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APPLICATION OF SAW TECHNIQUE FOR RESEARCH OF POTENTIAL NEW PARTNERS AGENCY OF ASAHAN DISTRICT STATISTICS CENTER

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Abstract: The Central Bureau of Statistics is a government agency that serves the public in providing accurate statistical data. Central Bureau of Statistics Every year the Central Bureau of Statistics accepts new partners. Partners who do data processing that has been done on data in the field. In this case, the acceptance of new partner candidates is quite often held to carry out survey and population census activities. The partner acceptance process is less effective because it still uses the manual method, namely the approach between existing partners. So we need a decision support system that can help election performance to be more effective. The basic concept of the Simple Addictive Weighting method is to find a weighted sum of performance ratings for each alternative on all criteria or attributes. The purpose of this research is to build and design a data processing application for prospective new partners at the Central Bureau of Statistics of the Asahan district to get an assessment according to the specified criteria. The results of the research conducted produced the best alternative decision, namely Ruslan Efendi with a score of 0.975 and Yenni Yulistina with a value of 0.95. based on these results can assist the Central Bureau of Statistics in determining the assessment of potential new partners so that they can provide a reference in decision making. In accordance with the criteria required by the Central Bureau of Statistics.

Keywords: decision support support system; simple addictive weighting; prospective partners; information systems.

Abstrak: Badan Pusat Statistik merupakan salah satu instansi pemerintah yang melayani masyarakat dalam menyediakan data statistik yang akurat. Badan Pusat Statistik Setiap tahunnya Badan Pusat Statistik menerima mitra baru. Mitra yang melakukan pengolahan data yang sudah dilakukan pada data dilapangan.. Dalam hal ini, penerimaan calon mitra baru cukup sering diadakan untuk menjalankan kegiatan survei dan sensus penduduk. Proses penerimaan mitra ini kurang efektif karena masih menggunakan cara manual, yaitu dan pendekatan antara mitra yang sudah ada sebelumnya. Sehingga dibutuhkan sebuah sistem pendukung keputusan yang dapat membantu kinerja pemilihan menjadi lebih efektif. Konsep dasar dari metode Simple Addictive Weighting mencari penjumlahan terbobot dari rating kinerja untuk setiap alternative pada semua kriteria atau atribut. Tujuan penelitian ini dapat membangun dan merancang sebuah aplikasi pengolahan data calon mitra baru di Badan Pusat Statistik kabupaten Asahan yang tepat untuk mendapatkan penilaian yang sesuai dengan kriteria yang ditentukan. Hasil dari penelitian yang dilakukan menghasilkan sebuah keputusan alternatif terbaik yaitu Ruslan efendi dengan nilai 0.975 serta Yenni Yulistina dengan nilai 0.95. berdasarkan hasil tersebut dapat membantu pihak Badan Pusat Statistik dalam menentukan penilaian calon mitra baru sehingga dapat memberikan acuan dalam pengambilan keputusan. Sesuai dengan kriteria yang dibutuhkan oleh pihak Badan Pusat Statistik.

Kata kunci : sistem pendukung pendukung keputusan; simple addictiv weighting; calon mitra; sistem informasi.

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INTRODUCTION

The age of information technology is now growing rapidly so that it has a myriad of benefits for its users, according to the needs and procedures that use it. In an agency today, some work activities are supported by information technology. The information technology is applied to help and accelerate work activities within the agency. And the use of information technology is also one of the things that affects the performance of an agency. Information Technology is a technology used to process data, including processing, obtaining, compiling, storing, manipulating data in various ways to produce quality information, namely relevant, accurate and timely information, which is used for personal, business, and government purposes[1]. Including the Central Statistics Agency which has used information technology[2].

The Central Statistics Agency (BPS) is one of the government agencies that serves the public in providing accurate statistical data. Previously, BPS was the Central Bureau of Statistics, which was formed based on Law Number 6 of 1960 concerning Census and Law Number 7 of 1960 concerning Statistics. As a substitute for the two laws, Law Number 16 of 1997 concerning Statistics was established. [3].

The office of the Central Statistics Agency of Asahan Regency is located on Jl. Tusam No. 2, Kisaran, Mekar Baru, District. West Kisaran City, Asahan Regency, North Sumatra 21216, is a Non-Departmental Government Institution in Indonesia that has the main function as a provider of basic statistical data, both for the government and for the general public, nationally and regionally[4].

The Central Statistics Agency in Asahan Regency not only conducts surveys or censuses from one variable, but the Central Statistics Agency of Asahan Regency conducts various surveys, the Asahan Regency Central Statistics Agency has many partners who assist in conducting the census. Every year the Central Bureau of Statistics receives a new partner[5].

However, the problem that exists in the agency, the Central Statistics Agency of Asahan Regency does not have a record of partner data and assessments from each partner. Whether the partner followed the pre-census training well or not. In addition, the Central Bureau of Statistics has difficulties when determining the selection of the best potential partners to deserve a job after attending training. Previously, the system used by the Central Statistics Agency of Asahan Regency to recruit partners or open registration for partners using selection methods and interviews, but in the current covid19 era, conducting face-to-face interview tests is very ineffective because they must be orderly in order to maintain distance in accordance with state regulations and also have little difficulty seeing or checking which partners are active or not in carrying out their duties[6] .

Because in this agency previously there was no system to register for partners and there was also no system to see whether previous partners were active or not in carrying out their duties, to help and facilitate the staff at the Asahan Regency Statistics Agency, an application

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design was made which aimed to make it easier for employees to find partners and then select which partners are good at collecting data in the field or processing census data and also helps employees to see which partners are active or not in carrying out their duties

The selection of partners for each census and survey activity has several criteria, namely, age, recent education, communication skills, punctuality, responsibility, and discipline. In each activity, special criteria can be added so that the results of the selection process can be more accurate in accordance with and the existence of a decision support system. In the application of the Simple Addictive Weigthing method, the calculation of the value of each of the criteria tested will have a different weight priority scale[7].

There are several methods used in SPK and one of them is the Simple Additive Weighting (SAW) method. The basic concept of the SAW method is to find a weighted sum of performance ratings for each alternative on all criteria or attributes. This is because the ranking in determining the best alternative to the SAW method is based on the criteria and weights determined at the beginning[8]. Basically, DSS is designed to support all stages of decision making from identifying problems, selecting relevant data, determining the approach used in the decision-making process to evaluating alternative options. In the decision-making process to produce an alternative requires a method[9]. This method was chosen because the assessment criteria used are very dynamic and can be determined according to the needs of the company or agency[10].

METHOD

Simple Additive Weighting (SAW) method, often also known as the weighted summation method. The basic concept of the Simple Additive Weight (SAW) method is to look for weighted summation of the performance rating on each alternative on all attributes. A larger value indicates that an alternative is more elected. According to the Simple Additive Weighting (SAW) Method it is recommended to solve the selection problem in a multi-process decision-making system[9]. The Simple Additive Weighting (SAW) method is a method that is widely used in decision making that has many attributes.

There are several steps in solving the *Simple Additive Weighting* (SAW) method are as follows[11]: First, determine the criteria that are used as a reference in supporting the decision, namely Ci. Second, determine the match rating of each alternative on each criterion. Third, create a decision matrix based on criteria (Ci). Fourth, normalize the matrix based on the equation adjusted to the type of attribute (profit attribute and cost attribute) so that an R normalized matrix is obtained. Fifth, the final result is obtained from the ranking process, namely the summation of the normalized matrix multiplication R with the weight vector so that the largest value is obtained which is chosen as the best alternative (Ai) as a solution.

The SAW method is often also known as the weighted summation method. The basic concept of the SAW method is to look for weighted summation of the performance rating on each alternative on all attributes[12].

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The calculation formula of the Simple Additive Weighting Method is shown in the following formula.

$$r_{ij} = \sum \begin{matrix} \frac{Xij}{Max\ Xij} & if\ j\ is\ a\ benefit\ attribute\ (benefit) \\ \frac{Min\ Xij}{Xij} & if\ j\ is\ a\ cost\ attribute\ (cost) \end{matrix} \quad (1)$$

Information:

RIJ :Rated Value Nominated
xij :the value of the attributes possessed of each keriteria
Max xij :the largest value of each criterion i
Min xij :the smallest value of each criterion i

Prefence value for each alternative (Vi)

$$V_i = \sum_{j=1}^{n} W_j \quad r_{ij} \quad (2)$$

Information:
Vi : ranking for each alternative
Wj :the weight value of each criterion
RIJ :Nationalized Performance Rating Value

A larger Vi value indicates that the Ai alternative is more elected.

In accordance with the flow of the Simple Addictive Weigthing method process in the Decision Support System, the assessment of new potential partners will be designed starting with the need for criteria data inputted in the system consisting of:

Table 1. Criteria

Code	Criterion	Weight	Normalized Weights	Information
C1	Age	10	10 / 100 = 0.10	Cost
C2	Final Education	20	20 / 100 = 0.20	Benefits
C3	Communication Skills	25	25/ 100 = 0.25	Benefits
C4	Timeliness	15	15 / 100 = 0.15	Benefits
C5	Responsibility	10	10 / 100 = 0.10	Benefits
C6	Discipline	20	20 / 100 = 0.20	Benefits
Total		**100**	**1**	

The data will be processed into a form that can be received by the computer which will later be stored in the *database*. After the data is inputted and processed, an *output* of the ranking results is obtained as a reference for the administrative part in the assessment of potential new partners.

Regarding the flow of the calculation process of the *Simple Addictive Weighting* (SAW) method by first describing the subcriteria along with the values from the assessment criteria for prospective new partners at the Central Statistics Agency.

Table 2. Subcriteria along with Criteria Values Age

Value	Information
5	18 – 25
4	26 – 33
3	34 – 41
2	42 – 49
1	50

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Table 3. Subcriteria along with Criteria Values Final Education

Value	Information
5	S1
4	D3
3	D1
2	SMA

Table 4. Subcriteria along with Criteria Values Communication Skills

Value	Information
5	Excellent
4	Good
3	Enough
2	Not Good Enough
1	Very Less

Table 5. Subcriteria with Criteria Values Timeliness

Value	Information
5	Very Precise
4	True
3	Quite Precise
2	Not Quite Right
1	Very Incorrect

Table 6. Subcriteria along with Criteria Values Responsibility

Value	Information
5	Excellent
4	Good
3	Enough
2	Less
1	Very less

Table 7. Subcriteria along with Criteria Values Discipline

Value	Information
5	Excellent
4	Good
3	Enough
2	Less
1	Very less

The first step is to make a decision table by compiling criteria and alternatives into matrix form. In this calculation, the researcher used 15 (fifteen) alternatives to carry out the calculation proces. Next determine the weighting based on the initial data**.** The weighted value of the assessment of potential new partners is converted by looking at the table of criteria.

Determining criteria C1, C2, C3, C4, C5, C6 is a favorable criterion**.** Decision making give weight based on the level of importance of each of the required criteria is as follows:

W = (3,4,5,5,5,4,)

The next step is to normalize the matrix X calculating the value of each criterion.

Normalization

The function of normalization is to calculate the normalized performance rating from the alternatives above using the formula 3:

$$r_{ij}= \sum_{\frac{Min\ Xij}{Xij}}^{\frac{Xij}{Max\ Xij}} \begin{matrix} if\ j\ is\ a\ benefit\ attribute\ (benefit) \\ if\ j\ is\ a\ cost\ attribute\ (cost) \end{matrix}$$

(3)

Preference (Vi)

The function of the preference is to search for the highest value. Next,

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multiplication is made between the W*R matrices by using the formula :

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

RESULTS AND DISCUSSION

System implementation is a procedure that must be carried out to complete the existing system design in the approved system design document, as well as test installing, and starting the use of the new system. In general, the purpose of this implementation is to carry out trials of the concept of system development that has been prepared. Implementation as a support analysis system requires several devices.

Table 8. Weight Value Data Conversion Table

No	Alternative	Criterion					
		C1	C2	C3	C4	C5	C6
1	Sri Indarin	4	2	5	4	1	4
2	Onita Prianti	4	3	4	3	4	3
3	Yenni Yulistina	3	3	3	5	5	4
4	Inako Cartine	4	5	4	4	3	4
5	Ruslan Efendi	4	4	3	3	4	4
6	Anastasya Arliza	5	3	4	4	3	2
7	Ahmad Shafi'i	4	2	3	3	2	1
8	SriPuji Astuti	4	2	4	3	3	4
9	Rudi	3	4	4	4	3	4
10	Sutriana	3	3	4	4	4	4
11	Dian Aprillia	5	4	3	3	4	3

Table 9. Normalization of each alternative on each criterion

Alternative	Criterion					
	C1	C2	C3	C4	C5	C6
A1	0,75	0,50	1,00	0,80	0,20	1,00
A2	0,75	0,75	1,00	1,00	0,80	0,75
A3	1,00	0,75	1,00	1,00	1,00	1,00
A4	0,75	1,00	0,80	0,80	1,00	1,00
A5	0,75	1,00	1,00	1,00	1,00	1,00
A6	0,60	0,75	0,80	1,00	1,00	0,50
A7	0,75	0,50	0,60	0,60	0,40	0,25
A8	0,75	0,50	0,80	1,00	1,00	1,00
A9	1,00	1,00	0,80	1,00	0,60	1,00
A10	1,00	0,75	1,00	1,00	0,80	1,00
A11	0,60	1,00	1,00	1,00	0,80	0,75
A12	0,75	0,50	0,80	0,80	0,80	1,00
A13	0,60	1,00	1,00	1,00	0,60	1,00
A14	0,60	0,50	0,80	1,00	1,00	1,00
A15	0,75	1,00	0,60	1,00	1,00	0,50

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Table 10. Alternative Assessment Results of Potential New Partners

Alternative Code	Alternative	Result	Ranking
A1	Sri Indarin	0,765	13
A2	Onita Prianti	0,855	8
A3	Yenni Yulistina	0,95	2
A4	Inako Cartine	0,895	6
A5	Ruslan Efendi	0,975	1
A6	Anastasya Arliz	0,76	14
A7	Ahmad Shafi'i	0,505	15
A8	Sri Puji Astuti	0,825	9
A9	Rudi	0,91	5
A10	Sutriana	0,93	3
A11	Dian Aprillia	0,89	7
A12	Muchlis Ashari	0,775	12
A13	Rina	0,92	4
A14	Novi Silavana Kawila	0,81	10
A15	Ita Purmala Sari	0,775	11

Assessment Type Data Page View

The assessment type data display page is a page that displays data data of the assessment type selected to be inputted by the admin in the page displaying data this type of assessment is available features to save assessment type data, change assessment type data, delete assessment type data and one table that aims to display assessment type data in the system. Here is what the assessment type data page looks like:

Image 1. Assessment Type Data Page View

Alternate Data Page View

The alternative data display page is a page that displays alternative data inputted by the admin in the alternative data display page, there are features available to add alternative data, change alternative data, delete alternative data and one table that aims to display alternative data on the system. Here is what the alternative data page looks like:

Image 2. Alternate Data Page View

Criteria Value Page View

The page displaying criteria values is a page that displays sub data data from criteria inputted by the admin in the page displaying the value of these criteria available features to add value data, change value data, delete criteria value

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data and one table that aims to display the data of criteria values in the system. Here's what the criteria values page looks like:

Image 3. Criteria Value Page View

Sub Criteria Values page view

The page displaying sub-criteria values is a page that displays data data from sub-criteria inputted by the admin in the page displaying sub-criteria values this is available features to add value data, change value data, delete sub-criteria value data and one table that aims to display sub-criteria value data in the system. Here's what the sub-criteria values page looks like:

Image 4. Sub Criteria Values Page View

Weight Value Page View

The page displaying weight values is a page that displays data data from weight values inputted by admins in the page displaying weight values this is available features to add weight data, change weight data, delete weight data and one table that aims to display weight value data in the system. Here's what the weight value page looks like:

Image 5. Weight Value Page View

Assessment Page View

The assessment display page is a page that displays data from the assessor entered by the admin in the assessment display page this feature is available features to add assessment data, change assessment data, delete assessment data and one table that aims to display assessment value data in the system. Here's what the scoring values page looks like:

Image 6. Assessment Page View

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Calculation Process Page View

The ga n perhitun process display page is a page that displays all data from criteria data, alternative data and criteria value data whose purpose is to be calculated using the *Simple Addictive Weighting (SAW)* method so that it will get the results of these calculations which will be used as a reference in decision making by the Central Statistics Agency. Here's what the calculation process page looks like:

Image 7. Calculation Process Page View

Report Print Page View

A report print page is a page that displays data on the results of the report in *pdf format* which aims to be able to print the results or*download* the results of these calculations. Here's what the report prints look like:

Image 8. Print Page View of the Report

Based on the results of the ranking in the table above, the best alternative decisions can be taken, namely **Ruslan efendi** with a value of **0.975** and **Yenni Yulistina with a** value of **0.95** if the value of V there is a similarity of values, the decision is returned to the decision maker, namely the Central Statistics Agency.

CONCLUSION

The system is built with a PHP programming language that can analyze alternative data and criteria so that it is processed by the system and produces automatic rankings that are useful as a reference for the Central Statistics Agency in making decisions on the assessment of new potential partners.

With the criteria and alternative data obtained, it can be analyzed using the *Simple Addictive Weigthing (SAW)* method so that it can be a reference to the Central Statistics Agency in the assessment of potential new partners of the Asahan Regency Statistics Agency.

The results of the analysis on the system obtained a decision of 1-10 the best alternative rankings are Ruslan efendi with a value of 0.975 and Yenni Yulistina with a value of 0.951 based on these results can help the Central Statistics Agency in determining the assessment of potential new partners so that it can provide a reference in decision making.

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