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Decision Support System for Controlling the Establishment Permit of Raudhatul Athfal (RA) Using the Multi Attribute Utility Theory Method

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Abstract

At the Labuhanbatu Selatan Ministry of Religion office, there were problems in selecting the Raudhatul Athfal (RA) establishment permit registration file, because the admin was still selecting files one by one without using accurate calculations, so the process of obtaining a recommendation for Raudhatul Athfal (RA) establishment permit took a long time. . Therefore we need a Decision Support System (DSS) to help simplify the decision-making process by using the Multi Attribute Utility Theory (MAUT) method which will weight each criterion where the highest criterion weight value influences the interests of the other criteria so as to produce calculations with high accuracy values. Calculations are carried out by manual calculations or system calculations. The application for selecting the Raudhatul Athfal (RA) establishment permit file is a web-based application where the application will perform calculations and perform rankings quickly and accurately in determining which madrasas will later receive a recommendation for Raudhatul Athfal's establishment permit.

Keywords: *Multi Attribute Utility Theory, Raudhatul Athfal, recommendation, application*

1. INTRODUCTION

In this era of globalization, technological advances in various fields are experiencing very rapid development [1]. One of them is in the section of early childhood education. Early childhood education is a form of education that focuses on the direction of growth and development of children. Early childhood education [2]. Education from an early age is considered very important because it is the beginning of the basic knowledge that a student must have [3], which aims to change people to become better in knowledge, attitudes, and skills [4]. Raudhatul Athfal is one of the formal education institutions organized by the Ministry of Religion for the Muslim community [5]. The Raudhatul Athfal Madrasah Establishment Permit is an operational permit for the implementation of madrasah education given by the Head of the Regional Office of the Ministry of Religion after fulfilling the requirements.

In order to quickly and thoroughly obtain a recommendation for a permit to establish Raudhatul Athfal, a decision support system is needed using the Multi Attribute Utility Theory method to make it easier for the Ministry of Religion of Labuhanbatu Selatan to select and provide accurate assessments so that files do not accumulate so that it takes a long time. SPK can be defined as an interactive computer-based system, which helps decision makers to use data from various models to solve unstructured problems. SPK is designed to support all stages of decision-making starting from identifying problems, selecting relevant data, determining the approach used in the decision-making process, to evaluating alternative selection activities [6]. The MAUT (Multi Attribute Utility Theory) method is a decision support system that produces a high level of accuracy with

several criteria for each alternative that has been assessed by several consumers, [7] thus producing a ranking based on the criteria and alternatives used, [8] by changing importance into a numerical value expressed on a scale of 0-1. The number 0 represents the worst choice and 1 the best choice [9].

2. RESEARCH METHODOLOGY

2.1. Data Collection Methods

In this study the authors collected data by interview, observation and literature study. The explanation of these data sources are:

a) Interview
Conducted interviews with Mr. Mirhan Astar as the head of the Islamic Education sector at the Labuhanbatu Selatan Ministry of Religion office to obtain the criteria for an RA establishment permit and existing data

b) Observation
Observations were made precisely in the field of Islamic Education regarding the process flow for obtaining a permit to establish a madrasah.

c) Library Studies
Collecting information from literature related to the title. Namely by studying a lot of previous research in the form of journals or theses and also learning from related books.

2.2. The Multi Attribute Utility Theory Method

The Multi Attribute Utility Theory (MAUT) method has the advantage that in carrying out normalization it is not necessary to analyze the performance rating on each attribute (benefit and cost), and in the process of normalization, attributes and utilities can stand alone.[10] The steps for the Multi Attribute Utility Theory method are :

a) Define Criteria
at this stage the author determines what are the alternatives and also the most decisive criteria for obtaining Raudhatul Athfal's establishment permit.

b) Determine the weight of the criteria
Determine the weight of the criteria for the RA establishment permit that has been obtained. The highest weight is the weight that determines how important one criterion is to the other criteria.

c) Normalize the weights with the result = 1
By finding the total weight of each criterion and dividing by the total weight of each criterion.

$$\sum_{i=1}^{n} wi = 1 \quad (1)$$

d) Conduct an assessment of each alternative

e) Alternative normalization with utility value
The results obtained are between 0-1.

$$u\,(x) = \frac{x - xi^{-}}{xi^{+} - xi^{-}} \quad (2)$$

f) Compute all alternative total evaluations

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Determine the final value of each criterion.

$$v(x) = \sum_{i=1}^{n} wivi \quad (x) \qquad (3)$$

g) Ranking
Sort the final scores from highest to lowest.

3. RESULTS AND DISCUSSION

3.1. Implementation of the Multi Attribute Utility Theory Method

a) Alternative Data

The data obtained from the results of observations at the office of the ministry of religion are in the table below.

Table 1. Aternative Data

No	Pengajuan madrasah permohonan izin	Jumlah Siswa	Jumlah Pengajar	Pendapatan Organisasi	Kualifikasi pendidikan kepala madrasah	Luas lahan madrasah (M^2)
1.	Al- ansor	27	2	9500000	S1	395
2.	AL- Fajr	36	4	12000000	S1	612
3.	Al ikhlas	16	2	7000000	S1	350
4.	Al- Kautsar	15	2	7500000	S1	432
5.	Amalia	23	4	8500000	S1	640
6.	Ar-Rido	31	3	10500000	S1	502
7.	Babun Najah	17	2	7500000	S1	485
8.	Baitul Ilmi	34	3	13000000	S1	660
9.	Munawaroh	31	3	12000000	S1	532
10.	Muttaqin	27	2	10000000	S1	816
11.	Nurul Hasana	13	1	6500000	SMA	348
12.	Nurul Islam	47	7	14000000	S1	400
13.	Qurrotayyuni	10	1	6000000	S1	600
14.	Salimah	25	2	8000000	SMA	749
15.	Ummu	30	5	11500000	S1	578
16.	Nurul Ilmi	39	4	11500000	S1	600
17.	Ulumahuam	28	5	9000000	S1	740

b) Subcriteria Data

In the research that was conducted at the office of the Ministry of Religion in South Labuh Anbatu, the authors obtained 5 criteria, namely :

Table 2. The number of students

Parameter	Value	Information
≥ 31	5	Sangat Baik
26 – 30	4	Baik
21 – 25	3	Cukup
16 – 20	2	Tidak Baik
≤ 15	1	Sangat Buruk

Table 3. Number of teachers

Parameter	Value	Information
≥ 6	4	Sangat Baik
4 – 5	3	Baik
2 - 3	2	Cukup
≤ 2	1	Buruk

Table 4. organization income

Parameter	Value	Information
≥ 12.000.000	5	Sangat Baik
10.000.000-11.999.999	4	Baik
8.000.000 – 9.999.999	3	Cukup
6.500.000 – 7.999.999	1	Buruk
≤ 6.499.999	1	Sangat Buruk

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https://tunasbangsa.ac.id/ejurnal/index.php/jurasik

Table 5. Madrasa Area

Parameter	Value	Information
≥ 601 M²	5	Sangat Baik
501 – 600 M²	4	Baik
401 M² - 500 M²	3	Cukup
301 M² - 400 M²	2	Buruk
≤ 300 M²	1	Sangat Buruk

Table 6. Educational Qualification

Parameter	Value	Information
>S2	3	Sangat Baik
S1	2	Baik
SMA/ SMK sederajat	1	Buruk

c) Normalization of weights with result = 1

The steps for normalizing the weight value with the result must be equal to 1. Normalizing the weight value can be by using the formula below:

Table 7. Normalize the weight of the criteria

Faktor	C1	C2	C3	C4	C5	Σ.W
Weight	0,040	0,090	0,156	0,257	0,457	**1**

Table 8. Criteria Data

Kode	Kriteria	Bobot
C1	Luas Lahan	0,040
C2	kualifikasi pendidikan	0,090
C3	Jumlah Guru	0,156
C4	Jumlah siswa	0,257
C5	pendapatan organisasi	0,457
	Total	1

d) Conduct an assessment of each alternative

Then the data obtained in the field is changed and adjusted to the sub-criteria weight values that have been determined.

Table 9. Alternative Data with Weight Value

No	Alternatif	C1	C2	C3	C4	C5
1	Al- ansor	2	2	2	4	3
2	AL- Fajr	5	2	3	5	5
3	Al ikhlas	2	2	2	2	2
4	Al- Kautsar	3	2	2	1	2
5	Amalia	5	2	3	3	3
6	Ar-Rido	4	2	2	5	4
7	Babun Najah	3	2	2	2	2
8	Baitul Ilmi	5	2	2	5	5
9	Munawaroh	4	2	2	5	5
10	Muttaqin	5	2	2	4	4
11	Nurul Hasana	2	1	1	1	2
12	Nurul Islam	2	2	4	5	5
13	Qurrotaayyuni	4	2	1	1	1
14	Salimah	5	1	2	3	3
15	Ummu	4	2	3	4	4
16	Nurul Ilmi	4	2	3	5	4
17	Ulummahuam	5	2	3	4	3

Jurnal Riset Sistem Informasi Dan Teknik Informatika (JURASIK)
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Table 10. The largest and smallest values

	C1	C2	C3	C4	C5
A-	2	1	1	1	1
A+	5	2	4	5	5

e) Alternative normalization with utility value

To make it easier to normalize the matrix, the largest and smallest values of the alternative data sub-criteria are previously sought

Tabel 11. Normalization Results

Alternatif	C1	C2	C3	C4	C5
Al- ansor	0	1	0,333	0,75	0,5
AL- Fajr	1	1	0,667	1	1
Al ikhlas	0	1	0,333	0,25	0,25
Al- Kautsar	0,333	1	0,333	0	0,25
Amalia	1	1	0,667	0,5	0,5
Ar-Rido	0,667	1	0,333	1	0,75
Babun Najah	0,333	1	0,333	0,25	0,25
Baitul Ilmi	1	1	0,333	1	1
Munawaroh	0,667	1	0,333	1	1
Muttaqin	1	1	0,333	0,75	0,75
Nurul Hasana	0	0	0	0	0,25
Nurul Islam	0	1	1	1	1
Qurrotaayyuni	0,667	1	0	0	0
Salimah	1	0	0,333	0,5	0,5
Ummu	0,667	1	0,667	0,75	0,75
Nurul Ilmi	0,667	1	0,667	1	0,75
Ulummahuam	1	1	0,667	0,75	0,5

f) Calculate all alternative total evaluations

Raudhatul Athfal Al- Ansor = (0,04 * 0) + (0,09 * 1) + (0,156*0,333) + (0,257 * 0,75) + (0,457*0,5) = 0,5632

Raudhatul Athfal Al- Fajr = (0,04 * 1) + (0,09 * 1) + (0,156 * 0,667) + (0,257 * 1) + (0,457 * 1) = 0,948

Raudhatul Athfal Al- Ikhlas = (0,04 * 0) + (0,09 * 1) + (0,156* 0,333) + (0,257 * 0,25) + (0,457 * 0,25) = 0,3205

Raudhatul Athfal Al- Kautsar = (0,04 * 0,333) + (0,09 * 1) + (0,156 * 0,333) + (0,257 *0) + (0,457 * 0,25) = 0,2695

Raudhatul Athfal Amalia = (0,04 * 1) + (0,09 * 1) + (0,156 * 0,667) + (0,257 *0,5) + (0,457 * 0,5) = 0,591

Raudhatul Athfal Ar- Rido = (0,04 * 0,667) + (0,09 * 1) + (0,156 * 0,333) + (0,257* 1) + (0,457 * 0,75) = 0,7684

Raudhatul Athfal Babun Najah = (0,04 * 0,333) + (0,09 * 1) + (0,156 * 0,333) + (0,257 * 0,25) + (0,457 * 0,25) = 0,333826

Raudhatul Athfal Baitul Ilmi	= (0,04 * 1) + (0,09* 1) + (0,156 * 0,333) + (0,257 * 1) + (0,457 * 1) = 0,896
Raudhatul Athfal Munawaroh	= (0,04 * 0,667) + (0,09 * 1) + (0,156 * 0,333) + (0,257 * 1) + (0,457 * 1) = 0,88267
Raudhatul Athfal Muttaqin	= (0,04 * 1) + (0,09 * 1) + (0,156 * 0,333) + (0,257 * 0,75) + (0,457 * 0,75) = 0,7175
Raudhatul Athfal Nurul Hasanah	= (0,04 * 0) + (0,09 * 0) + (0,156 * 0) + (0,257 * 0) + (0,457 * 0,25) = 0,11425
Raudhatul Athfal Nurul Islam	= (0,04 * 0) + (0,09 * 1) + (0,156 * 1) + (0,257 * 1) + (0,457 * 1) = 0,96
Raudhatul Athfal Qurrataayyuni	= (0,04 * 0,667) + (0,09 * 1) + (0,156 * 0) + (0,257*0) + (0,457* 0) = 0,11667
Raudhatul Athfal Salimah	= (0,04 * 1) + (0,09 * 0) + (0,156* 0,333) + (0,257 * 0,5) + (0,457 * 0,5) = 0,449
Raudhatul Athfal Ummu Zainab	= (0,04 * 0,667) + (0, 09 * 1) + (0,156 * 0,667) + (0,257 * 0,75) + (0,457 * 0,75) = 0,7561
Raudhatul Athfal Nurul Ilmi	= (0,04 * 0,667) + (0,09 * 1) + (0,156 * 0,667) + (0,257 * 1) + (0,457 * 0,75) = 0,8204
Raudhatul Athfal Ulummahuam	= (0,04 * 1) + (0,09 * 1) + (0,156 * 0,667) + (0,257 * 0,75) + (0,457 * 0,5) = 0,65525

The results of the calculations that have been done can be seen in the table below:

Table 12. The calculation results

Alternatif	Preferensi
Al- ansor	0,5632
AL- Fajr	0,948
Al ikhlas	0,3205
Al- Kautsar	0,2695
Amalia	0,591
Ar-Rido	0,7684
Babun Najah	0,333826
Baitul Ilmi	0,896
Munawaroh	0,88267
Muttaqin	0,7175
Nurul Hasana	0,11425
Nurul Islam	0,96
Qurrotaayyuni	0,11667
Salimah	0,449
Ummu Zainab	0,7561
Nurul Ilmi	0,8204
Ulummahuam	0,65525

g) Rangking

After obtaining the calculation results of all the total evaluations from the alternative data, an alternative ranking is then carried out so that it is known

which madrasah will receive a recommendation for a permit to establish raudhatul athfal from the office of the ministry of religion in South Labuhanbatu.

Table 13. Rangking

Alternatif	Preferensi	Rangking
Nurul Islam	0,96	1
AL- Fajr	0,948	2
Baitul Ilmi	0,896	3
Munawaroh	0,88267	4
Nurul Ilmi	0,8204	5
Ar-Rido	0,7684	6
Ummu Zainab	0,7561	7
Al-Muttaqin	0,7175	8
Ulummahuam	0,65525	9
Amalia	0,591	10
Al- ansor	0,5632	11
Salimah	0,449	12
Babun Najah	0,333826	13
Al ikhlas	0,3205	14
Al- Kautsar	0,2695	15
Qurrotaayyuni	0,11667	16
Nurul Hasana	0,11425	17

3.2. System Calculation Results

a) Assessment Data Page

Page containing raudhatul athfal data that has been assessed with the weight of the sub-criteria values.

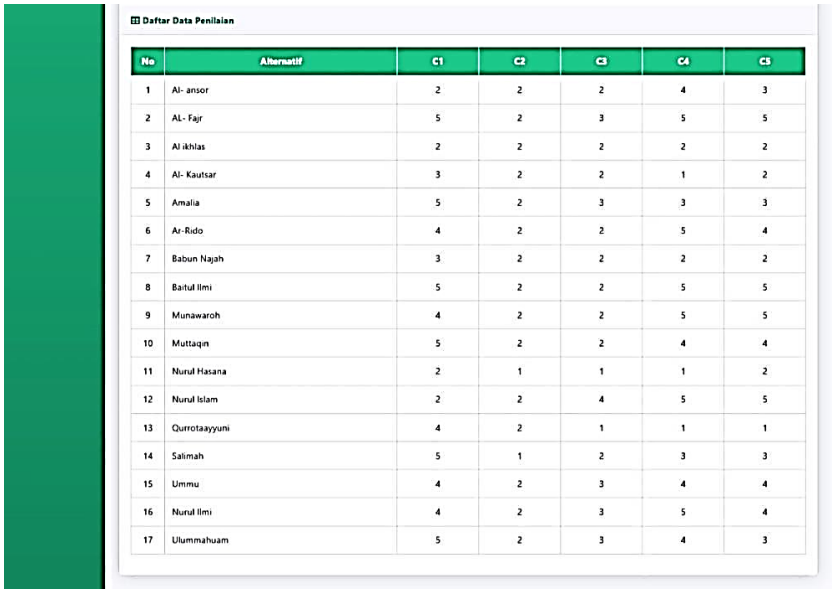

Figure 1. Assessment Data Page

b) Calculation Data Page

The page where all the calculations performed in the Multi Attribute Utility Theory method are displayed.

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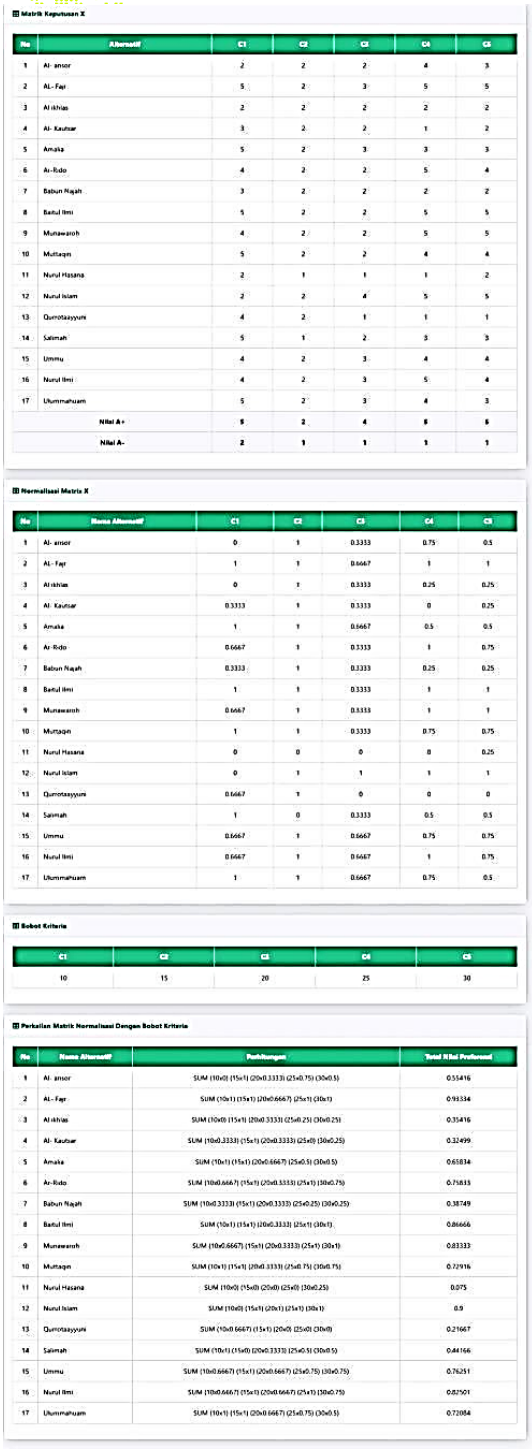

Figure 2. Calculation Data Page

c) Results Page

The results page is a page to display the results of the calculations that have been carried out and these results are ranked from the highest to the lowest value.

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https://tunasbangsa.ac.id/ejurnal/index.php/jurasik

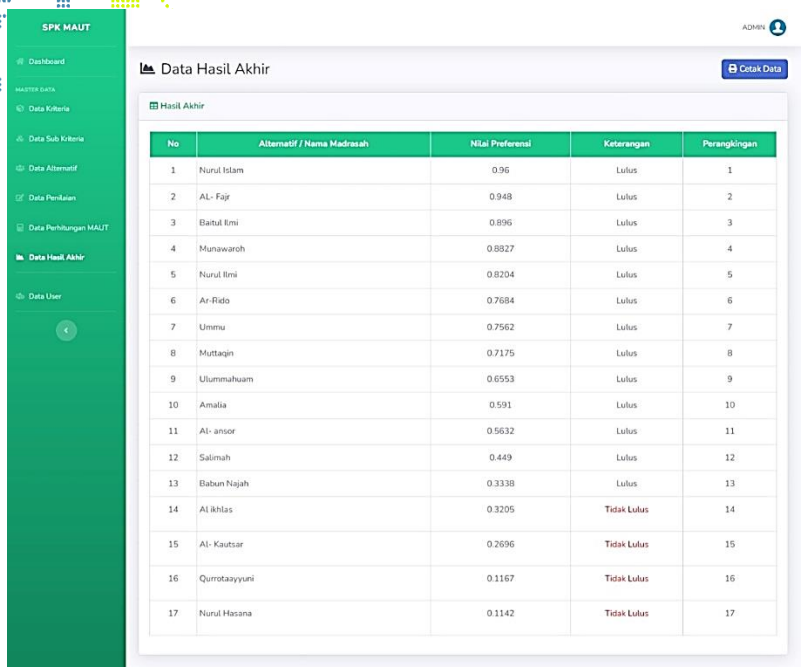

Figure 3. Results Page

4. CONCLUSION

Based on the discussion and results described, the following conclusions can be obtained calculations performed using the Multi Attribute Utility Theory Method, both with manual calculations and system calculations, have the same final data accuracy. Where is the highest final score that ranks first in the calculation with a preference value of 0.96 which is owned by the Raudhatul Athfal Nurul Islam alternative. With this it can be seen that the Multi Attribute Utility Theory Method can help the selection of recommendations for the establishment permit of Raudhatul Athfal to be easier and more accurate. The web-based application that has been made has successfully assisted employees of the Islamic Education division of the Labuhanbatu Selatan Office of the Ministry of Religion in selecting files to determine which madrasas are entitled to a recommendation for a permit for the establishment of Raudhatul Athfal

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