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Combination of EDAS Method and Entropy Weighting in the Selection of the Best Customer Service

Setiawansyah
Informatics, Universitas Teknokrat Indonesia, Indonesia
setiawansyah@teknokrat.ac.id

Abstract: Customer service is an integral part of a business that is responsible for providing service, support, and solutions to customers before, during, and after the purchase process. Selecting the best Customer Service is an important process in supporting a company's success in providing an exceptional customer experience. The main problems in assessing the best customer service are often related to subjectivity and gaps in data collection and analysis. Less clear or unstandardized assessment criteria can lead to bias, especially if the evaluation relies on the opinion of a particular individual without any supporting quantitative data. The purpose of this study is to apply the combination of EDAS method with Entropy Weighting in the selection process of the best customer service to produce an objective, transparent, and efficient scoring system by combining Entropy's ability to automatically determine the weight of criteria based on existing data, and using EDAS to evaluate and rank alternatives based on their distance from the average solution. Based on the ranking results in the best customer service alternative ranking, Andi occupies the first position with the highest score, which is 0.6017. In second place is Rina with a score of 0.5728, followed by Budi in third place with a score of 0.5053. Farhan is in fourth place with a score of 0.5. Furthermore, Siti took fifth place with a score of 0.4448, followed by Laila in sixth place with a score of 0.4172. Dewi is in seventh position with a score of 0.352, while Ahmad is in last position with the lowest score, which is 0.0928.
Keywords: Best; Combination; Customer Service; EDAS Method; Entropy Weighting;

1. INTRODUCING

Customer Service is an integral part of a business that is responsible for providing service, support, and solutions to customers before, during, and after the purchase process[1]. This role involves direct and indirect interaction to answer questions, handle complaints, and ensure customer satisfaction. As the spearhead of a company, Customer Service not only reflects the company's values and culture, but also affects customer loyalty as well as the overall reputation of the business. Selecting the best Customer Service is an important process in supporting a company's success in providing an exceptional customer experience. This assessment is carried out by considering various

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criteria, such as communication skills, speed in responding, level of empathy, problem-solving ability, and the level of customer satisfaction produced. Additionally, evaluation can also involve the use of performance data such as the number of complaints successfully resolved, customer retention rates, and direct feedback from customers[2]. By choosing the best Customer Service, companies can ensure that every interaction with customers provides positive value, strengthens brand image, and increases customer loyalty. A structured, transparent, and data-driven approach is essential to ensure that this selection process produces objective and accurate results. The main problems in assessing the best customer service are often related to subjectivity and gaps in data collection and analysis. Less clear or unstandardized assessment criteria can lead to bias, especially if the evaluation relies on the opinion of a particular individual without any supporting quantitative data. In addition, difficulties in measuring non-technical performance indicators, such as empathy or the ability to build relationships, are also a significant challenge. Other factors such as a lack of sufficient or valid customer data, weight imbalances between criteria, and limitations in evaluation tools or systems can also hinder the assessment process. If left unaddressed, these issues can result in unobjective results, reduce confidence in assessment results, and potentially affect the quality of a company's services. Problems in assessing the best Customer Service can be overcome with a Decision Support System (DSS) approach that integrates data-based analysis and multi-criteria methods. One of the methods in DSS is the evaluation based on distance from average solution method.

The evaluation based on distance from average solution (EDAS) method is one of the approaches in the DSS used to evaluate and rank alternatives based on their distance from the average solution[3]–[5]. This method measures the performance of alternatives by calculating two main values, namely positive distance from average (PDA) which reflects the advantages of the alternative over the average, and negative distance from average (NDA) which indicates its weakness. After that, the aggregate value is calculated to determine the final ranking of each alternative. The advantage of EDAS lies in its ability to consider the average reference value as a more realistic benchmark, making it suitable for decision-making in various fields, and adaptable to various types of qualitative and quantitative data. Another advantage is its ability to accommodate changes in data or decision-maker preferences without the need to repeat the entire analysis process[6], [7]. This makes EDAS highly efficient for dynamic decision-making that requires high flexibility. With this combination of advantages, EDAS is a strong choice in various case studies, such as performance evaluation, best selection, and prioritization in decision support systems. The EDAS method can also be integrated with the Entropy weighting technique to objectively determine the weight of the criteria, thereby improving the quality of the decision.

The combination of EDAS methods and Entropy weighting offers an objective and effective approach to multi-criteria decision-making. Entropy weighting is used to determine the weight of each criterion based on the degree of uncertainty or variation of the data, so that the resulting weights reflect the importance of the criteria objectively based on actual data[8]–[10]. Once the weights are determined, the EDAS method is used to evaluate alternatives by calculating the positive distance and negative distance from the mean solution for each criterion. This approach ensures that the decision-making process considers the actual distribution of data (via Entropy) while comprehensively evaluating alternatives based on their distance from the average solution[11], [12]. This combination is perfect for situations where the criteria data have significant variability, as it is able to produce more accurate, transparent, and objective alternative rankings. This combination of EDAS and Entropy weighting also offers advantages in reducing subjectivity in assessment. Entropy weighting, with its ability to analyze the distribution of information, avoids the influence of individual preferences or decisions that are not data-driven,

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guarantees that the resulting weights truly reflect the relative importance of each criterion. Once the weights are determined, EDAS plays a role in providing an alternative rating in a simple but effective way, measuring the relative strengths and weaknesses of each alternative against the average solution, which makes the evaluation process more objective, and easy to understand.

The purpose of this study is to apply the combination of EDAS method with Entropy Weighting in the selection process of the best Customer Service to produce an objective, transparent, and efficient scoring system by combining Entropy's ability to automatically determine the weight of criteria based on existing data, and using EDAS to evaluate and rank alternatives based on their distance from the average solution. This study develops an evaluation model that combines the EDAS method with the Entropy weighting method to produce a more objective and accurate performance assessment in selecting the best customer service. This research makes practical contributions for organizations that want to identify and reward the best customer service performance, which can ultimately improve service quality and customer satisfaction.

2. RESEARCH METHODOLOGY

The research stage is a series of systematic steps taken to answer a research question or solve a problem scientifically[13]–[15]. This stage includes a process ranging from problem identification, information collection, planning, to data analysis and delivery of results. Each stage is designed to ensure that research runs in a structured, valid, and reliable manner so that it can produce meaningful findings that can be accounted for academically and practically. The stages of the research carried out are shown in Figure 1.

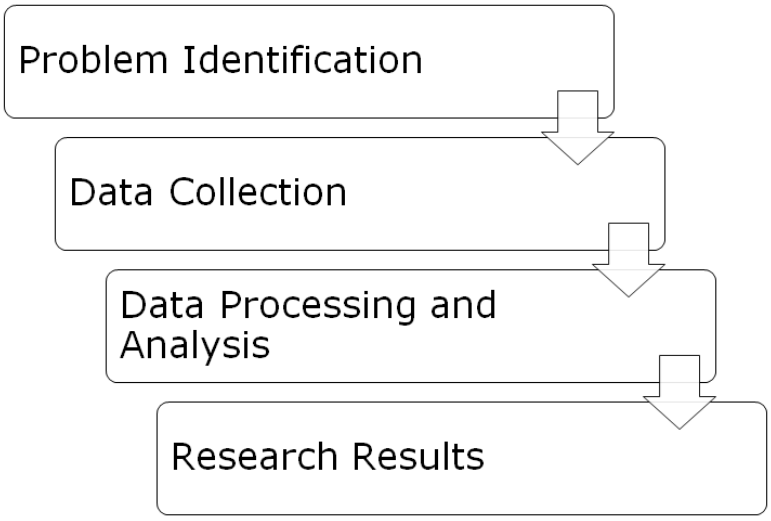

Figure 1. Research Stage

The study begins with the identification of problems, which highlight the difficulties in objectively determining the best customer service performance. Performance appraisals are often influenced by subjectivity in the weighting of criteria, resulting in less accurate results. Therefore, this study aims to integrate the Entropy Weighting method, which provides objective weights based on data, with the EDAS (Evaluation based on Distance from Average Solution) method, which is able to evaluate customer service performance comprehensively based on positive and negative ideal solutions.

The next stage is data collection, where customer service performance data is collected from various sources, such as performance reports, customer satisfaction surveys, and

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resolution time records. This data includes quantitative values for each specified criterion, such as responsiveness, customer satisfaction, resolution time, empathy, and communication skills. The data collected must be relevant and reflect the actual performance conditions.

After the data is collected, data processing and analysis are carried out. The first step is to calculate the weight of each criterion using the Entropy Weighting method, which calculates the level of data irregularity to produce an objective weight. Furthermore, the EDAS method is applied to evaluate customer service performance. This process involves calculating the positive and negative distances of the solution's mean, which is then used to determine the aggregate score and final rating of each alternative. This analysis provides a comprehensive overview of the strengths and weaknesses of each customer service based on existing criteria.

The last stage is the results of the research, where the research findings are presented in the form of the best customer service ratings. These results show the effectiveness of the combination of Entropy Weighting and EDAS methods in producing objective and accurate evaluations. This research not only provides recommendations for companies in choosing the best customer service, but also contributes to the development of methods in decision support systems.

The Entropy Weighting Method

The entropy weighting method is an objective technique in a decision support system that is used to determine the weight of each criterion based on the degree of variation or irregularity of the data on that criterion[16], [17]. This method comes from the concept of entropy in information theory, which measures uncertainty or chaos in a data system. The greater the variation in the value of a criterion, the more significant the criterion is in influencing the decision, so the weight is higher. Conversely, if the data on the criteria have a low or uniform degree of variation, then its contribution to the decision is considered smaller, so the weight is lower.

The decision matrix is formed based on the alternatives and criteria used. Each element in the matrix is an evaluation value of an alternative to certain criteria made with the following formula.

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

Data normalization is a data element in the decision matrix normalized so that all values are in the range of 0 to 1. Normalization is done to make comparative data even though it has different scales made using the following formula.

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

Calculating the entropy of each criterion using the entropy formula, the degree of irregularity in the normalized data for each criterion is calculated using the following formula.

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

Calculating degrees of diversity, this value reflects how significant the criterion is. The greater the value of the service, the more important the criterion is calculated using the following formula.

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

Determining the criteria weight of each criterion is calculated by dividing the degree of diversity by the total degree of diversity of all criteria, calculated using the following formula.

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

With the entropy weighting method, the process of determining the weight of criteria becomes more transparent and based on data patterns, resulting in a more reliable and objective decision support system.

Evaluation based on Distance from Average Solution (EDAS) Method

The Evaluation based on Distance from Average Solution (EDAS) method is one of the multi criteria decision making (MCDM) used to evaluate alternatives based on the distance from the average solution[18], [19]. This method assesses alternatives by considering the proximity to the ideal solution (positive) and staying away from the non-ideal solution (negative) using the average as a reference. The main advantages of the EDAS method are its simplicity and ability to handle complex data effectively.

The decision matrix is formed based on the alternatives and criteria used. Each element in the matrix is an evaluation value of an alternative against certain criteria using equation (1).

Calculating the average score for each criterion is used as a reference or average solution to measure how well the alternative performs against each criterion. This step involves calculating the average of the criterion values of all the alternatives evaluated calculated using the following formula.

$$AV_j = \frac{\sum_{i=1}^{j} x_{ij}}{n} \quad (6)$$

Positive Distance from Average Solution (PDA) to measure how far an alternative's value is above average for a positive attribute. Negative Distance from Average Solution (NDA) to measure how far an alternative's value is below average for a negative attribute, is calculated using the following formula for benefit criteria.

$$PDA_{ij} = \frac{\max(0,(x_{ij} - AV_j))}{AV_j} \quad (7)$$

$$NDA_{ij} = \frac{\max(0,(AV_j - x_{ij}))}{AV_j} \quad (8)$$

Calculated using the following formula for cost criteria.

$$PDA_{ij} = \frac{\max(0,(AV_j - x_{ij}))}{AV_j} \quad (9)$$

$$NDA_{ij} = \frac{\max(0,(x_{ij} - AV_j))}{AV_j} \quad (10)$$

Calculating the PDA and NDA aggregation score for each alternative of the PDA and NDA values are calculated for all alternatives and criteria, aggregation is carried out using the weighting of the criteria calculated using the following formula.

$$SP_i = \sum_{j=1}^{n} w_j * PDA_{ij} \quad (11)$$

$$SN_i = \sum_{j=1}^{n} w_j * NDA_{ij} \quad (12)$$

Normalizing the positive and negative distance weights is an important step to ensure that the distance values of each criterion can be fairly compared calculated using the following formula.

$$NSP_i = \frac{SP_i}{\max SP_i} \quad (13)$$

$$NSN_i = \frac{SN_i}{\max SN_i} \quad (14)$$

Calculating the final score for each alternative is calculated by combining the PDAS and NDAS scores using the following formula.

$$AS_i = \frac{1}{2} * (NSP_i + NSn_i) \quad (15)$$

The EDAS method is suitable for decision-making that requires a rational and comprehensive approach, such as in performance evaluation, candidate selection, or the selection of the best alternative in various situations.

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3. RESULT AND DISCUSSION

The combination of EDAS and entropy weighting methods in the selection of the best customer service is a systematic approach to determine the optimal choice based on objective data. Entropy weighting is used to objectively calculate the weight of the criteria by analyzing the degree of variation of the data on each criterion, thus eliminating subjective bias in weighting. Criteria that have higher data variation will get greater weight because they are considered more significant in decision-making. The EDAS method calculates PDA for positive attributes, and NDA for negative attributes. This combination ensures a more objective and accurate evaluation process, as the weighting of the criteria is generated quantitatively through entropy weighting, and alternative evaluations are carried out with EDAS considering the average solution as a reference. The end result is the selection of the best customer service that not only excels in individual performance but also meets various criteria in a balanced manner. This approach provides companies with powerful analytical tools to strategically improve the quality of customer service.

Data Collection

Data collection in the selection process of the best customer service aims to obtain relevant and accurate information about the performance of each customer service candidate based on predetermined criteria. The data collected can be quantitative data. This data is obtained through various methods, such as customer surveys, interviews with supervisors, direct observations, or historical performance reports. The data collected is consistent, representative, and valid to ensure objective evaluation results. This systematic data collection process is essential to support transparent and reliable decision-making. The results of data collection are shown in table 1.

Table 1. Data Collection

Alternative	Responsiveness	Customer Satisfaction	Complaint Handling	Work Accuracy	Attendance
Budi	85	90	80	88	95
Siti	92	88	85	86	90
Andi	88	85	90	90	88
Rina	80	87	88	85	92
Dewi	90	92	87	89	93
Ahmad	87	89	86	88	94
Laila	84	86	84	87	91
Farhan	89	91	89	90	96

The data sources for customer service assessment in the best selection usually come from various parties related to their performance. The score on each criterion is given on a scale of 0–100 based on supervisor assessments and customer survey results. All criteria are positive attributes, meaning that higher scores indicate better performance.

Entropy Method in Weight Determination

The Entropy method is one of the objective approaches in determining the weight of criteria in the decision support system. This method leverages concepts from information theory to measure the level of uncertainty or diversity of data associated with each criterion. The higher the level of uncertainty of a criterion, the less weight is given, because the information contained is considered less significant. In contrast, criteria with a low level of diversity, indicating more stable and consistent information, gain greater weight. This approach is very useful in data-driven decision-making, as it is able to eliminate

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subjectivity from the weighting process, resulting in more accurate and fair evaluations. By using the Entropy method, the resulting decisions are expected to be more representative of existing facts based on actual data patterns.

The decision matrix is formed based on the alternatives and criteria used. Each element in the matrix is an evaluation value of an alternative to certain criteria using equation (1).

$$X = \begin{bmatrix} 85 & 90 & 80 & 88 & 95 \\ 92 & 88 & 85 & 86 & 90 \\ 88 & 85 & 90 & 90 & 88 \\ 80 & 87 & 88 & 85 & 92 \\ 90 & 92 & 87 & 89 & 93 \\ 87 & 89 & 86 & 88 & 94 \\ 84 & 86 & 84 & 87 & 91 \\ 89 & 91 & 89 & 90 & 96 \end{bmatrix}$$

Data normalization is a data element in the decision matrix normalized so that all values are in the range of 0 to 1. Normalization is done to make comparative data even though it has different scales using equation (2).

$$k_{11} = \frac{r_{11}}{\sum_{i=1}^{m} r_{11,18}} = \frac{85}{85+92+88+80+90+87+84+89} = \frac{85}{695} = 0{,}1223$$

The overall results of the calculation of the matrix normalization value based on equation (1) are shown in table 2.

Table 2. The Overall Results of the Calculation of the Matrix Normalization Value

Alternative	Responsiveness	Customer Satisfaction	Complaint Handling	Work Accuracy	Attendance
Budi	0.1223	0.1271	0.1161	0.1252	0.1286
Siti	0.1324	0.1243	0.1234	0.1223	0.1218
Andi	0.1266	0.1201	0.1306	0.1280	0.1191
Rina	0.1151	0.1229	0.1277	0.1209	0.1245
Dewi	0.1295	0.1299	0.1263	0.1266	0.1258
Ahmad	0.1252	0.1257	0.1248	0.1252	0.1272
Laila	0.1209	0.1215	0.1219	0.1238	0.1231
Farhan	0.1281	0.1285	0.1292	0.1280	0.1299

Calculating the entropy of each criterion using the entropy formula, the degree of irregularity in the normalized data for each criterion is calculated using equation (3).

$$E_1 = \left[\frac{-1}{\ln 8}\right] \sum_{i=1}^{m} r_{11,18} * \ln r_{11,18} = (-0.125) -* (-2.0786) = 0.25982$$
$$E_2 = \left[\frac{-1}{\ln 8}\right] \sum_{i=1}^{m} r_{21,28} * \ln r_{21,28} = (-0.125) -* (-2.0791) = 0.25989$$
$$E_3 = \left[\frac{-1}{\ln 8}\right] \sum_{i=1}^{m} r_{31,38} * \ln r_{31,38} = (-0.125) -* (-2.0788) = 0.25985$$
$$E_4 = \left[\frac{-1}{\ln 8}\right] \sum_{i=1}^{m} r_{41,48} * \ln r_{41,48} = (-0.125) -* (-2.0793) = 0.25991$$
$$E_5 = \left[\frac{-1}{\ln 8}\right] \sum_{i=1}^{m} r_{51,58} * \ln r_{51,58} = (-0.125) -* (-2.0791) = 0.25988$$

Calculating degrees of diversity, this value reflects how significant the criterion is. The greater the value of the service, the more important the criterion is calculated using equation (4).

$$D_1 = 1 - E_1 = 1 - 0.25982 = 0.74018$$
$$D_2 = 1 - E_2 = 1 - 0.25989 = 0.74011$$
$$D_3 = 1 - E_3 = 1 - 0.25985 = 0.74015$$

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$D_4 = 1 - E_4 = 1 - 0.25991 = 0.74009$
$D_5 = 1 - E_5 = 1 - 0.25988 = 0.74012$

Determining the criteria weight of each criterion is calculated by dividing the degree of diversity by the total degree of diversity of all criteria, calculated using equation (5).

$$w_1 = \frac{D_1}{\sum_{j=1}^{m} D_{1,5}} = \frac{0.74018}{0.74018 + 0.74011 + 0.74015 + 0.74009 + 0.74012} = \frac{0.74018}{3.70064} = 0.20001$$
$$w_2 = \frac{D_2}{\sum_{j=1}^{m} D_{1,5}} = \frac{0.74011}{0.74018 + 0.74011 + 0.74015 + 0.74009 + 0.74012} = \frac{0.74011}{3.70064} = 0.2$$
$$w_3 = \frac{D_3}{\sum_{j=1}^{m} D_{1,5}} = \frac{0.74015}{0.74018 + 0.74011 + 0.74015 + 0.74009 + 0.74012} = \frac{0.74015}{3.70064} = 0.2$$
$$w_4 = \frac{D_4}{\sum_{j=1}^{m} D_{1,5}} = \frac{0.74009}{0.74018 + 0.74011 + 0.74015 + 0.74009 + 0.74012} = \frac{0.74009}{3.70064} = 0.19999$$
$$w_5 = \frac{D_5}{\sum_{j=1}^{m} D_{1,5}} = \frac{0.74012}{0.74018 + 0.74011 + 0.74015 + 0.74009 + 0.74012} = \frac{0.74012}{3.70064} = 0.2$$

The results of the calculation of the weight of the criteria using the entropy method for the selection of the best customer service show an almost even distribution of weight among the five criteria analyzed. The responsiveness criterion has the highest weight of 0.20001, followed by customer satisfaction, complaint handling, and attendance, each with a weight of 0.20000. Meanwhile, the work accuracy criterion has a slightly lower weight, which is 0.19999. This uniform weight distribution reflects that all criteria have an almost equal level of importance in determining the best customer service performance, with a slight advantage in the responsiveness aspect. This shows that responsiveness is the most prioritized aspect in evaluating customer service performance.

EDAS Method in Selecting the Best Customer Service

The EDAS method is one of the techniques in MCDM that is used to evaluate and select the best alternative based on certain criteria. In the context of selecting the best customer service, the EDAS method can help to assess the performance of each customer service based on several important criteria such as speed of response, customer satisfaction, complaint handling, job accuracy, and attendance. This method works by calculating the distance of each alternative to the average solution for each criterion.

The decision matrix is formed based on the alternatives and criteria used. Each element in the matrix is an evaluation value of an alternative against certain criteria using equation (1).

$$X = \begin{bmatrix} 85 & 90 & 80 & 88 & 95 \\ 92 & 88 & 85 & 86 & 90 \\ 88 & 85 & 90 & 90 & 88 \\ 80 & 87 & 88 & 85 & 92 \\ 90 & 92 & 87 & 89 & 93 \\ 87 & 89 & 86 & 88 & 94 \\ 84 & 86 & 84 & 87 & 91 \\ 89 & 91 & 89 & 90 & 96 \end{bmatrix}$$

Calculating the average score for each criterion is used as a reference or average solution to measure how well the alternative performs against each criterion. This step involves calculating the average of the criterion values of all the alternatives evaluated calculated using equation (6).

$$AV_1 = \frac{\sum_{i=1}^{j} x_{11,18}}{8} = \frac{85 + 92 + 88 + 80 + 90 + 87 + 84 + 89}{8} = \frac{695}{8} = 86.857$$
$$AV_2 = \frac{\sum_{i=1}^{j} x_{21,28}}{8} = \frac{90 + 88 + 85 + 87 + 92 + 89 + 86 + 91}{8} = \frac{708}{8} = 88.5$$

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$$AV_3 = \frac{\sum_{i=1}^{j} x_{31,38}}{8} = \frac{80+85+90+88+87+86+84+89}{8} = \frac{689}{8} = 86.125$$
$$AV_4 = \frac{\sum_{i=1}^{j} x_{41,48}}{8} = \frac{88+86+90+85+89+88+87+90}{8} = \frac{703}{8} = 87.857$$
$$AV_5 = \frac{\sum_{i=1}^{j} x_{51,58}}{8} = \frac{95+90+88+92+93+94+91+96}{8} = \frac{739}{8} = 92.375$$

Positive Distance from Average Solution (PDA) to measure how far an alternative's value is above average for a positive attribute calculated using equation (7).

$$PDA_{11} = \frac{\max(0,(x_{11} - AV_1))}{AV_1} = \frac{\max(0,(85-86.857))}{86.857} = \frac{0}{86.857} = 0$$

The overall result of the calculation of the PDA value using equation (7) is shown in table 3.

Table 3. The Overall Results of the Calculation of the PDA Value

Alternative	Responsiveness	Customer Satisfaction	Complaint Handling	Work Accuracy	Attendance
Budi	0.0000	0.0169	0.0000	0.0014	0.0284
Siti	0.0590	0.0000	0.0000	0.0000	0.0000
Andi	0.0129	0.0000	0.0450	0.0242	0.0000
Rina	0.0000	0.0000	0.0218	0.0000	0.0000
Dewi	0.0360	0.0395	0.0102	0.0128	0.0068
Ahmad	0.0014	0.0056	0.0000	0.0014	0.0176
Laila	0.0000	0.0000	0.0000	0.0000	0.0000
Farhan	0.0245	0.0282	0.0334	0.0242	0.0392

Negative Distance from Average Solution (NDA) to measure how far an alternative's value is below average for a negative attribute, is calculated using equation (8).

$$NDA_{11} = \frac{\max(0,(AV_1 - x_{11}))}{AV_1} = \frac{\max(0,(86.857-85))}{86.857} = \frac{1.857}{86.857} = 0.0216$$

The overall result of the calculation of the NDA value using equation (8) is shown in table 4.

Table 4. The Overall Results of the Calculation of the NDA Value

Alternative	Responsiveness	Customer Satisfaction	Complaint Handling	Work Accuracy	Attendance
Budi	0.0216	0.0000	0.0711	0.0000	0.0000
Siti	0.0000	0.0056	0.0131	0.0213	0.0257
Andi	0.0000	0.0395	0.0000	0.0000	0.0474
Rina	0.0791	0.0169	0.0000	0.0327	0.0041
Dewi	0.0000	0.0000	0.0000	0.0000	0.0000
Ahmad	0.0000	0.0000	0.0015	0.0000	0.0000
Laila	0.0331	0.0282	0.0247	0.0100	0.0149
Farhan	0.0000	0.0000	0.0000	0.0000	0.0000

Calculating the PDA and NDA aggregation score for each alternative of the PDA and NDA values are calculated for all alternatives and criteria, aggregation is carried out using the weighting of the criteria calculated using equation (11) and (12).

$$SP_1 = \sum_{j=1}^{n} w_{1,5} * PDA_{11,51}$$
$$SP_1 = (0.20001 * 0.0000) + (0.2 * 0.0169) + (0.2 * 0.0000) + (0.19999 * 0.0014) + (0.2 * 0.0284)$$
$$SP_1 = 0.0094$$

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$$SN_1 = \sum_{j=1}^{n} w_{1,5} * NDA_{11,51}$$
$$SN_1 = (0.20001 * 0.0216) + (0.2 * 0.0000) + (0.2 * 0.0711) + (0.19999 * 0.0000) + (0.2 * 0.0000)$$
$$SN_1 = 0.0185$$

The overall result of the calculation of the PDA and NDA aggregation value using equation (11) and (12) is shown in table 5.

Table 5. The Overall Results of the Calculation of the PDA and NDA Aggregation

Alternative	PDA Aggregation	NDA Aggregation
Budi	0.0094	0.0185
Siti	0.0118	0.0132
Andi	0.0164	0.0174
Rina	0.0044	0.0266
Dewi	0.0210	0.0000
Ahmad	0.0052	0.0003
Laila	0.0000	0.0222
Farhan	0.0299	0.0000

Normalizing the positive and negative distance weights is an important step to ensure that the distance values of each criterion can be fairly compared calculated using equation (13) and (14).

$$NSP_1 = \frac{SP_1}{\max SP_{1,8}} = \frac{0.0094}{0.0299} = 0.3129$$
$$NSN_1 = \frac{SN_i}{\max SN_{1,8}} = \frac{0.0185}{0.0266} = 0.6977$$

The overall result of the calculation of the PDA and NDA aggregation value using equation (13) and (14) is shown in table 6.

Table 6. The Overall Results of the Calculation of the Positive and Negative Distance Weights

Alternative	NSP	NSN
Budi	0.3129	0.6977
Siti	0.3946	0.4949
Andi	0.5493	0.6541
Rina	0.1456	1.0000
Dewi	0.7039	0.0000
Ahmad	0.1746	0.0109
Laila	0.0000	0.8344
Farhan	1.0000	0.0000

Calculating the final score for each alternative is calculated by combining the PDAS and NDAS scores using equatiin (15).

$$AS_1 = \frac{1}{2} * (NSP_1 + NSN_1)$$
$$AS_1 = \frac{1}{2} * (0.3129 + 0.6977) = 0.5053$$

The overall result of the calculation of the final score for each alternative using equation (15) is shown in table 7.

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Table 7. The Overall Results of the Calculation of the Final Score Alternative

Alternative	AS
Budi	0.5053
Siti	0.4448
Andi	0.6017
Rina	0.5728
Dewi	0.3520
Ahmad	0.0928
Laila	0.4172
Farhan	0.5000

The results of alternative rankings in the selection of the best customer service are shown in Figure 2.

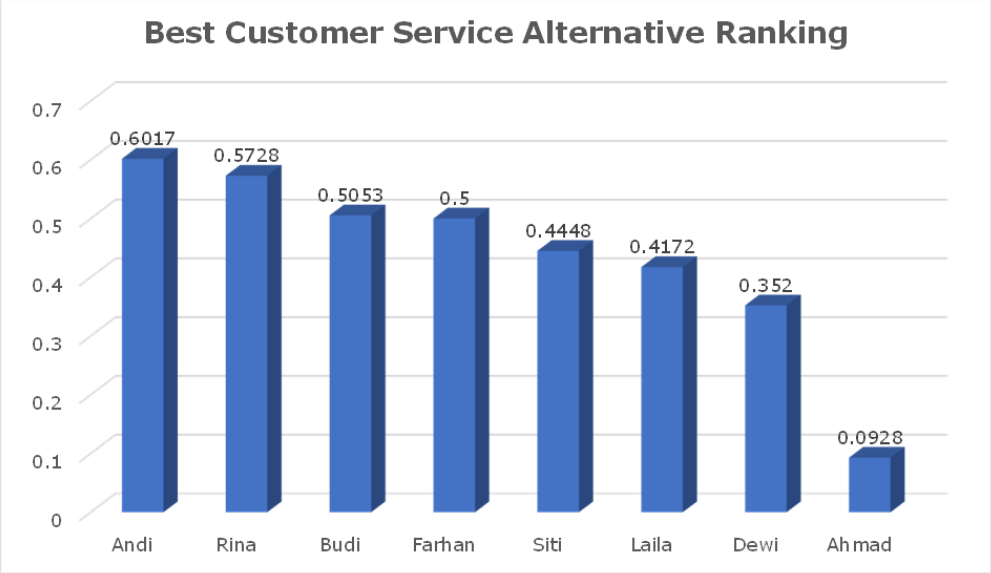

Figure 2. Best Customer Service Alternative Ranking

Based on the ranking results in the best customer service alternative ranking, Andi occupies the first position with the highest score, which is 0.6017. In second place is Rina with a score of 0.5728, followed by Budi in third place with a score of 0.5053. Farhan is in fourth place with a score of 0.5. Furthermore, Siti took fifth place with a score of 0.4448, followed by Laila in sixth place with a score of 0.4172. Dewi is in seventh position with a score of 0.352, while Ahmad is in last position with the lowest score, which is 0.0928.

4. CONCLUSION

The purpose of this study is to apply the combination of EDAS method with Entropy Weighting in the selection process of the best Customer Service to produce an objective, transparent, and efficient scoring system by combining Entropy's ability to automatically determine the weight of criteria based on existing data, and using EDAS to evaluate and rank alternatives based on their distance from the average solution. The combination of EDAS and entropy weighting methods in the selection of the best customer service is a systematic approach to determine the optimal choice based on objective data. Entropy weighting is used to objectively calculate the weight of the criteria by analyzing the degree of variation of the data on each criterion, thus eliminating subjective bias in weighting. Criteria that have higher data variation will get greater weight because they are considered

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more significant in decision-making. The EDAS method calculates PDA for positive attributes, and NDA for negative attributes. This combination ensures a more objective and accurate evaluation process, as the weighting of the criteria is generated quantitatively through entropy weighting, and alternative evaluations are carried out with EDAS considering the average solution as a reference. The end result is the selection of the best customer service that not only excels in individual performance but also meets various criteria in a balanced manner. This approach provides companies with powerful analytical tools to strategically improve the quality of customer service. Based on the ranking results in the best customer service alternative ranking, Andi occupies the first position with the highest score, which is 0.6017. In second place is Rina with a score of 0.5728, followed by Budi in third place with a score of 0.5053. Farhan is in fourth place with a score of 0.5. Furthermore, Siti took fifth place with a score of 0.4448, followed by Laila in sixth place with a score of 0.4172. Dewi is in seventh position with a score of 0.352, while Ahmad is in last position with the lowest score, which is 0.0928.

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