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Implementation of MABAC Method and Entropy Weighting in Determining the Best E-Commerce Platform for Online Business

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Abstract–The main problem in choosing an e-commerce platform for an online business is finding the one that best suits the specific needs of the business. Each platform has its advantages and disadvantages, such as ease of use, cost, features offered, as well as support for inventory management, shipping, and payments. Other challenges include ensuring that the platform can support future business growth, offer good scalability, and provide flexibility in terms of customization and integration with digital marketing tools. In addition, data security and a good user experience are also important considerations for long-term success. The purpose of this study is to implement the MABAC method and Entropy weighting in determining the best e-commerce platform for online businesses, so that this research can provide clear and data-driven recommendations to stakeholders regarding the most effective e-commerce platform. The application of the MABAC method combined with Entropy weighting in determining the best e-commerce platform for online business people offers a comprehensive and objective approach in decision-making. This combination not only improves decision-making accuracy, but also ensures that the most important criteria are weighted accordingly, resulting in more reliable results in choosing the best platform for business needs. The final result of the MABAC Platform A score is the first choice, considering the highest score of 0.82, which indicates its optimal performance in meeting the criteria that have been set. In addition, Platforms B and C, with scores of 0.78 and 0.75, respectively.

Keywords: Determining; E-Commerce; Entropy; Implementation; MABAC

1. INTRODUCING

An online business is a form of business that is run over the internet, allowing business actors to sell products or services without geographical restrictions. With relatively low capital compared to conventional businesses, online businesses offer ease in reaching consumers globally through various digital platforms such as e-commerce, social media, and websites[1]. Other advantages of online businesses include time flexibility, the ability to work from anywhere, as well as the potential to take advantage of digital marketing tools that can increase visibility and sales. In today's digital era, online businesses are becoming an increasingly popular choice among business actors because of their ability to develop quickly and effectively[2]. The best e-commerce platforms for online businesses offer convenience, flexibility, and support that suits the needs of the business. Shopify, for example, is known for its easy-to-use interface and full-featured features for small to medium-sized businesses. In Indonesia, Tokopedia and Bukalapak are popular choices due to their wide reach and support for local MSMEs. Lazada provides access to the Southeast Asian market with a robust logistics system, while WooCommerce offers high flexibility for users who want complete control over their website. Choosing the right platform depends on specific needs, such as business scale, target market, and feature preferences[3]. Choosing the best e-commerce platform for online business is very important because it can affect smooth operations and business growth. The main factors to consider are ease of use, business scale, features provided, and integration with payment and logistics systems. Platforms like Shopify are suitable for businesses with simple design and management needs, while WooCommerce offers more flexibility for users who want full control over their website. For the local market, Tokopedia and Bukalapak offer easy access to customers in Indonesia with promotion features and MSME support. Choosing the right platform must be in accordance with business goals and target markets, in order to maximize sales potential effectively. The main problem in choosing an e-commerce platform for an online business is finding the one that best suits the specific needs of the business. Each platform has its advantages and disadvantages, such as ease of use, cost, features offered, as well as support for inventory management, shipping, and payments. Other challenges include ensuring that the platform can support future business growth, offer good scalability, and

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provide flexibility in terms of customization and integration with digital marketing tools. In addition, data security and a good user experience are also important considerations for long-term success.

The Multi-Attributive Border Approximation Area Comparison (MABAC) method is one of the multi-criteria decision making (MCDM) methods used to evaluate and select the best alternative based on a number of criteria[4]–[6]. In this method, each alternative is evaluated by calculating its distance from the border approximation area, which is the area that represents the middle value of all criteria. This method allows decision-makers to analyze how far the evaluated alternative approaches or moves away from the optimal value, so that the best alternative is the one that has the shortest distance from the boundary area. MABAC is used in areas such as project management, supplier selection, and other strategic decision-making due to its ability to consider various criteria simultaneously and provide accurate results[7]–[9]. The MABAC method has several advantages that make it superior in multi-criteria decision-making. First, MABAC is able to handle problems with a variety of complex and diverse criteria, providing more comprehensive results. Second, this method takes into account the distance of each alternative from the border approximation area, which provides an objective and accurate evaluation of the alternative being considered. Third, MABAC is easy to implement because the calculations are not too complicated, so it can be applied in various sectors, such as supplier selection, risk assessment, and project management. The MABAC method also has a drawback that needs to be considered, namely that MABAC is not always ideal for situations with high uncertainty or incomplete data, as this method requires a definite value for each criterion. Third, although the calculation is relatively simple, the process of calculating the distance from the boundary area can be complicated if the number of alternatives and criteria is very large, requiring more time and resources for analysis. In addition, this method may not be as effective as other methods in dealing with criteria that are subjective or qualitative, due to its focus on quantitative value. To cover the weaknesses of MABAC, the entropy weighting method is used.

The Entropy weighting method is a technique used to objectively determine the weighting of criteria in MCDM problems[10]–[12]. In this method, the concept of entropy from information theory is applied to measure how much uncertainty or variation is contained in the data for each criterion. Criteria that have greater variation are considered more important, and thus gain higher weight. The advantage of the Entropy method is its objectivity in calculating weights based on data, without requiring subjective preferences from decision-makers[13]–[15]. This method is often used in various fields, such as supplier selection, performance appraisal, and project evaluation, due to its ability to automatically assign weights that reflect the importance of each criterion in a decision. The Entropy weighting method is particularly useful for situations where quantitative data is available and objective decision-making is essential, especially in performance evaluation, supplier selection, or complex risk analysis.

The combination of the MABAC method and Entropy weighting offers an innovative approach to complex multi-criteria decision-making. In an increasingly dynamic business world, effective decision-making requires an accurate evaluation of alternatives based on a number of relevant criteria. The MABAC method provides a framework for comparing alternatives by calculating the distance from the boundary area reflecting the optimal value, while the entropy weighting ensures that the criterion weights are objectively determined based on the variability of the data. By integrating these two methods, decision-makers can produce more comprehensive and accurate analysis, improving their ability to choose the best alternative amid various existing considerations. This approach is very suitable to be applied in various sectors, from supplier selection to project evaluation, where data-based and objective decision-making is essential.

The purpose of this study is to implement the MABAC method and Entropy weighting in determining the best e-commerce platform for online businesses, so that this research can provide clear and data-driven recommendations to stakeholders regarding the most effective e-commerce platform.

2. RESEARCH METHOD

2.1 The Research Framework

A research framework is a structure that composes and organizes the essential elements of a research[16], [17]. He provides systematic guidance on how the research will be conducted, including the steps to be taken, the methods to be used, and the relationships between the variables being studied. The existence of a research framework can

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ensure that research is carried out in a structured and focused manner, making it easier to achieve goals and produce valid and accountable findings. The outline of the research conducted is shown in Figure 1.

Figure 1. The Research Framework

The research framework of figure 1 is designed to implement the MABAC method and Entropy weighting in determining the best e-commerce platform for online businesses. First, the research will begin with the data collection stage, where information regarding the various existing e-commerce platforms, as well as relevant criteria for evaluation, will be gathered through literature studies and interviews with industry experts. Next, the data normalization stage will be carried out to ensure that all criteria values are within a uniform range. After that, the weighting of the criteria will be calculated using the Entropy method to give an objective weight to each criterion based on the variation of existing data. Then, the MABAC method will be applied to evaluate and rank alternative e-commerce platforms based on predetermined weights. Finally, the results of the evaluation will be analyzed and presented in the form of clear recommendations to stakeholders, and concluded with conclusions and suggestions for further research. The framework of this research is expected to provide a better understanding of criteria-based decision-making in the context of e-commerce platform selection.

2.2 Entropy Weighting Method

The Entropy weighting method is one of the objective approaches in the decision support system that aims to determine the weight of the criteria based on the degree of variation in the information contained in the data. In this method, the higher the variation in the data of a criterion, the greater the weight given, because the criterion is considered to contribute more to the decision-making process. By calculating the degree of uncertainty (entropy) of each criterion, this method is able to produce an objective weight and is not affected by the subjective preferences of the decision-maker, thus providing a balance in evaluating alternatives based on existing information. The first stage in the entropy weighting method, namely making a decision matrix, is a tabular representation of the alternatives that is evaluated based on several criteria in the decision-making process using (1). It is used in various Multi-Criteria Decision Making (MCDM) methods to compare and select the best alternative based on the set criteria.

$$X = \begin{bmatrix} x_{11} & x_{21} & x_{n1} \\ x_{12} & x_{22} & x_{n2} \\ \vdots & \vdots & \vdots \\ x_{1m} & x_{2m} & x_{nm} \end{bmatrix} \qquad (1)$$

The second stage in the entropy weighting method is data normalization to avoid scale differences between criteria using (2). Normalization is usually done by dividing each value by the number of values in the column, so that the values are proportional. This ensures that each criterion has an equal contribution to the calculation of entropy.

$$k_{ij} = \frac{r_{ij}}{\sum_{i=1}^{m} r_{ij}} \qquad (2)$$

The third stage in the entropy weighting method is the calculation of entropy using (3), entropy measures uncertainty or information contained in data.

$$E_j = \left[\frac{-1}{\ln m}\right] \sum_{i=1}^{m} r_{ij} \ln r_{ij} \qquad (3)$$

The fourth stage in the entropy weighting method is to calculate the dispersion value in the context of the Entropy method involving the calculation of data variations in each criterion using (4). This dispersion provides an indication of the extent to which the data is scattered and, in this case, relates to entropy reflecting the uncertainty in the data.

$$D_j = 1 - E_j \qquad (4)$$

The fifth stage in the entropy weighting method is the calculation of weight, the weight of the criterion is calculated based on how high the entropy of the criterion is using (4). The higher the entropy, the lower the weight, because the criteria with high entropy indicate a large variation in the data and vice versa.

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$$w_j = \frac{D_j}{\sum_{j=1}^{m} D_j} \quad (5)$$

The entropy method provides an objective approach to determine the weight of criteria, minimize subjectivity and take into account variations in information in the data.

2.2 MABAC Method

The MABAC method is one of the techniques in MCDM that is used to assess and rank a number of alternatives based on several criteria. This method works by calculating the distance between the alternative value and the boundary area specified in each criterion. MABAC has the advantage of its ability to handle complex and diverse data, and provides stable results because it considers a proportionate distance between alternatives and ideal solutions. The first stage in the MABAC method is to create a decision matrix based on the existing alternative assessment, with the following form of decision matrix equation (1).

The second stage in the MABAC method is to normalize the decision matrix to bring all criterion values to a uniform scale, allowing for fairer comparisons between alternatives. The form of the normalization equation of the decision matrix is as follows.

$$r_{ij} = \frac{x_{ij} - x_i^-}{x_i^+ - x_i^-} \quad (6)$$

$$r_{ij} = \frac{x_{ij} - x_i^+}{x_i^- - x_i^+} \quad (7)$$

Equation (6) to normalize with the type of benefit criterion, and equation (7) to normalize with the type of cost criterion. The third stage in the MABAC method is to determine the weight and preferences of each alternative using the following equation.

$$v_{ij} = \left(w_j * r_{ij}\right) + w_j \quad (8)$$

The fourth stage in the MABAC method is to calculate the approximation area of the border between each alternative pair based on the weights and preferences that have been set. The equation for the calculation of the conformity and non-conformity matrix is as follows.

$$G_I = \left[\prod_{j=1}^{m} v_{ij}^{1/m}\right] \quad (9)$$

The fifth stage in the MABAC method is to calculate the matrix elements of the alternative distance of the approximate boundary area between the weighted matrix (V) and the value of the approximate border area (G) using the following equation.

$$Q_{ij} = v_{ij} - G_i \quad (10)$$

The sixth stage in the MABAC method is to calculate the value of the function of the criteria for each alternative using the following equation.

$$S_i = \sum_{j=1}^{n} Q_{ij} \quad (11)$$

The MABAC method emphasizes a simple but effective approach in comparing alternatives with boundary areas that are the benchmark for evaluation. Another advantage of MABAC is its ability to handle problems with many criteria without requiring complex assumptions.

3. RESULT AND DISCUSSION

The implementation of the MABAC method combined with Entropy weighting in determining the best e-commerce platform for online businesses offers a comprehensive and objective approach to decision-making. Entropy weighting ensures that the significance of each criterion, such as platform features, user experience, security, and cost, is objectively determined based on the variability of data. By applying the MABAC method, the alternatives (e-commerce platforms) are evaluated and ranked based on their relative distance from an ideal solution, providing a clear and structured selection process. This combination not only enhances the accuracy of the decision-making but also ensures that the most important criteria are given appropriate weight, leading to more reliable results in selecting the best platform for business needs. By combining the MABAC method and Entropy weighting, the assessment process of e-commerce platforms becomes more transparent and accurate because it considers various aspects objectively and mathematically. Entropy weighting ensures that criteria with higher variations in information, such as transaction speed, ease of integration, or customer support, are given greater

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weight. Furthermore, MABAC provides a more in-depth calculation by evaluating each platform against the ideal boundary area, so that the alternative that best matches the optimal criteria can be easily identified. This approach is very suitable for use in the selection of e-commerce platforms, especially in the competitive digital era, where the right strategic decisions can have a significant impact on the growth of online businesses.

3.1 Data Collection

Collecting data in research to determine the best e-commerce platform involves several important stages. First, relevant criteria data must be identified, such as transaction speed, fees, security, ease of use, and additional features. These criteria are then assessed by experts or users of the e-commerce platform to provide a value based on their experience and knowledge. These values are usually measured on a numerical scale that can be used for further analysis. In addition, data collection can also be done through surveys, interviews, or from secondary sources such as industry reports or customer reviews. The results of the assessment data collection of e-commerce are displayed in table 1.

Table 1. E-commerce assessment data

Name	Transaction Speed	Fees	Security	Ease of Use	Additional Features
Platform A	9	6	8	7	8
Platform B	8	7	9	8	7
Platform C	7	8	7	6	9
Platform D	8	6	9	9	8
Platform E	7	9	8	7	7
Platform F	6	7	6	9	6

The data source in this study is shown in table 1 obtained from the assessment of experts who have experience and in-depth knowledge of e-commerce platforms. Experts are asked to assess five main criteria, namely transaction speed, fees, security, ease of use, and additional features. Each criterion is assessed using a score range of 1 to 10, where 1 indicates the lowest rating (unsatisfactory) and 10 indicates the highest rating (very satisfactory). This assessment is then used as an input for further analysis using the MABAC method and Entropy weighting, so that it can produce an objective and thorough evaluation in choosing the best e-commerce platform for online businesses.

3.2 Determining the Weight of Criteria Using the Entropy Method

Determining the weighting of criteria using the Entropy method is an effective approach in decision support systems, where the main goal is to provide objective and fair weighting based on the variety of information contained in the data. This method begins with the process of normalizing the criteria values, so that all data are on the same scale, followed by the calculation of the entropy value for each criterion that reflects the level of uncertainty or distribution of information. The first stage in the entropy weighting method, namely making a decision matrix using (1).

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

The second stage in the entropy weighting method is data normalization to avoid scale differences between criteria using (2).

$$k_{11} = \frac{r_{11}}{\sum_{i=1}^{m} r_{11,16}} = \frac{9}{9+8+7+8+7+6} = \frac{9}{45} = 0.2$$

The overall result of the final calculation of the normalized value on entropy for each criterion is shown in table 2.

Table 2. The overall result of the final calculation of the normalized value on entropy

Name	Transaction Speed	Fees	Security	Ease of Use	Additional Features
Platform A	0.2	0.139535	0.17021277	0.15217391	0.177778
Platform B	0.177778	0.162791	0.19148936	0.17391304	0.155556
Platform C	0.155556	0.186047	0.14893617	0.13043478	0.2

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Platform D	0.177778	0.139535	0.19148936	0.19565217	0.177778
Platform E	0.155556	0.209302	0.17021277	0.15217391	0.155556
Platform F	0.133333	0.162791	0.12765957	0.19565217	0.133333

The third stage in the entropy weighting method is the calculation of entropy using (3), entropy measures uncertainty or information contained in data.

$$E_1 = \left[\frac{-1}{\ln 6}\right]\sum_{i=1}^{m} r_{11,16} \ln r_{11,16} = (-0.558110627) * (-1.783565051) = 0.99543$$
$$E_2 = \left[\frac{-1}{\ln 6}\right]\sum_{i=1}^{m} r_{21,26} \ln r_{21,26} = (-0.558110627) * (-1.780865017) = 0.99392$$
$$E_3 = \left[\frac{-1}{\ln 6}\right]\sum_{i=1}^{m} r_{31,36} \ln r_{31,36} = (-0.558110627) * (-1.782210689) = 0.99467$$
$$E_4 = \left[\frac{-1}{\ln 6}\right]\sum_{i=1}^{m} r_{41,46} \ln r_{41,46} = (-0.558110627) * (-1.781274578) = 0.99415$$
$$E_5 = \left[\frac{-1}{\ln 6}\right]\sum_{i=1}^{m} r_{51,56} \ln r_{51,56} = (-0.558110627) * (-1.783565051) = 0.99543$$

The fourth stage in the entropy weighting method is to calculate the dispersion value in the context of the Entropy method involving the calculation of data variations in each criterion using (4).

$$D_1 = 1 - E_1 = 1 - 0.99543 = 0.004573$$
$$D_2 = 1 - E_2 = 1 - 0.99392 = 0.006080$$
$$D_3 = 1 - E_3 = 1 - 0.99467 = 0.005329$$
$$D_4 = 1 - E_4 = 1 - 0.99415 = 0.005852$$
$$D_5 = 1 - E_5 = 1 - 0.99543 = 0.004573$$

The fifth stage in the entropy weighting method is the calculation of weight, the weight of the criterion is calculated based on how high the entropy of the criterion is using (5).

$$w_1 = \frac{D_1}{\sum_{j=1}^{m} D_{1,5}} = \frac{0.004573}{0.004573 + 0.00608 + 0.005329 + 0.005852 + 0.004573} = \frac{0.004573}{0.026408} = 0.1732$$
$$w_2 = \frac{D_2}{\sum_{j=1}^{m} D_{1,5}} = \frac{0.00608}{0.004573 + 0.00608 + 0.005329 + 0.005852 + 0.004573} = \frac{0.00608}{0.026408} = 0.2302$$
$$w_3 = \frac{D_3}{\sum_{j=1}^{m} D_{1,5}} = \frac{0.005329}{0.004573 + 0.00608 + 0.005329 + 0.005852 + 0.004573} = \frac{0.005329}{0.026408} = 0.2018$$
$$w_4 = \frac{D_4}{\sum_{j=1}^{m} D_{1,5}} = \frac{0.005852}{0.004573 + 0.00608 + 0.005329 + 0.005852 + 0.004573} = \frac{0.005852}{0.026408} = 0.2216$$
$$w_5 = \frac{D_5}{\sum_{j=1}^{m} D_{1,5}} = \frac{0.004573}{0.004573 + 0.00608 + 0.005329 + 0.005852 + 0.004573} = \frac{0.004573}{0.026408} = 0.1732$$

The final result of the weighting method using Entropy is the weight of the criteria obtained after going through the normalization process, entropy calculation, and determination of the degree of dispersion. This weight reflects the relative contribution of each criterion in the decision-making process.

3.3 Determination of E-Commerce Using the MABAC Method

Determining e-commerce using the MABAC method is an innovative approach in complex decision-making processes, especially in choosing the most suitable e-commerce platform for online business needs. The MABAC method provides a systematic way to evaluate various alternatives based on relevant criteria, such as transaction speed, fees, security, ease of use, and additional features. By utilizing the principle of distance comparison between the alternative value and the ideal boundary area, MABAC is able to produce accurate and objective rankings, reflecting the extent to which each alternative meets the predetermined criteria. This approach is especially important in the competitive digital age, where the right decision in choosing an e-commerce platform can affect the success and growth of a business. The first stage in the MABAC method is to create a decision matrix based on the existing alternative assessment, with the following form of decision matrix equation (1).

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

The second stage in the MABAC method is to normalize the decision matrix to bring all the criteria values to a uniform scale, for the criteria of transaction speed, security, ease of use, and additional features using equation (6) and for the cost criterion using equation (7).

$$r_{11} = \frac{x_{11} - x_{11,16}^{-}}{x_{11,16}^{+} - x_{11,16}^{-}} = \frac{8-6}{9-6} = \frac{2}{3} = 0.667$$

The overall result of the final calculation of the normalized value on MABAC for each criterion is shown in table 3.

Table 3. The overall result of the final calculation of the normalized value on MABAC

Name	Transaction Speed	Fees	Security	Ease of Use	Additional Features
Platform A	0.667	0	0	0.5	0.5
Platform B	0.333	0.5	0.5	0.5	0
Platform C	0	0	1	0	0.5
Platform D	0.333	0.5	0.5	0.5	1
Platform E	1	1	0	0	0.5
Platform F	0.333	0.5	0.5	1	0

The third stage in the MABAC method is to determine the weight and preference of each alternative using equations (8).

$$v_{11} = (w_1 * r_{11}) + w_1 = (0.1732 * 0.667) + 0.1732 = 0.2887$$

The overall result of the final calculation of the weight value and preference of each alternative for each criterion is shown in table 4.

Table 4. The overall result of the final calculation of the weight value and preference on MABAC

Name	Transaction Speed	Fees	Security	Ease of Use	Additional Features
Platform A	0.2887	0.2302	0.2018	0.3324	0.2598
Platform B	0.2309	0.3453	0.3027	0.3324	0.1732
Platform C	0.1732	0.2302	0.4036	0.2216	0.2598
Platform D	0.2309	0.3453	0.3027	0.3324	0.3464
Platform E	0.3464	0.4604	0.2018	0.2216	0.2598
Platform F	0.2309	0.3453	0.3027	0.4432	0.1732

The fourth stage in the MABAC method is to calculate the approximation area of the boundary between each alternative pair based on the weights and preferences that have been established using equations (9).

$$G_1 = \left[\prod_{j=1}^{m} v_{11,16}^{1/6}\right] = \left[0.00021330^{1/6}\right] = 0.2444$$

$$G_2 = \left[\prod_{j=1}^{m} v_{21,26}^{1/6}\right] = \left[0.00100447^{1/6}\right] = 0.3165$$

$$G_3 = \left[\prod_{j=1}^{m} v_{31,36}^{1/6}\right] = \left[0.00045586^{1/6}\right] = 0.2774$$

$$G_4 = \left[\prod_{j=1}^{m} v_{41,46}^{1/6}\right] = \left[0.00079932^{1/6}\right] = 0.3046$$

$$G_5 = \left[\prod_{j=1}^{m} v_{51,56}^{1/6}\right] = \left[0.00018222^{1/6}\right] = 0.2381$$

The fifth stage in the MABAC method is to calculate the matrix elements of the alternative distance of the approximate boundary area between the weighted matrix (V) and the value of the approximate border area (G) using equation (10).

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$$Q_{11} = v_{11} - G_1 = 0.2887 - 0.2444 = 0.0442$$

The overall result of the final calculation of the value of the matrix of the alternative distance, the area, the estimated limit of each alternative for each criterion is shown in table 5.

Table 5. The overall result of the final calculation of the value of the matrix of the alternative distance on MABAC

Name	Transaction Speed	Fees	Security	Ease of Use	Additional Features
Platform A	0.0442	-0.0863	-0.0756	0.0278	0.0217
Platform B	-0.0135	0.0288	0.0253	0.0278	-0.0649
Platform C	-0.0712	-0.0863	0.1262	-0.0830	0.0217
Platform D	-0.0135	0.0288	0.0253	0.0278	0.1083
Platform E	0.1020	0.1439	-0.0756	-0.0830	0.0217
Platform F	-0.0135	0.0288	0.0253	0.1386	-0.0649

The sixth stage in the MABAC method is to calculate the value of the function of the criteria for each alternative using equation (11).

$$S_1 = \sum_{j=1}^{n} Q_{11,51} = 0.0442 + (-0.0863) + (-0.0756) + 0.0278 + 0.0217 = -0.0682$$

$$S_2 = \sum_{j=1}^{n} Q_{12,52} = (-0.0135) + 0.0288 + 0.0253 + 0.0278 + (-0.0649) = 0.0035$$

$$S_3 = \sum_{j=1}^{n} Q_{13,53} = (-0.0712) + (-0.0863) + 0.1262 + (-0.0830) + 0.0217 = -0.0927$$

$$S_4 = \sum_{j=1}^{n} Q_{14,54} = 0(-0.0135) + 0.0288 + 0.0253 + 0.0278 + 0.1083 = 0.1767$$

$$S_5 = \sum_{j=1}^{n} Q_{15,55} = 0.1020 + 0.1439 + (-0.0756) + (-0.0830) + 0.0217 = 0.1089$$

$$S_6 = \sum_{j=1}^{n} Q_{16,56} = (-0.0135) + 0.0288 + 0.0253 + 0.1386 + (-0.0649) = 0.1143$$

The final MABAC score shows a score that reflects the ranking of each e-commerce platform alternative based on an evaluation of relevant criteria, such as transaction speed, fees, security, ease of use, and additional features. These results provide clear guidance in determining the most suitable e-commerce platform for online business needs based on objective analysis.

3.4 Recommended Result

Outcome recommendations are an important step in the decision-making process, especially in the context of choosing the right e-commerce platform to support the needs of online businesses. Based on the analysis conducted using the MABAC method, each alternative is objectively evaluated based on relevant criteria, such as transaction speed, fees, security, ease of use, and additional features. The results of this analysis provide a clear picture of the performance of each platform, allowing stakeholders to make more informed decisions. Therefore, the recommendations compiled based on the results of this analysis not only focus on the alternatives with the highest scores, but also consider other aspects that may be relevant to the desired business strategy. It aims to provide a comprehensive and strategic guide in choosing an e-commerce platform that will support business growth and success in a competitive market. The results of the e-commerce ranking are shown in figure 2.

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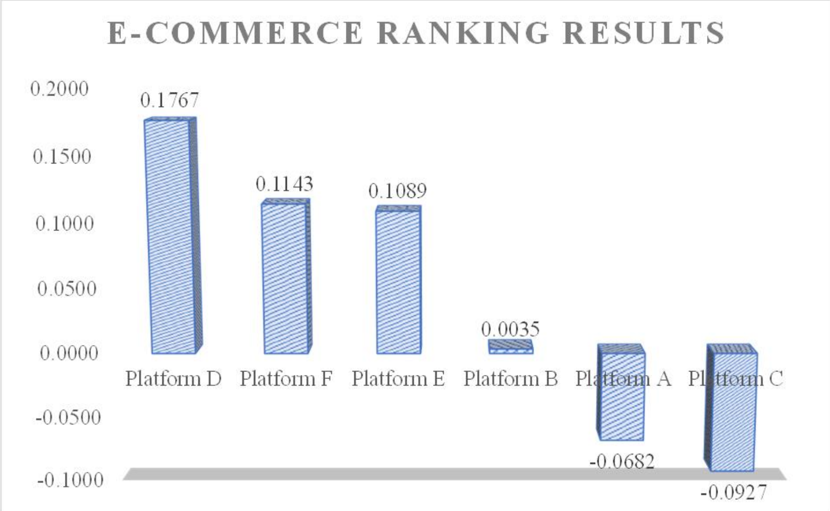

Figure 2. E-Commerce Ranking Results

Based on the ranking results from figure 2 in the MABAC method and the Entropy weighting shown in the graph above, Platform D occupies the top position with the highest value of 0.1767, followed by Platform F with a value of 0.1143, and Platform E with a value of 0.1089. Meanwhile, Platform B, despite having a positive value of 0.0035, is in fourth place, showing a lower performance compared to the top three platforms. Platform A and Platform C show negative values, -0.0682 and -0.0927, respectively, indicating that they are less competitive in these rankings. Overall, these results provide a clear insight into how the performance of various e-commerce platforms compares based on predetermined criteria.

4. CONCLUSION

The implementation of the MABAC method combined with Entropy weighting in determining the best e-commerce platform for online businesses offers a comprehensive and objective approach to decision-making. Entropy weighting ensures that the significance of each criterion, such as platform features, user experience, security, and cost, is objectively determined based on the variability of data. By applying the MABAC method, the alternatives (e-commerce platforms) are evaluated and ranked based on their relative distance from an ideal solution, providing a clear and structured selection process. This combination not only enhances the accuracy of the decision-making but also ensures that the most important criteria are given appropriate weight, leading to more reliable results in selecting the best platform for business needs. By combining the MABAC method and Entropy weighting, the assessment process of e-commerce platforms becomes more transparent and accurate because it considers various aspects objectively and mathematically. Entropy weighting ensures that criteria with higher variations in information, such as transaction speed, ease of integration, or customer support, are given greater weight. Furthermore, MABAC provides a more in-depth calculation by evaluating each platform against the ideal boundary area, so that the alternative that best matches the optimal criteria can be easily identified. This approach is very suitable for use in the selection of e-commerce platforms, especially in the competitive digital era, where the right strategic decisions can have a significant impact on the growth of online businesses. The results of the MABAC method ranking and Entropy weighting show that Platform D occupies the top position with the highest score of 0.1767, followed by Platform F with a value of 0.1143, and Platform E with a value of 0.1089. Meanwhile, Platform B, despite having a positive value of 0.0035, is in fourth place, showing a lower performance compared to the top three platforms. Platform A and Platform C show negative values, -0.0682 and -0.0927, respectively, indicating that they are less competitive in these rankings. Overall, these results provide a clear insight into how the performance of various e-commerce platforms compares based on predetermined criteria.

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