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Implementation of Simple Additive Weighting (SAW) Method To Determine Exemplary PKH Social Worker (Case Study: PPKH Garut Regency)

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Abstract—One measure of the success of an employee in carrying out his job is his election as an exemplary employee in the agency where he works. The selection must of course be based on standard measurement and objective assessment, the goal is that the predetermined results can be justified. A decision support system using the Simple Additive Weighting (SAW) method can help PPKH Garut regency in determining exemplary PKH social worker in each sub-district PPKH unit, this method will look for weight values for each predetermined criterion consisting of quantity, integrity, dedication, reliability, initiative, diligence, attitude, motivation and presence. The data sample taken in this research was PPKH X Sub-distric, where the results of the research are in the form of a ranking that can support the decision to choose an exemplary PKH social worker in PPKH Garut Regency.

Keywords: Decision Support System, PKH Social Worker, PPKH Garut Regency.

Abstrak —Salah satu ukuran keberhasilan seorang pegawai dalam menjalankan pekerjaannya adalah terpilihnya sebagai pegawai teladan di instansi tempatnya bekerja. Pemilihan tersebut tentunya harus didasarkan pada standar ukuran dan penilaian yang objektif, tujuannya agar hasil yang telah ditentukan dapat dipertanggung jawabkan. Sistem pendukung keputusan dengan menggunakan metode Simple Additive Weighting (SAW) dapat membantu PPKH Kab. Garut dalam menentukan pendamping sosial PKH teladan di setiap unit PPKH kecamatan, metode ini akan mencari nilai bobot untuk setiap kriteria yang telah ditentukan yang terdiri dari kuantitas, integritas, dedikasi, kehandalan, inisiatif, kerajinan, sikap, motivasi dan kehadiran. Sampel data yang diambil pada penelitian ini adalah PPKH Kec. X, dimana hasil penelitian berupa pemeringkatan yang dapat mendukung keputusan pemilihan pendamping sosial PKH teladan di PPKH Kab. Garut.

Kata Kunci: Sistem Pendukung Keputusan, Pendamping Sosial PKH, PPKH Kab.

I. INTRODUCTION

Program Keluarga Harapan (PKH) is a program that provides conditional social assistance to *Keluarga Penerima Manfaat* (KPM) that has been established by the Ministry of Social Affairs or *Kementerian Sosial* (Kemensos), as an effort to accelerate poverty reduction and has been launched by the Government of Indonesia since 2007 [1].

PKH implementers or *Pelaksana* PKH (PPKH) are agencies scattered in every region starting from the central level (PPKH Pusat), provincial level (PPKH Provinsi), regency or city level (PPKH Kabupaten / Kota) and sub-district level (PPKH Kecamatan). PKH social worker at the sub-district level are employees or people who have direct contact with KPMs to ensure that KPMs get their rights and carry out their obligations in accordance with the terms and conditions.

In an uncertain period of time, PPKH Garut regency in collaboration with the Garut regency Social Service has twice selected exemplary PKH social workers to give appreciation to workers who have shown achievements in carrying out their work. The selection was carried out on a bottom-up basis starting at the sub-district level where workers selected from the sub-district level were submitted to the regency level to take further tests. In its implementation the standards for measuring and assessing work performance are less clear and not transparent, so that dissatisfaction for those who feel that their performance has been maximized but are not selected. This in turn creates a negative stigma that the selection is subjective and the reward received is not based on work performance, but on other factors outside of work assignments. To overcome this problem, it is necessary to implement a decision support system with standardized measures so that the results can be accounted for [1].

Decision support system (DSS) is a system that is used to assist and determine decisions to information users to be more precise in solving problems that exist within a company, agency, or organization by data and certain methods [2]. One method that can be applied is the Simple Additive Weighting (SAW) method where the result is a ranking of exemplary employees [3]. By using the DSS in decision making, the standard for measuring and evaluating the performance of each worker will be determined properly, so that all parties involved can accept the decision [2].

II. METHOD

A. Research Framework

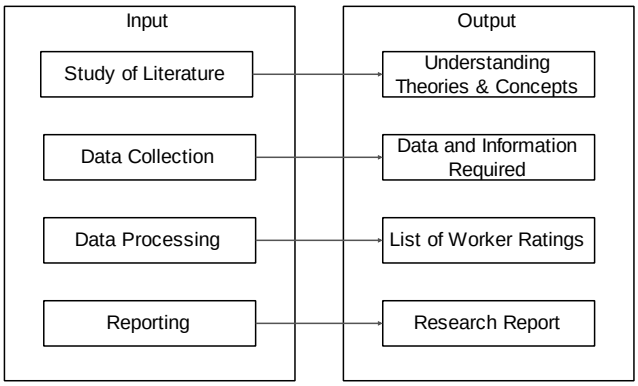

Fig. 1. Research Framework

B. SAW Method

SAW is a simple multi-criteria decision-making method [4]. The steps in this method include:

1. Assessment criteria (Cj, j = 1, 2, 3,…, m), which are used as a reference in making this decision are shown in Table I.

TABLE I. ASSESSMENT CRITERIA

Kode	Criteria (C_j)
C_1	Quantity
C_2	Integrity
C_3	Dedication
C_4	Realibility
C_5	Initiative
C_6	Diligence
C_7	Attitude
C_8	Motivation
C_9	Presence

Information:
Quantity : How quickly the worker gets the job done
Integrity : How committed the worker is to the job
Dedication : How much dedication is devoted by worker to realize the ideals and success of the PKH program
Realibility : Relates to whether or not worker can be relied on on certain issues
Initiative : How often worker take corrective action, make suggestions for job improvement and accept responsibility for completing work
Diligence : Willingness to carry out tasks without coercion and also of a routine nature
Attitude : Worker's behavior towards the organization or boss or coworkers
Motivation : How successful are worker in motivating KPM to leave PKH program participation.
Presence : How often are worker present at the workplace to work or attend internal organization meetings

2. Determine the weight of each criterion with (W_j, j = 1, 2, 3, …, m) where $\sum W_j = 1$.

3. Determine a decision matrix using Equation (1).

$$r_{ij} = \begin{cases} \dfrac{x_{ij}}{\max\limits_i x_{ij}} & \text{if j is benefit criteria} \\ \dfrac{\min\limits_i x_{ij}}{x_{ij}} & \text{if j is cost criteria} \end{cases} \quad (1)$$

Information:
r_{ij} : normalized performance rating value
x_{ij} : the attribute value that each criterion has
Max x_{ij} : the largest value of each criterion
Min x_{ij} : the smallest value of each criterion
Benefit : if the largest value is the best
Cost : if the smallest value is the best

4. Calculating the preference value for each alternative using Equation (2).

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

Information:
V_i : ranking for each alternative
W_j : the weighted value of each criterion
r_{ij} : normalized performance rating value

The biggest V_i value indicates that the alternative A_i is an alternative choice.

III. RESULTS AND DISCUSSION

A. Determination of the Scale and Weight of the Criteria

Determination of alternative values for each criterion using a Likert scale of 9-1 [5], with the following formulations:

TABLE II. CRITERIA LIKERT SCALE

Value	Quality
9	A
8	A-
7	B+
6	B
5	B-
4	C+
3	C
2	C-
1	D

The weight for each criterion based on the value of importance is addressed as in Table III.

TABEL III. CRITERIA WEIGHT

Kode	Criteria (C_j)	Weight (W_j)
C_1	Quantity	0.05
C_2	Integrity	0.20
C_3	Dedication	0.10
C_4	Realibility	0.03
C_5	Initiative	0.09
C_6	Diligence	0.15
C_7	Attitude	0.17
C_8	Motivation	0.08
C_9	Presence	0.13
	Summary	1.00

B. Implementation

This study used a sample of 21 PKH Social Workers in X Sub-district, with the following steps:

1. Value tabulation for each of the alternative criteria obtained from interviews with informants and supporting data is shown in Table IV.

TABEL IV. WORKER DATA AND VALUE TABULATION

Alternative	C_1	C_2	C_3	C_4	C_5	C_6	C_7	C_8	C_9
Worker 1	A	A	A	A	A	B+	A	B+	A
Worker 2	A	C+	B	B+	B	B+	B+	B	B
Worker 3	B+	B	B	B	B+	C+	C	B	C
Worker 4	B	B+	B+	B	B+	B	B+	B	B+
Worker 5	B	B+	C	C	B	C+	B+	B	C+
Worker 6	B	C+	B	C+	B	B	B	B	B
Worker 7	A	C+	B	B	A	A	B+	A	B+
Worker 8	A	B+	A	A	B	A	B+	A	A
Worker 9	A	B+	B+	B+	B	B	A	B	B
Worker 10	B	A	C	A	D	B	B	B	B
Worker 11	A	B	A	B+	B	A	B	B+	A
Worker 12	A	B	B+	B+	B	B+	B	A	B
Worker 13	A	B	A	A	B	B	B+	B+	B+
Worker 14	B	D	D	C	D	D	C	D	D
Worker 15	C+	B+	B	C+	B	C	B	C+	C+
Worker 16	B	A	A	B	B	B	B	B	A
Worker 17	A	A	A	A	A	A	A	B+	A
Worker 18	A	B	B	B	B	B	B	B	B
Worker 19	C+	B+	B	B	C+	B	B	C+	C+
Worker 20	B	C	B	B	B	B+	C+	B	B+
Worker 21	B	B	C+	B	B+	C+	B+	B	C+

2. The data value for each of the alternative criteria is then converted according to the Likert scale of 9-1. So that you get the following results:

TABEL V. CRITERIA VALUE CONVERSION TABLE

Alternative	C_1	C_2	C_3	C_4	C_5	C_6	C_7	C_8	C_9
Worker 1	9	9	9	9	9	7	9	7	9
Worker 2	9	4	6	7	6	7	7	6	6
Worker 3	7	6	6	6	7	4	3	6	3
Worker 4	6	7	7	6	7	6	7	6	7
Worker 5	6	7	3	3	6	4	7	6	4
Worker 6	6	4	6	4	6	6	6	6	6
Worker 7	9	4	6	6	9	9	7	9	7
Worker 8	9	7	9	9	6	9	7	9	9
Worker 9	9	7	7	7	6	6	9	6	6
Worker 10	6	9	3	9	1	6	6	6	6
Worker 11	9	6	9	7	6	9	6	7	9
Worker 12	9	6	7	7	6	7	6	9	6
Worker 13	9	6	9	9	6	6	7	7	7
Worker 14	6	1	1	3	1	1	3	1	1
Worker 15	4	7	6	4	6	3	6	4	4
Worker 16	6	9	9	6	6	6	6	6	9
Worker 17	9	9	9	9	9	9	9	7	9
Worker 18	9	6	6	6	6	6	6	6	6
Worker 19	4	7	6	6	4	6	6	4	4
Worker 20	6	3	6	6	6	7	4	6	7
Worker 21	6	6	4	6	7	4	7	6	4

3. Normalizing the decision matrix using Equation (1). If a criterion is included in the profit criteria type, the greater the value the better. Meanwhile, if the criteria are included in the type of cost criteria, the smaller the value the better.

TABLE VI. TYPES OF CRITERIA

Kode	Criteria (C_j)	Type
C_1	Quantity	Benefit
C_2	Integrity	Benefit
C_3	Dedication	Benefit
C_4	Realibility	Benefit
C_5	Initiative	Benefit
C_6	Diligence	Benefit
C_7	Attitude	Benefit
C_8	Motivation	Benefit
C_9	Presence	Benefit

1) Quantity

$$r_{11} = \frac{9}{\text{Max}(9,9,7,6,6,6,9,9,9,6,9,9,9,6,4,6,9,9,4,6,6)} = \frac{9}{9} = 1$$

$$r_{21} = \frac{9}{\text{Max}(9,9,7,6,6,6,9,9,9,6,9,9,9,6,4,6,9,9,4,6,6)} = \frac{9}{9} = 1$$

…

$$r_{211} = \frac{6}{\text{Max}(9,9,7,6,6,6,9,9,9,6,9,9,9,6,4,6,9,9,4,6,6)} = \frac{6}{9}\ 0.67$$

2) Integrity

$$r_{12} = \frac{9}{\text{Max}(9,4,6,7,7,4,4,7,7,9,6,6,6,1,7,9,9,6,7,3,6)} = \frac{9}{9} = 1$$

$$r_{22} = \frac{4}{\text{Max}(9,4,6,7,7,4,4,7,7,9,6,6,6,1,7,9,9,6,7,3,6)} = \frac{4}{9} = 0.44$$

…

$$r_{212} = \frac{6}{\text{Max}(9,4,6,7,7,4,4,7,7,9,6,6,6,1,7,9,9,6,7,3,6)} = \frac{6}{9} = 0.67$$

3) Dedication

$$r_{13} = \frac{9}{\text{Max}(9,6,6,7,3,6,6,9,7,3,9,7,9,1,6,9,9,6,6,6,4)} = \frac{9}{9} = 1$$

$$r_{23} = \frac{6}{\text{Max}(9,6,6,7,3,6,6,9,7,3,9,7,9,1,6,9,9,6,6,6,4)} = \frac{6}{9} = 0.67$$

…

$$r_{213} = \frac{4}{\text{Max}(9,6,6,7,3,6,6,9,7,3,9,7,9,1,6,9,9,6,6,6,4)} = \frac{4}{9} = 0,44$$

…

9) Presence

$$r_{19} = \frac{9}{\text{Max}(9,6,3,7,4,6,7,9,6,6,9,6,7,1,4,9,9,6,4,7,4)} = \frac{9}{9} = 1$$

$$r_{29} = \frac{6}{\text{Max}(9,6,3,7,4,6,7,9,6,6,9,6,7,1,4,9,9,6,4,7,4)} = \frac{6}{9} = 0.67$$

…

$$r_{219} = \frac{4}{\text{Max}(9,6,3,7,4,6,7,9,6,6,9,6,7,1,4,9,9,6,4,7,4)} = \frac{4}{9} = 0.44$$

TABLE VII. NORMALIZATION RESULTS

Alternative	R_1	R_2	R_3	…	R_9
Worker 1	1.00	1.00	1.00	…	1.00
Worker 2	1.00	0.44	0.67	…	0.67
Worker 3	0.78	0.67	0.67	…	0.33
Worker 4	0.67	0.78	0.78	…	0.78
Worker 5	0.67	0.78	0.33	…	0.44
Worker 6	0.67	0.44	0.67	…	0.67
Worker 7	1.00	0.44	0.67	…	0.78
Worker 8	1.00	0.78	1.00	…	1.00
Worker 9	1.00	0.78	0.78	…	0.67
Worker 10	0.67	1.00	0.33	…	0.67
Worker 11	1.00	0.67	1.00	…	1.00
Worker 12	1.00	0.67	0.78	…	0.67
Worker 13	1.00	0.67	1.00	…	0.78
Worker 14	0.67	0.11	0.11	…	0.11
Worker 15	0.44	0.78	0.67	…	0.44
Worker 16	0.67	1.00	1.00	…	1.00
Worker 17	1.00	1.00	1.00	…	1.00
Worker 18	1.00	0.67	0.67	…	0.67
Worker 19	0.44	0.78	0.67	…	0.44
Worker 20	0.67	0.33	0.67	…	0.78
Worker 21	0.67	0.67	0.44	…	0.44

4. Calculating the preference value of each worker using Equation (2).

$V_{Worker1}$ = (0.05*1.00) + (0.20*1.00) + (0.10*1.00) + (0.03*1.00) + (0.09*1.00) + (0.15*0.78) + (0.17*1.00) + (0.08*0.78) + (0.13*1.00)
= 0.95

$V_{Worker2}$ = (0.05*1.00) + (0.20*0.44) + (0.10*0.67) + (0.03*0.78) + (0.09*0.67) + (0.15*0.78) + (0.17*0.78) + (0.08*0.67) + (0.13*0.67)
= 0.68

$V_{Worker3}$ = (0.05*0.78) + (0.20*0.67) + (0.10*0.67) + (0.03*0.67) + (0.09*0.78) + (0.15*0.44) + (0.17*0.33) + (0.08*0.67) + (0.13*0.33)
= 0.55

$V_{Worker4}$ = (0.05*0.67) + (0.20*0.78) + (0.10*0.78) + (0.03*0.67) + (0.09*0.78) + (0.15*0.67) + (0.17*0.78) + (0.08*0.67) + (0.13*0.78)
= 0.74

$V_{Worker5}$ = (0.05*0.67) + (0.20*0.78) + (0.10*0.33) + (0.03*0.33) + (0.09*0.67) + (0.15*0.44) + (0.17*0.78) + (0.08*0.67) + (0.13*0.44)
= 0.60

$V_{Worker6}$ = (0.05*0.67) + (0.20*0.44) + (0.10*0.67) + (0.03*0.44) + (0.09*0.67) + (0.15*0.67) + (0.17*0.67) + (0.08*0.67) + (0.13*0.67)
= 0.61

$V_{Worker7}$ = (0.05*1.00) + (0.20*0.44) + (0.10*0.67) + (0.03*0.67) + (0.09*1.00) + (0.15*1.00) + (0.17*0.78) + (0.08*1.00) + (0.13*0.78)
= 0.78

$V_{Worker8}$ = (0.05*1.00) + (0.20*0.78) + (0.10*1.00) + (0.03*1.00) + (0.09*0.67) + (0.15*1.00) + (0.17*0.78) + (0.08*1.00) + (0.13*1.00)
= 0.89

$V_{Worker9}$ = (0.05*1.00) + (0.20*0.78) + (0.10*0.78) + (0.03*0.78) + (0.09*0.67) + (0.15*0.67) + (0.17*1.00) + (0.08*0.67) + (0.13*0.67)
= 0.78

$V_{Worker10}$ = (0.05*0.67) + (0.20*1.00) + (0.10*0.33) + (0.03*1.00) + (0.09*0.11) + (0.15*0.67) + (0.17*0.67) + (0.08*0.67) + (0.13*0.67)
= 0.65

$V_{Worker11}$ = (0.05*1.00) + (0.20*0.67) + (0.10*1.00) + (0.03*0.78) + (0.09*0.67) + (0.15*1.00) + (0.17*0.67) + (0.08*0.78) + (0.13*1.00)
= 0.81

$V_{Worker12}$ = (0.05*1.00) + (0.20*0.67) + (0.10*0.78) + (0.03*0.78) + (0.09*0.67) + (0.15*0.78) + (0.17*0.67) + (0.08*1.00) + (0.13*0.67)
= 0.74

$V_{Worker13}$ = (0.05*1.00) + (0.20*0.67) + (0.10*1.00) + (0.03*1.00) + (0.09*0.67) + (0.15*0.67) + (0.17*0.78) + (0.08*0.78) + (0.13*0.78)
= 0.76

$V_{Worker14}$ = (0.05*0.67) + (0.20*0.11) + (0.10*0.11) + (0.03*0.33) + (0.09*0.11) + (0.15*0.11) + (0.17*0.33) + (0.08*0.11) + (0.13*0.11)
= 0.18

$V_{Worker15}$ = (0.05*0.44) + (0.20*0.78) + (0.10*0.67) + (0.03*0.44) + (0.09*0.67) + (0.15*0.33) + (0.17*0.67) + (0.08*0.44) + (0.13*0.44)
= 0.58

$V_{Worker16}$ = (0.05*0.67) + (0.20*1.00) + (0.10*1.00) + (0.03*0.67) + (0.09*0.67) + (0.15*0.67) + (0.17*0.67) + (0.08*0.67) + (0.13*1.00)
= 0.80

$V_{Worker17}$ = (0.05*1.00) + (0.20*1.00) + (0.10*1.00) + (0.03*1.00) + (0.09*1.00) + (0.15*1.00) + (0.17*1.00) + (0.08*0.78) + (0.13*1.00)
= 0.98

$V_{Worker18}$ = (0.05*1.00) + (0.20*0.67) + (0.10*0.67) + (0.03*0.67) + (0.09*0.67) + (0.15*0.67) + (0.17*0.67) + (0.08*0.67) + (0.13*0.67)
= 0.68

$V_{Worker19}$ = (0.05*0.44) + (0.20*0.78) + (0.10*0.67) + (0.03*0.67) + (0.09*0.44) + (0.15*0.67) + (0.17*0.67) + (0.08*0.44) + (0.13*0.44)
= 0.62

$V_{Worker20}$ = (0.05*0.67) + (0.20*0.33) + (0.10*0.67) + (0.03*0.67) + (0.09*0.67) + (0.15*0.78) + (0.17*0.44) + (0.08*0.67) + (0.13*0.78)
= 0.59

$$V_{Worker21} = (0.05*0.67) + (0.20*0.67) + (0.10*0.44) + (0.03*0.67) + (0.09*0.78) + (0.15*0.44) + (0.17*0.78) + (0.08*0.67) + (0.13*0.44)$$
$$= 0.60$$

TABLE VIII. PREFERENCE VALUE OF EACH WORKER

Alternative	V_1	V_2	V_3	…	V_9	V_i
Worker 1	0.05	0.20	0.10	…	0.13	0.95
Worker 2	0.05	0.09	0.07	…	0.09	0.68
Worker 3	0.04	0.13	0.07	…	0.04	0.55
Worker 4	0.03	0.16	0.08	…	0.10	0.74
Worker 5	0.03	0.16	0.03	…	0.06	0.60
Worker 6	0.03	0.09	0.07	…	0.09	0.61
Worker 7	0.05	0.09	0.07	…	0.10	0.78
Worker 8	0.05	0.16	0.10	…	0.13	0.89
Worker 9	0.05	0.16	0.08	…	0.09	0.78
Worker 10	0.03	0.20	0.03	…	0.09	0.65
Worker 11	0.05	0.13	0.10	…	0.13	0.81
Worker 12	0.05	0.13	0.08	…	0.09	0.74
Worker 13	0.05	0.13	0.10	…	0.10	0.76
Worker 14	0.03	0.02	0.01	…	0.01	0.18
Worker 15	0.02	0.16	0.07	…	0.06	0.58
Worker 16	0.03	0.20	0.10	…	0.13	0.80
Worker 17	**0.05**	**0.20**	**0.10**	**…**	**0.13**	**0.98**
Worker 18	0.05	0.13	0.07	…	0.09	0.68
Worker 19	0.02	0.16	0.07	…	0.06	0.62
Worker 20	0.03	0.07	0.07	…	0.10	0.59
Worker 21	0.03	0.13	0.04	…	0.06	0.60

The Vi with the largest preference value is the chosen worker, so that worker 17 is the recommended worker to become an exemplary PKH Social Worker in PPKH X Sub-district.

CONCLUSION

Based on the results described, it is concluded that the implementation of the SAW method is effective as a decision support system in determining exemplary PKH social workers in PPKH Garut Regency. The results of research conducted on 21 PKH Social Workers in X Sub-district showed that exemplary PKH social worker in the region received a preference value of 0.98.

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