].
		The assessment is carried out quantitatively based on subjective selection resulting in a lack of transparency in the decision making process [13].

From the above problems, the writer in this paper uses a combination of SAW and ARAS methods [14]. Where in the alternative data process, the alternative data conversion and the alternative data normalization use the SAW method [14], then determine the normalized matrix weight, determine the value of the optimization function, and determine the highest level of the alternative using the ARAS method [14]. The purpose of this paper is to help decision-makers in universities, in this case, the ASMI Institute of Business Management, an undergraduate program majoring in information systems to find qualified lecturers to be considered as permanent lecturers. The criteria seen are academic qualifications, teaching experience, relevant to the study program, and courses that have been taught.

MATERIALS AND METHODS

a. Simple Additive Weighting

The SAW method is often also known as a weighted addition method. The basic concept of the SAW method is to find the weighted sum of the performance ratings for each alternative on all attributes. The SAW method is recommended to solve selection problems in multi-process decision-

Accredited Rank 3 (Sinta 3) based on the Decree of the Dirjen Penguatan RisBang Kemenristekdikti
No. 28/E/KPT/2019, September 26, 2019. Published by PPPM STMIK Nusa Mandiri

VOL. 6. NO. 2 FEBRUARY 2020
P-ISSN: 2685-8223 | E-ISSN: 2527-4864
DOI: 10.33480/jitk.v6i2.1740

making systems. The Simple Additive Weighting method is a method that is widely used in decision making which has many attributes. The SAW method requires a decision matrix normalization process (X) to a scale that can be compared with all existing alternative ratings. Nofriansyah in [15].

$$Rij = \begin{cases} \frac{Xij}{Max.Xij} \\ \frac{Min.ij}{Xij} \end{cases} \quad \text{.....(1)}$$

= if j is the (benefit) attribute
= if j is the (cost) attribute

r_{ij} is the normalized performance rating of the alternatives Ai for attribute Cj; i = 1,2,3,4 ..., m and j = 1,2,3,4 ..., n.

The option value for each (Vi) is determined as:

$$Vi = \sum Wjrij \quad \text{.....(2)}$$

The largest Vi value indicates that the alternative Ai is preferred.

b. Additive Ratio Assessment (ARAS)

The ARAS method is part of the DSS that is used to rank a criterion, in ranking it, this method has several steps to calculate it [7].

The steps of the Additive Ratio Assessment (ARAS) method are as follows:

1. Establishment of Decision Making Matrix

$$X = \begin{bmatrix} X01 & X0j & \dots & X0n \\ Xi1 & Xij & \dots & Xin \\ \dots & \dots & \dots & \dots \\ Xn1 & Xmj & \dots & Xmn \end{bmatrix} (i = 0, m; j = 1, n) \quad \text{.....(3)}$$

Which one
n = total criteria
m = total alternatives

X_{ij} = performance value of alternative $_i$ against criterion $_jX_{0j}$ = optimum value of criterion $_j$

If the Optimal Value of Criterion $_j$ X_{0j} is not known, then:

$$X0j = \frac{\max}{i} . Xij \text{ , if } \frac{\max}{i} . Xij \text{ is preferable} \quad \text{.....(4)}$$

$$X0j = \frac{\min}{i} . Xij \text{ , if } \frac{\min}{i} . Xij \text{ is prefable} \quad \text{.....(5)}$$

2. Normalize the decision matrix for all criteria

If the criteria are Beneficial (Benefit), normalization is carried out following:

$$X_{ij} = \frac{Xij}{\sum_{i=0}^{m} Xij} \quad \text{.....(6)}$$

Where X_{ij} is the normalized value.

If the criteria are Non-Beneficial (Cost), normalization is carried out following:

$$\text{Step 1 : } Xij^* = \frac{1}{Xij} \text{ and Step 2 : } R = \frac{Xij*}{\sum_{i=0}^{m} Xij*} \quad \text{.....(7)}$$

3. Determination of the normalized matrix weights

Where W_j Criteria Weight $_jD = [D_{ij}]$ m.n = $R_{ij}.W_{ij}$

4. Determine the value of the optimization function (S_i)

$$Si = \sum_{j=1}^{n} Dij; (i=1,2,..,m; j=1,2,..,n) \quad \text{.....(8)}$$

Where S_i is the value of the alternative optimality function i. The greatest value is the best, and the least value is the worst. Taking into account the process, the proportional relationship with the value and weight of the criterion understudy influences the final result.

5. Determines the highest ranking level of the alternatives

$$Ki = \frac{Si}{S0} \quad \text{.....(9)}$$

Where S_i and S0 are the optimal criteria values, obtained from the equation. The value, calculated on Uidan, is in the interval [0.1].

RESULTS AND DISCUSSION

In this paper, using a combination of 2 methods, namely the merger of SAW with ARAS.

The data used in the journal comes from the IBM ASMI Jakarta campus, namely 8 lecturers who teach in the undergraduate program majoring in information systems. We obtained data related to academic qualifications, academic relevance to the study program, number of years of teaching, and the suitability of courses that have been taught, which we obtained from the academic team at the IBM ASMI Jakarta campus. Here are alternative data:

Process Data with the SAW Method

1) Input Value obtained by each candidate

The process of combining SAW with ARAS can be seen in the following Figure 1.

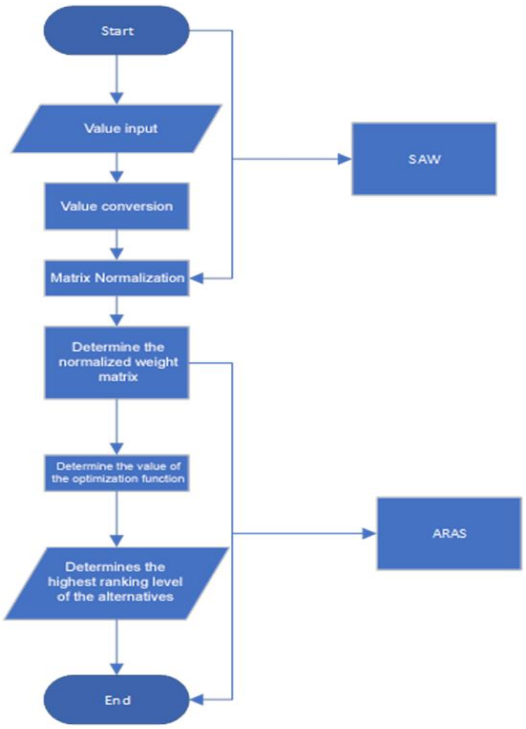

Figure 1. Flowchart of the Merger of SAW and ARAS

Table 1. Alternative Data for Permanent Lecturer Recommendations

Name	Academic Qualifications	Academic Relevance to the Study Program	Number of Teaching Years	Number of Subject Matches that have been taught
Adya Satyapuspita	S2	Not	1	1
Aristarkus Didimus Rumpak	S2	Not	16	1
Aston Freddy	S2	Not	6	1
Imam Jayadi	S2	Not	8	1
Jerry M. Logahan	S2	Relevant	16	1
Jones Zenas Rante	S2	Relevant	16	1
Rolty Glendy Wowiling	S2	Relevant	2	1
Yakub M. Saleh	S2	Not	10	1

2) Convert values based on a range of values

Table 2. Criteria Table

Criteria	Information	Type	Weight
K1	Academic Qualifications	Benefit	30%
K2	Relevance of Study Program	Benefit	25%
K3	Teaching Year	Benefit	30%
K4	Subjects taught	Benefit	15%

These numbers can be converted to crips numbers K1 = 0.3; K2 = 0.25; K3 = 0.3; K4 = 0.15 ;.

Table 3. Alternative Value Weight Table

Type of Criteria	Name	Conversion Weight
Academic Qualifications	S2	1
	S3	2
Relevance of Study Program	Not	1
	Relevant	2
Teaching Year	<5 years	1
	>=5 years	2
Subjects Taught	<5	1
	>=5	2

After the weights are determined and can be converted into crips numbers; 1 (0.4), 2 (0.6).

Table 4. Alternative Value Conversion Table

Name	Value Criteria			
	K1	K2	K3	K4
Adya Satyapuspita	0,4	0,4	0,4	0,4
Aristarkus Didimus Rumpak	0,4	0,4	0,6	0,4
Aston Freddy	0,4	0,4	0,6	0,4
Imam Jaya	0,4	0,4	0,6	0,4
Jerry M. Logahan	0,6	0,6	0,6	0,4
Jones Zenas Rante	0,4	0,6	0,6	0,4
Rolty Glendy Wowiling	0,4	0,6	0,4	0,4
Yakub M. Saleh	0,4	0,4	0,6	0,4

3) Normalization Matrix R

Based on the suitability rating table, a decision matrix can be formed, as follows:

Accredited Rank 3 (Sinta 3) based on the Decree of the Dirjen Penguatan RisBang Kemenristekdikti
No. 28/E/KPT/2019, September 26, 2019. Published by PPPM STMIK Nusa Mandiri

VOL. 6. NO. 2 FEBRUARY 2020
P-ISSN: 2685-8223 | E-ISSN: 2527-4864
DOI: 10.33480/jitk.v6i2.1740

$$Rij = \begin{cases} \frac{Xij}{Max.Xij} \\ \frac{Min.ij}{Xij} \end{cases} \quad \text{..... (7)}$$

= if j is the (benefit) attribute
= if j is the (cost) attribute

For Academic Qualification Criteria (C1) Included in the benefit attribute:

Table 5. Result of Normalization of Decision Matrix R

C1	C2	C3	C4
0,67	0,67	0,67	1
0,67	0,67	1	1
0,67	0,67	1	1
0,67	0,67	1	1
1	1	1	1
0,67	1	1	1
0,67	1	0,67	1
0,67	0,67	1	1

Process with the ARAS Method

1) Determine the normalized weight

The next process is determining the normalized weight of the matrix

The calculation above produces a matrix which can be seen in table 6:

Table 6. Results of Normalized Weights

0,20	0,20	0,20	0,30
0,20	0,20	0,30	0,30
0,20	0,20	0,30	0,30
0,20	0,20	0,30	0,30
0,30	0,30	0,30	0,30
0,20	0,30	0,30	0,30
0,20	0,30	0,20	0,30
0,20	0,20	0,30	0,30

2) The next step is to determine the value of the optimization function

Label Name	Result
S_1	0,90
S_2	1,00
S_3	1,00
S_4	1,00
S_5	1,20
S_6	1,10
S_7	1,00
S_8	1,00
Total	8,20

3) Determine the highest ranking level of the alternative

Label Name	Result
K_1	0,109756098
K_2	0,12195122
K_3	0,12195122
K_4	0,12195122
K_5	0,146341463
K_6	0,134146341
K_7	0,12195122
K_8	0,12195122

From the above calculations, the highest-ranking level is obtained, where each prospective lecturer has high to low scores.

Table 7. Highest Rank Ranking Results

Alternative	Value (K)	Ranking
Jerry M. Logahan	0,146341	1
Jones Zenas Rante	0,134146	2
Aristarkus Didimus Rumpak	0,121951	3
Aston Freddy	0,121951	4
Imam Jayadi	0,121951	5
Rolty Glendy Wowiling	0,121951	6
Yakub M. Saleh	0,121951	7
Adya Satyapuspita	0,109756	8

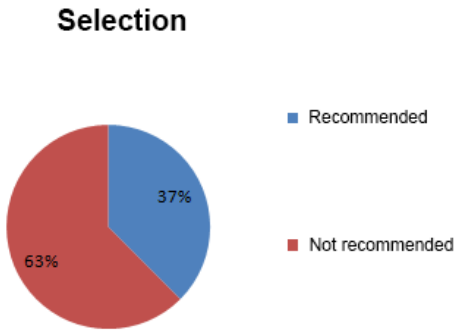

Figure 2. Assessment Criteria Graph

From the calculation above, the results show that Jerry M. Logahan is the most recommended to become a permanent lecturer with a score of 0.146341. In the second and third positions, for SAW, Brother Jones Zenas Rante and Brother Aristarkus Didimus Rumpak with each score of 0.134146 and 0.121951. The score for the first rank has a big difference with the second rank because of different academic qualifications, Brother Jerry M. Logahan has an S3 academic qualification while the second rank is an S2 academic qualification. The difference in academic qualifications is the most significant among the other criteria because lecturer standards are the minimum criteria for qualifications for education in order to achieve graduate learning.

= jika j adalah atribut keuntungan (*benefit)*
=jika j adalah atribut biaya *(cost)*

CONCLUSION

In accordance with the results of the research, the determination of honorary lecturers to become permanent lecturers at the IBM ASMI Information Systems Study Program by combining the SAW and ARAS methods, the authors draw the following conclusions: Determination of honorary lecturers to become permanent lecturers at the IBM ASMI Information System Study Program with several criteria, namely academic qualifications, academic relevance, years of teaching, and courses taught using manual methods which are still inaccurate and effective because there is no weight on each predetermined criterion. By combining the SAW and ARAS methods of calculating the value for the criteria for determining honorary lecturers to become permanent lecturers, it produces accurate analysis and information compared to only one of the calculation methods so that IBM ASMI can use it as a tool to make the right decisions. Judging from the results of the ranking in the calculations, the values obtained are 0.146341, 0.134146, and 0.121951. These results prove that the ranking with the assessment using the SAW and ARAS methods produces an effective, accurate, and efficient assessment.

REFERENCE

[1] D. M. Rajagukguk, "Implementasi Metode Simple Additive Weighting pada Sistem Pendukung Keputusan Penerima Beasiswa," *Edu Komputika J.*, vol. 4, no. 1, pp. 55–55, 2017.

[2] A. S. Nadeak, "Penerapan Metode Aras (Additive Ratio Assessment) Dalam Penilaian Guru Terbaik," *Semin. Nas. Teknol. Komput. Sains*, vol. 2, no. 2010, pp. 571–578, 2019.

[3] J. A. D. Guterres, "Pemanfaatan Metode Saw Dan Topsis Sebagai Media Pendukung Keputusan Pemberian Bantuan Rumah Layak Huni,"*Pros. SINTAK 2017*, pp. 51–56, 2017.

[4] M. A. Rahmat, B. Pramono, and R. A. Saputra, "Pemilihan lokasi baru bts telkomsel cabang kota kendari menggunakan metode saw dan topsis berbasis web gis *1,2,3," vol. 3, no. 1, pp. 47–54, 2017.

[5] D. Kartini *et al.*, "the Selection of Prospective Employees Using the Shannon Entropy Weighting Method and Aras Method," vol. 01, no. 1, pp. 23–32, 2020.

[6] A. Aras and U. Mendukung, "Penerapan Metode Additive Ratio," vol. 8106, pp. 1–13, 2020.

[7] R. Fachrizal, "IMPLEMENTASI ARAS (Additive Ratio Assessment) DALAM PEMILIHAN KASIR TERBAIK STUDI KASUS OUTLET CARDINAL STORE PLAZA MEDAN FAIR," *Sainteks*, no. Januari, pp. 501–510, 2019.

[8] A. S. Yogha Radhitya, Fitro Nur Hakim, "Rancang Bangun Sistem Pendukung Keputusan Penentuan Penerima Beasiswa Dengan Metode SAW," *J. Speed – Sentra Penelit. Eng. dan Edukasi*, vol. 8, pp. 23–32, 2016.

[9] I. Septiana, M. Irfan, A. R. Atmadja, and B. Subaeki, "Sistem Pendukung Keputusan Penentu Dosen Penguji Dan Pembimbing Tugas Akhir Menggunakan Fuzzy Multiple Attribute Decision Making dengan Simple Additive Weighting (Studi Kasus: Jurusan Teknik Informatika UIN SGD Bandung)," *J. Online Inform.*, vol. 1, no. 1, p. 43, 2016.

[10] M. F. Asnawi and M. A. M. Baihaqy, "Implementasi Metode Simple Additive Weigth (SAW) pada Sistem Pendukung Keputusan Penentuan Dosen Berprestasi," *J. Penelit. dan Pengabdi. Kpd. Masy. UNSIQ*, vol. 6, no. 3, pp. 198–205, 2019.

[11] A. Apandi, "Sistem Pendukung Keputusan Penilaian Guru Terbaik Menggunakan Metode Additive Ratio Assessment (Aras)," *Semin. Nas. Teknol. Komput. Sains*, pp. 476–483, 2020.

[12] P. Stmik and B. Mulia, "Dewi Kusumawati , Siti Nurhayati dan Fitriyanti Andi Masse . Implementasi Metode Simple Additive Weighting (SAW) Untuk Evaluasi Kinerja Dosen Pada Stmik Bina Mulia Palu IJ Jurnal Sains Komputer dan Teknologi Informasi Page," pp. 116–122, 2020.

[13] L. A. Yunus, "Sistem Pendukung Keputusan Penilaian Kinerja Dosen Dengan Menggunakan Metode Additive Ratio Assesment," *J. Sist. Inf. Dan Tek. Komput.*, vol. 5, no. 1, pp. 31–35, 2020.

[14] R. Septian, I. Hadi, Ridwansyah, W. Gata, Widiastuti, and M. Iqbal, "Penelitian Dosen Yayasan," 2021.

[15] D. M. D. Utami Putra and I. P. A. Pratama, "Rancang Bangun Sistem Pendukung Keputusan Penentuan Penerima Beasiswa Dengan Menggunakan Metode TOPSIS," *S@Cies*, vol. 7, no. 1, pp. 30–36, 2016.

Accredited Rank 3 (Sinta 3) based on the Decree of the Dirjen Penguatan RisBang Kemenristekdikti
No. 28/E/KPT/2019, September 26, 2019. Published by PPPM STMIK Nusa Mandiri