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Optimizing E-Commerce Platform Selection Using Root Assessment Method and MEREC Weighting

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Abstract: The number of users of e-commerce platforms has increased significantly in recent years, and consumers are now more likely to shop online due to ease of access, diverse product choices, and flexibility in transaction times. The difficulty in determining the best e-commerce platform is often caused by subjectivity in the weighting of the criteria used for evaluation. The weighting process is carried out based on the preferences of certain individuals or groups, without considering objective data. This research aims to apply an objective, structured, and accurate approach in evaluating and ranking e-commerce platforms based on relevant multi-dimensional criteria. By using the root assessment method, the evaluation process can be carried out systematically through hierarchical analysis, while the MEREC weighting ensures that the weight of each criterion reflects its real impact on the outcome of the decision. Through the combination of these two methods, this research is expected to make a significant contribution to improving the quality of decision-making, especially in helping users or business people choose the e-commerce platform that best suits their needs. The results of the final score calculation Platform E was ranked first with the highest score of 4.87083, Platform A was ranked second with a score of 4.85162, and Platform B was ranked third with a score of 4.83842. Future research should address the identified limitations by exploring the integration of advanced predictive analytics and artificial intelligence techniques to improve the adaptability and resilience of models. In addition, sensitivity analysis of the MEREC Root Assessment and Weighting Methods should be performed to understand its performance under various data conditions.
Keywords: E-commerce platforms; Decision-making; Root assessment method; MEREC weighting; Objective approach;

1. INTRODUCING

The users of e-commerce platforms have experienced a significant increase in recent years, driven by advances in digital technology, wider internet penetration, and changes in people's consumption patterns. Consumers are now more likely to shop online because of ease of access, diverse product choices, and flexibility in transaction times[1], [2]. This phenomenon has been further accelerated by the global pandemic which has encouraged the adoption of digital transactions as an alternative to conventional shopping. In addition, the integration of technologies such as digital payments, artificial intelligence, and more efficient logistics has strengthened the appeal of e-commerce platforms as a modern shopping solution. This creates a competitive digital ecosystem, where each platform competes to offer the best services to meet the evolving needs of consumers[3]. In the process of choosing an e-commerce platform, factors such as features, ease of use, cost, and reliability are the main aspects that determine the decision. Complete and relevant features, such as payment integration, shipment

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tracking, as well as digital marketing support, provide added value for users. Ease of use is also a priority, especially for consumers who prioritize an intuitive and seamless shopping experience[4]. In addition, competitive fees, both in the form of transaction fees and subscriptions, are an important consideration for businesses in maintaining operational efficiency. The reliability of the platform, which includes system stability, data security, and responsive technical support, also greatly affects the level of trust and user satisfaction. The combination of these factors forms a crucial basis for evaluation to ensure that the chosen e-commerce platform can optimally meet the needs.

The difficulty in determining the best e-commerce platform is often caused by subjectivity in the weighting of the criteria used for evaluation. In many cases, the weighting process is carried out based on the preferences of a specific individual or group, without considering objective data. This can lead to biased evaluation results that are less representative of the user's real needs. As a result, the decision-making process becomes inaccurate and potentially results in suboptimal platform choices. An approach based on mathematical methods and objective data is needed to overcome these challenges and provide more reliable results. The imbalance of criterion weights in manual or traditional evaluations is often a major problem in the selection of e-commerce platforms. Manual processes tend to be influenced by the subjectivity of the assessor, where some criteria may be considered more important without an objective basis, while others are ignored or underpaid. This can result in inconsistent and biased decisions, as the weights of the criteria do not reflect the actual value or impact on the evaluation objectives. This imbalance can lead to less than optimal platform selection, which can ultimately harm users in terms of both consumer experience and business efficiency[5]. To overcome the problem in selecting the best e-commerce, a decision support system approach is used.

A decision support system (DSS)-based approach is very important in helping the process of selecting an e-commerce platform that is more objective and efficient[6], [7]. In today's dynamic and choice-filled environment, manual decisions are often influenced by subjective preferences and undertake into account the complexity of relevant criteria. DSS offers a solution by combining mathematical methods and data-driven analysis to systematically evaluate various alternatives. This approach not only improves the accuracy of the results, but also simplifies the decision-making process, especially when it comes to considering many interrelated criteria[8], [9]. With the help of DSS, businesses can identify the e-commerce platform that best suits their needs, thereby supporting a more effective and sustainable operational strategy. One of the methods in DSS is the root assessment method. The DSS-based approach has a number of advantages that make it effective in alternative selection. DSS allows for a more objective and structured evaluation process, by integrating various mathematical methods and data-driven analysis to address the complexity of the criteria. Its reliability in handling imbalances, criterion weights, and assessment subjectivity makes decision outcomes more consistent and accountable. One of the methods in DSS is the root assessment method.

The root assessment method is one of the systematic approaches in the decision support system used to evaluate and rank alternatives based on various criteria[1], [10], [11]. This method focuses on data normalization, criteria weighting, and aggregate value calculation using root-based functions. This method offers advantages in the form of high objectivity, the ability to handle extreme values, and a simple evaluation process, making it suitable for application in various cases that require multi-criteria analysis. This method is also relatively simple in its application, making it easy for users to implement it in a variety of evaluation scenarios[11], [12]. With its ability to simplify processes and generate more rational decisions, the root assessment method is well suited for use in a variety of cases, including in the selection of e-commerce platforms that require an in-depth analysis of various important factors. The weakness of the root assessment method in determining the weight of the criteria is its dependence on subjectivity in the weighting process. Although this method uses objective data for normalization and calculation of final values, the determination of the weighting of the criteria still requires subjective judgment from experts or users. This process can be influenced by personal preferences or opinions, which can potentially result in weights that do not reflect the actual importance of these criteria. If weighting is not done carefully or does not take into account the relevant context, the results of the evaluation can be biased, reducing the accuracy and objectivity of the decisions made. This weakness makes this method less ideal for cases that require weighting that is highly sensitive to changing

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conditions or user needs. To cover the weakness of the root assessment method in the weight of the criteria is used method based on the removal effects of criteria

Method based on the Removal Effects of Criteria (MEREC) is a multi-criteria evaluation approach designed to help facilitate alternative selection by considering the impact of the removal of one or more criteria on the performance of alternatives[13], [14]. The MEREC method has the main advantage of generating objective criteria weights by considering the direct impact of the elimination of each criterion on the overall evaluation results. This approach uses the principle of sensitivity analysis to measure how changes in a single weight or criterion affect a rating or final decision. In the MEREC, each criterion is evaluated by gradually removing it from the evaluation process and seeing how the changes affect the rating or final score of each alternative. This method helps detect the resilience or sensitivity of alternatives to changes in criteria, providing insight into how robust the resulting decisions are. The combination of the root assessment method and MEREC weighting presents an innovative approach to multi-criteria decision-making. The root assessment method provides the ability to rank alternatives by breaking down complex evaluations into simple hierarchical steps, while MEREC objectively weights criteria based on their influence on decision outcomes when they are omitted. By combining these two methods, the decision-making process becomes more structured and transparent, as the root assessment method provides a logical evaluation framework, while MEREC ensures that the weight of the criteria reflects the impact in a real way. This combination allows for a more in-depth evaluation of alternatives, with an emphasis on truly significant criteria. Additionally, this approach is flexible and applicable to a variety of contexts, making it a reliable tool for multi-criteria decision-making.

Research related in selecting the best e-commerce using the GRA-TOPSIS integration helps in selecting the best logistics service provider for their e-commerce business[15]. The combination of FUCOM and SAW methods helps in selecting the best e-commerce in Indonesia based on the calculation of preference values has a significant influence on the ranking results[16]. The AHP and TOPSIS methods can help consumers in choosing a suitable e-commerce platform in Malaysia[17]. The difference with this study in this study is the objective weighting method using MEREC which produces the weight of the criteria based on the assessment data that has been carried out.

This research aims to apply an objective, structured, and accurate approach in evaluating and ranking e-commerce platforms based on relevant multi-dimensional criteria. By using the root assessment method, the evaluation process can be carried out systematically through hierarchical analysis, while the MEREC weighting ensures that the weight of each criterion reflects its real impact on the outcome of the decision. Through the combination of these two methods, this research is expected to make a significant contribution to improving the quality of decision-making, especially in helping users or business people choose the e-commerce platform that best suits their needs.

2. RESEARCH METHODOLOGY

The research stage is a series of systematic processes carried out to achieve research objectives effectively[18]. This stage ensures that research runs scientifically and produces valid and accountable outputs. All stages are interrelated and form a cycle that allows research to continue to develop in accordance with the dynamics of needs and advances in science. The stages of the research carried out are shown in Figure 1.

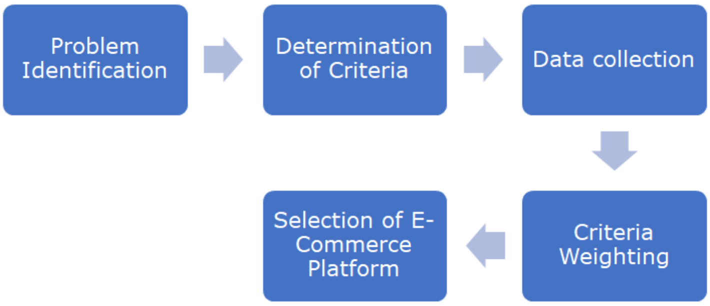

Figure 1. The Research Stage

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The research stages in optimizing e-commerce platform selection using root assessment method and MEREC weighting are carried out systematically to achieve optimal and reliable results. The first stage is problem identification, where researchers observe the challenges of choosing the best e-commerce platform that suits the needs of users. After that, data related to the performance of various e-commerce platforms is collected through the collection of primary and secondary data. In the next stage, the criteria were weighted using the MEREC method, which gave weight based on the influence of each criterion on the final decision. The data obtained was then processed using the Root Assessment Method, which calculates the final score of each alternative based on the integration of criterion weights and performance values.

2.1. Method based on the Removal Effects of Criteria (MEREC) Weighting

Method based on the Removal Effects of Criteria (MEREC) is a weighting technique used in multi-criteria assessment to determine the appropriate weight for each criterion based on the effect of the elimination of the criteria on the outcome of the decision[19], [20]. This method focuses on measuring the impact of changes in the weight of one criterion on the total value of the decision, so as to provide a more objective weight and in accordance with the importance of each criterion in the context of the decision. Through MEREC, assessments can be carried out by considering the impact of variability on decision outcomes, aiding in achieving more balanced and accurate solutions.
Decision matrix is the formation of a decision table that contains alternatives that are assessed based on a number of criteria. Each element in the matrix represents the performance value of an alternative against a specific criterion.

$$X = \begin{bmatrix} x_{11} & \cdots & x_{m1} \\ \vdots & \ddots & \vdots \\ x_{1n} & \cdots & x_{mn} \end{bmatrix} \quad (1)$$

Each row in the matrix represents an alternative to be evaluated, while a column represents a criterion or attribute used to evaluate an alternative.
Matrix normalization is the process of converting the values in a decision matrix into a uniform scale, allowing comparisons between criteria that may have different units or scales.

$$n_{ij} = \begin{cases} \frac{\min x_{kj}}{x_{ij}} & (for\ benefical\ criteria) \\ \frac{x_{ij}}{\max x_{kj}} & (for\ non - benefical\ criteria) \end{cases} \quad (2)$$

The n_{ij} value is the result of normalization, the x_{ij} value is an alternative value from the existing criteria, and the min/max is the minimum or maximum value of each criterion.
Ranking calculation without elimination of criteria is the process of calculating the final score or ranking of each alternative based on all criteria in the normalized decision matrix, without any reduction or elimination of criteria.

$$S_i = \ln\left(1 + \left(\frac{1}{m}\sum\left|\ln(n_{ij})\right|\right)\right) \quad (3)$$

The value of S_i is the result of calculation without elimination of criteria, and M is the value of many criteria.
Ranking calculation with the elimination of criteria is the process of recalculating scores or alternative rankings after one or more criteria have been removed from the matrix, to assess the effect of each criterion on the final result.

$$S'_{ij} = \ln\left(1 + \left(\frac{1}{m}\sum_{k,k\neq j}\left|\ln(n_{ij})\right|\right)\right) \quad (4)$$

The value of S_{ij} is the result of elimination of criteria is the process of recalculating scores, and M is the value of many criteria.
Calculating the effect of elimination criteria is the process of measuring changes or differences in alternative scores/ratings before and after certain criteria are removed, to evaluate the sensitivity or contribution of each criterion.

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$$E_j = \sum \left| S'_{ij} - S_i \right| \quad (5)$$

The value of E_j is the result of effect of elimination criteria. Calculating the criterion weights is the process of determining the relative importance of each criterion, which is later used to combine alternative performance values.

$$w_j = \frac{E_j}{\sum_k E_k} \quad (6)$$

The value of w_j is the result of criterion weights. The results of this MEREC are used to give a weight that better reflects the importance of each criterion in the final decision. MEREC weighting provides a more objective approach in determining the weighting of the criteria used in the multi-criteria analysis.

2.2. Root Assessment Method

The root assessment method is one of the approaches in multi-criteria decision-making that focuses on calculating alternative performance values by integrating the weighting of criteria and evaluation of the decision matrix[21], [22]. This method has unique characteristics in its assessment process, which involves root-based transformations to simplify or normalize the data.
The first process in the root assessment method is that the decision matrix is a table that contains the performance values of each alternative to each criterion, made using equation (1).
The second process in the root assessment method is the normalization of the decision matrix to change the performance value to a uniform scale.

$$n_{ij} = \frac{x_{ij}}{\sum_{i=1}^{n} x_{ij}} \quad (7)$$

The n_{ij} value is the result of normalization, the $\sum_{i=1}^{n} x_{ij}$ value is total value of all existing criteria.
The third process in the root assessment method is that the multiplication of weights is carried out on each normalized value multiplied by the weight of the criteria to produce a weighted matrix.

$$k_{ij} = n_{ij} * w_i \quad (8)$$

The k_{ij} value is the result of multiplication of weights, w_j is the result of criterion weights. The fourth process in the root assessment method is to calculate the total normalization score for each alternative calculated by summing all weighted scores based on the type of criteria that are benefit and cost.

$$S_{+i} = \sum_{i=1}^{n} k_{+ij} \quad (9)$$
$$S_{-i} = \sum_{i=1}^{n} k_{-ij} \quad (10)$$

The criteria for benefit are calculated using equation (9), while for the criteria for cost are calculated using equation (10). The S_{+j} value is the result of total normalization score for criteria benefit, S_{-j} value is the result of total normalization score for criteria cost.
The fifth process in the root assessment method is to calculate the final score used to determine the alternative ranking. The alternative with the highest score is considered the best option. This method provides results that reflect the relative contribution of each criterion to the overall performance of the alternative.

$$RI_i = \sqrt[2+S_{-i}]{2 + S_{+i}} \quad (11)$$

The RI_j value is the result of the final score used to determine the alternative ranking. This method is often used to simplify complex data and provide more stable results in decision-making, especially when the data has a wide range.

3. RESULT AND DISCUSSIONS

Optimizing e-commerce platform selection using root assessment method and MEREC Weighting highlights the effectiveness of the combination of the root assessment method and MEREC weighting in producing optimal decisions. Root assessment method is used to evaluate the performance of e-commerce platforms based on important criteria. This method provides a structured assessment by

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using a root-based normalization process to align the value scale of each criterion, thus allowing for objective cross-platform comparisons. Meanwhile, MEREC weighting ensures that the weighting of the criteria is calculated objectively based on the influence of each criterion on the overall evaluation. The combination of root assessment method and MEREC provides an accurate and efficient data-driven solution to help businesses determine the best e-commerce platform.

3.1. Data Collection

Data collection in the selection of e-commerce platforms is carried out through a multi-criteria evaluation approach involving various sources of information. Platform performance data is collected based on key criteria, such as user experience (C-A) is a benefit criterion, service price (C-B) is a cost criterion, security features (C-C) are benefit criteria, system integration (C-D) is a benefit criterion, payment feature (C-E) is a cost criterion, delivery feature (C-F) is a benefit criterion, system reliability (C-G) is a benefit criterion. The data of the assessment results are shown in table 1.

Table 1. Assessment Data

Name	C-A	C-B	C-C	C-D	C-E	C-F	C-G
Platform A	9	8	8	7	9	8	9
Platform B	8	9	7	8	8	9	8
Platform C	7	6	9	9	8	7	9
Platform D	6	7	8	8	7	8	7
Platform E	8	8	8	9	9	9	8

Data sources include surveys of users who have used the platform, technical performance reports, customer reviews, as well as publicly available information, such as service specifications from platform providers. To ensure validity and objectivity, the data was analyzed using statistical methods or aggregation of scores from various respondents. This approach allows for the collection of comprehensive and relevant information, thus providing a solid basis for accurate evaluation and ranking of e-commerce platforms. The value range in the e-commerce assessment data table reflects the performance level of each platform based on predetermined criteria. The values vary on a scale from 1 to 10, with higher value ranges indicating better performance on certain criteria, while lower values indicate weakness. By understanding this value range, performance differences between platforms can be identified, thus helping a more objective evaluation and selection process. Analysis of the value range can also be used to observe the distribution of data and detect potential anomalies or inconsistencies in the assessment results.

3.2. Calculation of Weight Criteria Using MEREC Weighting

The calculation of criterion weights using the MEREC weighting method is carried out by considering the impact of the elimination of each criterion on the final result. In this method, each criterion is removed individually, and its impact on the change in ranking or alternate score is calculated. The weight of the criteria is determined based on how much the total score change occurs when the criteria are removed. The greater the impact, the higher the weight of the criteria in the evaluation process. This approach allows for more objective measurement by identifying the most decisive criteria in influencing alternative rankings, resulting in more accurate decisions that better reflect the needs or objectives of the evaluation.

The general form of the decision matrix using (1) is based on the assessment data obtained from table 1 as follows.

$$X = \begin{bmatrix} x_{11} & x_{21} & x_{31} & x_{41} & x_{51} & x_{61} & x_{71} \\ x_{12} & x_{22} & x_{32} & x_{42} & x_{52} & x_{62} & x_{72} \\ x_{13} & x_{23} & x_{33} & x_{43} & x_{53} & x_{63} & x_{73} \\ x_{14} & x_{24} & x_{34} & x_{44} & x_{54} & x_{64} & x_{74} \\ x_{15} & x_{25} & x_{35} & x_{45} & x_{55} & x_{65} & x_{75} \end{bmatrix}$$

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The results of the decision matrix based on the assessment data that have been carried out are displayed as follows.

$$X = \begin{bmatrix} 9 & 8 & 8 & 7 & 9 & 8 & 9 \\ 8 & 9 & 7 & 8 & 8 & 9 & 8 \\ 7 & 6 & 8 & 9 & 8 & 7 & 9 \\ 6 & 7 & 9 & 8 & 7 & 8 & 7 \\ 8 & 8 & 9 & 9 & 9 & 9 & 8 \end{bmatrix}$$

Matrix normalization is the process of converting the values in a decision matrix into a uniform scale, allowing comparisons between criteria that may have different units or scales by using (2).

$$n_{11} = \frac{\min x_{11,15}}{x_{11}} = \frac{6}{9} = 0.6667$$

The calculation results obtained from the analysis of this method can be seen in detail in equation (2), and the calculation results are shown in table 2.

Table 2. Matrix Normalization Results

Name	C-A	C-B	C-C	C-D	C-E	C-F	C-G
Platform A	0.6667	0.8889	0.8750	1.0000	0.7778	0.8750	0.7778
Platform B	0.7500	1.0000	1.0000	0.8750	0.8750	0.7778	0.8750
Platform C	0.8571	0.6667	0.7778	0.7778	0.8750	1.0000	0.7778
Platform D	1.0000	0.7778	0.8750	0.8750	1.0000	0.8750	1.0000
Platform E	0.7500	0.8889	0.8750	0.7778	0.7778	0.7778	0.8750

Ranking calculation without elimination of criteria is the process of calculating the final score or ranking of each alternative based on all criteria in the normalized decision matrix, without any reduction or elimination of criteria by using (3).

$$S_1 = \ln\left(1 + \left(\frac{1}{5}\sum\left|\ln\left(n_{11,15}\right)\right|\right)\right) = 0.1695$$

The calculation results obtained from the analysis of this method can be seen in detail in equation (3), and the calculation results are shown in table 3.

Table 3. Ranking Calculation without Elimination of Criteria

Name	S_i
Platform A	0.1695
Platform B	0.1260
Platform C	0.1879
Platform D	0.0890
Platform E	0.1855

Ranking calculation with the elimination of criteria is the process of recalculating scores or alternative rankings after one or more criteria have been removed from the matrix, to assess the effect of each criterion on the final result by using (4).

$$S'_{11} = \ln\left(1 + \left(\tfrac{1}{5}\textstyle\sum_{k,k\neq j}\left|\ln\left(n_{12,15}\right)\right|\right)\right) = 0.0870$$

The calculation results obtained from the analysis of this method can be seen in detail in equation (4), and the calculation results are shown in table 4.

Table 4. Ranking Calculation with Elimination of Criteria

Name	C-A	C-B	C-C	C-D	C-E	C-F	C-G
Platform A	0.0870	0.1240	0.1220	0.1387	0.1070	0.1220	0.1387
Platform B	0.0714	0.1090	0.1090	0.0917	0.0917	0.0763	0.1090

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Name	C-A	C-B	C-C	C-D	C-E	C-F	C-G
Platform C	0.1387	0.1070	0.1266	0.1266	0.1413	0.1577	0.1577
Platform D	0.0890	0.0557	0.0714	0.0714	0.0890	0.0714	0.0890
Platform E	0.1342	0.1552	0.1533	0.1387	0.1387	0.1387	0.1695

Calculating the effect of elimination criteria is the process of measuring changes or differences in alternative scores/ratings before and after certain criteria are removed, to evaluate the sensitivity or contribution of each criterion by using (5).

$$E_1 = \sum \left|S'_{11,15} - S_1\right| = 0.23749$$

The calculation results obtained from the analysis of this method can be seen in detail in equation (5), and the calculation results are shown in table 5.

Table 5. Calculating the Effect of Elimination Criteria

	C-A	C-B	C-C	C-D	C-E	C-F	C-G
E_j	0.23749	0.20710	0.17564	0.19069	0.19012	0.19176	0.09391

Calculating the criterion weights is the process of determining the relative importance of each criterion, which is later used to combine alternative performance values by using (6).

$$w_1 = \frac{E_1}{\sum_k E_{1,7}} = \frac{0.23749}{1.28671} = 0.18457$$

The calculation results obtained from the analysis of this method can be seen in detail in equation (6), and the calculation results are shown in table 6.

Table 6. Calculating the Criteria Weights

	C-A	C-B	C-C	C-D	C-E	C-F	C-G
w_j	0.18457	0.16096	0.13650	0.14820	0.14775	0.14903	0.07299

The final result of the criterion weighting using MEREC weighting provides a weight that shows the importance of each criterion in the evaluation process. These results provide clearer and more targeted guidance in choosing the best alternative, focusing on the criteria that most affect performance or the final decision.

3.3. E-Commerce Selection Using the Root Assessment Method

Choosing an e-commerce platform using the root assessment method is an approach used to evaluate and select the e-commerce platform that best suits the needs of the business. This approach ensures that decisions can be made more objectively, reducing subjective bias, and ensuring that the chosen platform can meet the specific needs of the business in a competitive e-commerce environment.

The first process in the root assessment method is that the decision matrix is a table that contains the performance values of each alternative to each criterion, made using equation (1).

The second process in the root assessment method is the normalization of the decision matrix to change the performance value to a uniform scale by using (7).

$$n_{11} = \frac{x_{11}}{\sum_{i=1}^{n} x_{11,15}} = \frac{9}{9+8+7+6+8} = 0.23684$$

The calculation results obtained from the analysis of this method can be seen in detail in equation (7), and the calculation results are shown in table 7.

Table 7. Normalization of the Decision Matrix

Name	C-A	C-B	C-C	C-D	C-E	C-F	C-G
Platform A	0.23684	0.21053	0.20000	0.17073	0.21951	0.19512	0.21951
Platform B	0.21053	0.23684	0.17500	0.19512	0.19512	0.21951	0.19512

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Name	C-A	C-B	C-C	C-D	C-E	C-F	C-G
Platform C	0.18421	0.15789	0.22500	0.21951	0.19512	0.17073	0.21951
Platform D	0.15789	0.18421	0.20000	0.19512	0.17073	0.19512	0.17073
Platform E	0.21053	0.21053	0.20000	0.21951	0.21951	0.21951	0.19512

The third process in the root assessment method is that the multiplication of weights is carried out on each normalized value multiplied by the weight of the criteria to produce a weighted matrix by using (8).

$k_{11} = n_{11} * w_1 = 0.23684 * 0.18457 = 0.04371$

The calculation results obtained from the analysis of this method can be seen in detail in equation (8), and the calculation results are shown in table 8.

Table 8. Calculation Multiplication of Weights

Name	C-A	C-B	C-C	C-D	C-E	C-F	C-G
Platform A	0.04371	0.03389	0.02730	0.02530	0.03243	0.02908	0.01602
Platform B	0.03886	0.03812	0.02389	0.02892	0.02883	0.03271	0.01424
Platform C	0.03400	0.02541	0.03071	0.03253	0.02883	0.02544	0.01602
Platform D	0.02914	0.02965	0.02730	0.02892	0.02523	0.02908	0.01246
Platform E	0.03886	0.03389	0.02730	0.03253	0.03243	0.03271	0.01424

The fourth process in the root assessment method is to calculate the total normalization score for each alternative calculated by summing all weighted scores based on the type of criteria that are benefit and cost by using (9) and (10).

$$S_{+1} = \sum_{i=1}^{n} k_{+11,31,41,61,71} = 0.17385$$

$$S_{-1} = \sum_{i=1}^{n} k_{-21,51} = 0.03389$$

The calculation results obtained from the analysis of this method can be seen in detail in equation (9) and (10), and the calculation results are shown in table 9.

Table 9. Calculation the Total Normalization Score

Name	S_{+i}	S_{-i}
Platform A	0.17385	0.03389
Platform B	0.16745	0.03812
Platform C	0.16754	0.02541
Platform D	0.15213	0.02965
Platform E	0.17808	0.03389

The fifth process in the root assessment method is to calculate the final score used to determine the alternative ranking. The alternative with the highest score is considered the best option. This method provides results that reflect the relative contribution of each criterion to the overall performance of the alternative by using (11).

$RI_1 = \sqrt[2+S_{-1}]{2 + S_{+1}} = 4.85162$

The calculation results obtained from the analysis of this method can be seen in detail in equation (11), and the calculation results are shown in table 10.

Table 10. Calculation the Final Score

Name	RI_i
Platform A	4.85162
Platform B	4.83842

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Name	RI_i
Platform C	4.79151
Platform D	4.73811
Platform E	4.87083

3.4. Results of E-Commerce Selection Recommendations Using Root Assessment Method and MEREC Weighting

The results of the e-commerce selection recommendation using the root assessment method and MEREC weighting aim to provide objective and structured decisions in choosing the best e-commerce platform based on various important criteria. The root assessment method is used to assess and identify the main factors that affect the election decision, by measuring the impact and relevance of each factor. Meanwhile, MEREC weighting serves to give weight to each criterion, ensuring that the more important factors receive more attention in the evaluation process. The combination of these two methods allows for comprehensive analysis, thus assisting users or companies in choosing the e-commerce platform that best suits their business needs and goals effectively. The results of the e-commerce selection ranking recommendations are shown in table 11.

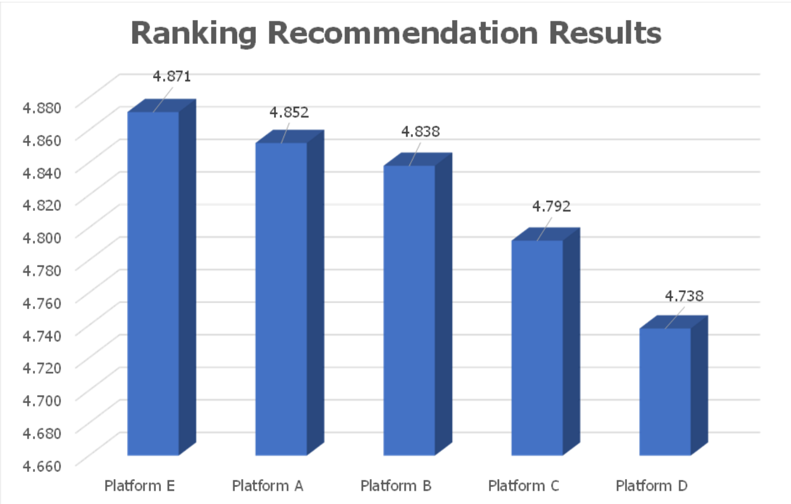

Figure 2. Ranking Recommendation Results

The result of the calculation of the final score, Platform E ranked first with the highest score of 4.87083, showing superior performance in various criteria evaluated. In second place, Platform A follows with a score of 4.85162, showing excellent performance but slightly lower than Platform E. Platform B is ranked third with a score of 4.83842, indicating a solid performance but not as strong as Platform A. In fourth place, Platform C with a score of 4.79151 reflects good performance but still below the previous platforms. Lastly, Platform D ranked fifth with a score of 4.73811, showing good results but below other platforms in terms of overall performance.

4. CONCLUSION

This research aims to apply an objective, structured, and accurate approach in evaluating and ranking e-commerce platforms based on relevant multi-dimensional criteria. By using the root assessment method, the evaluation process can be carried out systematically through hierarchical analysis, while the MEREC weighting ensures that the weight of each criterion reflects its real impact on the outcome of the decision. Through the combination of these two methods, this research is expected to make a significant contribution to improving the quality of decision-making, especially in helping users or business people choose the e-commerce platform that best suits their needs. The result of the calculation of the final score, Platform E ranked first with the highest score of 4.87083, showing superior

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performance in various criteria evaluated. In second place, Platform A follows with a score of 4.85162, showing excellent performance but slightly lower than Platform E. Platform B is ranked third with a score of 4.83842, indicating a solid performance but not as strong as Platform A. In fourth place, Platform C with a score of 4.79151 reflects good performance but still below the previous platforms. Lastly, Platform D ranked fifth with a score of 4.73811, showing good results but below other platforms in terms of overall performance. The limitations of this study lie in the scope of the data and methods used. The Root Assessment Method and MEREC Weighting approaches, although they provide objective results in the selection of e-commerce platforms, have sensitivity to the quality of the initial data obtained from respondents or other sources. Therefore, further research is needed to explore the integration of this method by conducting a criterion weight sensitivity test on the ranking results.

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