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Hybrid Modification Preference Selection Index with Optimized Pairwise Ratio Analysis Method for Multi-Criteria Decision Making: An Integrated Weighting and Ranking Approach

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ABSTRACT

Multi-criteria job candidate selection requires an objective and systematic approach because candidates are evaluated using multiple criteria with different levels of importance. This study proposes a hybrid Modification Preference Selection Index with Optimized Pairwise Ratio Analysis (MPSI-OPARA) framework that integrates objective criteria weighting and alternative ranking. MPSI is used to determine criterion weights based on normalized performance variation, while OPARA is applied to rank candidates through adjusted pairwise comparisons. The framework is demonstrated using six job candidates evaluated across six criteria: educational background, work experience, technical competence, communication skills, problem-solving ability, and interview performance. The results show that educational background and work experience are the dominant criteria, with weights of 0.5600 and 0.3422, respectively. OPARA produces Candidate IMS as the first-ranked candidate, Candidate GTB as the second-ranked candidate, and Candidate RDH as the third-ranked candidate. Furthermore, comparisons with SAW, SMART, WASPAS, and MOORA produce identical ranking positions, demonstrating consistent ranking outcomes. These findings indicate that the proposed MPSI-OPARA framework provides a systematic and consistent approach for objective criteria weighting and job candidate selection.

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I. Introduction

in a multi-criteria environment is challenging because alternatives must often be evaluated using multiple criteria with different characteristics, measurement scales, distributions, and levels of importance[1]–[3]. Multi-Criteria Decision-Making (MCDM) methods provide systematic mechanisms for addressing such problems by supporting the evaluation of alternatives across multiple and potentially conflicting criteria. In general, MCDM involves two essential stages, namely determining the relative importance of criteria and ranking alternatives according to their overall performance[4], [5]. The quality of both stages directly affects the reliability of the resulting decision, making the selection of appropriate weighting and ranking mechanisms an important consideration in MCDM applications.

Reliable criteria weighting is particularly important because criterion weights determine the relative contribution of each criterion to the final evaluation[6], [7]. Conventional weighting approaches that rely heavily on expert judgments may introduce subjectivity and bias because individual assessments can differ according to perceptions, experience, and preferences. Objective weighting methods provide an alternative by deriving criterion importance from the information contained in the decision matrix[8]–[10]. Such approaches are particularly relevant when criteria have different scales, distributions, and levels of variation. By considering the characteristics of the available data, objective weighting can provide a more consistent basis for determining the contribution of each criterion to the decision process.

In addition to reliable weighting, the ranking stage must be capable of distinguishing the performance of alternatives in a systematic manner. The characteristics of alternatives may vary considerably across criteria, and closely distributed performance values can make the final priority order sensitive to changes in weights or evaluation conditions. Therefore, an appropriate ranking mechanism is required to transform weighted criterion performance into an overall priority order while maintaining sufficient stability. The reliability of an MCDM framework should consequently be considered not only from the numerical ranking produced by a method but also from the consistency of the resulting priorities when the analytical conditions are varied or compared with alternative ranking approaches.

Although numerous weighting and ranking methods have been developed in MCDM, the integration of methods with different computational mechanisms remains an area that requires further investigation. Modification preference selection index (MPSI) and optimized pairwise ratio analysis (OPARA) offer potentially complementary functions within such an integrated framework. MPSI can determine the relative importance of criteria from information contained in the decision data[11], [12], whereas OPARA can evaluate and rank

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alternatives according to their performance across the considered criteria[13], [14]. However, previous studies have generally investigated weighting and ranking methods separately or integrated them with other established techniques. The specific integration of MPSI as an objective weighting mechanism and OPARA as an alternative ranking mechanism remains relatively limited, particularly with respect to the stability and robustness of the resulting decision outcomes.

The need for such an integrated approach is particularly relevant to job candidate selection, where decision-makers must simultaneously consider multiple dimensions of candidate suitability. Recruitment decisions may involve educational background, work experience, technical competence, communication skills, problem-solving ability, and interview performance. These criteria have different characteristics and may produce conflicting or closely distributed performance values among candidates. Consequently, relying on a single subjective assessment of criterion importance may not adequately represent the information contained in the candidate evaluation data. An MCDM framework that combines objective weighting and systematic ranking can provide a transparent computational procedure for establishing candidate priorities while reducing dependence on subjective determination of criterion importance.

To further examine the reliability of the proposed decision process, ranking consistency should be evaluated beyond the result obtained from a single analytical configuration. Sensitivity analysis can be used to investigate whether changes in criterion weights or evaluation conditions substantially affect the resulting priority order. In parallel, rank correlation with alternative MCDM ranking techniques can provide an additional measure of consistency by examining the degree of agreement between different ranking mechanisms[15]–[17]. A ranking that remains relatively consistent under analytical variations and demonstrates strong agreement with alternative approaches provides stronger evidence of stability and robustness. Therefore, the combination of objective weighting, systematic ranking, sensitivity analysis, and comparative rank evaluation offers a more comprehensive basis for assessing an MCDM framework.

Based on these considerations, this study proposes a hybrid MPSI–OPARA framework that integrates objective criteria weighting and alternative ranking into a two-stage MCDM process. In the first stage, MPSI is employed to determine the relative importance of the criteria based on information derived from the decision data. The resulting weights are then incorporated into OPARA in the second stage to evaluate the performance of alternatives and establish their priority order. This structure follows the sequence objective weighting → alternative ranking, allowing MPSI and OPARA to perform complementary roles within a unified decision-making framework. The proposed framework is further examined through sensitivity analysis and rank correlation to determine the stability and robustness of the resulting ranking under variations in analytical conditions.

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Accordingly, this study aims to develop and evaluate a hybrid MPSI–OPARA framework for multi-criteria job candidate selection. Specifically, the study seeks to determine objective criterion weights using MPSI, apply the resulting weights within OPARA to evaluate and rank candidate alternatives, and assess the stability and robustness of the resulting ranking. The evaluation is conducted through sensitivity analysis and rank correlation to determine whether the priority order remains consistent under variations in analytical conditions and across alternative ranking mechanisms. Ultimately, the study is expected to provide an alternative MCDM framework that integrates objective weighting and systematic ranking while offering a more reliable and consistent basis for candidate selection.

II. Methodology

2.1. Research Workflow

Research Workflow refers to the systematic sequence of activities undertaken to achieve the objectives of a study in a structured and logically connected manner[18], [19]. It describes the overall research process, beginning with the identification of the research problem, followed by data collection and preparation, selection and definition of evaluation criteria, application of the proposed methods, analysis and interpretation of the results, and validation of the findings. A well-defined research workflow ensures that each stage of the study is conducted consistently and contributes directly to the achievement of the research objectives. In multi-criteria decision-making research, the workflow provides a clear representation of how input data are processed through weighting and ranking procedures to produce reliable decision outcomes. The overall research workflow adopted in this study is presented in Figure 1.

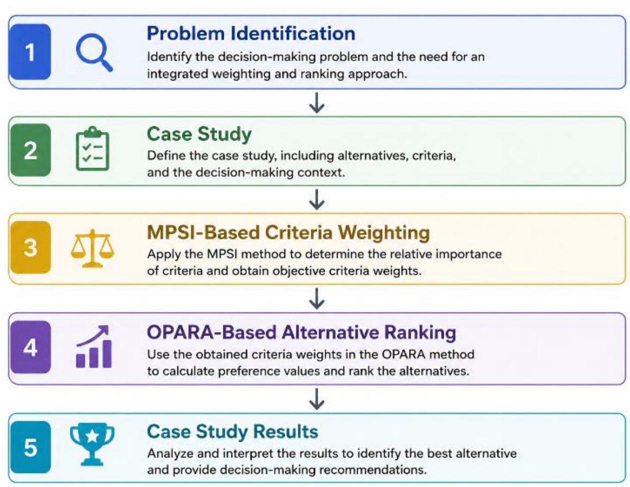

Figure 1. Research Workflow

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The research workflow consists of five main stages, beginning with Problem Identification, which defines the multi-criteria decision-making problem and the need for an integrated weighting and ranking approach. The second stage, Case Study, establishes the decision context, alternatives, and criteria used in the analysis. The third stage applies MPSI-Based Criteria Weighting to determine the relative importance and objective weights of the criteria. These weights are then incorporated into the fourth stage, OPARA-Based Alternative Ranking, to calculate preference values and determine the ranking of alternatives. Finally, Case Study Results presents the analysis and interpretation of the obtained results to identify the best alternative and provide decision-making recommendations.

2.2. MPSI Weighting

MPSI-Based Criteria Weighting refers to a systematic process for determining the relative importance of decision criteria using the MPSI method[20], [21]. The process involves analyzing the values of each criterion within the decision matrix to assess their preference levels and determine the degree of importance associated with each criterion. Through this evaluation, numerical weights are generated to represent the relative contribution of individual criteria to the decision-making process. The obtained weights provide an objective basis for distinguishing more influential criteria from less influential criteria, while maintaining consistency with the characteristics of the underlying decision data.

The MPSI-based criteria weighting process begins with the construction of the decision matrix, which represents the performance values of each alternative with respect to the considered criteria, as presented in Equation (1). The decision matrix is then normalized according to the type of criterion, where benefit and cost criteria are treated using their respective normalization procedures, as defined in Equation (2). Subsequently, the average normalized value for each criterion is calculated to determine its central preference level across all alternatives, as shown in Equation (3). The variation of each criterion is then evaluated based on the deviations of its normalized values from the corresponding average value, as defined in Equation (4). Finally, the criterion weights are obtained by normalizing the calculated preference variation values across all criteria, as presented in Equation (5), resulting in a set of weights that represents the relative importance of each criterion and has a total value of one.

$$X = [x_{ij}]_{mxn} \tag{1}$$

$$r_{ij} = \begin{cases} \dfrac{x_{ij}}{\max_j x_{ij}}; benefit \\ \dfrac{\min_j x_{ij}}{x_{ij}}; cost \end{cases} \tag{2}$$

$$\vartheta_j = \frac{\sum_{i=1}^{m} r_{ij}}{m} \tag{3}$$

$$p_j = \sum_{i=1}^{m} (r_{ij} - \vartheta_j)^2 \tag{4}$$

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$$w_j = \frac{p_j}{\sum_{j=1}^{n} p_j} \quad (5)$$

The MPSI method provides a systematic approach for determining the relative importance of decision criteria based on the information contained in the decision matrix. Through normalization, calculation of the average preference values, and measurement of criterion variation, MPSI produces objective weights that reflect the differences in the performance characteristics of the criteria. Criteria with greater preference variation obtain higher weights, indicating a stronger contribution to the decision-making process. The final weights are normalized so that their total value equals one, providing a consistent representation of the relative importance of all criteria. Overall, MPSI offers a structured and data-driven mechanism for objective criteria weighting in multi-criteria decision-making problems.

2.3. OPARA Method

The OPARA method is a multi-criteria decision-making method used to evaluate and rank alternatives through pairwise comparisons based on performance values for each criterion[22], [23]. This method optimizes the comparison process by using ratios adjusted to the range of alternative values, then makes linear adjustments and aggregates the comparison results to get the final score for each alternative. OPARA allows the relative information between alternatives to be considered systematically, making it possible to produce performance measures that form the basis for determining the order or priority of alternatives.

The OPARA method starts with creating a decision matrix that contains the performance scores of each alternative for all criteria using (1). Next, a range-based pairwise adjusted ratio is used to compare alternatives based on the range of criteria values in Equations (6) and (7), then it's adjusted linearly using the linearly adjusted pairwise ratio in Equation (8). The adjusted results are aggregated through aggregated pairwise adjusted ratios in Equation (9). The final step is the final score of the alternatives to produce the final values and determine the ranking of each alternative based on Equation (10).

$$\rho_j = \begin{cases} \frac{(\alpha-1)\max_j x_{ij} + \min_j x_{ij}}{\alpha \max_j x_{ij}} & if \frac{\max_j X_{ij} - \min_j x_{ij}}{\max_j x_{ij} + \min_j x_{ij}} > \beta \\ 1 & otherwise \end{cases} \quad (6)$$

$$RPAR_{kl} = \sum_{j \in BC} w_j \left(\frac{x_{kj}}{x_{lj}}\right)^{\rho_j} + \sum_{j \in NC} w_j \left(\frac{x_{lj}}{x_{lj}}\right)^{\rho_j} \quad (7)$$

$$LPAR_{kl} = \sum_{j \in BC} w_j \left(\frac{x_{kj}}{x_{lj}}\right)^{\tau_j} + \sum_{j \in NC} w_j \left(\frac{x_{lj}}{x_{lj}}\right)^{\tau_j} \quad (8)$$

$$APAR_{kl} = \omega RPAR_{kl} + (1-\omega) LPAR_{kl} \quad (9)$$

$$S_i = \frac{1}{n}\left(\sum_{l=1}^{n}\left(\frac{APAR_{il}}{\sum_{k=1}^{n} APAR_{kl}}\right)\right) \quad (9)$$

The OPARA method produces a final score that represents the relative preference level of each alternative based on pairwise comparisons between alternatives across all criteria. The process of combining aggregated pairwise adjusted ratios gives a final value that can be used to systematically rank the alternatives. Alternatives with

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higher final scores indicate a better preference level compared to others. By considering the relative relationships between alternatives through the ratio adjustment stages, OPARA provides an evaluation mechanism that can generate a structured ranking of alternatives and support decision-making in multi-criteria problems.

III. Result and Discussion

The hybrid MPSI with OPARA is an integrated multi-criteria decision-making approach designed to combine objective criteria weighting with systematic alternative ranking. In this framework, the MPSI is employed to determine the relative importance of evaluation criteria by considering the preference characteristics of each criterion and generating a representative weight for the decision process. The resulting weights are subsequently incorporated into the OPARA to evaluate the relative performance of alternatives through adjusted pairwise comparisons across the considered criteria. The integration of MPSI and OPARA enables the decision-making process to separately address the importance of criteria and the comparative performance of alternatives, producing a final score that can be used to establish the priority order of alternatives. This hybrid framework provides a structured approach for handling multi-criteria decision problems in which reliable weighting and consistent ranking are both essential for obtaining meaningful decision outcomes.

3.1. Case Study

The proposed hybrid MPSI with OPARA is applied to the job candidate selection problem to demonstrate its applicability in multi-criteria decision making. The case study focuses on evaluating candidates based on several relevant criteria, including educational background, work experience, technical competence, communication skills, problem-solving ability, and interview performance. These criteria represent different aspects of candidate suitability and may have varying levels of importance in the recruitment process. MPSI is first employed to determine the objective importance of each criterion from the decision matrix, producing criterion weights that reflect their relative contribution to the evaluation. The obtained weights are then incorporated into OPARA to conduct pairwise comparisons of candidate performance across the selected criteria. The resulting final scores are used to establish the priority ranking of candidates, with higher scores indicating greater suitability for the position. Through this case study, the MPSI–OPARA framework provides an integrated mechanism for determining criterion importance and ranking job candidates in a systematic and transparent manner.

The evaluation data consist of 6 job candidates assessed using six criteria: educational background (C1), work experience (C2), technical competence (C3), communication skills (C4), problem-solving ability (C5), and interview performance (C6). The assessment scores are

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obtained from the evaluation of candidates by the recruitment team using a predefined rating scale, where each criterion represents a specific aspect of candidate suitability. Educational background, work experience, technical competence, communication skills, problem-solving ability, and interview performance are treated as benefit criteria because higher scores indicate better candidate performance. The resulting assessment data form the initial decision matrix used in the MPSI–OPARA framework. The complete candidate evaluation data and corresponding criterion scores are presented in Table 1.

Table 1.Candidate Evaluation Data

Candidate Name	C1	C2	C3	C4	C5	C6
Candidate ASF	3	4	88	82	84	86
Candidate RDH	3	5	85	88	86	84
Candidate GTB	4	3	90	85	89	91
Candidate SYR	2	6	82	79	83	85
Candidate IMS	4	5	91	90	92	89
Candidate ABT	2	4	80	84	81	78

The assessment data presented in Table 1 provide the basis for the subsequent application of the proposed MPSI–OPARA framework. The data capture the diverse characteristics of each candidate across educational background, work experience, technical competence, communication skills, problem-solving ability, and interview performance, allowing the candidates to be evaluated from multiple perspectives. The decision matrix in Table 1 is subsequently processed using MPSI to determine the relative importance of each criterion, while the resulting weights are incorporated into OPARA to obtain the final candidate scores and ranking. Thus, the case study provides a consistent empirical basis for examining the applicability of the proposed hybrid approach to job candidate selection.

3.2. Implementation of MPSI in Determining Criteria Weights

The MPSI weighting is used to determine the relative importance of evaluation criteria in a multi-criteria decision-making problem. The method evaluates the preference characteristics of each criterion based on the available decision data and generates a preference value that reflects its contribution to the decision process. These preference values are subsequently processed to obtain normalized criterion weights. The resulting weights indicate the relative importance of each criterion, with higher values representing criteria that have a greater influence on the overall evaluation. Thus, MPSI provides an objective mechanism for establishing criterion weights before they are applied in the subsequent alternative evaluation and ranking process.

Decision Matrix Construction. The first stage of the MPSI-based weighting process is the construction of the decision matrix, which contains the performance values of each alternative with respect to all considered criteria. This matrix serves as the fundamental input for the subsequent calculations by providing a structured representation of the

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evaluation data. The decision matrix is constructed using (1), with the assessment data the same as the data in Table 1.

The second stage involves normalizing the decision matrix to transform the original criterion values into comparable scales. The normalization procedure is determined by the type of criterion, where benefit and cost criteria are processed using their respective normalization formulations. This step ensures that the performance values can be compared consistently across different criteria. The normalization process is performed using (2), with the resulting normalized values presented in Table 2.

Table 2. Normalization Result of the MPSI Weighting

Candidate Name	C1	C2	C3	C4	C5	C6
Candidate ASF	0.7500	0.6667	0.9670	0.9111	0.9130	0.9451
Candidate RDH	0.7500	0.8333	0.9341	0.9778	0.9348	0.9231
Candidate GTB	1.0000	0.5000	0.9890	0.9444	0.9674	1.0000
Candidate SYR	0.5000	1.0000	0.9011	0.8778	0.9022	0.9341
Candidate IMS	1.0000	0.8333	1.0000	1.0000	1.0000	0.9780
Candidate ABT	0.5000	0.6667	0.8791	0.9333	0.8804	0.8571

The third stage calculates the average normalized value for each criterion based on the normalized performance values of all alternatives. This value represents the central level of each criterion and provides a reference for evaluating the distribution of alternative performance. The average normalized values are calculated using (3) and presented in Table 3.

Table 3. Average Value Result of the MPSI Weighting

	C1	C2	C3	C4	C5	C6
Average Value	0.7500	0.7500	0.9451	0.9407	0.9330	0.9396

The fourth stage determines the variation of each criterion by evaluating the deviations of the normalized values from their corresponding average normalized values. This stage identifies the degree of variation associated with each criterion and provides the basis for determining its relative preference. The preference variation values are calculated using (4), with the resulting values presented in Table 4.

Table 4. Variation Result of the MPSI Weighting

	C1	C2	C3	C4	C5	C6
Variation Value	0.2500	0.1528	0.0118	0.0098	0.0098	0.0123

The final stage determines the weight of each criterion by normalizing the calculated preference variation values across all criteria. The resulting weights represent the relative importance of each criterion in the decision-making process, where a higher weight indicates a greater contribution to the overall evaluation. The final criterion weights are calculated using (5) and presented in Table 5, with the total weight equal to one.

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Table 5. Criteria Weights Result of the MPSI Weighting

	C1	C2	C3	C4	C5	C6
Criteria Weights	0.5600	0.3422	0.0265	0.0219	0.0219	0.0275

The MPSI weighting results presented in Table 1 show that C1 has the highest weight at 0.5600, indicating that this criterion has the greatest relative importance in the evaluation process. C2 follows with a weight of 0.3422, also contributing substantially to the overall decision. In contrast, C3 obtains a weight of 0.0265, while C6 has a slightly higher weight of 0.0275. Meanwhile, C4 and C5 each receive a weight of 0.0219, indicating relatively limited influence compared with C1 and C2. Collectively, C1 and C2 account for 90.22% of the total weighting, demonstrating that the MPSI results strongly concentrate decision importance on these two criteria, whereas the remaining four criteria collectively contribute only 9.78%. This distribution suggests that C1 and C2 are the dominant factors in the subsequent candidate evaluation, while C3–C6 provide supporting contributions to the final ranking.

3.3. Ranking Alternatives using the OPARA Method

The OPARA method is applied to rank job candidates based on their performance across the six evaluation criteria and the criterion weights obtained from the MPSI method. The ranking process evaluates the relative performance of candidates through pairwise adjusted ratios for each criterion, allowing the performance differences between candidates to be systematically incorporated into the assessment. The resulting pairwise values are subsequently aggregated across all criteria by considering their respective MPSI weights. The aggregated values are then used to calculate the final score of each candidate, which serves as the basis for determining the ranking order. Candidates with higher final scores are considered more preferable because they demonstrate stronger overall performance across the evaluated criteria. Through this process, OPARA transforms the weighted performance relationships among candidates into a final priority order for the job selection decision.

The first stage of the OPARA method is the construction of a decision matrix containing the performance scores of each candidate across all considered criteria. The matrix provides the initial performance information required to compare candidates throughout the ranking process. The decision matrix is constructed using (1), with the candidate performance data presented in Table 1.

The second stage determines the range-based pairwise adjusted ratio by comparing the performance of candidates according to the range of values observed for each criterion. This process establishes the relative differences between candidates while considering the distribution of criterion values. The calculation is performed using (6) and (7), with the resulting pairwise adjusted ratios presented in Table 3.

Table 6. Pairwise Adjusted Ratio Result of the OPARA Method

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Candidate Name	C1	C2	C3	C4	C5	C6
Candidate ASF	1.0000	0.9707	0.9804	1.0477	0.9093	1.0992
Candidate RDH	1.0320	1.0000	1.0163	1.0749	0.9386	1.1312
Candidate GTB	1.0315	1.0054	1.0000	1.0968	0.9366	1.1427
Candidate SYR	0.9761	0.9417	0.9730	1.0000	0.8894	1.0605
Candidate IMS	1.1008	1.0688	1.0777	1.1558	1.0000	1.2120
Candidate ABT	0.9156	0.8863	0.9051	0.9485	0.8340	1.0000

The third stage applies a linear adjustment to the pairwise ratios obtained in the previous stage. This adjustment transforms the pairwise relationships into a more consistent scale while preserving the relative performance differences among candidates. The calculation is performed using (8), with the resulting values presented in Table 7.

Table 7. Linier Adjusted Ratio Result of the OPARA Method

Candidate Name	C1	C2	C3	C4	C5	C6
Candidate ASF	1.0000	0.9813	0.9856	1.0276	0.9411	1.0611
Candidate RDH	1.0198	1.0000	1.0068	1.0454	0.9598	1.0809
Candidate GTB	1.0191	1.0017	1.0000	1.0534	0.9586	1.0847
Candidate SYR	0.9817	0.9610	0.9738	1.0000	0.9246	1.0371
Candidate IMS	1.0629	1.0431	1.0470	1.0930	1.0000	1.1285
Candidate ABT	0.9447	0.9260	0.9340	0.9665	0.8895	1.0000

The fourth stage aggregates the adjusted pairwise ratios across all criteria to obtain a comprehensive representation of each candidate's relative performance. The aggregation incorporates the importance of the criteria through the weights obtained from the MPSI method, allowing more influential criteria to contribute proportionally to the evaluation. The aggregation is performed using (9), with the results presented in Table 8.

Table 8. Aggregates Adjusted Ratio Result of the OPARA Method

Candidate Name	C1	C2	C3	C4	C5	C6
Candidate ASF	1.0000	0.9760	0.9830	1.0376	0.9252	1.0802
Candidate RDH	1.0259	1.0000	1.0116	1.0602	0.9492	1.1060
Candidate GTB	1.0253	1.0036	1.0000	1.0751	0.9476	1.1137
Candidate SYR	0.9789	0.9514	0.9734	1.0000	0.9070	1.0488
Candidate IMS	1.0818	1.0560	1.0624	1.1244	1.0000	1.1702
Candidate ABT	0.9301	0.9062	0.9196	0.9575	0.8618	1.0000

The final stage calculates the overall score of each candidate based on the aggregated pairwise adjusted ratios. These scores represent the overall preference of each candidate and are used to establish the final ranking, where candidates with more favorable scores receive higher positions in the ranking order. The final scores are calculated using (10), with the resulting candidate scores and rankings presented in Table 9.

Table 9. Overall Score Result of the OPARA Method

Candidate Name	Final Score
Candidate ASF	0.1656
Candidate RDH	0.1697
Candidate GTB	0.1700

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Candidate SYR	0.1617
Candidate IMS	0.1792
Candidate ABT	0.1538

The overall results obtained from the OPARA method provide the basis for determining the priority order of the evaluated job candidates. The final scores represent the relative performance of each candidate after considering the established criteria and their corresponding weights obtained from the MPSI method. Based on these results, the candidates are subsequently arranged according to their overall level of preference, where a higher final score indicates a more favorable position in the selection process. The resulting ranking provides a systematic representation of candidate priorities and facilitates the identification of the most suitable candidates for the recruitment decision. The complete ranking results obtained from the OPARA method are presented visually in Figure 2.

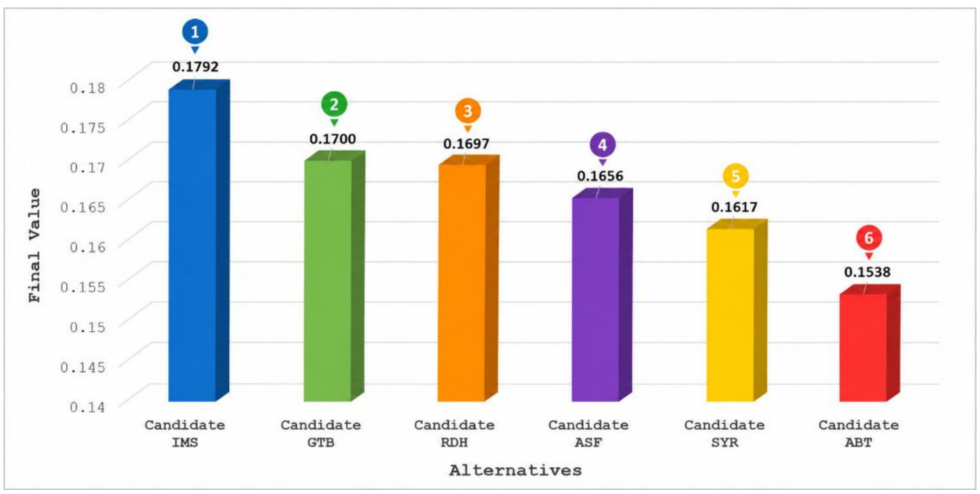

Figure 2. Ranking Alternatives using the OPARA Method

The OPARA method produces a clear ranking for candidates based on their final scores shown in Figure 2. The ranking places the IMS Candidate in first place with a final score of 0.1792, followed by the GTB Candidate in second place with a score of 0.1700, and the RDH Candidate in third place with a score of 0.1697. The ASF Candidate is in fourth place with a score of 0.1656, while the SYR Candidate ranks fifth with a score of 0.1617. Finally, the ABT Candidate comes in sixth with a final score of 0.1538. This ranking shows the relative differences in candidate performance after the criteria weights obtained through MPSI are included in the OPARA evaluation, thus providing a clear order of priority for the job candidate selection process.

3.4. Ranking Comparison with the MCDM Method

Ranking comparison with MCDM methods is an evaluation process that compares the alternative priority orders produced by the proposed method with those generated by other established multi-criteria decision-making

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methods[24]–[26]. The comparison is conducted using the same alternatives, criteria, decision matrix, and criterion weights to ensure that differences in ranking primarily reflect the characteristics of each ranking method. This approach provides a basis for examining the consistency and reliability of the resulting alternative rankings. The purpose of ranking comparison is to assess the consistency, robustness, and reliability of the proposed MPSI-OPARA approach by identifying similarities and differences in ranking results across different MCDM methods. Consistent rankings indicate that the resulting alternative priorities are relatively stable despite differences in the calculation mechanisms of the methods, while variations in ranking positions can reveal the sensitivity of alternatives to different ranking procedures. The comparison therefore helps demonstrate the practical reliability of the proposed approach in supporting multi-criteria decision-making.

To evaluate the consistency of the proposed MPSI-OPARA approach, the resulting candidate ranking is compared with rankings generated by four established Multi-Criteria Decision-Making (MCDM) methods, namely Simple Additive Weighting (SAW), Simple Multi-Attribute Rating Technique (SMART), Weighted Aggregated Sum Product Assessment (WASPAS), and Multi-Objective Optimization on the Basis of Ratio Analysis (MOORA). The comparison aims to examine whether the proposed approach produces a ranking pattern that is consistent with these commonly applied MCDM methods. The same decision matrix and MPSI-derived criterion weights are used as the basis for all comparative methods to maintain a consistent evaluation framework. The resulting rankings are then compared based on the position of each candidate across the methods, allowing similarities and differences in ranking outcomes to be identified. A high level of agreement indicates that the candidate priorities are relatively stable, whereas differences in ranking positions may reflect the distinct normalization and aggregation mechanisms employed by each method. The comparative ranking results are presented in Figure 3.

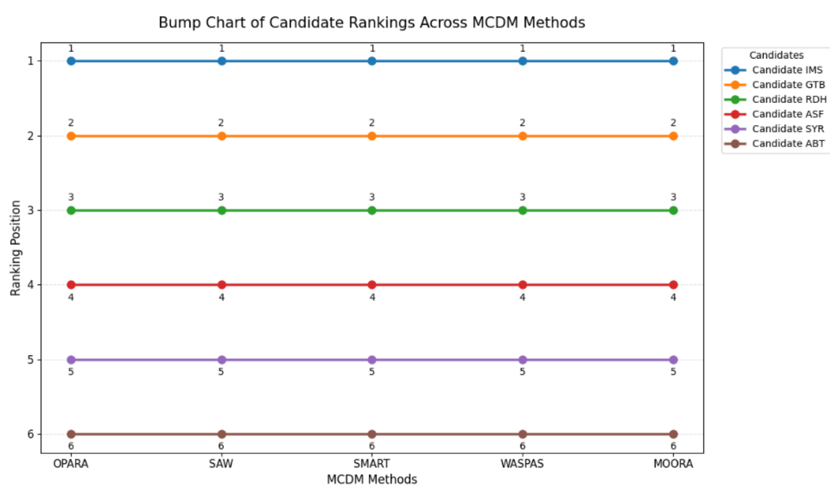

Figure 3. Comparison Results of Alternative Rankings

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The ranking comparison demonstrates complete consistency among the OPARA, SAW, SMART, WASPAS, and MOORA methods. All five methods produce identical ranking positions for the evaluated candidates, with no changes in position across the compared methods. This consistency indicates that the candidate priorities remain stable regardless of the ranking technique applied. The absence of ranking shifts also suggests that the differences in calculation mechanisms among the MCDM methods do not substantially affect the final ordering of alternatives in this case study. Therefore, the results provide strong evidence of the ranking stability and consistency of the proposed MPSI-OPARA approach when compared with established MCDM methods.

3.5. Discussion

The MPSI weighting results provide an important insight into the relative importance of the criteria in job candidate selection. Educational background (C1) obtains the highest weight of 0.5600, followed by work experience (C2) with a weight of 0.3422. Together, these two criteria accounts for 90.22% of the total criterion weight, while technical competence, communication skills, problem-solving ability, and interview performance collectively contribute only 9.78%. This substantial concentration of weight is primarily associated with the variation observed in the normalized candidate performance data. The variation values for C1 and C2 are 0.2500 and 0.1528, respectively, which are considerably higher than those of C3–C6, whose values range from 0.0098 to 0.0123. From the MPSI perspective, this indicates that educational background and work experience provide greater discriminatory information for distinguishing candidates in the evaluated dataset. The result does not necessarily imply that the other criteria are unimportant in recruitment, but rather that their observed performance differences among the six candidates are relatively limited. Consequently, the MPSI weights reflect the characteristics of the available data and indicate that candidate differentiation in this particular case is dominated by educational background and work experience.

The practical implication of these findings is that the proposed MPSI-OPARA framework can support recruiters in establishing candidate priorities through a transparent and data-driven evaluation process. The OPARA results identify Candidate IMS as the first-ranked alternative with a final score of 0.1792, followed by Candidate GTB with 0.1700 and Candidate RDH with 0.1697. The high position of IMS is consistent with its strong performance in educational background and work experience, which are the two criteria receiving the largest weights, while the candidate also demonstrates strong performance across the remaining criteria. The ranking therefore illustrates how the interaction between objective criterion importance and pairwise performance comparison can produce a differentiated candidate priority order. The practical value of the framework is particularly relevant when recruitment teams must evaluate several candidates using heterogeneous assessment criteria, as it provides an explicit computational basis for identifying which

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characteristics contribute most to candidate differentiation. Moreover, the identical ranking produced by OPARA, SAW, SMART, WASPAS, and MOORA strengthens confidence in the obtained priorities because the same ordering is maintained despite differences in the underlying ranking mechanisms. This consistency suggests that IMS, GTB, and RDH can be prioritized as the first three candidates within the evaluated decision context, while the remaining candidates occupy lower positions according to their overall performance.

Despite these findings, several limitations should be considered when interpreting the results. First, the analysis is based on only six candidates and six evaluation criteria, meaning that the resulting weight distribution is strongly dependent on the characteristics of this particular dataset. The dominant weights assigned to educational background and work experience may therefore change when a larger and more diverse candidate population is evaluated. Second, the assessment data are represented using predefined numerical scores, which may not fully capture qualitative aspects of recruitment such as interpersonal behavior, organizational fit, leadership potential, motivation, or communication dynamics. Third, the objective nature of MPSI means that the resulting weights are derived from performance variation in the dataset rather than from organizational priorities. Consequently, a criterion with low variation can receive a relatively small weight even when recruiters consider it strategically important. In addition, although the proposed framework demonstrates consistent ranking with four established MCDM methods, the comparison does not by itself establish that one method is universally superior, since the ranking agreement may be influenced by the characteristics of the dataset and the use of identical criterion weights. These limitations indicate that the findings should be interpreted primarily within the scope of the evaluated recruitment case.

Future research can extend the MPSI–OPARA framework by applying it to larger datasets involving more candidates, job positions, organizations, and evaluation criteria to examine its generalizability across different recruitment contexts. Future studies may also incorporate additional criteria such as organizational fit, leadership ability, adaptability, teamwork, career potential, salary expectations, and behavioral assessment to provide a more comprehensive representation of candidate suitability. Since recruitment assessments may contain linguistic judgments, incomplete information, or uncertainty, integrating MPSI–OPARA with fuzzy, grey, interval, or probabilistic approaches could provide greater flexibility in handling imprecise evaluation data. Comparative research can also examine the proposed framework against a broader range of objective weighting and ranking methods using statistical rank correlation, sensitivity analysis, and robustness measures. Furthermore, machine learning techniques could be explored to identify patterns in historical recruitment data and complement the MCDM-based ranking process with predictive candidate performance analysis. Such extensions would allow the proposed framework

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to move beyond a static candidate ranking and support more adaptive, comprehensive, and evidence-based recruitment decision-making.

IV. Conclusion

The proposed Hybrid Modification Preference Selection Index with Optimized Pairwise Ratio Analysis (MPSI–OPARA) provides an integrated approach for multi-criteria job candidate selection by combining objective criterion weighting with systematic alternative ranking. The MPSI results demonstrate that C1 and C2 are the dominant criteria, collectively contributing 90.22% of the total criterion weight, while the remaining criteria provide supporting contributions to the evaluation. The subsequent application of OPARA successfully transforms the weighted candidate performance into a clear priority order, with the resulting scores distinguishing the relative suitability of the six evaluated candidates. Furthermore, the comparison with SAW, SMART, WASPAS, and MOORA produces identical ranking positions across all candidates, demonstrating a high degree of ranking consistency and stability. These findings indicate that the MPSI–OPARA framework can provide a systematic, transparent, and consistent mechanism for addressing multi-criteria job candidate selection, particularly when objective criterion weighting and reliable alternative ranking are required.

CRediT Authorship Contribution Statement

Tri Widodo: Writing – review & editing, Writing – original draft, Validation, Methodology, Conceptualization. **Dedi Darwis:** Writing – original draft, Formal analysis, Conceptualization. **Shaban Nassor:** Writing – original draft, Software, Investigation.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Data Availability

The data used to support the findings of this study are available from the corresponding author upon request.

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Declaration of Generative AI and AI-assisted Technologies in The Writing Process

The authors used Generative AI to improve the writing clarity of this paper. They reviewed and edited the AI-assisted content and take full responsibility for the final publication.

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