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Decision Support System for Job Applicant Recommendation Using ROC and ORESTE Methods

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Abstract

This study developed a Decision Support System (DSS) to assist the employee selection process for an agricultural company located in North Sumatra by utilizing a combination of the Rank Order Centroid (ROC) and ORESTE methods. The system was designed to address the limitations of the manual selection process, which had been time-consuming and inefficient. The ROC method was used to objectively determine the weights of each selection criterion, while the ORESTE method was applied to rank candidates based on their closeness to the company's ideal profile. The study evaluated ten candidates based on key aspects such as educational background, competencies, work experience, and completeness of documents. The testing results demonstrated that the system was capable of producing accurate rankings consistent with manual calculations and was able to reduce the selection time from approximately two months to just a few minutes. The implementation of this system improved the objectivity and efficiency of the selection process while minimizing the risk of subjectivity in recruitment decision-making.

Keywords: Decision Support System, ROC, ORESTE, Employee Selection, Candidate Ranking

1. INTRODUCTION

The development of information technology had brought significant impacts across various aspects of life, including the industrial sector and human resource management. One important area affected by this advancement was the recruitment process [1]. Previously conducted manually, the recruitment process had begun to transition to digital-based systems in order to enhance efficiency and accuracy. The utilization of technology, such as Decision Support Systems (DSS), had become an alternative solution to assist companies in selecting the best candidates based on predetermined criteria [2][3]. With the implementation of DSS, decision-making in employee selection became not only faster but also more objective and systematic[4].

However, various issues were still found in practice, as seen in a case experienced by a palm oil plantation company, specifically engaged in crude palm oil (CPO)

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production in North Sumatra. The recruitment process in the company was still conducted manually using spreadsheet applications such as Microsoft Excel, resulting in a selection process that could take up to two months. Additionally, the absence of a centralized system caused applicant data to be scattered, at risk of being lost, and difficult to manage. The selection process was also considered less objective as it focused solely on basic aspects such as education and work experience, without an in-depth analysis of candidate compatibility with company needs. Consequently, the company often recruited employees who were not well-suited for the positions, which negatively affected team productivity and overall work effectiveness.

To address these issues, this study designed and implemented a Decision Support System (DSS) using a combination of the Rank Order Centroid (ROC) and ORESTE methods. The ROC method was employed to determine the weight of each selection criterion based on the company's priorities[5][6], while the ORESTE method was used to rank candidates based on the weighted criteria[7][8]. This approach was expected to improve the efficiency and accuracy of the employee selection process, minimize subjectivity, and assist the company in making better-informed decisions in selecting suitable candidates.

Previous studies had extensively explored the application of various methods within Decision Support Systems (DSS) to support selection processes, both in the context of employee recruitment and other domains. One such study employed a combination of the ARAS and Weighted Product (WP) methods to enhance objectivity in the employee selection process, highlighting that subjectivity and the absence of standardized evaluation criteria were the main issues in traditional recruitment methods[9]. Another study implemented a combination of the Rank Order Centroid (ROC) and MOORA methods in employee recruitment, which successfully addressed problems related to delays and inaccuracies caused by manual evaluation systems[5]. Meanwhile, research that applied a combination of ROC and ORESTE methods was conducted in the context of scholarship selection for outstanding students, rather than in the recruitment process[10]. This indicated that although the ROC and ORESTE methods had been effectively utilized in other contexts, their application in employee recruitment systems remained limited and warranted further investigation.

Furthermore, there had been applications of ROC and ORESTE methods in entirely different domains, such as in a study on a web-based medicinal plant recommendation system. That study demonstrated that the ROC–ORESTE combination could be used to rank alternatives based on multiple criteria, although its context was plant selection, not human resource selection.

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This research developed a Decision Support System (DSS) for the selection of job applicants in a private company using a combination of the ROC (Rank Order Centroid) and ORESTE methods. The ROC method was used to assign weights to each selection criterion based on the priority order determined by the company[11], while the ORESTE method was employed to rank the candidates according to their scores in each weighted criterion[12]. The main objective of this research was to enhance objectivity, efficiency, and accuracy in the employee selection process. The system developed was intended to support management in making precise and measurable decisions in choosing the best candidates, aligned with the company's needs and priorities.

2. METHODS

2.1. Research Methods

This research employed a quantitative approach, which focused on the collection and analysis of numerical data to measure and evaluate variables related to the employee selection process. This approach allowed for the integration of numerical data from the ROC (Rank Order Centroid) and ORESTE (Organization, Rangement Et Synthèse de Données Relationnelles) methods with qualitative insights obtained through interviews and field observations. The quantitative method was used to assess objective criteria in the selection of job applicants, where the collected data were statistically analyzed to provide an accurate overview of candidate suitability based on predefined criteria[13][14]. Through this approach, the research aimed to produce data-driven and objective recommendations in the selection process, while also offering concrete insights into the effectiveness of the information system in supporting decision-making at PT. Saudara Sejati Luhur Asian Agri.

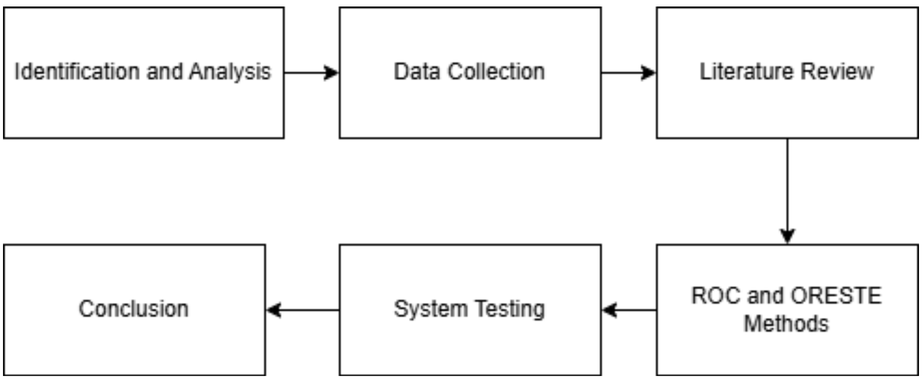

Figure 1. Research Flowchart

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As illustrated in Figure 1, the research followed a systematic process, beginning with problem analysis, where the researcher identified and formulated the research issue. This was followed by the collection of relevant preliminary data, and a literature and library study to understand the context and existing related studies. Based on this understanding, the researcher determined the most appropriate method to answer the research questions. The chosen method was then implemented in the method application or system design phase, where data were collected and analyzed. The results of this stage were then tested to validate the findings and ensure their accuracy. Finally, the research concluded with drawing conclusions and providing recommendations based on the obtained results, addressing the initial research questions and offering potential directions for future research[15]. This process ensured a structured and scientific approach, where each step was based on the previous one and contributed to a comprehensive and reliable final outcome.

2.2. System Development Method

In the database development process, MySQL was used. To meet the system requirements, the researcher utilized the PHP programming language with the Bootstrap framework. The research adopted the Waterfall development method, a traditional software development approach that proposed a systematic and sequential process for building software[16]. The stages of the research were as follows:

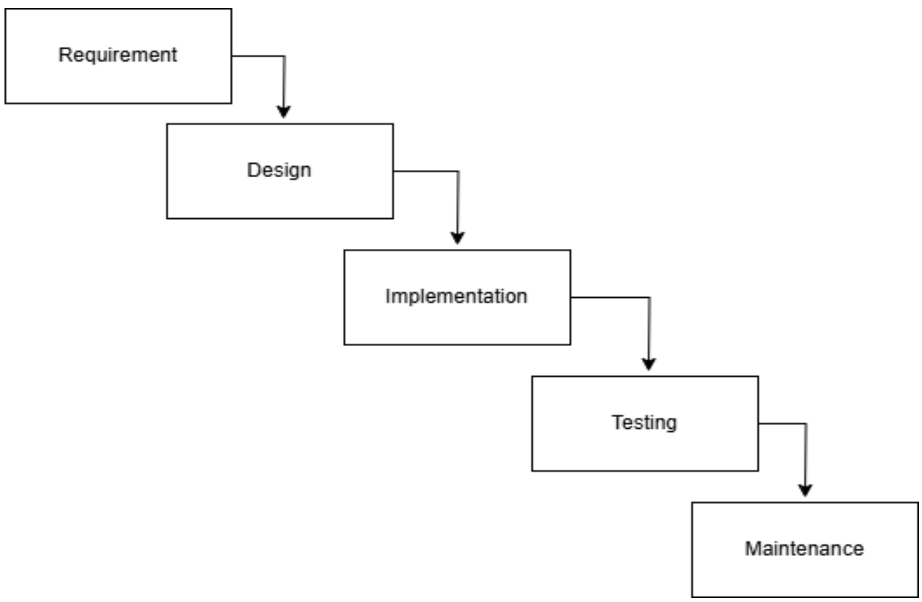

Figure 2. Waterfall Method[17]

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The image above illustrated the Waterfall model, which is a linear and sequential software development method. The process began with the Requirement phase, where all system requirements were gathered and analyzed. It then proceeded to the Design phase, during which the system architecture was created based on the identified requirements. Afterward, in the Implementation phase, the program was coded according to the design specifications[18]. The resulting implementation was then tested during the Testing phase to ensure that the system functioned as expected. Once testing was successful, the system moved into the Maintenance phase, where bugs were fixed and necessary updates were made. This model emphasized that each phase had to be completed before moving on to the next[19].

2.3. ROC and ORESTE Methods

The ROC (Rank Order Centroid) and ORESTE (Organizational, Rangement Et Synthèse De Données Relatives à l'Evaluation) methods were two multi-criteria decision-making techniques used in this study. These methods were applied to determine the ranking and provide recommendations for job applicants based on several predefined criteria[12], the process as shown in Figure 3.

The selection criteria for prospective employees were established and validated through direct discussions with the company's decision-maker, namely the Administrative Officer. The Administrative Officer had a comprehensive understanding of the company's needs in terms of qualifications and competencies required from prospective candidates, and thus played a significant role in formulating and approving the criteria used.

Administrative Officer stated that an ideal candidate should possess an appropriate educational background, strong academic performance, relevant competency certifications, sufficient work experience, as well as demonstrate good work ethics and strong teamwork abilities. In addition, the Administrative Officer emphasized the importance of supplementary skills such as software proficiency, communication skills, and the completeness of supporting documents, including a health certificate and curriculum vitae (CV).

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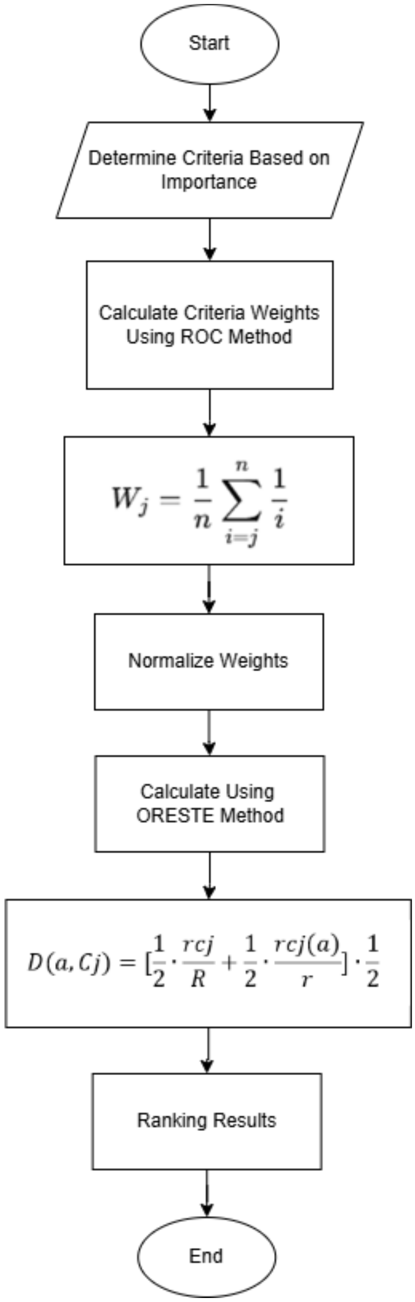

Figure 3. Calculation Flow

These criteria were then formulated into sub-criteria and quantitative scoring scales to be applied in the decision-making calculations. The validation process was

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carried out by obtaining final approval from the Administrative Officer on the list of criteria and their assigned priority weights, which were subsequently used in the ROC and ORESTE methods. This ensured that the developed system aligned accurately with the company's requirements and expectations.

1) ROC Method (Rank Order Centroid)
   ROC is a simple method for determining the weights of several criteria ranked according to their importance. This method assumes that the higher the rank of a criterion, the smaller its weight[20].
   a) Rank according to importance: First, all criteria are ranked based on their level of importance, from the most important to the least important.
   b) Calculate the weight using the Rank Order Centroid formula.

$$W_j = \frac{1}{n}\sum_{i=j}^{n}\frac{1}{i} \quad (1)$$

   After the criteria are ranked, the weight for each criterion is calculated using the following formula:
   Where:
   Wj = Weight for the j-th criterion
   n = Total number of criteria
   i = The rank of the criterion from j to n
   c) Weight normalization
   If necessary, the obtained weights can be normalized so that the total sum of the weights equals 1.

2) ORESTE Method
   ORESTE is one of the methods developed from various other approaches in decision support systems, particularly in the category of Multi-Attribute Decision Making (MADM) methods. The uniqueness of this method lies in the application of Besson Rank, which is an approach used to determine the priority scale of each criterion indicator. In the ranking process, if values are available for each criterion, the average is used as the basis for ordering.

   Multi-Attribute Decision Making (MADM) is a method used in the decision-making process by considering multiple criteria. This process typically involves subjective evaluation of the available options and is more suitable for situations with a limited number of alternatives that do not require complex mathematical analysis. One of the steps in using the ORESTE method to determine rankings is as follows[21].
   a) The value of each alternative is converted into an ordinal form using the Besson Rank approach. If there are equal values, an

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average ranking is used. The data is then sorted from the highest to the lowest value. The alternative with the highest value for a given criterion is assigned rank 1, and the subsequent ranks are assigned based on the order of the following values[22].

b) Calculate the Distance Score by comparing each pair of alternatives and criteria as a measure of the "distance" from the ideal condition, which is the position occupied by the best alternative on the most important criterion[23]. This value is obtained from the average of the Besson Rank of the criterion and the Besson Rank of the alternative within that criterion, calculated using formula as shown in Equation 2.

$$D(a, Cj) = \left[\frac{1}{2} \cdot \frac{rcj}{R} + \frac{1}{2} \cdot \frac{rcj(a)}{r}\right] \cdot \frac{1}{2} \quad (2)$$

Explanation:
D(a, Cj) : Distance Score value
rcj : Besson Rank for the j-th criterion
rcj(a) : Besson Rank of alternative *a* on criterion *j*
R : Coefficient (typically uses the default value of 3)

3. RESULTS AND DISCUSSION

3.1. Observation Analysis

Based on the results of observations and interviews conducted with the administrative department, data were obtained from several job applicants who were used as research samples. The researcher selected 25 samples to be used in the research calculations using the ROC and ORESTE methods. The issue identified in the employee selection process was that it was still conducted manually, which caused the process to take up to two months to complete. Therefore, this study aimed to provide a solution by conducting a criteria-based evaluation of the 25 applicant samples in order to determine the most eligible candidates for acceptance. For the purpose of manual calculation analysis, the researcher used data from 10 job applicants as the primary sample, as presented in the table.

Table 1. Primary data

No.	Applicant Name	Age	Gender
1	Kristian Ricardo Sitorus	23 years	Male
2	Suryadi	25 years	Male
3	Abdul Sandi	23 years	Male
4	Tri Wahyuda	25 years	Male
5	Erpan	23 years	Male
…	…	…	…

No.	Applicant Name	Age	Gender
6	Ade Wardana	23 years	Male
7	Yoga Pranata	22 years	Male
8	Darmansyah Dalimunthe	23 years	Male
9	Reza Ali Afriansyah Harahap	24 years	Male
10	Arif Wahyudi	22 years	Male
….	Saufi Hardy Sinambela	21 years	Male

3.2. Implementation of ROC and ORESTE Methods

Based on the research analysis, it was found that the calculations using the ROC and ORESTE methods were carried out through several computational steps. These calculations were intended as a solution to the previously identified problem. The Rank Order Centroid (ROC) method was used to calculate the weight of each criterion in the selection process. The sample data of job applicants were used as alternative data to determine the selection of job candidates.

$$W_1 = \frac{1 + \frac{1}{2} + \frac{1}{3} + \frac{1}{4} + \frac{1}{5}}{5} = 0{,}457$$

$$W_2 = \frac{0 + \frac{1}{2} + \frac{1}{3} + \frac{1}{4} + \frac{1}{5}}{5} = 0{,}257$$

$$W_3 = \frac{0 + 0 + \frac{1}{3} + \frac{1}{4} + \frac{1}{5}}{5} = 0{,}157$$

$$W_4 = \frac{0 + 0 + 0 + \frac{1}{4} + \frac{1}{5}}{5} = 0{,}090$$

$$W_5 = \frac{0 + 0 + 0 + 0 + \frac{1}{5}}{5} = 0{,}040$$

The results of the weight calculations above are shown in the following table:

Table 2. Criteria weight

Criterion	Description	Weight
K1	Education and Certification	0.457
K2	Skills	0.257
K3	Experience, Personality, and Attitude	0.157
K4	Additional Factors	0.090
K5	Document Aspects	0.040

The first step in the calculation process was to convert the alternative data for each criterion into Besson Rank, calculate the Distance Score values, and then proceed

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with the computation of Preference values. The table above presented the criterion weights that were used in calculating the sample data using the ORESTE method. This calculation involved converting the alternative data for each criterion into Besson Rank. The complete calculation process was discussed in the following section.

Table 3. Besson Rank

Data Alternative	K1	K2	K3	K4	K5	K6	K7	K8
A1	1	5,5	4,5	9	4	3	3,5	6
A2	21,5	21,5	21,5	20	4	3	1	6
A3	21,5	21,5	4,5	2	23	18,5	3,5	6
A4	21,5	21,5	21,5	2	23	18,5	15,5	6
A5	13,5	12,5	13	20	4	3	15,5	6
A6	5,5	12,5	13	9	17,5	18,5	15,5	22,5
A7	13,5	12,5	13	9	4	8,5	15,5	22,5
A8	5,5	12,5	4,5	9	11	8,5	15,5	6
A9	5,5	12,5	21,5	20	23	3	3,5	15,5
A10	5,5	12,5	4,5	2	4	8,5	3,5	15,5

The Besson Rank was a multi-criteria decision-making approach that operated by converting the values of each alternative for every criterion into a ranked format. In its application to the "Alternative Data 2" table, ten alternatives (A1 to A10) were evaluated based on ten criteria (K1 to K10). Each value within the respective criteria was sorted and ranked, taking into account whether the criterion was categorized as a benefit or a cost. For benefit criteria, higher values were assigned better ranks, whereas for cost criteria, lower values received better ranks.

Once all the values were converted into ranks, the ranking results were summed for each alternative. The alternative with the lowest total rank was considered the most optimal, as it demonstrated consistently strong performance across various criteria. Before proceeding to the next stage of calculation, it was essential to first identify the type of each criterion whether it was a benefit or a cost.

Table 4. Distance score value

	K1	K2	K3	K4	K5	K6	K7	K8
A1	0,629961	2,755499	2,258201	4,502057	2,080084	1,635533	2,059415	3,120126
A2	10,75036	10,75036	10,75036	10,00042	2,080084	1,635533	1,518294	3,120126
A3	10,75036	10,75036	2,258201	1,040042	11,50252	9,253894	2,059415	3,120126
A4	10,75036	10,75036	10,75036	1,040042	11,50252	9,253894	7,768685	3,120126
A5	6,750914	6,251066	6,500986	10,00042	2,080084	1,635533	7,768685	3,120126
A6	2,755499	6,251066	6,500986	4,502057	8,754352	9,253894	7,768685	11,25888
A7	6,750914	6,251066	6,500986	4,502057	2,080084	4,268375	7,768685	11,25888
A8	2,755499	6,251066	2,258201	4,502057	5,510997	4,268375	7,768685	3,120126
A9	2,755499	6,251066	10,75036	10,00042	11,50252	1,635533	2,059415	7,768685
A10	2,755499	6,251066	2,258201	1,040042	2,080084	4,268375	2,059415	7,768685

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The table above presented the calculated distance scores for ten alternatives (A1 to A10) based on ten criteria (K1 to K10) in a multi-criteria decision-making process using the ORESTE method. The values in the table indicated the distance between each alternative and a predefined ideal or reference profile. The smaller the distance score of an alternative for a given criterion, the closer the alternative was to the optimal condition. Therefore, these values played a crucial role in determining the final preferences and rankings of each alternative. This process assisted decision-makers in objectively evaluating the performance of each alternative based on its proximity to the ideal values across all applied criteria.

Table 5. Preference value

	K1	K2	K3	K4	K5	K6	K7	K8
A1	0,629961	2,755499	2,258201	4,502057	2,080084	1,635533	2,059415	3,120126
A2	10,75036	10,75036	10,75036	10,00042	2,080084	1,635533	1,518294	3,120126
A3	10,75036	10,75036	2,258201	1,040042	11,50252	9,253894	2,059415	3,120126
A4	10,75036	10,75036	10,75036	1,040042	11,50252	9,253894	7,768685	3,120126
A5	6,750914	6,251066	6,500986	10,00042	2,080084	1,635533	7,768685	3,120126
A6	2,755499	6,251066	6,500986	4,502057	8,754352	9,253894	7,768685	11,25888
A7	6,750914	6,251066	6,500986	4,502057	2,080084	4,268375	7,768685	11,25888
A8	2,755499	6,251066	2,258201	4,502057	5,510997	4,268375	7,768685	3,120126
A9	2,755499	6,251066	10,75036	10,00042	11,50252	1,635533	2,059415	7,768685
A10	2,755499	6,251066	2,258201	1,040042	2,080084	4,268375	2,059415	7,768685

The table above shows the preference values of ten alternatives (A1–A10) across eight criteria (K1–K8) based on the ORESTE method. These values are derived from the distance scores and reflect each alternative's closeness to the ideal profile. The higher the value, the greater its contribution to the overall evaluation and the higher the ranking of that alternative.

Table 6. The final result

Alternative	Nama	Nilai	Ranking
A1	Kristian Ricardo Sitorus	9.5343	1
A2	Arif Wahyudi	11,66569	2
A3	Darmansyah Dalimunte	15,08426	3
A4	Noni Soraya	16,75279	4
A5	Benny Arisandi	17,71822	5
A6	Wahyudi Panjaitan	18,02161	6
A7	Ardianto	18,51068	7
A8	Yoga Pranata	19,39856	8
A9	Erpan	19,95761	9
A10	Ali Rido Marpaung	20,89048	10

Based on the manual calculations that had been conducted, referring to Table 6 above which showed the ranking results of ten alternatives based on preference values, lower values indicated better performance. Kristian Ricardo Sitorus achieved the lowest score of 9.5343, securing first place and thus becoming the

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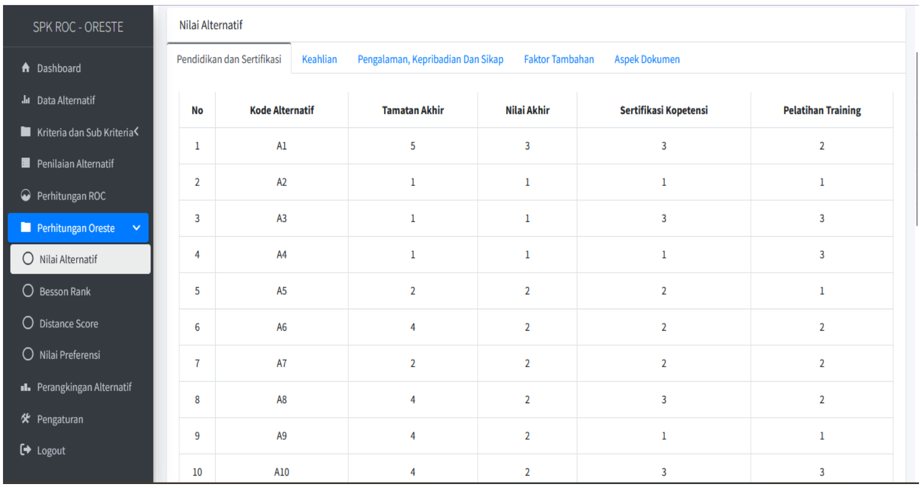
most optimal choice. This table served as a reference for determining the best alternative.

3.3. System Implementation

After completing the manual calculations, the next step was to implement the calculation results into a system that had been developed using PHP and HTML programming languages with the Laravel framework and a MySQL database. This system was created to address the problems identified regarding the recruitment process at the company, which was still conducted manually and took up to two months to complete. Additionally, the absence of a centralized system posed risks of data loss and made management difficult. The selection process was also considered insufficiently objective due to the lack of in-depth criteria analysis related to the suitability of candidates for the company's needs. As a result, the company often hired employees who were less suitable, which negatively impacted work effectiveness and team productivity. The implementation of the developed system aimed to ensure that the system functioned properly and that the calculation accuracy corresponded with the results of the manual calculations previously conducted.



No	Kode Alternatif	Tamatan Akhir	Nilai Akhir	Sertifikasi Kopetensi	Pelatihan Training
1	A1	5	3	3	2
2	A2	1	1	1	1
3	A3	1	1	3	3
4	A4	1	1	1	3
5	A5	2	2	2	1
6	A6	4	2	2	2
7	A7	2	2	2	2
8	A8	4	2	3	2
9	A9	4	2	1	1
10	A10	4	2	3	3

Figure 4. Decision matrix

The Figure 4 shows the interface of a decision support system based on the ROC and ORESTE methods, which evaluates and ranks ten alternatives based on the "Education and Certification" criteria. The "Alternative Scores" table displays the scores for sub-criteria such as Final Education, Final Score, Competency

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Certification, and Training. This system assists users in conducting objective and systematic assessments in the selection process.

Peringkat dan Bobot Kriteria

Edit Peringkat

Nama Kriteria	Peringkat Kriteria	Bobot Kriteria
Pendidikan dan Sertifikasi	Peringkat 1	0.457
Keahlian	Peringkat 2	0.257
Pengalaman, Kepribadian Dan Sikap	Peringkat 3	0.157
Faktor Tambahan	Peringkat 4	0.090
Aspek Dokumen	Peringkat 5	0.040

Figure 5. Criteria weighting

The Figure 5 displays a table of rankings and weights for five criteria in a decision-making system based on the ROC method. These criteria include Education and Certification, Skills, Experience and Attitude, Additional Factors, and Document Aspects. Education and Certification has the highest weight (0.457), indicating its primary importance, while Document Aspects has the lowest weight (0.040). These weights are used to objectively assess the influence of each criterion in ranking the alternatives.

No	Kode Alternatif	Tamatan Akhir (K1)	Nilai Akhir (K2)	Sertifikasi Kopetensi (K3)	Pelatihan Training (K4)
1	A1	1	5.5	4.5	9
2	A2	21.5	21.5	21.5	20
3	A3	21.5	21.5	4.5	2
4	A4	21.5	21.5	21.5	2
5	A5	13.5	12.5	13	20
6	A6	5.5	12.5	13	9
7	A7	13.5	12.5	13	9
8	A8	5.5	12.5	4.5	9
9	A9	5.5	12.5	21.5	20
10	A10	5.5	12.5	4.5	2

Figure 6. Besson rank

The Figure 6 displays a table view from a decision support system using the ORESTE method, specifically at the Besson Rank determination stage. The table contains score data for ten alternatives (A1 to A10) based on four sub-criteria under the "Education and Certification" category: Final Education (K1), Final Score (K2), Competency Certification (K3), and Training (K4). Each alternative is assigned a numerical value according to its achievement in each sub-criterion, which will be used in further calculations to determine the final ranking. This

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information serves as the initial basis in the ORESTE analysis before being converted into preference values and used to determine the final selection outcome.

Figure 7. Distance score value

The Figure 7 shows the interface of a decision support system using the ORESTE method, displaying the Distance Score results for the "Education and Certification" category. The table presents the distance of each alternative (A1–A10) from the ideal profile based on four sub-criteria. These values serve as a reference for determining preferences and final rankings in the criteria-based selection process.

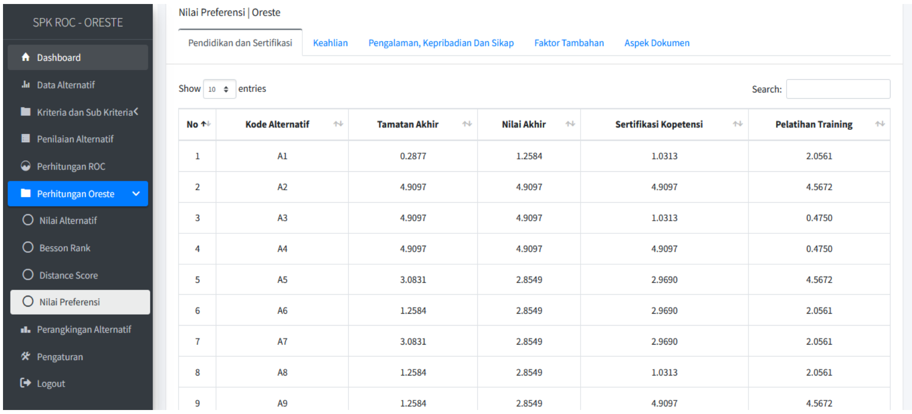

Figure 8. Preference values

The Figure 8 shows the final normalization results of the ORESTE method for the "Education and Certification" criteria. The table contains standardized values for alternatives A1 to A10 based on the sub-criteria of Final Education, Final Score, Competency Certification, and Training. This normalization aligns the measurement scales across criteria to facilitate objective and fair comparison of alternatives.

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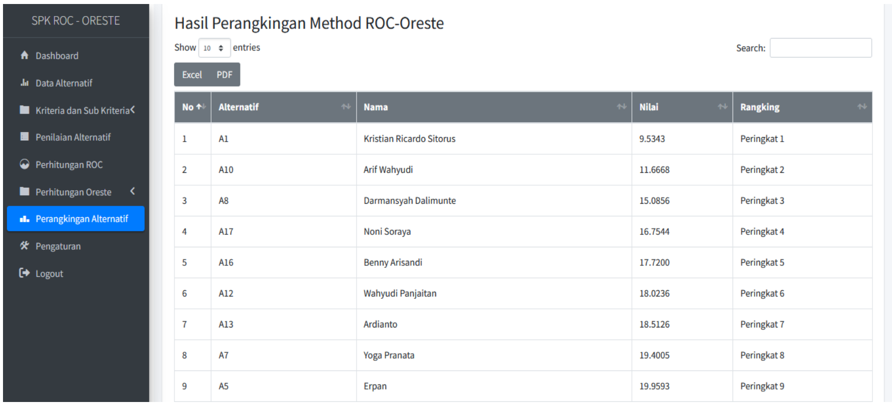

Figure 9. Final ranking results

The Figure 9 displayed the ranking results of alternatives using the ROC-Oreste method within a decision support system. The table on the "Alternative Ranking" page presented a list of alternatives (A1 to A5, A8, A10, A12, A13, A16, and A17), along with the corresponding individual names, computed values, and their final rankings. The alternative A1 (Kristian Ricardo Sitorus) obtained a score of 9.5343 and ranked 1st, while alternative A5 (Erpan) received a score of 19.9593 and was placed in the 9th position.

3.4. System Testing

After the system had been developed, the next step was to conduct testing on the system. The testing was carried out by the company, specifically by the department responsible for the recruitment process. The purpose of this testing was to ensure that all functions within the system operated as expected. The following table presents the list of tests that were conducted along with the results obtained.

Table 7. Blackbox Testing

No	Input/Output Design	Expected Outcome	Result
1	Login to the System	Displays the Login Page	√
2	Registration	Displays the Registration Page	√
3	View Dashboard Page	Displays the Dashboard Page	√
4	View Alternative Data Page	Displays the Alternative Data Page	√
5	View Add Alternative Feature	Displays the Add Alternative Feature Page	√
6	View Edit Alternative Feature	Displays the Edit Alternative Feature Page	√
7	View Criteria Data Page	Displays the Criteria Data Page	√
8	View Add Criteria Data Feature	Displays the Add Criteria Data Feature Page	√
9	View Edit Criteria Feature Page	Displays the Edit Criteria Feature Page	√
10	View Sub-Criteria Data Page	Displays the Sub-Criteria Data Page	√

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11	View Add Sub-Criteria Data Feature	Displays the Add Sub-Criteria Data Feature Page	√
12	View Edit Sub-Criteria Data Feature	Displays the Edit Sub-Criteria Data Feature Page	√
13	View Sub-Criteria Score Page	Displays the Sub-Criteria Score Page	√
14	View Add Criteria Score Feature	Displays the Add Criteria Score Feature Page	√
15	View Edit Criteria Score Feature	Displays the Edit Criteria Score Feature Page	√
16	View Alternative Evaluation Data Page	Displays the Alternative Evaluation Data Page	√
17	View Edit Alternative Evaluation Data Feature	Displays the Edit Alternative Evaluation Data Feature Page	√
18	View ROC Method Calculation Page	Displays the ROC Method Calculation Page	√
19	View Edit Ranking Feature Page	Displays the Edit Ranking Feature Page	√
20	View Printable Final Ranking Results Page	Displays the Final Ranking Results Page in PDF/Excel Format	√
21	View Accepted Applicants Limit Settings Page	Displays the Settings Page for Number of Accepted Applicants	√

Based on the results of the testing that had been conducted, the developed system functioned properly without any detected errors. Feedback provided by the company, specifically from the administrative department responsible for the recruitment process, indicated that the system could significantly assist in streamlining the recruitment process and ensuring an objective evaluation method. As a result, the selected candidates were more aligned with the company's needs. This also had a positive impact on both the job applicants and the company.

3.5. Discussion

The results of both manual calculations and system implementation clearly demonstrated the effectiveness of the developed decision support system in addressing the inefficiencies of the company's traditional recruitment process. Through a rigorous application of the ROC and ORESTE methods on the candidate data, it was established that alternative A1 (Kristian Ricardo Sitorus) achieved the highest preference score of 9.5343 and ranked first. This result was consistently reflected in both the manual analysis and the automated system, proving the reliability and accuracy of the system in identifying the most suitable candidate.

The system's successful replication of the manual ranking results highlighted its ability to overcome the primary challenges identified during the observation and interview phases—namely, the lengthy, manual evaluation process that previously took up to two months and was highly susceptible to human bias. By implementing the ROC method, the system objectively determined the weight of each criterion—such as Education and Certification (K1), Skills (K2), Experience and Attitude

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(K3), Additional Factors (K4), and Document Aspects (K5)—allowing the evaluation of candidates based on measurable, objective data rather than subjective judgment.

A significant advantage of the new system was its ability to process the data of more than 15 candidates within minutes, compared to the manual process, which required weeks or even months. This efficiency not only reduced the administrative burden but also enabled the recruitment team to focus more on strategic tasks, such as interviewing and onboarding the best candidates. Additionally, the system improved the accountability of recruitment decisions by maintaining a transparent calculation trail that could be reviewed and audited if needed.

The system's scalability was another critical strength, as it could be easily adapted for recruitment processes in other companies or applied across different departments requiring candidate evaluation based on multiple criteria. By converting candidate performance data into Besson Ranks and calculating Distance and Preference Scores, the system ensured that every decision was grounded in objective, data-driven analysis.

Moreover, the implementation of the system using modern technologies—including PHP, HTML, Laravel, and MySQL—ensured that the solution was not only reliable and accurate but also user-friendly for recruitment staff. The testing phase, as shown by the successful outcomes of all blackbox test scenarios, confirmed that the system was fully operational with all core features performing as expected. Features such as alternative data management, criteria weighting, sub-criteria scoring, preference calculations, and final ranking generation all functioned flawlessly.

Feedback from the company's administrative department, which was directly responsible for recruitment, further validated the system's positive impact. Staff reported that the new system significantly streamlined the selection process, increased the transparency and objectivity of candidate evaluations, and helped them better align new hires with organizational needs. This improvement also enhanced the company's reputation with job applicants, who appreciated the faster, clearer, and more objective recruitment process.

The combination of accurate manual calculations, robust system implementation, and thorough testing demonstrated that the developed decision support system effectively resolved the previous inefficiencies and subjectivity in the company's recruitment process. The integration of ROC and ORESTE methods provided a solid, scientifically validated foundation for multi-criteria decision-making, ensuring that the company could confidently select the most suitable candidates based on comprehensive, objective evaluations.

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4. CONCLUSION

This study set out to enhance objectivity, efficiency, and accuracy in the employee selection process. To achieve this, a Decision Support System (DSS) was developed for a private company, combining the ROC (Rank Order Centroid) and ORESTE methods. The ROC method effectively established the weights of each selection criterion based on company priorities, while the ORESTE method accurately ranked candidates using their performance scores across these criteria. The manual calculations performed using the ROC and ORESTE methods were consistent with the system's automated results, confirming the system's accuracy and reliability. Notably, the candidate Kristian Ricardo Sitorus achieved a preference score of 9.5343, securing the top rank. The system significantly accelerated the recruitment process, enabling management to identify and select the most suitable candidates quickly and objectively, thereby aligning hiring decisions with the company's strategic needs.

For future development, it is recommended that the decision support system be deployed on a real-time, web-based platform to improve accessibility for stakeholders across different locations and time zones. Integrating features for automated applicant data management and real-time tracking of selection progress could further streamline the recruitment workflow and enhance transparency. Additionally, making the system scalable and adaptable for various job positions and departments would extend its benefits, supporting broader and more diverse recruitment needs across the organization. By adopting these improvements, the system would not only optimize the speed and objectivity of hiring but also provide lasting value as a comprehensive tool for strategic human resource management.

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