

Research Article

# Best Employee Selection Using The Additive Ratio Assessment Method

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## Abstract:

This study aims to solve the problem of selecting the best employees at Café Alvina. In order for employee performance to be further improved and more motivated in doing their work, the leadership gives awards to employees who have a good reputation in it so that all employees are motivated to be able to improve the quality of their respective work. The problem of selecting the best employees is done by building a decision support system. The DSS was built using the ARAS (Additive Ratio Assessment method) method. The criteria used consisted of discipline, responsible, diligent, and cooperation with the weight of each criterion being 0.28, 0.11, 0.19, 0.31, 0.11. The results obtained from this study are the best employee recommendations consisting of employee\_004 with a score of 0.9246 ranked 1st, employee\_006 with a score of 0.8244, ranked 2nd, and employee\_002 with a score of 0.5446 ranked 3rd. Through this decision support system, Alvina's café manager was greatly assisted because it becomes easier to decide on the selection of the best employees at the Café.

**Keywords:** Café, employees, selecting, DSS, ARAS



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## 1. INTRODUCTION

The development of computer technology that is increasingly rapidly in this day and age provides more benefits in human life [1]–[9]. One of the benefits is as a system that can be used to assist humans in making decisions on a problem or what is often referred to as a decision support system [10]–[18], [19]–[23]. A person is often faced with problems in making decisions between good choices, so a tool is needed so that the decision-making process takes place effectively and efficiently and so that the resulting decisions are the best decisions. Computer-based decision support system is one way to help these problems. Employees are one of the important elements in a company, both private and national. Many companies really value the performance of their employees because it is employees who determine the fate of a company. Alvina Cafe is a company engaged in the food sector.

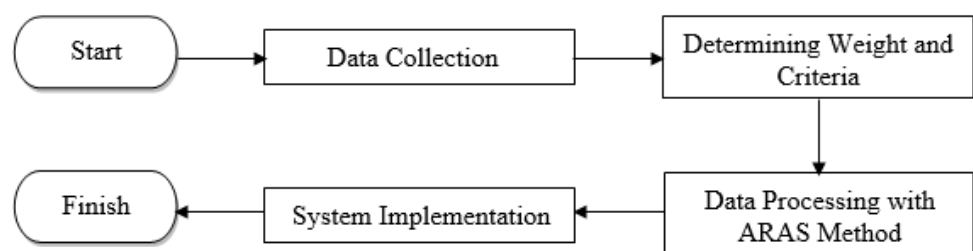
Alvina Cafe was founded on March 13, 2017. Alvina has many employees who work with each other in their respective fields. In addition, Alvina is also led by

a manager who manages the work. Alvina itself has its own charm from food to drinks that cannot be purchased elsewhere and Alvina also has a very high quality of service to customers. The performance of Alvina Cafe's employees is very good. For that there must be a reward or award for employees who have a good reputation in it so that the performance of the employees can be further improved and more motivated to do their work. In addition, an evaluation is needed for employees so that in the future Alvina Cafe can improve the quality of work of its employees. Alvina Cafe needs a system that is easy to use in determining the selection of the best employees. For this reason, a decision support system can be used that can be used by Alvina Cafe and its employees via the internet.

The method used in making this system is the Additive Ratio Assessment method. The Aras method is used because a complex problem can be simplified and the decision-making process accelerated [24], [25], [25]–[29]. In addition, the Aras method allows users to intuitively assign a relative weight value of a compound criterion, namely by performing pairwise comparisons which are converted into a set of numbers that represent the relative priority of each criterion and this system is expected to be a solution in deciding the selection the best employees and can ease the work of the Alvina Cafe Manager in choosing the best employees. Although this system can choose the best employees, the final decision remains in the hands of the Alvina Cafe Manager because this system is used to assist in selecting the best employees and not to replace the role of the Alvina Cafe Manager.

## 2. METHOD

To complete this research, the research phase was carried out to build a decision support system for selecting the best employees at Café Alvina, following the steps shown in Figure 1.



**Figure 1.** Research Framework

The criteria used in the DSS The selection of the best employees at Cafe Alvina consists of Discipline, Responsible, Diligent, and Cooperation with the weight of each criterion being 0.28, 0.11, 0.19, 0.31, 0.11. Criteria data and types of each criterion can be seen in table 1.

**Table 1.** Criteria Table

Criteria	Description	Weight	Criteria Type
C <sub>1</sub>	Discipline	0.28	Max
C <sub>2</sub>	Responsible	0.11	Max
C <sub>3</sub>	Diligent	0.19	Max
C <sub>4</sub>	Cooperation	0.31	Max
C <sub>5</sub>	Honest	0.11	Max

To make it easier to process the data that has been collected, the values of each criterion are grouped with values as shown in table 2.

**Table 2.** Criteria Value

No	Discipline (C <sub>1</sub> )	Responsibility (C <sub>2</sub> )	Diligent (C <sub>3</sub> )	Cooperation (C <sub>4</sub> )	Honest (C <sub>5</sub> )	Criteria Value
1	Very Good	Very Good	Very Good	Very Good	Very Good	5
2	Good	Good	Good	Good	Good	4
3	Good Enough	Good Enough	Good Enough	Good Enough	Good Enough	3
4	Deficient	Deficient	Deficient	Deficient	Deficient	2
5	Not Good	Not Good	Not Good	Not Good	Not Good	1

The data from the assessment results of each employee alternative that will be processed in the decision support system for selecting the best employee can be seen in table 3.

**Table 3.** Criteria Results

No	Alternative	Criteria				
		C <sub>1</sub>	C <sub>2</sub>	C <sub>3</sub>	C <sub>4</sub>	C <sub>5</sub>
1	A1	5	2	3	1	2
2	A2	3	3	5	1	1
3	A3	4	3	4	1	3
4	A4	4	3	5	5	5
5	A5	1	3	4	2	5
6	A6	5	4	4	5	3

### 3. RESULT AND DISCUSSION

The selection of land for tobacco cultivation is very important so that the planning of the farming business produces profits that are in line with the expectations of tobacco commodity agricultural land in Bojonegoro Regency and the average lamongan is dominated by paddy fields. The area of land owned by

At this stage, data processing has been collected using the ARAS (Additive Ratio Assessment method) method. The steps taken include:

Step 1: Determining the Decision Matrix

$$X_{ij} = \begin{bmatrix} 5 & 4 & 5 & 5 & 5 \\ 5 & 2 & 3 & 1 & 2 \\ 3 & 3 & 5 & 1 & 1 \\ 4 & 3 & 4 & 1 & 3 \\ 4 & 3 & 5 & 5 & 5 \\ 1 & 3 & 4 & 2 & 5 \\ 5 & 4 & 4 & 5 & 3 \end{bmatrix} \quad (1)$$

Step 2: Normalize the Decision Making Matrix (DDM) for all criteria, as follows:

The matrix 1 is added down to get the result [27,22,30,20,24].

$$C_1 : R_{01} = \frac{5}{27} = 0.1852$$

$$R_{43} = \frac{5}{30} = 0.1667$$

$$R_{11} = \frac{5}{27} = 0.1852$$

$$R_{53} = \frac{4}{30} = 0.1333$$

$$R_{21} = \frac{3}{27} = 0.1111$$

$$R_{63} = \frac{4}{30} = 0.1333$$

$$R_{31} = \frac{4}{27} = 0.1481$$

$$C_4 : R_{04} = \frac{5}{20} = 0.25$$

$$R_{41} = \frac{4}{27} = 0.1481$$

$$R_{14} = \frac{1}{20} = 0.05$$

$$R_{51} = \frac{1}{27} = 0.037$$

$$R_{24} = \frac{1}{20} = 0.05$$

$$R_{61} = \frac{5}{27} = 0.1852$$

$$R_{34} = \frac{1}{20} = 0.05$$

$$C_2 : R_{02} = \frac{4}{22} = 0.1818$$

$$R_{44} = \frac{5}{20} = 0.25$$

$$R_{12} = \frac{2}{22} = 0.0909$$

$$R_{54} = \frac{2}{20} = 0.1$$

$$R_{22} = \frac{3}{22} = 0.1364$$

$$R_{64} = \frac{5}{20} = 0.25$$

$$R_{32} = \frac{3}{22} = 0.1364$$

$$C_5 : R_{05} = \frac{5}{24} = 0.2083$$

$$R_{42} = \frac{3}{22} = 0.1364$$

$$R_{15} = \frac{2}{24} = 0.0833$$

$$\begin{aligned}
 R_{52} &= \frac{3}{22} = 0.1364 & R_{25} &= \frac{1}{24} = 0.0417 \\
 R_{62} &= \frac{4}{22} = 0.1818 & R_{35} &= \frac{3}{24} = 0.125 \\
 C_3 : R_{03} &= \frac{5}{30} = 0.1667 & R_{45} &= \frac{5}{24} = 0.2083 \\
 R_{13} &= \frac{3}{30} = 0.1 & R_{55} &= \frac{5}{24} = 0.2083 \\
 R_{23} &= \frac{5}{30} = 0.1667 & R_{65} &= \frac{3}{24} = 0.125 \\
 R_{33} &= \frac{4}{30} = 0.1333
 \end{aligned}$$

Then the result of normalization is:

$$X = \begin{bmatrix} 0.1852 & 0.1818 & 0.1667 & 0.25 & 0.2083 \\ 0.1852 & 0.0909 & 0.1 & 0.05 & 0.0833 \\ 0.1111 & 0.1364 & 0.1667 & 0.05 & 0.0417 \\ 0.1481 & 0.1364 & 0.1333 & 0.05 & 0.125 \\ 0.1481 & 0.1364 & 0.1667 & 0.25 & 0.2083 \\ 0.037 & 0.1364 & 0.1333 & 0.1 & 0.2083 \\ 0.1852 & 0.1818 & 0.1333 & 0.25 & 0.125 \end{bmatrix} \quad (2)$$

Step 3: Determine the normalized weight:

$$\begin{aligned}
 D_{01} &= X_{01} * W_1 = 0.1852 * 0.28 = 0.0519 \\
 D_{11} &= X_{11} * W_1 = 0.1852 * 0.28 = 0.0519 \\
 D_{21} &= X_{21} * W_1 = 0.1111 * 0.28 = 0.0311 \\
 D_{31} &= X_{31} * W_1 = 0.1481 * 0.28 = 0.0415 \\
 D_{41} &= X_{41} * W_1 = 0.1481 * 0.28 = 0.0415 \\
 D_{51} &= X_{51} * W_1 = 0.037 * 0.28 = 0.0104 \\
 D_{61} &= X_{61} * W_1 = 0.1852 * 0.28 = 0.0519
 \end{aligned}$$

$$\begin{aligned}
 D_{02} &= X_{02} * W_2 = 0.1818 * 0.11 = 0.02 \\
 D_{12} &= X_{12} * W_2 = 0.0909 * 0.11 = 0.01 \\
 D_{22} &= X_{22} * W_2 = 0.1364 * 0.11 = 0.015 \\
 D_{32} &= X_{32} * W_2 = 0.1364 * 0.11 = 0.015 \\
 D_{42} &= X_{42} * W_2 = 0.1364 * 0.11 = 0.015 \\
 D_{52} &= X_{52} * W_2 = 0.1818 * 0.11 = 0.02
 \end{aligned}$$

$$\begin{aligned}
 D_{03} &= X_{03} * W_3 = 0.1667 * 0.19 = 0.0317 \\
 D_{13} &= X_{13} * W_3 = 0.1 * 0.19 = 0.019 \\
 D_{23} &= X_{23} * W_3 = 0.1667 * 0.19 = 0.0317
 \end{aligned}$$

$$D_{33} = X_{33} * W_3 = 0.1333*0.19 = 0.0253$$

$$D_{43} = X_{43} * W_3 = 0.1667*0.19 = 0.0317$$

$$D_{53} = X_{53} * W_3 = 0.1333*0.19 = 0.0253$$

$$D_{63} = X_{63} * W_3 = 0.1333*0.19 = 0.0253$$

$$D_{04} = X_{04} * W_4 = 0.25*0.31 = 0.0775$$

$$D_{14} = X_{14} * W_4 = 0.05*0.31 = 0.0155$$

$$D_{24} = X_{24} * W_4 = 0.05*0.31 = 0.0155$$

$$D_{34} = X_{34} * W_4 = 0.05*0.31 = 0.0155$$

$$D_{44} = X_{44} * W_4 = 0.025*0.31 = 0.0775$$

$$D_{54} = X_{54} * W_4 = 0.01*0.31 = 0.031$$

$$D_{64} = X_{64} * W_4 = 0.25*0.31 = 0.0775$$

$$D_{05} = X_{05} * W_5 = 0.2083*0.11 = 0.0229$$

$$D_{15} = X_{15} * W_5 = 0.0833*0.11 = 0.0091$$

$$D_{25} = X_{25} * W_5 = 0.0417*0.11 = 0,0045$$

$$D_{35} = X_{35} * W_5 = 0.125*0.11 = 0,0137$$

$$D_{45} = X_{45} * W_5 = 0.2083*0.11 = 0,02292$$

$$D_{55} = X_{55} * W_5 = 0.2083*0.11 = 0,0292$$

$$D_{64} = X_{64} * W_4 = 0.125*0.11 = 0.1375$$

From the calculation above, the following matrix can be obtained:

$$D = \begin{bmatrix} 0.0519 & 0.02 & 0.0317 & 0.0775 & 0.0229 \\ 0.0519 & 0.01 & 0.019 & 0.0155 & 0.0091 \\ 0.0311 & 0.015 & 0.0317 & 0.0155 & 0.0458 \\ 0.0415 & 0.015 & 0.0253 & 0.0155 & 0.1375 \\ 0.0415 & 0.015 & 0.0317 & 0.0775 & 0.0229 \\ 0.0104 & 0.015 & 0.0253 & 0.031 & 0.2292 \\ 0.0519 & 0.02 & 0.0253 & 0.0775 & 0.125 \end{bmatrix} \quad (3)$$

Step 4: Determine the value of the optimum function by adding up the criteria values for each alternative from the matrix multiplication with the weights from the previous step.

$$S_0 = 0.0519 + 0.02 + 0.0317 + 0.0775 + 0.0229 = 0.2039$$

$$S_1 = 0.0519 + 0.01 + 0.19 + 0.0155 + 0.0091 = 0.1055$$

$$S_2 = 0.0311 + 0.015 + 0.0317 + 0.0155 + 0.0458 = 0.0978$$

$$S_3 = 0.0415 + 0.015 + 0.0253 + 0.0155 + 0.1375 = 0.1110$$

$$S_4 = 0.0415 + 0.015 + 0.0317 + 0.0775 + 0.0229 = 0.1885$$

$$S_5 = 0.0104 + 0.015 + 0.0253 + 0.031 + 0.2292 = 0.1046$$

$$S_6 = 0.0519 + 0.02 + 0.0253 + 0.0775 + 0.125 = 0.1884$$

Step 5: Determine the highest ranking level of each alternative by dividing the alternative value against alternative 0.

$$K_0 = \frac{0.2039}{0.9997} = 0.2039$$

$$K_1 = \frac{0.1055}{0.9997} = 0.1055$$

$$K_2 = \frac{0.0978}{0.9997} = 0.0978$$

$$K_3 = \frac{0.1110}{0.9997} = 0.1110$$

$$K_4 = \frac{0.1885}{0.9997} = 0.1885$$

$$K_5 = \frac{0.1046}{0.9997} = 0.1046$$

$$K_6 = \frac{0.1884}{0.9997} = 0.1884$$

From the calculation above, the results of the ranking table for each alternative can be obtained, namely:

**Table 4.** Value of each Alternative

Alternative	C <sub>1</sub>	C <sub>2</sub>	C <sub>3</sub>	C <sub>4</sub>	C <sub>5</sub>	S	K
A <sub>0</sub>	0.0519	0.02	0.0317	0.0075	0.0229	0.2039	0.2039
A <sub>1</sub>	0.0519	0.01	0.019	0.0155	0.0091	0.1055	0.1055
A <sub>2</sub>	0.0311	0.015	0.0317	0.0155	0.0458	0.0978	0.0978
A <sub>3</sub>	0.0415	0.015	0.0253	0.0155	0.1375	0.1110	0.1110
A <sub>4</sub>	0.0415	0.015	0.0317	0.0775	0.0229	0.1885	0.1885
A <sub>5</sub>	0.0104	0.015	0.0253	0.031	0.2292	0.1046	0.1046
A <sub>6</sub>	0.0519	0.02	0.0253	0.0775	0.125	0.1884	0.1884

So from the results of the calculation of the ranking level of each alternative, where the value of each alternative is divided by A<sub>0</sub> so as to produce a Utility value which will be used as a ranking level to choose the Alvina Café Manager with the highest results.

**Table 5.** Ranking

Alternative	Score(K <sub>i</sub> )	Ranking
A <sub>0</sub>	0.5174	4
A <sub>3</sub>	0.4798	6
A <sub>2</sub>	0.5446	3
A <sub>4</sub>	0.9246	1
A <sub>5</sub>	0.5130	5
A <sub>6</sub>	0.8244	2

From the results of the calculation above, a ranking is carried out based on the highest score. The 3 best employees from the results obtained from this study consisted of employee\_004 with a score of 0.9246 ranked 1<sup>st</sup>, employee\_006 with a score of 0.8244, ranked 2<sup>nd</sup>, and employee\_002 with a score of 0.5446 ranked 3<sup>rd</sup>.

#### 4. CONCLUSIONS

Based on the DSS which was built using the ARAS (Additive Ratio Assessment method) method, the problem of selecting the best employees can be done easily and quickly so that the Alvina café manager is greatly assisted because it becomes easier to decide on the selection of the best employees at the Café. The criteria used in the DSS with the ARAS method consist of Discipline, Responsible, Diligent, and Cooperation with the weight of each criterion being 0.28, 0.11, 0.19, 0.31, 0.11. The results obtained from this study are the best employee recommendations that Alvina Café managers can choose based on the highest score.

#### AUTHOR CONTRIBUTIONS

Conceptualization; Victor Marudut Mulia Siregar [V.M.M.S], Erwin Sirait [E.S], Lasminar Lusia Sihombing [L.L.S], Ivana Maretha Siregar [I.M.S], methodology; [V.M.M.S], [E.S], [L.L.S], [I.M.S], validation; [V.M.M.S], [E.S], [L.L.S], [I.M.S], formal analysis; [V.M.M.S], [E.S], [L.L.S], [I.M.S], investigation; [V.M.M.S], [E.S], [L.L.S], [I.M.S], data curation; [V.M.M.S], [E.S], [L.L.S], [I.M.S], writing—original draft preparation; [V.M.M.S], [E.S], [L.L.S], [I.M.S], writing—review and editing; [V.M.M.S], [E.S], [L.L.S], [I.M.S], visualization; supervision project administration; [V.M.M.S], [E.S], [L.L.S], [I.M.S], funding acquisition; [V.M.M.S], [E.S], [L.L.S], [I.M.S], have read and agreed to the published version of the manuscript.

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#### CONFLICTS OF INTEREST

The authors declare no conflict of interest.



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