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Comparison between Multiple Attribute Decision Making Methods through Objective Weighting Method in Determining Best Employee

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ABSTRACT- Multiple Attribute Decision Making (MADM) is a popular method to be selected in numerous studies in solving decision-making cases. Methods like SAW, WASPAS, SMART, and WP are preferred among researchers to be used for many purposes. However, the best method still not compared in determining best employee. Hence, the study conducted the comparison between the methods by using the Rank Similarity Index (RSI). The index is used to express the most appropriate method. In terms of weighting, we propose the D-CRITIC method as the tool to support the comparison procedure. Moreover, we select the bus driver as the sample case of the study with total of 10 candidates are nominated to be chosen as the best. The company has given the rank list before, so we just compare the actual rank with the result of MADM methods calculations. The result shows that SAW and WASPAS are the methods with the highest similarity towards the rank. Furthermore, these methods also reach the great score of the RSI between the others.

KEYWORDS- MADM, Comparison, Best Employee, Objective Weighting, RSI.

I. INTRODUCTION

As one of the decision-making methods to determine the best alternative based on certain criteria, Multiple Attribute Decision Making (MADM) is considered to become the main character in numerous researches [1]. The method is undertaking many criteria as the basis for decision making, with a subjective assessment of the problem of selection through mathematical analysis [2]. Moreover, MADM is usually known as selector models and used for evaluating, ranking and selecting the finest alternative [3]. There are several methods that can be used to solve the MADM problem, including Simple Additive Weighting (SAW), Simple Multi-Attribute Rating Technique (SMART), Weighted Aggregated Sum Product Assessment (WASPAS), and Weighted Product (WP) [2].

The SAW method proposes the weighted sum of the performance ratings for each alternative on all attributes [4], while the SMART method present the combined utilization of qualitative and quantitative attributes which emphasizing to rank the alternatives [5]. Meanwhile, the WASPAS method also applying both qualitative and quantitative attributes to determine the alternatives grade. It is one of the newest methods of MADM which registers the combination of Weighted Sum Model (WSM) and Weighted Product Model (WPM) [6]. Moreover, the WP method shapes the decisions by determining the criteria factors as benefits (conflicts between criteria) by looking for the results of the multiplication of the alternative criteria values against the criteria weights [7]. The methods were commonly to be utilized for management purposes, especially in employee issues. In present, researches are frequently used the SAW method to select the best employee in certain companies [8]–[12]. Similarly, the SMART method is also implemented to rank the employees performances in several institutions [13]–[17]. In line with this, the WASPAS method was applied to determine employees' qualification in numbers of studies recently [18]–[22]. Also, many studies employed the WP method to assist some organization to decide the best personnel [23]–[27]. Hence, a comparison is necessary to show which method has the great performance in determining best employee.

In term of weight, there are two ways to undertake the weighting method in MADM analysis, namely subjective and objective method [28]. The subjective method requires some preliminary information from decision making before weighting [29], while objective method directly assess the data structure in the decision matrix to determine the weight, thus increasing the objectivity [30]. The popular models of objective weighting include: CRiteria Importance Through Intercriteria Correlation (CRITIC) method, Data Envelopment Analysis (DEA), FANMA method, Entropy method, and the latest is CILOS and IDOCRIW methods [28], [30]. As the most widely applied model, the CRITIC method has the value to examine the difference of intensity and the conflicting relationship held by each decision criterion [31]. Nevertheless, the model still has the weakness in capturing the actual relationships between criteria. Hence, a novel objective method D-CRITIC (Distance-CRiteria Importance Through Intercriteria Correlation) is introduced. The method is proposed to using distance correlation instead the Pearson correlation to conflicting relationships between criteria to minimizing the possible error in the final weights. D-CRITIC method [32].

The study took the bus driver as the sample of object demonstration. Drivers play the important role to carrying out the main operational tasks in a transportation company. They are expected to have basic driving skills, and well driving habits or the ability to drive a bus to take passengers safely [33]. Then, as the employee of the company, drivers are also demanded to have the work achievement e.g. good performance in their tasks. Researchers stated that work discipline, loyalty, working experience, and knowledge are the indicators of employees' performance in an organization [34]–[36]. To sum up, the study stresses on comparing the MADM methods (SAW, SMART, WASPAS, and WP) in determining the best bus driver in a transportation company by using D-CRITIC as the objective weighting method.

II. LITERATURE

A. Simple Additive Weighting (SAW)

SAW is one of the methods which have the simple mathematical process in solving MADM problems. The method starts with (a) Finding the weighted sum (w_j) of the performance ratings on each alternative of all attributes. Then, the second step of (b) SAW method requires the process of normalizing the decision matrix (r_{ij}) to a scale that will compare it with all existing alternative ratings. Finally, (c) the alternative preference value is obtain by total of multiplication of r_{ij} and w_j [37].

$$r_{ij} = \frac{x_{ij}}{Max(x_{ij})} \quad (1)$$

$$r_{ij} = \frac{Min(x_{ij})}{x_{ij}} \quad (2)$$

Both equations are used to determine the normalized matrix (r_{ij}). Equation (1) is used for *benefit* criteria, while Equation (2) is used for *cost* criteria. The benefit is the criteria which are expected to have the greater value. In contrast, the cost is expected to have the smaller value. Then, the alternative preference value (V_i) is given as:

$$V_i = \sum_{j=1}^{n} w_j r_{ij} \quad (3)$$

B. Simple Multi-Attribute Rating Technique (SMART)

SMART popularity among the other MADM methods is due to its ease to responds the needs of decision makers and the way of analyze responses. The analysis is transparent; hence, this method allows the decision maker to understand the problem quickly and more acceptable. The calculation begins with (a) Determine the criteria of each alternative; (b) Define the weight (w_i) and normalized the weight of every criterion (w_j) by using Equation (4); (c) Determine the utility value (U_i) by converting the criterion value on each criterion, and finally (d) Calculate the total value of alternative (T_i) [38].

$$w_j = \frac{w_i}{\sum w_i} \quad (4)$$

Furthermore, Equation (5) and Equation (6) is used to calculate the utility value for each of the respective criteria. Equation (5) is used for *benefit* criteria, while Equation (6) is used for *cost* criteria.

$$U_i = 100 \frac{(C_i - C_{min})}{(C_{max} - C_{min})} \quad (5)$$

$$U_i = 100 \frac{(C_{max} - C_i)}{(C_{max} - C_{min})} \quad (6)$$

Then, the total value of each alternative is determined by totalizing the multiply value of U_i and w_j as shown in Equation (7).

$$T_i = \sum_{j=1}^{m} U_i\, w_j \quad (7)$$

C. Weighted Aggregated Sum Product Assessment (WASPAS)

WASPAS method was emerged later than other MADM methods by optimizing in the assessment of the selection of the highest and lowest values [39]. The method combined WPM and WSM, thus it make room for simple determination of relative importance of each attribute, as well as evaluating and prioritizing them [1]. Determining the matrix normalization (r_{ij}) is the first step to undertake the calculation (a) by using Equation (1) and Equation (2) similar to the SAW method. The second step is to discover the two criteria of optimality (b); The WSM is calculated by using Equation (8), while WPM is computed by using Equation (9). In the WSM calculation, the value r_{ij} is multiply with w_j. On the other hand, the value of r_{ij} in WPM calculation is raised by w_j [40].

$$WSM_i = \sum_{j=1}^{n} r_{ij}\, w_j \quad (8)$$

$$WPM_i = \prod_{j=1}^{n} (r_{ij})^{w_j} \quad (9)$$

Finally (c), the calculation of the WASPAS value (Q_i) by combining the results of the WSM and WPM which is the joint generalized criterion of weighted aggregation of additive and multiplicative by using Equation (10) [39].

$$Q_i = 0.5 * \sum_{j=1}^{n} WSM_i + 0.5 * \sum_{j=1}^{n} WPM_i \quad (10)$$

D. Weighted Product (WP)

In the WP method, multiplication is used to relate the attribute rating, and the rating of each attribute must be raised to the first power with the weight of the attribute in question. The weight value becomes negative if the criteria are *cost*. In contrast, it remains positive for the *benefit* criteria [41]. The method starts with (a) normalizing the matrix (r_{ij}) by using Equation (4). Then, the next step (b) is to determine the preference value for alternative (S_i) by using Equation (9). The last step (c) is to calculating preference vector values (V_i) for ranking of each alternative by using Equation (11).

$$V_i = \frac{\prod_{j=1}^{n} (r_{ij})^{w_j}}{\prod_{j=1}^{n} r_{ij}\, w_j} \quad (12)$$

III. METHODOLOGY

A. Alternatives

Data used in the study is primary data which have been collected from the stakeholder of the company. The study proposed a total of 10 alternatives to be processed by using those 4 of MADM methods. The rank of alternatives has been set by the company which it will compare to the result of MADM methods decisions. The actual rank is listed in Table 1.

Table 1: Alternatives Rank by the Company

Alternatives	Rank
A1	3
A2	1
A3	6
A4	7
A5	2
A6	5
A7	8
A8	4
A9	10
A10	9

B. Criterion

The criterion chosen in the study is the indicators of employees' performance in an organization, namely work discipline (C1), loyalty (C2), working experience (C3), and knowledge (C4) [34]–[36]. C1, C2, and C4 is stated as the *benefit* criteria, while only C3 is a *cost* criterion. The score of each criterion is determined by using Likert-type scale. The conversion from the original score to the Likert value as follows.

Table 2: Likert Value

Original Score	Likert Scale
< 60	1
61 – 70	2
71 – 80	3
81 – 90	4
91 – 100	5

Previously, the stakeholder has been conducted a test to obtain the score of each alternative which are shown in Table 3. The score of 10 alternatives will be used to obtain the weighting value through D-CRITIC method in the next subsection.

Table 3: Criterion Score

Alternatives	C1	C2	C3	C4
A1	5	3	2	3
A2	3	5	2	5
A3	2	5	5	4
A4	3	4	4	1
A5	3	3	1	3
A6	3	3	2	3
A7	2	5	5	2
A8	4	4	4	5
A9	3	1	4	1
A10	3	3	4	1

C. D-CRITIC Method

As explained in Section 1, D-CRITIC method is used to determine the weight value of each criterion. To perform the method, there are 5 steps to be undertaken consecutively [32]. The first step is to normalization of the decision matrix from Table 3 by using Equation (13). The normalization of the decision matrix calculation result is illustrated in Table 4.

$$\overline{X_{ij}} = \frac{X_{ij} - X_{ij}^{worst}}{X_{ij}^{best} - X_{ij}^{worst}} \qquad (13)$$

Where:
$\overline{X_{ij}}$ is the normalized score of alternative i with respect to criterion j;
X_{ij} is the actual score of alternative i with respect to criterion j;
X_{ij}^{best} is the best score of criterion j;
X_{ij}^{worst} is the worst score of criterion j.

Table 4: The Result of Decision Matrix Normalization

Alternatives	C1	C2	C3	C4
A1	1.00	0.50	0.25	0.50
A2	0.33	1.00	0.25	1.00
A3	0.00	1.00	1.00	0.75
A4	0.33	0.75	0.75	0.00
A5	0.33	0.50	0.00	0.50
A6	0.33	0.50	0.25	0.50
A7	0.00	1.00	1.00	0.25
A8	0.67	0.75	0.75	1.00
A9	0.33	0.00	0.75	0.00
A10	0.33	0.50	0.75	0.00

The second step of the model is to calculate the standard deviation of each criterion (S_j) by using Equation (14). The calculation of the S_j of each criterion is shown in Table 5.

$$S_j = \sqrt{\frac{\left(\sum_{i=1}^{m} X_{ij} - \overline{X_j}\right)}{m-1}} \qquad (14)$$

Table 5: Standard Deviation of Each Criterion

Criteria	Standard Deviation
C1	0.291865012
C2	0.316227766
C3	0.354534123
C4	0.387298335

The third step is the differentiator between the original CRITIC and D-CRITIC. The conflicting relationships between criteria are obtained by using the distance correlation of every pair of criteria. The calculation the distance correlation ($dCor(c_j, c_j')$) of every pair of criteria (c_j) is present by applying Equation (15). The result of the distance correlation computing is listed in Table 6.

$$dCor(c_j, c_j') = \frac{dCov(c_j, c_j')}{\sqrt{\left(dVar(c_j)dVar(c_j')\right)'}} \qquad (15)$$

Where:
$dCov(c_j, c_j')$ is the distance covariance between c_j and c_j'
$dVar(c_j, c_j') = dCov(c_j)$ is the distance variance of c_j
$dVar(c_j, c_j') = dCov(c_j')$ is the distance variance of c_j'

Table 6: Distance correlation of Every Pair of Criteria

Criteria Pairing	Distance Correlation (c_j, c_j')
C1, C2	1.361157559
C1, C3	1.474255129
C1, C4	0.819793165
C2, C3	0.739847049
C2, C4	0.478349407
C3, C4	1.273103708

The next step is computing the information content (I_j) by using Equation (16), where I_j denotes the information content of c_j. The value of I_j from each criterion is summarized in Table 7.

$$I_j = S_j \sum_{j'=1}^{n} \left(dCor\left(c_j, c_j'\right)\right) \tag{16}$$

Table 7: The Result of Information Content Calculation

Criteria	Information Content (I_j)
C1	1.0668267
C2	0.75282319
C3	1.017793388
C4	0.750456826

Furthermore, the final step is determining the objective weight (w_j) by applying Equation (17). The determination of the objective weight (w_j) is shown in Table 8.

$$w_j = \frac{I_j}{\sum_{j=1}^{n} I_j} \tag{17}$$

Table 8: The Weight of Each Criteria

Criteria	Weight (w_j)
C1	0.297340135
C2	0.209822784
C3	0.283673837
C4	0.209163244

As shown in Table 8, all the result of objective weight calculation will be employed along with the MADM methods. Table 8 also shows the weight of each criteria which is summed as 1.

IV. RESULT

In this section, the calculation of each MADM method is explained separately. Then, the rank decision obtained from every method will be compared to the actual alternatives rank by the company as listed in Table 1.

A. SAW Method Calculation

The estimation of SAW method starts with set the weighted sum (w_j) of the criterion. Since the study highlighted the use of objective weight (i.e., D-CRITIC), the weight of each criteria in Table 8 is employed. The second step of the calculation is to normalizing the decision matrix (r_{ij}) by using Equation (1) and Equation (2) as follow.

$$r_{ij} = \begin{bmatrix} 1 & 0.6 & 0.5 & 0.6 \\ 0.6 & 1 & 0.5 & 1 \\ 0.4 & 1 & 0.2 & 0.8 \\ 0.6 & 0.8 & 0.25 & 0.2 \\ 0.6 & 0.6 & 1 & 0.6 \\ 0.6 & 0.6 & 0.5 & 0.6 \\ 0.4 & 1 & 0.2 & 0.4 \\ 0.8 & 0.8 & 0.25 & 0.1 \\ 0.6 & 0.2 & 0.25 & 0.2 \\ 0.6 & 0.6 & 0.25 & 0.2 \end{bmatrix}$$

The next step is to determine the alternative preference value (V_i) by using Equation (3). The result of this step is shown in Table 9.

Table 9: The Result of Alternative Preference Value (V_i) Calculation

Alternatives	Value	Rank
A1	0.69056867	3
A2	0.739227028	1
A3	0.552824201	6
A4	0.459013416	8
A5	0.713469535	2
A6	0.571632616	5
A7	0.469158903	7
A8	0.685812039	4
A9	0.333119746	10
A10	0.417048859	9

The result of SAW method pointed out that A2 is decided to be the best bus driver with rank number 1, followed by A5 and A1. Table 9 also shows that A4, A10, and A9 as the lowest ranking among the alternatives.

B. SMART Method Calculation

The first step of SMART method calculation is confirmed the criteria of each alternative which is listed in Table 8 along with the weight (w_i). Then next step is to normalized the weight of every criterion (w_j).

However, since D-CRITIC has been used with the total of overall weight is 1. Hence, the second step is leaped. Determining the utility value (U_i) by converting the criterion value on each criterion is the third step of the calculation. Equation (5) and (6) is employed in this stage and the results are presented in Table 10.

Table 10: The Utility Value (U_i) for Each Criteria

Alternatives	C1	C2	C3	C4
A1	1	0.5	0.75	0.5
A2	0.333	1	0.75	1
A3	0	1	0	0.75
A4	0.333	0.75	0.25	0
A5	0.333	0.5	1	0.5
A6	0.333	0.5	0.75	0.5
A7	0	1	0	0.25
A8	0.667	0.75	0.25	1
A9	0.333	0	0.25	0
A10	0.333	0.5	0.25	0

The last step to be undertake is to calculate the total value of alternative (T_i) by totalizing the multiply value of U_i from

Table 10 and w_j from Table 8 through Equation (7). Table 11 shows the result of the calculation of the final step of SMART method along with the rank decision.

Table 11: The Result of Total Value of Alternative ($\boldsymbol{T_i}$) Calculation

Alternatives	U_1w_1	U_2w_2	U_3w_3	U_4w_4	Value	Rank
A1	0.297	0.105	0.213	0.105	0.720	2
A2	0.099	0.210	0.213	0.209	0.731	1
A3	0.000	0.210	0.000	0.157	0.367	6
A4	0.099	0.157	0.071	0.000	0.327	7
A5	0.099	0.105	0.284	0.105	0.592	4
A6	0.099	0.105	0.213	0.105	0.521	5
A7	0.000	0.210	0.000	0.052	0.262	9
A8	0.198	0.157	0.071	0.209	0.636	3
A9	0.099	0.000	0.071	0.000	0.170	10
A10	0.099	0.105	0.071	0.000	0.275	8

According to Table 11, A2 is also selected as the best bus driver with the highest value of T_i, followed by A1 and A8. The lowest rank is pinned on A10, A7, and A9.

C. WASPAS Method Calculation

The WASPAS method calculation is performed by determining the matrix normalization (r_{ij}) at the first time. Since this step has the similar process with the SAW method, the study stated the same result of the matrix normalization in subsection 4.1. The second step is to evaluating the WSM value for each criterion by using Equation (8); the value r_{ij} is multiply with the value of w_j from Table 8. The result of this concern is summarized in Table 12.

Table 12: The Result of Weighted Sum Model Calculation

Alternatives	$r_{nC1}w_{C1}$	$r_{nC2}w_{C2}$	$r_{nC3}w_{C3}$	$r_{nC4}w_{C4}$	Total Value
A1	0.297	0.126	0.142	0.125	0.691
A2	0.178	0.210	0.142	0.209	0.739
A3	0.119	0.210	0.057	0.167	0.553
A4	0.178	0.168	0.071	0.042	0.459
A5	0.178	0.126	0.284	0.125	0.713
A6	0.178	0.126	0.142	0.125	0.572
A7	0.119	0.210	0.057	0.084	0.469
A8	0.238	0.168	0.071	0.209	0.686
A9	0.178	0.042	0.071	0.042	0.333
A10	0.178	0.126	0.071	0.042	0.417

The WPM value of each criterion is accomplished by using Equation (9); the value of r_{ij} is raised by the value of w_j from Table 8. Table 13 illustrates the calculation of WPM.

Table 13: The Result of Weighted Product Model Calculation

Alternatives	$(r_{1C1})^{w_{C1}}$	$(r_{2C2})^{w_{C2}}$	$(r_{3C3})^{w_{C3}}$	$(r_{4C4})^{w_{C4}}$	Total Value
A1	1	0.898	0.821	0.899	0.663
A2	0.859	1	0.821	1	0.706
A3	0.762	1	0.633	0.954	0.460
A4	0.859	0.954	0.675	0.714	0.395
A5	0.859	0.898	1	0.899	0.694
A6	0.859	0.898	0.821	0.899	0.570
A7	0.762	1	0.633	0.826	0.398
A8	0.936	0.954	0.675	1	0.603
A9	0.859	0.713	0.675	0.714	0.295
A10	0.859	0.898	0.675	0.714	0.372

The last step of WASPAS method is combining the results of the WSM and WPM or value of Q_i by using Equation (10). Table 14 shows the final result of WASPAS calculation along with the decision rank.

Table 14: The Result of Q_i Calculation

Alternatives	Value	Rank
A1	0.676891682	3
A2	0.722480586	1
A3	0.506607666	6
A4	0.427059894	8
A5	0.703514686	2
A6	0.570694764	5
A7	0.433707548	7
A8	0.644228942	4
A9	0.314252268	10
A10	0.394505629	9

As listed in Table 14, A2 is once more is declared as the finest bus driver in the company with the highest value of Q_i, followed by A5 and A1. The lowest rank drivers according to the result are A4, A10, and A9.

D. SMART Method Calculation

The first step of WP method calculation is normalizing the matrix (r_{ij}). Since the study has been employed D-CRITIC, the matrix normalization is needless and skipped the first step. The next step of WP method is equal to WASPAS method. In this step, Equation (9) also used to determine the preference value for alternative (S_i). Hence, the study stated Table 13 as the result of the second step. Then, calculating preference vector values (V_i) by using Equation (11) is the last step to be proceed. Table 15 shows the final result of WP method along with ranking of each alternative.

Table 15: The Result of Preference Vector Value (V_i) Calculation

Alternatives	Value	Rank
A1	0.128629385	3
A2	0.136875962	1
A3	0.076630223	8
A4	0.134514775	2
A5	0.077241125	7
A6	0.110503404	5
A7	0.116882158	4
A8	0.089292093	6
A9	0.057289388	10
A10	0.072141488	9

The result of WP method shows that A2 is again as the rank number 1, followed by A5 and A1. Table 15 also shows that A4, A10, and A9 as the lowest ranking among the alternatives.

E. Comparison between Methods

All methods present various conclusions regarding the rank decision. However, similarity still found between them. Table 16 illustrates the comparison between the actual rank and all MADM methods rank version.

Table 16: Company's Rank VS MADM Method's Rank

Alternatives	Rank				
	Company	SAW	SMART	WASPAS	WP
A1	3	3	2	3	3
A2	1	1	1	1	1
A3	6	6	6	6	8
A4	7	8	7	8	2
A5	2	2	4	2	7
A6	5	5	5	5	5
A7	8	7	9	7	4
A8	4	4	3	4	6
A9	10	10	10	10	10
A10	9	9	8	9	9

Table 16 shows that all four 4 methods are conclude Alternative 2 (A2) as the first rank and have an equal position as the company's rank. In the second rank, only SAW and WASPAS method has the similarity to the company's decision, which is Alternative 5 (A5). On the other hand, SMART method has the imprecise result of the third rank prediction. Rest of the method come out with the identical decision with the company that is declares Alternative 1 (A1) is the third rank. The company stated that the fourth rank from the list placed by Alternative 8 (A8). However, only SAW and WASPAS method point out the same decision to the company.

All the methods are decided same result to the company in determining the bottom rank of the list i.e., Alternative 9 (A9). The rest of the rank are varied. According to the result, WASPAS method is the most rigorous. WASPAS method is predicted 8 out of 10 similarities to the actual rank from the company or 80% of the comparison. In the same way, SAW method also presented 8 similar decisions towards the company's rank. Those methods are estimated equal rank of the alternatives. In contrast, both SMART and WP method only have 5 similarities to the rank by company (50%).

On the other hand, the non-parametric correlation is usually employed to evaluate the comparison of MCDM methods [42]. Spearman correlation coefficient test (SCCT) is the techniques to be used as the measurement of the relationship between different ranks. It is applied in various studies to test their sensitivity and importance specific information in different MCDM problems [43]. The SCCT value will be obtained by using Equation (18).

$$r_s = \frac{6\sum_{i=1}^{n} d_i^2}{n(n^2-1)} \quad (18)$$

The SCCT value (r_s) then applied to express the Rank Similarity Index (RSI). RSI is the measure of the MCDM method similarity for the decision results with others that are suitable. The measure shows the relative closeness of one method to another in terms of the similarity of the ranking results. The method that has the largest RSI value indicates that the resulting ranking is the most similar or close to all the results of the other methods.

RSI starts with determining the Rank Correlation (RC) which is determined between ranking results for method concerning to each method Mh (h = 1, 2, … K; $k \neq h$) is calculated by applying the RCC equation as:

$$RC_{kh} = r_s(O_k, O_h) \quad (19)$$

Finally, RSI is computed by calculating the average rank correlation (RC) value by using the Equation (20).

$$RSI_k = \frac{\sum_{h=1}^{k} RC_{kh}}{k} \quad (20)$$

Equation (18) and Equation (19) produces an RCC matrix as shown in Table 17 which is used to determine the Rank Similarity Index (RSI) value by using Equation (20) as illustrated in Table 18.

Table 17: Rank Correlation Coefficient (RCC) Matrix

Method	SAW	SMART	WASPAS	WP
SAW	1.000	0.927	1.000	0.527
SMART	0.927	1.000	0.927	0.552
WASPAS	1.000	0.927	1.000	0.527
WP	0.527	0.552	0.527	1.000

Table 18: Rank Similarity Index (RSI) Value

Method	SAW	SMART	WASPAS	WP
RSI	0.8635	0.8515	0.8635	0.6515

According to Table 18, WASPAS and SAW method have the equal score of the RSI as 0.8635, SMART method has the RSI value as 0.8515 and WP method as 0.6515. Hence, it indicates that WASPAS and SAW method have the most similar ranking results to the ranking results given by other MCDM methods and proves that those method are the most appropriate method chosen to be used in determining best employee.

V. CONCLUSION

MADM has numerous methods to be selected as the calculation to rank the alternatives in various problems. SAW, WASPAS, SMART, and WP are kinds of a method that are usually employed by the researcher in determining the best employee in a company. As referred to in the study result, those methods are resulting in surprising outcomes. SAW and WASPAS methods are declaring an equal alternative rank. They predict 80% similarities towards the actual rank of the company. On the other hand, SMART and WP method only predicted 60% similarities. Despite they are resulting different ranks of the alternatives; the rank is over the company version. The study also operated the SCCT to present the RSI value between the methods. The result pointed out that both SAW and WASPAS method have the highest score. These methods are likely to be the most suitable method to be applied in employee selection cases.

Additionally, the study also applied the D-CRITIC method as the means of objective weighting determination. Since the method is not tested in an employee selection case yet, this study employed D-CRITIC as the calculation of the weight of each criterion. D-CRITIC resulting an applicable result to become the supporter of MADM methods.

CONFLICTS OF INTEREST

The authors declare that they have no conflicts of interest.

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