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Implementation of AHP-MAUT and AHP-Profile Matching Methods in OJT Student Placement DSS

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ABSTRACT

To improve the quality and quality of employment, OJT is very much needed by Monarch Bali students, but the process, which is still manual, makes decisions that are taken less fast, accurate, effective and efficient. In line with the roadmap of Monarch Bali, it is necessary to develop an automation system to be able to improve the performance of decision making for OJT student placement by making a DSS. The method used in this research is AHP-MAUT and AHP-PM. The decision makers in this study were 3 people, and out of a total of 500 OJT students, 8 OJT students for F&B class, 12 OJT students for Housekeeping class, 13 OJT students for Catering class, and 17 OJT students for Food Management class with a total of 50 OJT students. Implementation of AHP-MAUT, OJT students from the F&B class with the code StudentD04 have the highest preference value of 0.5724, and OJT students from the beverage class with the code StudentA02 have a preference value of 4.1155 calculated using AHP-PM, each being ranked first.

1. Introduction

The campus must have a good strategic plan in order to be able to excel in the intense competition among business people in the community. For organizations, having a business strategy alone is not enough to face today's competition, where the business strategy that is usually outlined in a Business Plan document or blueprint must also be complemented by an IS / IT strategy[1]. The growth in the number of hotels and restaurants, an increase in the number of tourists and an increase in the Gross Regional Domestic Product which has a significant effect on employment in the tourism sector must be accommodated by the campus[2]. Monarch Bali innovatively and creatively has provided a strong foundation in supporting operations, namely the Quality Management System with one of its implementations, an integrated system that includes IT-based learning and various other up-to-date integrated systems[3].

To improve the quality and quality of employment, on the job training (OJT) is very much needed by Monarch Bali students. The placement of OJT students in the Monarch Bali environment, which is still manual, makes the process less fast, accurate, effective and efficient. Students and OJT coordinators often have difficulty determining the location of OJT for students who want to develop their abilities more optimally. Some hotels and restaurants where OJT are held sometimes experience problems when they find that many students are booming or find students who are less competent in their fields. In line with the roadmap of Monarch Bali, it is necessary to develop an automation system to be able to improve the placement performance of OJT students by creating a Decision Support System (DSS).

DSS is an effective system in helping to make complex decisions, using decision-making rules, analysis models, comprehensive databases and knowledge of the decision makers themselves [18][4]. The Analytic Hierarchy Process (AHP) method allows to provide a value that represents the level of preference for a given alternative, and has been used in various fields[5][6]. The Multi-Attribute Utility Theory (MAUT) method has simplicity in solving complex problems which gives decision makers the freedom to produce more accurate decisions[7], [8]. The Profile Matching (PM) method compares individual competencies to job competencies so that the differences in competence can be seen, the smaller the gap generated, the greater the weight of the value which means having a greater chance for someone to occupy that position[9], [10].

On the Job Training (OJT) is an organized process to improve employee skills, knowledge, work habits and attitudes[11]. OJT is the method most widely used to train workers and employees can directly learn their job responsibilities[12]. OJT can take the form of job rotation, temporary assignments, job instructions, briefings and internships. OJT in the form of an internship aims to bridge the gap between the theoretical and practical abilities students have while studying and the actual conditions in the world of work[13].

The Analyticial Hierarchy Process (AHP) method is utilized in generating ratio scales based on pairwise comparisons in the form of discrete or continuous in a multiple-level hierarchical structure, which provides benefits in making decisions in choosing the best alternative based on certain criteria[14][19]. The main component of AHP is a functional hierarchy with input in the form of human perception. In the AHP method, something complex will be separated into separate groups which are then arranged into a hierarchical form[15]. The stages in solving problems using the AHP method are decomposition (creating a hierarchy), comparative judgment (scoring criteria and alternatives), synthesis of priority (determining priorities) and logical consistency. In determining the priority of elements, using the Saaty Scale, which is shown in Table 1 as follows:

TABLE 1
SAATY SCALE

Intensities	Description / Linguistics
1	Just as important (equal)
3	Quite important (moderate)
5	More important (strong)
7	Very important (demonstrated)
9	Extremely important (extreme)
2,4,6,8	The middle value between adjacent values (intermediate value)

Measuring consistency is done by multiplying each value in the first column by the relative priority of the first element, the value in the second column by the relative priority of the second element and so on, adding up each row, the result of the sum of rows divided by the element of the relative priority concerned, and adding the quotient in above with the number of elements present, the result is called λmax. Consistency Index is calculated by equation 1. Consistency Ratio is calculated by equation 2. Index Random Consistency (IR) in this study is based on the Alonso-Lamata RI Values shown in Table 2. Next, check the hierarchical consistency. If the consistency value of the hierarchy is more than 10%, then the data judgment must be corrected. However, if the Consistency Ratio is less or equal to 0.1, the calculation result can be declared correct.

$$CI = \frac{(\lambda_{max} - n)}{(n-1)} \quad (1)$$

$$CR = \frac{CI}{IR} \quad (2)$$

TABLE 2
ALONSO-LAMATA RI VALUES

Number of Element	Random Index
3	0,5245
4	0,8815
5	1,1086
6	1,2479
7	1,3417
8	1,4056

The Multi-Attribute Utility Theory (MAUT) method is used to identify and extract information about user preferences in a personal context. Overall information about multidimensional user behavior is divided into several unidimensional parts which are then given size and weight [20]. The use of the MAUT approach allows for filtering information according to user preferences by identifying the effects of several attributes[16]. Alternative evaluation is obtained by normalizing the alternative weights with equation 3 for the conditions of the benefit / benefit criteria and equation 4 for the conditions of the cost / loss criteria. The calculation of the marginal value of utility uses equation 5 and the calculation of the final utility value (preference value) is based on equation 6.

$$r_{ij}^{*} = \frac{r_{ij} - \min(r_{ij})}{\max(r_{ij}) - \min(r_{ij})} \quad (3)$$

$$r_{ij}^{*} = 1 + \left(\frac{\min(r_{ij}) - r_{ij}}{\max(r_{ij}) - \min(r_{ij})}\right) \quad (4)$$

$$u_{ij} = \frac{e^{(r_{ij}^{*})^2} - 1}{1{,}71} \quad (5)$$

$$U_i = \sum_{j=1}^{n} w_j \times u_{ij} \quad (6)$$

The Profile Matching (PM) method assumes that there is an ideal predictor variable level that must be met by the studied subjects, not a minimum level that must be met or passed[17]. PM is a process of comparing the actual data value of a profile to be assessed with the expected profile, so that the difference in competence can be seen, the smaller the resulting gap, the greater the weight of the value. To calculate

the gap value between the subject's profile and the required profile, equation 7 is used. After getting the gap value, proceed to calculate the gap mapping value based on the gap analysis, according to Table 3. To calculate the final value, which in general the final value in the PM method is the average of all the sums of the GAP map values of all criteria multiplied by the weighting of the criteria, with equation 8.

$$GAP\ Value\ =\ Alternative\ Profile\ -\ Criteria\ Profile \quad (7)$$

$$NV_i = \sum w_j * \mathrm{R}_{ij}{}^{*} \quad (8)$$

TABLE 3
GAP VALUE WEIGHT

Difference (Gap)	Weight Value	Description / Linguistics
0	6	There is no GAP
1	5,5	1 level / level excess competency
-1	5	1 level / level deficient competency
2	4,5	2 level / level excess competency
-2	4	Competency deficiency 2 levels / level
3	3,5	3 levels of excess competency / level
-3	3	3 level / level deficient competencies
4	2,5	4 levels / levels of excess competency
-4	2	Competency deficiency 4 levels / levels
5	1,5	5 levels / level excess competency
-5	1	Competency deficiency 5 levels / level

2. Research Method

The research method used in this study follows the stages of the Cross Industry Standard Process for Data Mining (CRISP-DM) model [18]. This framework is expected to be able to analyze business problems and current conditions, provide appropriate data transformation to provide a model that can assess effectiveness and document the results obtained. The first stage is business understanding, is used to determine business goals, analyze business situations, and determine the objectives of the DSS [21]. The current condition of Monarch Singaraja, does not have an automated process for the placement of OJT students, which results in the OJT location not getting students with optimal skills. Sometimes there are excess students at OJT locations. The goal of Monarch Singaraja is to be able to provide optimal, automated, OJT locations and avoid piling up students in just one OJT location. At data understanding stage, the data collection process is carried out. The criteria used in this study include (C1) Academic Skills, (C2) Personality Skills, (C3) Language & Communication Skills, (C4) Servicing Skills, (C5) Culinary Skills, and (C6) Housekeeping Skills. For the OJT student data used, in total there were 500 OJT students for D-1 level in the 2019-2020 school year, consisting of 83 OJT students for Beverage class, 120 OJT students for Housekeeping class, 130 OJT students for Cookery class, and 167 OJT students for F&B class.

Data preparation stage includes the selection of data to be used and data to be issued for inclusion in the DSS calculation [22]. The three decision maker will weight the criteria using the Saaty scale to be adjusted to the AHP method. As an alternative, student data will be assessed based on predetermined criteria using a Likert scale to adjust to the MAUT and PM methods. Based on these data, 10% each will be randomly selected from each class as a sampling, so that we get 8 OJT students for Beverage class, 12 OJT students for Housekeeping class, 13 OJT students for Cookery class, and 17 OJT students for F&B class. The AHP-MAUT and AHP-PM methods were chosen for the placement of OJT students. The first step is the preparation of comparison data between criteria sourced from the decision maker as a resource, and alternative data from OJT student grade profile data. By using the AHP method, to determine the weighted criteria data. Furthermore, the alternative data is normalized using the MAUT method and the PM method so as to produce alternative normalization data [23]. Criteria weighting data using the AHP method and alternative normalization data using the MAUT and PM methods will be weighted normalization calculations and then calculating preference values that can be ranked to be able to determine the best OJT students for which OJT placement can be carried out correctly [24][25]. At evaluation stage, testing is carried out both on the results of the recommendations from the DSS and the performance of the methods used. At deployement stage, deployment planning is carried out based on previous evaluations [26][27].

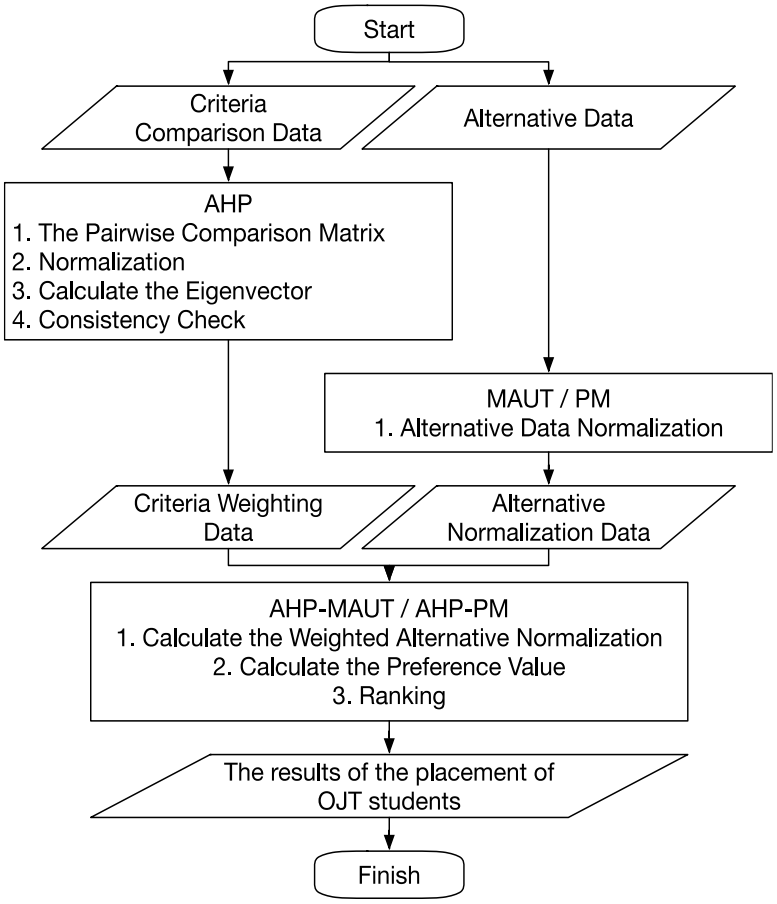

Fig. 1. Research Flow Diagram using AHP-MAUT and AHP-PM in OJT Student Placement

3. Result and Analysis

This research was conducted based on the results of a questionnaire to 3 decision makers and 50 OJT students in the Monarch Singaraja environment. The weighting between the criteria for decision maker 1, decision maker 2 and decision maker 3 from the questionnaire, which are shown in Table 4, Table 5 and Table 6. Equally important weights are not shown in the table. In the table, "MDR" means quite important (moderate), "STR" means more important (strong), "DMS" means very important (demonstrated), and "EXT" means extremely important. Furthermore, it will focus on the calculation of decision maker 1, where decision maker 2 and decision maker 3 will have the same calculation steps. The results of the questionnaire in the form of a pairwise comparison matrix in linguistic conditions will be translated using the Saaty scale and a synthesis is carried out, which is shown in Table 7.

TABLE 4
DECISION MAKER 1 PAIRWISE COMPARISON MATRIX

Criteria	C1	C2	C3	C4	C5	C6
C1	-	MD	MD			
C2		-	MD			
C3			-			
C4	MD	MD	MD	-		
C5	MD	MD	MD		-	
C6	MD	MD	MD			-

TABLE 5
DECISION MAKER 2 PAIRWISE COMPARISON MATRIX

Criteria	C1	C2	C3	C4	C5	C6
C1	-					
C2	ST	-				
C3			-			
C4	ST	ST	ST	-		
C5	ST	ST	ST		-	
C6	ST	ST	ST			-

TABLE 6
DECISION MAKER 3 PAIRWISE COMPARISON MATRIX

Criteria	C1	C2	C3	C4	C5	C6
C1	-	MD				
C2		-				
C3	MD	MD	-	MD	MD	MD
C4				-		
C5					-	
C6						-

TABLE 7
DECISION MAKER 1 PAIRWISE COMPARISON MATRIX CONVERTED BY SAATY SCALE

Criteria	C1	C2	C3	C4	C5	C6
C1	1	3	3	1/3	1/3	1/3
C2	1/3	1	3	1/3	1/3	1/3
C3	1/3	1/3	1	1/3	1/3	1/3
C4	3	3	3	1	1	1
C5	3	3	3	1	1	1
C6	3	3	3	1	1	1
SUM	10 2/3	13 1/3	16	4	4	4

Normalization in the AHP method is done by dividing the element value by the number of column values, and the eigenvector value is generated from the sum of the criteria for each row, as follows:

$$C_{11} = \frac{1}{10^{2}/_{3}} = 0{,}094 \qquad C_{12} = \frac{3}{13^{1}/_{3}} = 0{,}225 \qquad C_{13} = \frac{3}{16} = 0{,}188$$

$$C_{14} = \frac{^{1}/_{3}}{4} = 0{,}083 \qquad C_{15} = \frac{^{1}/_{3}}{4} = 0{,}083 \qquad C_{16} = \frac{^{1}/_{3}}{4} = 0{,}083$$

$$EV\ C_1 = \frac{0{,}094+0{,}225+0{,}188+0{,}083+0{,}083+0{,}083}{6} = 0{,}126$$

For the next standard, use the same formula to produce the eigenvector value. Eigenvectors on resource 1 for criteria C1 is 0,126, C2 is 0,091, C3 is 0,061, C4 is 0,241, C5 is 0,241 and C6 is 0,241. After getting the Eigenvector from each criterion, then λmax can be calculated, starting from multiplying the pairwise comparison matrix with the eigen vector. Each of the results of the multiplication, is divided again by the eigenvector, and the average is found to get λmax. λmax for decision maker 1, is determined using the following steps.

$$\lambda = \begin{bmatrix} 1{,}0 & 3{,}0 & 3{,}0 & 0{,}3 & 0{,}3 & 0{,}3 \\ 0{,}3 & 1{,}0 & 3{,}0 & 0{,}3 & 0{,}3 & 0{,}3 \\ 0{,}3 & 0{,}3 & 1{,}0 & 0{,}3 & 0{,}3 & 0{,}3 \\ 3{,}0 & 3{,}0 & 3{,}0 & 1{,}0 & 1{,}0 & 1{,}0 \\ 3{,}0 & 3{,}0 & 3{,}0 & 1{,}0 & 1{,}0 & 1{,}0 \\ 3{,}0 & 3{,}0 & 3{,}0 & 1{,}0 & 1{,}0 & 1{,}0 \end{bmatrix} \begin{bmatrix} 0{,}126 \\ 0{,}091 \\ 0{,}061 \\ 0{,}241 \\ 0{,}241 \\ 0{,}241 \end{bmatrix} = \begin{bmatrix} 0{,}8229 \\ 0{,}5576 \\ 0{,}3743 \\ 1{,}5563 \\ 1{,}5563 \\ 1{,}5563 \end{bmatrix}$$

$$\lambda_{max} = \left(\frac{0{,}8229}{0{,}126} + \frac{0{,}5576}{0{,}091} + \frac{0{,}3743}{0{,}061} + \frac{1{,}5563}{0{,}241} + \frac{1{,}5563}{0{,}241} + \frac{1{,}5563}{0{,}241}\right)/6$$

$$\lambda_{max} = \frac{(\,6{,}5289 + 6{,}1533 + 6{,}0904 + 6{,}4675 + 6{,}4675 + 6{,}4675\,)}{6} = 6{,}3625$$

After getting λmax, then calculate the Consistency Index and Consistency Ratio for decision maker 1, using the following steps. Based on the Alonso-lamata RI Values, the IR used is 1.2479 considering the number of criteria is 6.

$$CI = \frac{(\lambda_{max} - n)}{(n-1)} = \frac{(\,6{,}3625-6)}{(6-1)} = \frac{0{,}3625}{5} = 0{,}0725$$

$$CR = \frac{CI}{IR} = \frac{0{,}0725}{1{,}2479} = 0{,}0581$$

Because CR is less than 0.1, the hierarchy is considered consistent, the calculation is declared correct and can be used as a criterion weight. The comparison matrix for Decision maker 2 and Decision maker 3 is also calculated using the same steps as Decision maker 1, resulting in an eigenvector value for Decision maker 1, Decision maker 2, and Decision maker 3. To find the weighted average of all informants, a geometric mean calculation will be performed from the weight of the criteria for all informants. If the sum of the criterion weights from geometric mean does not equal 1, then normalization is carried out against the criteria weights. The steps for getting the weighted average criteria.

TABLE 8
WEIGHTED CRITERIA BY THE THREE DECISION MAKER AND THE GEOMETRIC MEAN

Criteria	DM 1 EV	DM 2 EV	DM 3 EV	EV Geometric Mean	EV Normalized Geometric Mean
C1	0,126	0,047	0,156	0,097	0,108
C2	0,091	0,085	0,108	0,094	0,223
C3	0,061	0,054	0,368	0,107	0,104
C4	0,241	0,272	0,123	0,200	0,223
C5	0,241	0,272	0,123	0,200	0,119
C6	0,241	0,272	0,123	0,200	0,223
SUM	1	1	1	0,898	1

To get the final result of the calculation using AHP-MAUT, previously it is necessary to calculate the alternative normalization, calculate the marginal value of utility and calculate the final utility value. To be able to perform normalization calculations using the MAUT method, there are 50 data from OJT students consisting of 8 OJT students for Beverage class, 12 OJT students for Housekeeping class, 13 OJT students for Cookery class, and 17 OJT students for F&B class, which will be normalized, and an assessment has been carried out based on predetermined criteria. The OJT student data is shown in Table 9.

TABLE 9
OJT STUDENT ALTERNATIVE DATA

OJT Student ID	N C1	N C2	N C3	N C4	N C5	N C6
StudentA01	3	2	5	3	4	2
StudentA02	3	5	5	5	4	3
StudentA03	5	4	5	3	4	3
StudentA04	2	4	4	3	3	3
...	...	...	...	...	...	...
StudentD17	3	1	4	5	4	3
MIN	1	1	1	2	2	2
MAX	5	5	5	5	5	5

To be able to normalize the OJT student profile assessment data using the MAUT method, use the following steps:

$$r_{ij}^{*} = \frac{r_{ij} - \min(r_{ij})}{\max(r_{ij}) - \min(r_{ij})}$$

$$r_{11}^{*} = \frac{3-1}{5-1} = 0{,}50 \qquad r_{12}^{*} = \frac{2-1}{5-1} = 0{,}25 \qquad r_{13}^{*} = \frac{5-1}{5-1} = 1{,}00$$

$$r_{14}^{*} = \frac{3-2}{5-2} = 0{,}33 \qquad r_{15}^{*} = \frac{4-2}{5-2} = 0{,}67 \qquad r_{16}^{*} = \frac{2-2}{5-2} = 0{,}00$$

For further alternatives also apply the same formula, so that the results of normalization calculations can be seen in Table 10.

TABLE 10
OJT STUDENT ALTERNATIVE NORMALIZED VALUE DATA

OJT Student ID	N C1*	N C2*	N C3*	N C4*	N C5*	N C6*
StudentA01	0,50	0,25	1,00	0,33	0,67	0,00
StudentA02	0,50	1,00	1,00	1,00	0,67	0,33
StudentA03	1,00	0,75	1,00	0,33	0,67	0,33
StudentA04	0,25	0,75	0,75	0,33	0,33	0,33
...	...	...	...	...	...	...
StudentD17	0,50	0,00	0,75	1,00	0,67	0,33

Furthermore, after getting the results of the normalized value, then we can calculate the marginal value of utility, using the following steps:

$$u_{ij} = \frac{e^{(r_{ij}^{*})^2} - 1}{1{,}71}$$

$$u_{11} = \frac{e^{(0,50)^2} - 1}{1{,}71} = 0{,}166 \qquad u_{12} = \frac{e^{(0,25)^2} - 1}{1{,}71} = 0{,}038 \qquad u_{13} = \frac{e^{(1,00)^2} - 1}{1{,}71} = 1{,}005$$

$$u_{14} = \frac{e^{(0,33)^2} - 1}{1{,}71} = 0{,}069 \qquad u_{15} = \frac{e^{(0,67)^2} - 1}{1{,}71} = 0{,}327 \qquad u_{16} = \frac{e^{(0,00)^2} - 1}{1{,}71} = 0{,}000$$

For the next alternative, also apply the same formula, so that the results of the marginal value of utility can be seen in table 11 as follows:

TABLE 11
OJT STUDENT MARGINAL VALUE OF UTILITY

OJT Student ID	N C1*	N C2*	N C3*	N C4*	N C5*	N C6*
StudentA01	0,166	0,038	1,005	0,069	0,327	0,000
StudentA02	0,166	1,005	1,005	1,005	0,327	0,069
StudentA03	1,005	0,442	1,005	0,069	0,327	0,069
StudentA04	0,038	0,442	0,442	0,069	0,069	0,069
...	...	...	...	...	...	...
StudentD17	0,166	0,000	0,442	1,005	0,327	0,069

After getting the marginal value of utility, proceed to calculate the final utility value, using the following formula. The final result of calculating the final utility value as the AHP-MAUT preference value for the next alternative can be presented in Table 12. The results of the top 10 ranking using AHP-MAUT are presented in Table 13.

$U_i = \sum_{j=1}^{n} w_j \times u_{ij}$

$U_1 = \sum[(0{,}108 \times 0{,}166); (0{,}104 \times 0{,}038); (0{,}119 \times 1{,}005); (0{,}223 \times 0{,}069) ; (0{,}223 \times 0{,}327); (0{,}223 \times 0{,}000)] = 0{,}2299$

TABLE 12
OJT STUDENT PREFERENCE VALUE AND RANKING USING AHP-MAUT

OJT Student ID	N Vi	Ranking
StudentA01	0,2299	Rank 33
StudentA02	0,5547	Rank 02
StudentA03	0,3780	Rank 18
StudentA04	0,1487	Rank 45
…	…	…
StudentD17	0,3827	Rank 15

TABLE 13
TOP 10 RANKING OJT STUDENT USING AHP-MAUT

OJT Student ID	N Vi	Ranking
StudentD04	0,5724	Rank 01
StudentA02	0,5547	Rank 02
StudentC01	0,4680	Rank 03
StudentC02	0,4619	Rank 04
StudentD08	0,4585	Rank 05
StudentC13	0,4543	Rank 06
StudentD09	0,4444	Rank 07
StudentC04	0,4291	Rank 08
StudentC10	0,4244	Rank 09
StudentB09	0,4205	Rank 10

To get the final result of the calculation using AHP-PM, previously it is necessary to determine the gap value, calculate the gap value between the subject's profile value and the required profile, calculate the gap mapping and calculate the final value. In this OJT student placement case study, the gap value for the PM method has been determined as shown in table 14 as follows:

TABLE 14
GAP VALUE FOR THE PM METHOD

GAP C1	GAP C2	GAP C3	GAP C4	GAP C5	GAP C6
5	5	5	5	5	5

To calculate the gap value between the subject profile and the specified profile, use the OJT student grade profile data as the subject profile and the specified gap profile value, by following the steps.

$Gap = Atribute\ Value - Target\ Value$

$Gap_{11} = 3 - 5 = -2$ $Gap_{12} = 2 - 5 = -3$ $Gap_{13} = 5 - 5 = 0$

$Gap_{14} = 3 - 5 = -2$ $Gap_{15} = 4 - 5 = -1$ $Gap_{16} = 2 - 5 = -3$

The next alternative also applies the same steps, so that the calculation results of the gap value between the subject's profile and the specified profile can be seen in table 15. Based on the predetermined gap value of the OJT student profile, it is continued to be translated using gap analysis, to get the value of the gap mapping, the results are shown in Table 16.

TABLE 15
GAP VALUE BETWEEN SUBJECT'S PROFILE AND THE SPECIFIED PROFILE

OJT Student ID	N C1	N C2	N C3	N C4	N C5	N C6
StudentA01	-2	-3	0	-2	-1	-3
StudentA02	-2	0	0	0	-1	-2
StudentA03	0	-1	0	-2	-1	-2
StudentA04	-3	-1	-1	-2	-2	-2
…	…	…	…	…	…	…
StudentD17	-2	-4	-1	0	-1	-2

TABLE 16
GAP MAPPING VALUE

OJT Student ID	N C1*	N C2*	N C3*	N C4*	N C5*	N C6*
StudentA01	3,0	2,0	5,0	3,0	4,0	2,0
StudentA02	3,0	5,0	5,0	5,0	4,0	3,0
StudentA03	5,0	4,0	5,0	3,0	4,0	3,0
StudentA04	2,0	4,0	4,0	3,0	3,0	3,0
…	…	…	…	…	…	…

OJT Student ID	N C1*	N C2*	N C3*	N C4*	N C5*	N C6*
StudentD17	3,0	1,0	4,0	5,0	4,0	3,0

After getting the OJT student profile gap score, proceed to calculate the weighted profile value as the AHP-PM method preference value, with the following steps. The final results of calculating the preference value using AHP-PM, for further alternatives, can be presented in table 17. The results of the top 10 ranking using AHP-PM are presented in table 18.

$NV_i = \sum w_j * r_{ij}^*$

$NV_1 = \sum[(0{,}108 \times 3{,}0); (0{,}104 \times 2{,}0); (0{,}119 \times 5{,}0); (0{,}223 \times 3{,}0); (0{,}223 \times 4{,}0); (0{,}223 \times 2{,}0)]$

$NV_1 = \sum(0{,}3242; 0{,}2088; 0{,}5961; 0{,}6683; 0{,}8911; 0{,}4455) = 3{,}1340$

TABLE 17
OJT STUDENT PREFERENCE VALUE AND RANKING USING AHP-PM

OJT Student ID	N Vi	Ranking
StudentA01	3,1340	Rank 33
StudentA02	4,1155	Rank 02
StudentA03	3,7817	Rank 18
StudentA04	3,1155	Rank 45
...	...	
StudentD17	3,5788	Rank 44

TABLE 18
TOP 10 RANKING OJT STUDENT USING AHP-PM

OJT Student ID	N Vi	Ranking
StudentA02	4,1155	Rank 01
StudentD08	4,0000	Rank 02
StudentD04	3,8861	Rank 03
StudentB01	3,7950	Rank 04
StudentA03	3,7817	Rank 05
StudentC10	3,6803	Rank 06
StudentC02	3,6765	Rank 07
StudentC04	3,6609	Rank 08
StudentC12	3,6588	Rank 09
StudentD14	3,6543	Rank 10

Based on the preference value obtained from the calculation of the AHP-MAUT and AHP-PM methods on student profile value data for OJT placement, it can be presented in a graph that is ordered based on the largest to the smallest average preference value, shown in Figure 2.

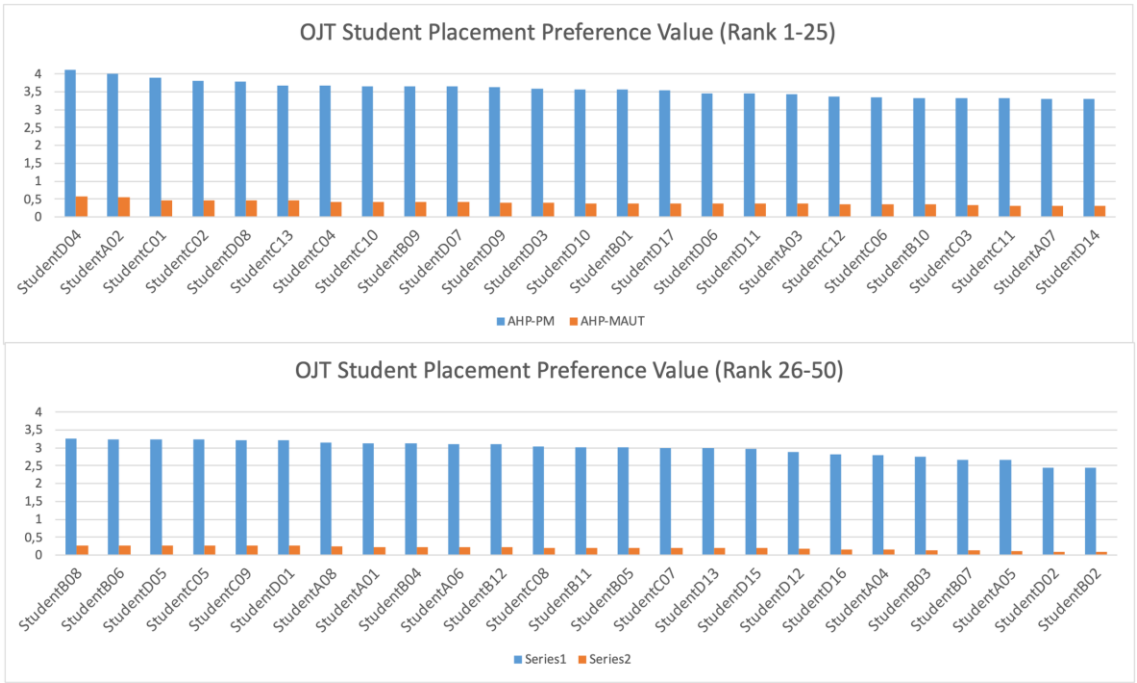

Fig. 2. Preference Value of OJT Students Using AHP-MAUT and AHP-PM

4. Conclusion

Based on the research that has been done, a combination of the AHP-MAUT and AHP-PM methods can be used in solving case studies of placing OJT students who take data on Monarch Singaraja. In the manual calculation implementation of the AHP-MAUT method, OJT students from the F&B class with the code StudentD04 had the highest preference value of 0.5724, followed by OJT students from the beverage class code StudentA02 with a preference value of 0.5547, and the third place was OJT students from the cookery class code StudentC01 with a preference value of 0.4680. Manual calculation implementation using the AHP-PM method, StudentA02 with a preference value of 4.1155 become the first rank, the second rank is won by StudentD08 with a preference value of 4,000 and the third rank goes StudentD04 with a preference value of 3.886. The obstacle faced in this study is the condition of COVID-19 which has an impact on the placement of OJT students in the field which causes the accuracy test to be carried out, where the comparison between the results of manual calculations and the reality in the field cannot be calculated properly. For further research, it is expected to be able to experiment with methods in the DSS that are newer and more diverse, assess the profile of OJT students more accurately, increase the variety of criteria and test for accuracy, sensitivity, and testing of the software that will be produced.

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