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Decision Support System for Determining the Best Nurse at Grandmed Hospital Using the Simple Additive Weighting Method

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ABSTRACT

A decision support system is a combination of individual intelligence sources with component capabilities to improve decision quality. Decision support system is also a computer-based information system for decision-making management that handles semi-structured problems. The purpose of this study was to create an application for nurse employees at Grandmed Hospital. Based on the results of the research that has been discussed, the Decision Support System for Determining the Best Nurse at Grandmed Hospital using the Simple Additive Wieghting (SAW) method with the benefit of being able to make it easier to process nurse data and make it easier to determine the best nurse for a nurse promotion at Grandmed Hospital.

Keywords*: Decision Support System, Best Nurse, Simple Addite Weighting*

1. Introduction

Various fields of work use computer technology to manage data, improve service quality and produce a series of information that is accurate and as expected. In addition, computer technology is able to increase company profits in making a decision.

Decision Support System (DSS) is a model-based system consisting of procedures for data processing and considerations to assist in making decisions. To be successful in achieving its objectives, the system must be simple and easy to control. It is important that these systems be computer based and used in addition to the problem solving capabilities of a person. DSS aims to provide information, guide, predict and direct information users to make better decisions.

Grand Medistra Hospital officially changed its name to Grandmed Hospital starting April 19, 2017. Grandmed Hospital is a private hospital that has referrals for health services for doctors and people in need. HR is one of the important factors of an organization, institution or company. HR in the form of humans who are employed in an organization as movers, thinkers and planners to achieve the goals of the organization. Therefore, the management of nursing human resources is very important in supporting the implementation of effective and good nursing so as to improve the degree of public health.

Nurses as one of the important assets in the implementation of health facilities, apart from being paramedics to treat patients, nurses are the ones who are most often in direct contact and automatically always actively communicate with patients. In determining the best nurse previously, Grandmed Hospital had previously carried out the factors before making a decision, namely skills, discipline, leadership, and cooperation. Therefore, there are several problems encountered by the hospital, such as

the process used manually so that it takes a long time to get the results of determining the best nurse. Therefore, Grandmed Hospital needs a way to determine the best nurse. One of the appropriate methods of the problem of determining the best nurse, The author uses the SAW method to assist in determining the best nurse. As for some of the problems obtained by the author related to the determination of the best nurse, such as the absence of a computerized application in determining the best nurse, the absence of a calculation method in determining the best nurse.

2. Methodology

The SAW (Simple additive weighting) method is a simple and classic multi-criteria decision-making method. This method is included in the weighting method or known as addition. The steps in the SAW method are as follows: (a) Determine the criteria that will be used as a reference in making decisions, namely: Cj. (b) Determine the weight for each criterionW = [W1,W2,W3,…,WJ]. (c) Normalizing the decision matrix by performing a comparison process on all existing alternative values, the normalization formula is: Ri j = normalized performance rating value. Xi = attribute value owned by each criterion. Max xij = the largest value of each criterion. Min xij = the smallest value of each criterion. Benefit = if the greatest value is the best. Cost = if the smallest value is the best. (d) Calculates the preference value for each alternative. Vi is given as$V_i = \sum_{j=1}^{n} W_j \ r_{ij}$

Vi= rank for each alternative

wj= weighted value of each criterion rij = value of normalized performance rating A greater value of Vi indicates that alternative Ai is more selected.

3. Results and Discussion

Based on the results of the observations that the author made on the data of nurses, the authors made an analysis of the calculations using the data of nurses.From a number of nurses at Grandmed Hospital, only 5 people were taken as an example to apply the simple additive weighting method in determining the best nurse.

Table 1.
Nurse Data

NIK	Nurse name	J. Gender	Address	Task
2487	Sandro adam fahlevi ancient, AMK	Man	Graveyard	Single
2486	Jupianto kican simatupang, AMK	Man	Graveyard	Single
2485	Remika turnip, AMK	Woman	Graveyard	Marry
2351	Risma Kartika Sari, S.Kep	Woman	T. morawa	Single
2497	Ramadhan syahputra, S.Kep, NS	Woman	Graveyard	Marry
2499	Safia, AMK	Woman	Graveyard	Marry
400	Nurzaini, AMK, S.Kep, NS	Woman	Quiz rod	Single
1430	Lilyani, S. Kep, NS	Woman	Quiz rod	Marry
619	Lolita simanjuntak, S. Kep,	Woman	Graveyard	Marry

	NS			
306	Ria Rismawati, S. Kep, NS	Woman	Graveyard	Marry
1945	Evy Pionika, S.Kep, NS	Woman	Quiz rod	Single
2505	Lily beautiful princess, AMK	Woman	Graveyard	Single
1954	Hoirul alfan, S, Kep, NS	Woman	Graveyard	Single
2492	Jenda wants to wake up, AMK	Woman	Graveyard	Marry
2472	Mutiara Tarigan, Amd. Keb	Woman	Graveyard	Single
1194	Anni kholila, AMK, S.Kep, NS	Woman	Graveyard	Single
2162	Sartika Dewi Asnita S.kep, NS	Woman	Graveyard	Single
1768	Fitriyani, AMK	Woman	Quiz rod	Single
289	Nurhayati harahap, AMK, S.Kep, NS	Woman	Quiz rod	Marry
196	Nurlena saragih, AMK, S. Kep, NS	Woman	Quiz rod	Single

Table 2.
Crips Value (Sub Criteria)

Criteria	Information	Crips	Score
C1	Skills	Skilled	40
		Well	30
		Enough	15
		Less skilled	10
		Very less	5
C2	Discipline	Discipline	40
		Well	30
		Enough	15
		Lack of discipline	10
		Very less	5
C3	Leadership	Very good	40
		Well	30
		Enough	15
		Not enough	10
		Very less	5
C4	Cooperation	Very good	40
		Well	30
		Enough	15
		Not enough	10
		Very less	5

3.1 Determine the alternative, namely Ai.

Table 3.
Alternative Value

NIK	Name	Score			
		Skills (C1)	Discipline (C2)	Leadership (C3)	Cooperation (C4)
2351	Risma Kartika Sari, S.Kep	Enough	Enough	Enough	Enough
400	Nurzaini, Amk, S. Kep, Ns	Enough	Enough	Well	Enough
1945	Evy Pionika, Skep, Ns	Skilled	Well	Very good	Very good
1194	Anni kholila, Amk, S.Kep.Ns.	Enough	Well	Well	Enough
2162	Sartika Dewi Asnita S.Kep,	Enough	Enough	Well	Enough

3.2 Determining the suitability of each alternative on each criterion for determining the best nurse.

Table 4.
Twig Match On Each Alternative

Alternative	Criteria			
	C1	C2	C3	C4
Risma Kartika Sari, S.Kep	15	15	15	15
Nurzaini, Amk, S. Kep, Ns	15	15	30	15
Evy Pionika, Skep, Ns	40	30	40	40
Anni kholila, Amk, S.Kep.Ns.	15	30	30	15
Sartika Dewi Asnita Sihombing, S.Kep, Ns	15	15	30	15

3.3 Determine the weight for each criterion.

Table 5.
Weight For Each Criterion

Criteria	Information	Weight
C1	Skills	20
C2	Discipline	20
C3	Leadership	40
C4	Cooperation	20

W= 20 + 20 + 40 + 20 = 100

3.4 Calculate the normalization value of each alternative with the formula:

$$\sum \quad r_{ij} = \frac{x_{ij}}{Maxx_{ij}}$$

Information:
Rij = value of normalized performance rating
Xij = attribute value owned from each criterion
Max Xij = the largest value of each criterion
Benefit = greatest value is best

Table 6.
Criteria Type

Criteria	Criteria type	Information
Skills	Profit	Always needed anytime
Discipline	Profit	On time to work
Leadership	Profit	Responsible at work
Cooperation	Loss	Team cohesiveness is needed

Normalization for criteria can be seen as follows.

a. For skill criteria

$1115Max\{15,15,40,15,15\} = 1540r11\frac{15}{Max\{15,15,40,15,15\}} = \frac{15}{40} = 0{,}375$

$r21\frac{15}{Max\{15,15,40,15,15\}} = \frac{15}{40} = 0{,}375$

$r31\frac{40}{Max\{15,15,40,15,15\}} = \frac{40}{40} = 1$

$r41\frac{15}{Max\{15,15,40,15,15\}} = \frac{15}{40} = 0{,}375$

$r51\frac{15}{Max\{15,15,40,15,15\}} = \frac{15}{40} = 0{,}375$

b. For disciplinary criteria (C2)

$$r12\frac{15}{Max\{15,15,30,30,15\}} = \frac{15}{30} = 0{,}5$$

$$r22\frac{15}{Max\{15,15,30,30,15\}} = \frac{15}{30} = 0{,}5$$

$$r32\frac{30}{Max\{15,15,30,30,15\}} = \frac{30}{30} = 1$$

$$r42\frac{30}{Max\{15,15,30,30,15\}} = \frac{30}{30} = 1$$

$$r52\frac{15}{Max\{15,15,30,30,15\}} = \frac{15}{30} = 0{,}5$$

c. For leadership criteria (C3)

$$r13\frac{15}{Max\{15,30,40,30,30\}} = \frac{15}{40} = 0{,}375$$

$$r23\frac{30}{Max\{15,30,40,30,30\}} = \frac{30}{40} = 0{,}375$$

$$r33\ \frac{40}{Max\{15,30,40,30,30\}} = \frac{40}{40} = 1$$
$$r43\ \frac{30}{Max\{15,30,40,30,30\}} = \frac{30}{40} = 0{,}375$$
$$r53\ \frac{30}{Max\{15,30,40,30,30\}} = \frac{30}{40} = 0{,}375$$

d. For cooperation criteria (C4)

$$r14\ \frac{15}{Min\{15,15,40,15,15\}} = \frac{15}{15} = 1$$
$$r24\ \frac{15}{Min\{15,15,40,15,15\}} = \frac{15}{15} = 1$$
$$r34\ \frac{15}{Min\{15,15,40,15,15\}} = \frac{15}{40} = 0{,}375$$
$$r45\ \frac{15}{Min\{15,15,40,15,15\}} = \frac{15}{15} = 1$$
$$r54\ \frac{15}{Min\{15,15,40,15,15\}} = \frac{15}{15} = 1$$

The results of normalization are made in the form of a normalization matrix as below:

$$X = \begin{matrix} 0.375 & 0.5 & 0.375 & 1 \\ 0.375 & 0.5 & 0.75 & 1 \\ 1 & 1 & 1 & 0.75 \\ 0.375 & 1 & 0.75 & 1 \\ 0.375 & 0.5 & 0.75 & 1 \end{matrix}$$

3.5 Calculating Preference Values For Each Alternative.

And then the W * R matrix multiplication and the addition of the multiplication results are made to obtain the best alternative by ranking the largest values as follows:

$$V_i = \sum_{j=1}^{n} W_j \ r_{ij}$$

W = [20 20 40 20]

The preference values for determining the ranking results are as follows:

V_1= (20 x 0.375) + (20 x 0.5) + (40 x 0.375) + (20 x 1)= 52.5
V_2= (20 x 0.375) + (20 x 0.5) + (40 x 0.75) + (20 x 1) = 67.5
V_3 = (20 x 1) + (20 x 1) + (40 x 1) + (20 x 0.75) = 87.5
V_4= (20 x 0.375) + (20 x 1) + (40 x 0.75) + (20 x 1)= 77.5
V5 **=**(20 x 0.375) + (20 x 0.5)+ (40 x 0.75) + (20 x 1) = 67.5

From the results of the multiplication of the W * R matrix obtained, the final result of the largest decision value is as follows:

Table 7.
Preference value

Alternative	The final result

Evy Pionika, Skep, Ns	87.5
Anni kholila, Amk, S.Kep.Ns.	77.5
Sartika Dewi Asnita Sihombing, S.Kep, Ns	67.65
Nurzaini, Amk, S. Kep, Ns	67.56
Risma Kartika Sari, S.Kep	52.5

4. Conclusion

Based on the results of the Decision Support System for Determining the Best Nurse at Grandmed Hospital using the Simple Additive Weighting (SAW) method, it can be used as one of the media in determining the best nurse at Grandmed Hospital. With this application, determining the best nurse can be done quickly, precisely, looks better and structured.

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