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RESEARCH PAPER

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IMPLEMENTATION OF WEIGHTED PRODUCTS IN THE MAKING OF A HEALTHY HUMAN RESOURCE ASSESSMENT SYSTEM FOR PUBLIC HEALTH CENTERS

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Abstract: The performance evaluation of medical personnel at the Public Health Center is a form of government efforts to improve health service providers for the community. To realize these goals, the government, through the Minister of Health's Decree number 857/MENKES/SK/IX/2009 concerning performance evaluation of Health Human Resources. The implementation of human resource performance appraisal has been carried out so far, only by recording personal data individually, so that the data gap has an opportunity to be engineered by someone. Determining the performance of health human resource performance with excellent performance, the Decision Support System is using by the Weighted Product (WP) method, where this method is very suitable for the selection of various alternatives that depart from the determination of the weight of each assessment criteria. With the decision of the optimal weight by the Head of the Community Health Center, this method began to formulate a weight matrix to used as an exponential factor for each medical staff's compatibility rating. The program output obtained, it turns out not much different compared to manual calculations — testing by examining the program outputs with manual counts. Although there are slight differences between the two results, the difference is tiny, ranging from 0.001 to 0.002. But because the main goal of the decision support system is to get the best ranking of alternatives.

Keywords: Performance Evaluation, Assessment, Health Human, Resources, Puskesmas

I. INTRODUCTION

Puskesmas are the spearhead for improving the welfare of the community in the health sector. To enhance the quality of service and coverage of a work area, optimal medical and paramedical performance is required by their main duties and functions as health workers.

1.1. Background

Based on the [1] article 1 paragraph 1 Health workers are every person who devotes himself in the field of health and has an understanding or skills through health education which for certain types requires the authority to conduct health efforts.

One complaint that is often heard from the public relating to the government apparatus is in addition to the convoluted due to rigid bureaucracy, unscrupulous behavior of people who are sometimes unfriendly, as well as employee performance in providing services related to timeliness in providing services, quantity, and quality of service which is still very low. The low service performance will build a bad image at the Puskesmas, where dissatisfied patients will tell their colleagues. Vice versa, the higher the performance of services provided, will be a plus for the health center, in this case, the services provided by the health center[2].

Service performance concerns the results of work, work speed, work done by customer expectations, and timeliness in completing work. A person's performance is a combination of ability, effort, and opportunity to assess his work.

Puskesmas Kampung Bali is one of the Community Health Centers serving the community in a particular environment, where the density of service work to the community is quite high. Therefore it requires skilled and dedicated health care workers in carrying out their work so that the skills and performance of health care workers (medical personnel) become an issue that requires special attention from the health center. Control over the performance of competent medical personnel will undoubtedly produce good results as well. Therefore it is necessary to have a tool/method that can help the management of the Puskesmas in evaluating the performance of existing medical personnel.

1.2. Problem

The problems that arise when making a program as described above are how to design an application program that can be used to assess the performance of Medical Workers.

II. LITERATURE REVIEW

Multi-Attribute Decision Making (MADM) is an analytical method that reduces the use of mathematics used for alternative selection with several criteria. MADM is also used to solve problems in discrete spaces with a limited number of choices [3] [6].

In general, the Multi-Attribute Decision-Making model considered as follows:

For example A = {ai | i = 1, ... n} is the set of decision alternatives and C = {Cj | j = 1, ... m} is the set of expected goals, then Xo alternatives will be determined, which have the highest degree of expectation of the relevant objectives Cj.

Most MADM approaches are carried out through 2 steps, namely: first, to aggregate decisions that are responsive to all objectives on each alternative; second, ranking the alternative choices based on the results of the decision aggregation.

Thus it can be said that, the problem of Multi-Attribute Decision Making (MADM) is evaluating m alternative Ai (i = 1,2, ..., m) to a set of attributes or criteria Cj (j = 1,2, ..., n), where each interdependent characteristics of one another. The decision matrix for each alternative to each attribute, X, is given as:

$$X = \begin{pmatrix} X_{11} & X_{12} & \ldots\ldots & X_{1n} \\ X_{21} & X_{22} & \ldots\ldots & X_{2n} \\ X_{31} & X_{32} & \ldots\ldots & X_{3n} \\ \ldots\ldots & \ldots\ldots & \ldots\ldots & \ldots\ldots \\ X_{m1} & X_{m2} & \ldots\ldots & X_{mn} \end{pmatrix} \quad (1)$$

Where :

Xij: is the performance rating of alternative I to the jth attribute, and the value of w weights shows the relative importance.

And w is given as w = {w_1, w_2, w_3, …… w_n} is the preference weights of each alternative.

Performance rating (X), and weight value (W) are the central values that represent the absolute preference of the decision-maker. MADM problems end with the ranking process to get the best alternative obtained based on the overall profits of the given a choice.

Another phrase conveyed by [4], namely: Various MADM methods have been proposed to solve various applications of decision problems. One way of MADM is Weighted Product (WP). This method is more efficient than other methods for solving MADM problems. The reason is because of the time needed in the calculation[5] [7].

$$P_i = \left(\prod_{j=1}^{m} M_{ij}\ normal\right)^{Wj} \quad (2)$$

Where :

M_{ij} is the rating of each attribute

W_j weights for each quality A similar formula was also conveyed by [5]

$$P_i = \left(\prod_{j=1}^{m} y_{ij}\right) \wedge Wj \quad (3)$$

Where :

y_{ij} is the rating of each attribute

W_j weights each attribute

Similar expressions are conveyed by [4] as follows:

A = {ai | i = 1, 2, 3, ... n}

Where A is an alternative set, then C is known as the set of criteria written in the following notation:

C = {cj | j = 1, 2, 3, ... m}

Furthermore, weights W for each alternative are arranged with the following notation:

W = {wj | j = 1, 2, 3, ... n}

Based on the three equations above, the match rating matrix becomes:

$$D = \begin{pmatrix} d_{11} & d_{12} & d_{13} & \ldots\ldots & d_{1n} \\ d_{21} & d_{22} & d_{23} & \ldots\ldots & d_{2n} \\ \ldots\ldots & \ldots\ldots & \ldots\ldots & \ldots\ldots & \ldots\ldots \\ \ldots\ldots & \ldots\ldots & \ldots\ldots & \ldots\ldots & \ldots\ldots \\ d_{n1} & d_{n2} & d_{n3} & \ldots\ldots & d_{nn} \end{pmatrix} \quad (4)$$

where d_{11}, d_{12} ..... d_{nn} is the compatibility rating of each alternative.

The next step is to arrange the normalization matrix for the beneficial attributes using the following formula:

$$r_{ij} = \frac{d_{ij}}{d_{ij}^{max}} \quad (5)$$

Meanwhile, if the attribute for an attribute that is not profitable, the formula is:

$$r_{ij} = \frac{d_{ij}^{min}}{d_{ij}} \quad (6)$$

The next step is to construct a weighted normalized matrix with the following formula:

$$V_{ij} = r_{ij}^{w_{ij}} \quad (7)$$

Then, calculate the scores of each alternative with the following formula:

$$M_i = \prod_{j=1}^{m} V_{ij} \quad (8)$$

Then in the final stage proceed with ranking to get the best alternative, with the formula:

$$BAWP = Max \prod_{i=1}^{n} M_i \quad (9)$$

III. METHODOLOGY

The research methods used are:

1. Literature search relating to policies regarding the assessment of the performance of medical personnel at the Puskesmas
2. Interviews with the performance appraisal officer,
3. System (software) development

Existing System

The implementation of determining the performance of medical personnel that applies to technical service units and public health centers in Bengkulu City has so far followed the provisions stipulated by Decree of the Minister of Health of the Republic of Indonesia Number 857 / Menkes / SK / IX / 2009 concerning Assessment Guidelines Health Human Resources Performance at the Health Center. There are seven types of criteria used as guidelines for performance evaluation,

according to the Minister of Health's Decree No. 857/Menkes /SK/IX/2009, 7 criteria, namely:

1. HR group
2. Education
3. Working Period
4. Presence
5. Deduction component
6. Enhancing Components
7. Productivity

The weighting of each of these criteria explained as follows:

1. HR group

Table 1. Positions and Job Descriptions and Functions

No	Position	Main Tasks and Functions	Weight
1	Head of Puskesmas	Coordinating the implementation of Health Office affairs, by compiling technical policies, providing guidance, controlling and facilitating the eradication of diseases, health services, family health and promotion, and environmental health; take responsibility and report the results of official performance to the Head of the Health Service	4 (Very Good)
2.	Administration: - Head of admin-istration - Administration of Puskesmas	Helps coordinate the imple-mentation of Health Service affairs, in accordance with the main tasks and functions of health centers, by synergizing the planning and execution of activity programs in each puskesmas program, which includes eradication of diseases, health services, family health and promotion and environmental health; fostering and controlling the implementation of office administration services, equipment, staffing, finance, performance appraisal and reporting; and to account for and report the results of the performance of Puskesmas administration to the Puskesmas head in accordance with the established guidelines and instructions	3 (Good)
3	Functional Officer with a Credit Score: General Practitioner, Dentist, Midwife, Nurse, Dental Nurse, Hospital Staff, Sanitarian, Nutritionist, Pharmacist, Assistant Pharmacist	Carrying out Puskesmas affairs by providing public health services, emergency measures, mental health, adolescent health, child health, health consultations, providing referrals, health testing, autopsy, post mortem, public health counseling, accountability and reporting of performance results to the Head of Service Bengkulu City Health through the Head of Puskesmas to create a healthy, active and prosperous community.	2 (Norma l)
4	Functional Officer with no credit frame: Administration staff. General, Counter Officers, Treasurer, Treasurer, goods	Carry out tasks providing services, incoming and outgoing mail agenda, typing and sending letters, inventory of goods, doing data rejuvenation at the Puskesmas	1 (Low)

2. Education

Table 2. Educational Criteria

No.	Education	Weight
1.	Doctor, Dentist, Bachelor	4
2.	Baccalaureate	3
3.	Bachelor degree	2
4.	Senior High School	1

3. Years of service

Table 3. Criteria for Years of Service

No.	Years of Service	Weight
1.	More than ten years	4
2.	5-10 years	3
3.	1 – 5 years	2
4.	Less than one year	1

4. Attendance Criteria

Table 4. Attendance Criteria

No.	Number of Attendance	Weight
1.	Full according to the number of working days per month	4
2.	Average absentees one time per month	3
3.	Alpha averages two times per month	2
4.	The average of absent is more than three times per month	1

5. Reduction Criteria

Table 5. Reduction Criteria

No.	Number of reprimand letters received	Weight
1.	Never received a letter of reprimand	4
2.	Have received a letter of reprimand	3
3.	Have received a warning letter and a warning letter	2
4.	Often receive letters of reprimand and warning letters.	1

6. Enhancement Criteria

Table 6. Enhancement Criteria

No.	The number of awards received	Weight
1.	Has been awarded at the national level	4
2.	Has been awarded at the provincial level	3
3.	Has been awarded at the regional level	2
4.	Never got an award	1

7. Productivity Criteria

Table 7. Productivity Criteria

No.	Productivity at work	Weight
1.	Very productive in carrying out the main tasks and functions	4
2.	Productive in carrying out the main tasks and functions	3
3.	Productive enough in carrying out the main tasks and functions	2
4.	Less productive in carrying out the main tasks and functions	1

IV. RESULTS AND DISCUSSION

1. Results

The results of the research on the implementation of the weighted product method for evaluating the performance of medical personnel are computer programs that can be explained based on the display of the following images:

Figure 1. Main Menu Display

The Main Menu functions as a controller of all forms provided, namely: forms for managing medical personnel data, criteria for determining weighting forms, assessment forms, preference weighting forms and other forms related to medical personnel assessment systems. Following are some examples of each form as described above, which are:

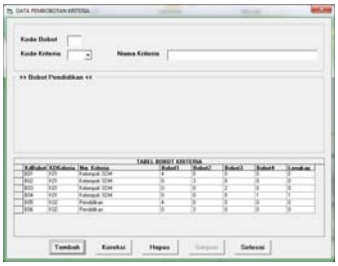

Figure 2. Criteria Weighting Form

In the Criteria Weighting Form above, if done via the 'Tambah' button and proceed by selecting the criteria code and proceed by filling in the criteria described. Then the program will request the level of each type of rules accordingly, as shown in Figure 3 below:

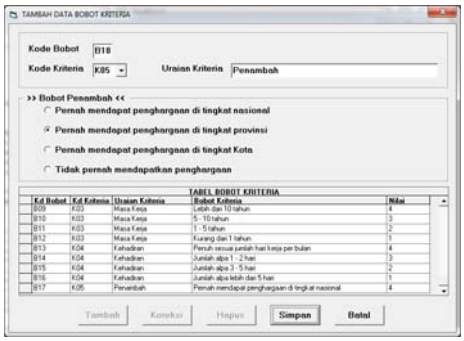

Figure 3. Criteria Weighting Form (continued)

Whereas the medical personnel form as the main subject of the assessment is in the form of medical personnel, as in Figure 4 below:

Figure 4. Medical Personnel Form

The next step is filling in the performance data of each medical person, following all the criteria set by the Chair of the Puskesmas. The appearance of the form for filling the performance data is shown in Figure 5 below:

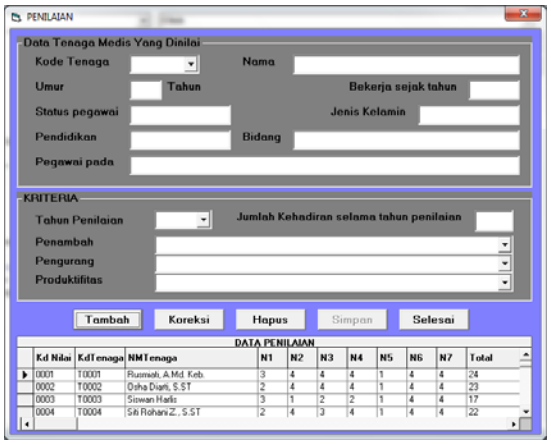

Figure 5. Medical Personnel Data Form

Before starting the assessment process, the operator must fill in the preference weight, because preference weight is the main element in determining the degree of performance of medical personnel identified by the Head of the Puskesmas. The display of charging the preference weights is shown in Figure 6 below:

Figure 6. Preference Weight Form

Furthermore, after all the required data has been filled out through each of the appropriate forms, the next operator will evaluate the performance of the medical personnel. The appearance of the medical personnel assessment process as following pictures:

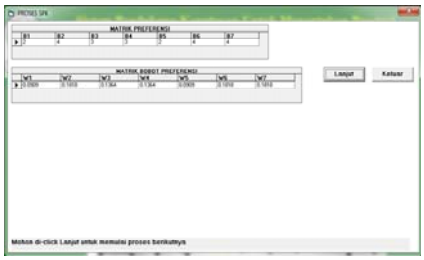

Figure 7. Early Stage Performance Assessment Process

And after clicking the Next button, then the form appears like the following figure 8:

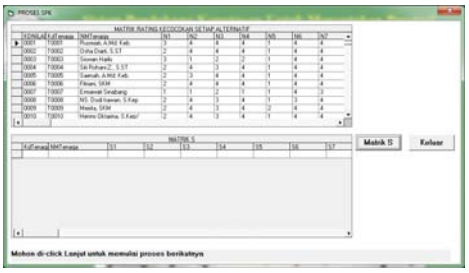

Figure 8. WP Process Step 2

In brief, step by step, the WP process that occurs finally reaches the ranking results like Figure 9 below:

Figure 9. WP Process Final Step

In this study, the desired outcome is, as shown in Figure 10 below:

DINAS KESEHATAN KOTA BENGKULU

PUSKESMAS KAMPUNG BALI

Jalan Nasirwan Zainal No. 1 Kampung Bali Kota Bengkulu

RANKING HASIL PENILAIAN KINERJA TENAGA MEDIS

Tahun Penilaian : 2015

No.	Nama Tenaga Medik	SDM	PDD	MSK	MDR	TAM	KUR	PRO	Nilai	Keterangan
1	Wita Widianti, A.Md.Keb.	1	3	3	4	1	4	3	0,0460	Sangat Baik
2	Mulyati, SKM	2	4	4	4	1	4	3	0,0437	Baik
3	Siti Rohani Z., S.ST	2	4	3	4	1	4	4	0,0431	Baik
4	Henny Oktarina, S.Kep	2	4	3	4	1	4	4	0,0431	Baik
5	Dorniken, SST	2	4	3	4	1	4	4	0,0431	Baik
6	Fitriani, SKM	2	4	4	4	1	4	4	0,0413	Baik
7	Rizmi Puspa Dewi, SKM	2	4	4	4	1	4	4	0,0413	Baik
8	Lidia Handayani, S.Kep	2	4	4	4	1	4	4	0,0413	Baik
9	Yunisa Tri Asyani, S.Kep.	2	4	4	4	1	4	4	0,0413	Baik
10	Osha Diarti, S.ST	2	4	4	4	1	4	4	0,0413	Baik
11	NS. Dodi Irawan, S.Kep	2	4	3	4	1	3	4	0,0409	Baik
12	Agriyeni, A.Md. F	2	3	3	4	1	4	4	0,0409	Baik
13	Susi Eka Fitri, A.Md.Kep.	2	3	3	4	1	4	4	0,0409	Baik
14	Riya Endhi Yuni, A.Md.Kep.	2	3	3	4	1	4	4	0,0409	Baik
15	Nurliana MS	2	3	3	4	1	4	4	0,0409	Baik
16	Merita, SKM	2	4	3	4	2	4	4	0,0405	Baik
17	Elin Lestari, SKM	2	4	3	4	2	4	4	0,0405	Baik
18	Rusmiati, A.Md. Keb.	3	4	4	4	1	4	4	0,0400	Baik
19	Saenah, A.Md. Keb	2	3	4	4	1	4	4	0,0394	Baik
20	Nurdanelli Nafli, A.Md.Kep.	2	3	4	4	1	4	4	0,0394	Baik
21	drg. Annisa Murdiah	2	4	1	1	1	3	4	0,0394	Baik
22	Ilsa Oktapia, A.Md.Keb	2	3	2	1	1	3	4	0,0340	Sedang
23	Ermawati Sinaluing	1	1	2	1	1	4	3	0,0329	Sedang
24	Yulia Gustina, A.Md.KL	2	2	2	1	1	3	4	0,0316	Sedang
25	Siswan Harlis	3	1	2	2	1	4	4	0,0311	Sedang

Keterangan :
SDM : Sumber daya Manusia
PDD : Pendidikan
MSK : Masa Kerja
MDR : Kehadiran
TAM : Pemanbah
KUR : Pengurang
PRO : Produktifitas

Bengkulu, 16 September 2016
a.n. Kepala Puskesmas Kampung Bali
Ka. Sub Bag Tata Usaha

SISWAN HARLIS

Figure 10. WP Process Final Step

In Figure 10 above, that program outcomes in the form of Recommendation Letter of award recipients to medical personnel with the highest value.

V. CONCLUSION

Based on the results of the program output, as shown in Figure 10 above and compared with the manual calculation that has been used by the Performance Evaluation Section of the Medical Staff of Kampung Bali Health Center can be called the same because it has a small difference. Meanwhile, using manual calculation or conventional calculation, the result is the highest value achieved by WITA WIDIANTI, A.Md. Keb. Namely: 0.0458, while the program output is 0.0460. That means there is a difference of 0,0002, which can be called the result is not much different.

VI. ACKNOWLEDGMENT

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