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# THE APPLICATION OF THE ARAS METHOD IN EVALUATING THE TOP GRADUATING STUDENTS

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***Abstract***
*This study aims to design and develop a decision support system for identifying the top graduating students using the Additive Ratio Assessment (ARAS) method at STMIK Profesional Makassar. This system was developed to facilitate the objective evaluation of students based on several criteria, namely GPA, TOEFL scores, academic achievements, and organizational involvement. The ARAS method was used because it is capable of performing an alternative ranking process based on predetermined criteria values and weights. Data collection was conducted through interviews, observations, and literature reviews. The system was built using the PHP programming language and a MySQL database. The results of the study indicate that the application of the ARAS method can assist the university in identifying the top students more effectively, quickly, and accurately based on the results of optimization calculations and alternative student rankings.*
***Keywords:*** *ARAS, Assessment, Students, Ranking, SPK*

## INTRODUCTION

The development of information technology has significantly influenced various fields, including higher education (Graha et al., n.d.). Information technology is not only used as a medium for communication and data processing, but also as a tool to support fast, precise, and accurate decision-making processes (Nisrina et al., 2025). Universities as educational institutions have the responsibility to produce qualified and high-achieving graduates (Dhmaid, 2026). Therefore, a system is needed to assist universities in determining the best students objectively.

The selection of the best students is not only based on academic achievement, but also considers non-academic aspects such as foreign language proficiency, achievements, and organizational involvement (Thalib et al., n.d.). Manual assessment processes often cause several problems, including calculation errors, lengthy selection procedures, and subjectivity in decision making. The large amount of student data and assessment criteria also makes the evaluation process more complex. To overcome these problems, a Decision Support System (DSS) is needed to support the assessment process effectively and efficiently (Suryadi et al., 2025).

One method that can be applied in a Decision Support System is the Additive Ratio Assessment (ARAS) method. ARAS is a multi-criteria decision-making method used to determine the best alternative based on the values and weights of predetermined criteria. This method has advantages such as simple calculation processes, easy implementation, and the ability to produce objective ranking results (Setiyani, 2022).

In this study, the criteria used include GPA, TOEFL scores, achievements, and organizational activities. The system was developed using the PHP programming language and MySQL database to simplify student data processing

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(Setiyani, 2022). This research aims to design a decision support system for selecting the best students using the ARAS method at STMIK Profesional Makassar so that the selection process can be carried out more quickly, accurately, and objectively (Sharma et al., 2024).

## METHOD

The method applied in this study is the ARAS method, which is an effort to implement a pre-established plan through concrete activities so that the set objectives can be optimally achieved (Baloyi & Meyer, 2020). This research method serves as a foundation or guideline to ensure that the research is conducted properly, accurately, and smoothly.

1. Activity Design The research location is the place or area where the research will be conducted. The research conducted by the author was carried out at STMIK PROFESIONAL Makassar.
2. Data Collection Techniques The data collection instrument contains a complete and detailed description of the steps and procedures for data collection. The author used the ARAS method in writing this thesis to develop better working methods to provide appropriate data in the following manner:
   a. Interview
      This study was conducted by asking a number of fundamental questions regarding the data required to build this system.
   b. Library Research
      The author sought out, collected, and read a wide range of literature and information as references directly related to and relevant to the issue. The author also conducted online research to find important information.
   c. Observation
      Observation is a data collection method based on the results of observing research subjects. In this study, observation involves more than just taking notes; it also involves analyzing the data and conducting further research on the results of the observations.
3. Operational Definition
   Based on the proposed title, the operational definition includes:
   a. Students who have achieved the highest level of excellence in campus activities.
   b. Assessment is the process of collecting and analyzing information in any form that can be used as a basis for making decisions regarding the criteria for selecting the best students at STMIK Profesional Makassar.
   c. A recommendation is a suggestion that is
   d. An application is software specifically designed to meet the needs of various activities and tasks, such as public services, business activities, advertising, games, and various other activities.
   e. The ARAS method is a ranking method; it is expected that this method will yield more accurate results in identifying the top students because it is based on predetermined criteria and weights, thereby ensuring optimal outcomes.
4. Analytical techniques

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To determine the best method for evaluating students, a simple hierarchy was created consisting of three levels: goals, criteria, and alternatives. The following is a detailed explanation of the steps in the ARAS method.
The steps for calculation using the ARAS method are as follows.

a. Creation of a Decision-Making Matrix

$$X = \begin{bmatrix} X_{0i} & X_{0j} & \dots & X_{0n} \\ X_{i1} & X_{ij} & \dots & X_{in} \\ \vdots & \vdots & \ddots & \vdots \\ X_{ni} & X_{mj} & \dots & X_{mn} \end{bmatrix} (i = 0, m ; .... j = 1, n)$$

M = number of alternatives
N = number of criteria
Xij = performance scores of the alternatives; based on the criteria
$J_{XOJ}$ = the optimal value of the criterion J
If the optimal value of the criterion J ( $X_{OJ}$) It is unknown, therefore:
$X_{oj}$ = Max$\frac{Max}{i}$ = $X_{ij}$. If $\frac{Max}{i}$.$X_{ij}$ is
Preference
$X_{oj}$ = Max$\frac{Max}{i}$ = $X_{ij}$. If $\frac{Max}{i}$.$X_{ij}$ is Prefeerable.

b. Normalization of the decision matrix for all criteria
If the criteria *beneficial* (Max) Therefore, normalization was performed as follows: $6_{ij}$ *=$\frac{Xij}{\sum_1^m=0 X_{ij}}$ → where : $X_{ij}$ * is the normalization value. If the criterion *non beneficial* so normalization was performed :
→Tahap 1 = $X_{ij=\frac{1}{Xij}}$
→Tahap 2 = R = $\frac{Xij}{\sum_1^m=0 X_{ij}}$

c. Determining the weights of the normalized matrix.
*D=[dij] m x n = rij.wj → Dimana : wj = bobot kriteria*

d. Determining the value of the optimization function
(Si) Si = $\sum_i^n = 1$ dij : (I = 1,2,…. .m;J – 1,2, … .n) where Σ is the value of the optimization function for alternative i. The largest value is the best, and the smallest value is the worst. Taking the process into account, the proportional relationship between the values and the weights of the criteria under consideration influences the final result.

e. Determine the highest ranking level of the alternative.
$K_I$=$\frac{S_i}{S_0}$ Where $S_i$ and $S_0$ is the optimal criterion value, obtained from the equation.

## RESULTS AND DISCUSSION

The results and discussion phase is the stage at which the designed system is implemented as an application. In this phase, the system's user interface and its functions are described:

1. Student Data Display
   Used to enter student data as the variable to be measured. The image below shows Figure 1.

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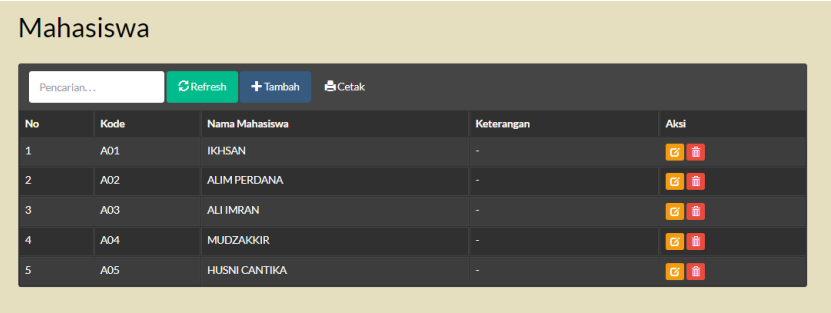


**Figure 1. Student Data View**

2. Criteria Data Display
   Used to display the criteria used to evaluate each student candidate. See the Figure 2.

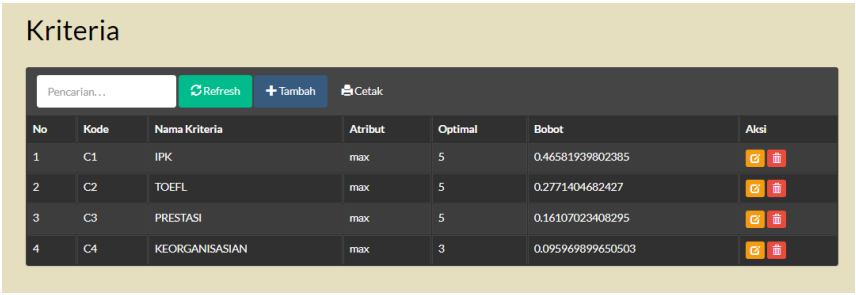


**Figure 2. Criteria Data Display**

3. Assessment Input Screen
   Used to enter assessment data based on predetermined weights. The image below shows Figure 3.


**Figure 3. Assessment Input Screen**

4. Ranking View
   Used to display the results of data processing to generate a ranking of the top students. See the Figure 4.

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Perangkingan

| Kode | Nama | Total | Fungsi Optimal | Rank |
|---|---|---|---|---|
| | Optimal | 0.221 | 1 | |
| A05 | HUSNI CANTIKA | 0.253 | 1.145 | 1 |
| A01 | IKHSAN | 0.155 | 0.703 | 2 |
| A04 | MUIZZAKKIR | 0.155 | 0.703 | 3 |
| A03 | ALI IMRAN | 0.125 | 0.566 | 4 |
| A02 | ALIM PERDANA | 0.091 | 0.414 | 5 |

**Figure 4. Ranking View**

## DISCUSSION

1. Determination of Criteria and Subcriteria

   A table of criteria and subcriteria, including examples of criteria, descriptions, and the types and subcriteria that have been defined. As shown in the table 1.

**Table 1. Criteria and Subcriteria**

| Kriteria | Keterangan | Sub kriteria | Bobot |
|---|---|---|---|
| **C1** | IPK | < 3.50 | 1 |
| | | 3.50 - 3.69 | 2 |
| | | 3.70 - 3.89 | 3 |
| | | 3.90 (5) | 5 |
| **C2** | TOEFL | < 351 | 1 |
| | | 351-349 | 2 |
| | | 450 - 499 | 3 |
| | | >=500 | 5 |
| **C3** | PRESTASI | 1 | 1 |
| | | 3 | 2 |
| | | 5 | 3 |
| | | >5 | 5 |
| **C4** | ORGANISASI | Buruk | 1 |
| | | Cukup | 2 |
| | | Baik | 3 |

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| | | | |
|---|---|---|---|
| | | Sangat Baik | 5 |

2. Determining the Compatibility Ratings of Alternatives for Each Criterion.
The rating table for the suitability of student grades has been compiled according to needs, starting from the name and weighted grades. As shown in the table 2.

**Tabel 2. Student Grade Compatibility Rating**

| **Mhs/Kriteria** | **Ket** | | **C1** | **C2** | **C3** | **C4** |
|---|---|---|---|---|---|---|
| **Bobot** | | | **5** | **3** | **2** | **1** |
| **Optimal** | | | **5** | **5** | **5** | **3** |
| A1 | IKHSAN | | 3 | 3 | 3 | 1 |
| A2 | INDO ILLANG | | 3 | 5 | 5 | 2 |
| A3 | INDAH | | 5 | 5 | 1 | 3 |
| A4 | IWAN | | 1 | 5 | 3 | 2 |
| A5 | LA BACO | | 1 | 1 | 1 | 2 |

3. Normalization
The normalization process is performed to obtain the decision matrix results. See Table 4.

**Tabel 4. Normalization**

| | | | |
|---|---|---|---|
| 5 | 5 | 0.2 | 0.3 |
| 3 | 3 | 0.3 | 1 |
| 3 | 5 | 0.2 | 0.5 |

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| | | | |
|---|---|---|---|
| 5 | 5 | 1 | 0.3 |
| 1 | 5 | 0.3 | 0.5 |
| 1 | 1 | 1 | 0.5 |
| **18** | **24** | **3.07** | **3.17** |

Thus, the decision matrix can be solved using the example solutions C1, C2, C3, and C4, which are identical to the solution method C1.

C1= $R_{01} = \frac{5}{18} = 0{,}28$

= $R_{11} = \frac{3}{18} = 0{,}17$

= $R_{21} = \frac{3}{18} = 0{,}17$

= $R_{31} = \frac{5}{18} = 0{,}28$

= $R_{41} = \frac{1}{18} = 0{,}06$

= $R_{51} = \frac{1}{18} = 0{,}06$

Based on the results of the decision matrix calculations above, the normalized decision matrix is as follows. As shown in the table 5.

**Tabel 5. Matrix calculation results**

| | | | |
|---|---|---|---|
| 0.28 | 0,23 | 0.02 | 1.03 |
| 0,17 | 0,15 | 0,11 | 0,32 |
| 0,17 | 0,21 | 0.07 | 0,16 |
| 0,28 | 0,24 | 0,33 | 0,11 |
| 0,06 | 0,21 | 0,12 | 0,16 |
| 0,06 | 0,04 | 0,33 | 0,16 |

4. Determining the weights of the normalized matrix

The next step is to determine the weights of the normalized matrix by multiplying the matrix by the normalized criteria weights. For example, the result of multiplying D1 is shown in Table 6. The results of multiplying D2, D3, and D4 are the same as that of D1. See table 6.

**Table 6. Normalized Matrix**

| | | | |
|---|---|---|---|
| 0.28 | 0,23 | 0.02 | 1.03 |
| 0,17 | 0,15 | 0,11 | 0,32 |
| 0,17 | 0,21 | 0.07 | 0,16 |
| 0,28 | 0,24 | 0,33 | 0,11 |
| 0,06 | 0,21 | 0,12 | 0,16 |
| 0,06 | 0,04 | 0,33 | 0,16 |
| **0,5** | **0,3** | **0,2** | **0,1** |

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**D1**

$D_{01}$ = A * 101 * W1 = 0,28 * 0,5= 0,13
$D_{11}$ = A * 11 * W1 = 0,17 * 0,5= 0,08
$D_{21}$ = A * 21 * W1 = 0,17* 0,5= 0,08
$D_{31}$ = A * 31 * W1 = 0,28 * 0,5= 0,13
$D_{41}$ = A * 41 * W1 = 0,06 * 0,5= 0,03
$D_{51}$ = *A * 51 * W1 = 0,06 * 0,5= 0,03*

The matrix results obtained from the above multiplication calculations are shown in Table 7:

**Table 7. Hasil Matriks**

| | | | |
|---|---|---|---|
| 0,13 | 0,06 | 0,01 | 0,01 |
| 0,08 | 0,03 | 0,02 | 0,03 |
| 0,08 | 0,06 | 0,01 | 0,03 |
| 0,13 | 0,06 | 0,05 | 0,01 |
| 0,03 | 0,06 | 0,02 | 0,02 |
| 0,03 | 0,01 | 0,03 | 0,02 |

5. Determining the value of the optimization function
   The value of the optimization function is determined by summing the criterion values for each student, based on the results of the matrix multiplication by the weights performed earlier.
   S01 = 0,13+ 0,06+ 0,01+ 0,01=0.21
   S1 = 0,08+ 0,03+0,02+ 0,03 =0,16
   S2 = 0,08+ 0,58 + 0,01 + 0,03 = 0,16
   S3 = 0,13+ 0,06+ 0,05 + 0,01= 0,25
   S4 =0,03+ 0,06+ 0,02 +0,02 = 0,12
   S5 =0,03+ 0,01+ 0,03 +0,02 =0,11
6. Determine the highest ranking for each alternative
   $K_I=\frac{S_i}{S_0}$ Where $S_i$ and $S_0$ are the optimality criteria values, obtained from the equation as is clear.
   K0 = $\frac{S01}{S0} = \frac{0,287}{0.28}$ = 1
   K1 = $\frac{S11}{S0} = \frac{0,16}{0.28}$ = 0,77
   K2 = $\frac{S12}{S0} = \frac{0,16}{0.28}$ = 0,78
   K3 = $\frac{S13}{S0} = \frac{0,25}{0.28}$ = 1.20
   K4 = $\frac{S14}{S0} = \frac{0,12}{0.28}$ = 0,56
   K5 = $\frac{S15}{S0} = \frac{0.11}{0.28}$ = 0,51

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Based on the calculations above, the following table shows the ranking levels for each alternative are shown in Table 8.

**Table 8. Ranking Results**

| | C1 | C2 | C3 | C4 | Total | Fungsi Optima | Rank |
|---|---|---|---|---|---|---|---|
| Optimal | 0.13 | 0.06 | 0.01 | 0.01 | 0.21 | 1 | |
| A001 | 0.08 | 0.03 | 0.02 | 0.03 | 0.16 | 0.77 | 3 |
| A002 | 0.08 | 0.06 | 0.01 | 0.02 | 0.16 | 0.78 | 2 |
| A003 | 0.13 | 0.06 | 0.05 | 0.01 | 0.25 | 1.20 | 1 |
| A004 | 0.03 | 0.06 | 0.02 | 0.02 | 0.12 | 0.56 | 4 |
| A005 | 0.03 | 0.01 | 0.05 | 0.02 | 0.11 | 0.51 | 5 |

## CONCLUSION

This study successfully designed and developed a Decision Support System (DSS) for evaluating top graduating students using the Additive Ratio Assessment (ARAS) method at STMIK Profesional Makassar. The system was developed to support objective and efficient decision making in selecting the best students based on several criteria, including GPA, TOEFL scores, achievements, and organizational involvement. The implementation of the ARAS method enabled the ranking process to be carried out systematically through normalization, weighting, and optimization calculations.

The results of the study indicate that the ARAS method is effective in producing accurate and objective rankings of student alternatives. The developed system also simplifies data processing and reduces errors and subjectivity that often occur in manual assessments. In addition, the use of PHP and MySQL facilitated the development of an application capable of processing student data quickly and efficiently.

Therefore, the proposed system can assist universities in determining top graduating students more effectively, transparently, and accurately. Future research is expected to improve the system by integrating additional assessment criteria and comparing ARAS with other decision-making methods to achieve more optimal results.

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