Analysis and Comparison of Methods Evaluation Process Multifactor Simple Additive Weighting Method In Tilawatil Musabaqah Quran (MTQ) North Sumatra Province

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Abstract-The purpose of holding an MTQ is Essentially to broadcast the Koran while looking for the best to represent the MTQ at the next level. But the point is the greatness of newspapers. With that symbol, it IS ALSO DEMANDED that a person is not only good at reading and writing, but far more important is understanding the content of the newspaper itself. The goal is not only for of participants (who take part in the competition) but Also (and this is more important) for the listener. Decision Support System (DSS) is used as an alternative to application in the selection of MusabaqahTilawatil Quran (MTQ) in North SumatraProvince by using the multifactor Evaluation Process Method and the Simple Additive Weighting Method. In the MFEP and SAW methods decision making is done by giving Subjective and objective considerations Considered to factors that are important. Reviews These considerations are in the form of weighting the multifactor Involved and are Considered important. With this Analysis and Comparison, it is expected to be Able to find a more suitable method and Be Able to help as a jury assistant to take a decision on the contestants and can help solve the problems in the MusabaqahTilawatil Quran (MTQ) Selection in North Sumatra Province properly.

Keywords: Musabaqah Tilawatil Quran (MTQ), multifactor Evaluation Process, Simple Additive weighting.

1. Introduction

Musabaqah Tilawatil Qur'an (MTQ) First held in 1940 since the founding of Jami'iyah Qurro wal Huffadz established by Nahdlatul Ulama, the largest Islamic organizations in Indonesia. [1] Since 1968, when the ministers of religion held by KH Muhammad Dahlan MTQ instituted nationwide. MTQ first held in Maksar during Ramadan in 1968. [1] MTQ until 2019 it had lasted a total of 27 times and MTQ 27 carried in Medan, North Sumatra. [1] Systematic calculation of the value of the participants in the implementation of Musabaqah Tilawatil Qur'an is the thing to the integrated and accountable results and decisions. To the authors conducted a study to compare two methods of multifactor Evaluation Process (MFEP) and Simple Additive weighting method (SAW) in order to determine which method is more suitable and efficient in implementing the MTQ assessment system.

2. Research methodology

2.1 Multi method Factro Evaluation Process (MFEP)

Multifactor Evaluation Process a decision-making model that uses a collective approach dariproses decision making [2] As for the calculation process steps using MFEP methods, namely:

- Determining factors and weighting factors where the total weighting must be equal to one.
- Load value for each factor affecting the decision of the data to be processed, the value entered in the decision-making process of the data to be processed, the value entered in the decision making process is an objective value.
- Evaluation of weight calculation process is a process between the weight calculation of weight factor and factor evaluation by the sum of all evaluations hasilweight untukmemperoleh total evaluation results.

$W = w_1 + w_2 + w_3 + w_4 + \dots \dots \dots$.Persamaan wn (1)

Information :

W = Total weight criteria

w = Weight of criteria

We = we .Persamaan (2)

Information :

We = Evaluation weights

w = Weight of criteria

e = Evaluation criteria

Evaluation = Weight Weight Factor x Factor Evaluation

Multi-factor in decision making, decision makers subjectively and intuitively weigh the various factors that have an important influence on alternative them. For influence strategic decisions, it is recommended to use a quantitative approach as MFEP [2].

In the first MFEP - all around the criteria that an important factor in the consideration given weighting (weighting) as appropriate. The same step conducted on alternative - the alternative will be selected, who then dapat dievaluasi related to factors - factors such consideration. Jumlah darimasing - masing bobot kriteria (w) harus samadengan 1 and mempunyairange nilai evaluasikriteria (e).

2.2 Simple Additive weighting method (SAW)

Simple Additive weighting method (SAW) is often also known summation method terbobot. Konsep term basis SAW method is to find a weighted summation of rating performance on each alternative on all attributes. SAW method requires a process of normalizing the decision matrix (X) to a scale that can be compared with all the ratings of existing alternatives. This method is the method most famous and most widely used in dealing with situations of Multiple Attribute Decision Making (MADM) [3]. MADM itself is a method used to find alternatives alternative optimal of a number of specific criteria.

SAW method requires decision makers determining the weights for each attribute. The total score for alternatives is obtained by adding up all the multiplication of rating (which can be compared cross-attribute) and the weight of each attribute. Rating each attribute dimension must be free in the sense that has gone through the process of normalization previous matrix [3].

Step Completion Simple Additive Weighting (SAW) as follows [5]:

- Determining criteria - criteria that will be used as reference in decision making.
- The rating determines the suitability of each alternative on each criterion.
- Make decisions based on criteria matrix (Ci), then normalized matrix based on equations that are tailored to the type attribute (attribute or attributes benefit costs) in order to obtain the normalized matrix R.
- The final results obtained from the ranking process is the summation of the normalized R matrix multiplication with the weight vector in order to obtain the greatest value is selected as the best alternative (Ai) as a solution.

formula untuk melakukan normalisasi tersebut adalah :

$$r_{ij} = \begin{cases} \frac{X_{ij}}{\text{Max}_i X_{ij}} & \text{jika } j \text{ adalah Atribut keuntungan (benefit)} \\ \frac{\text{Min}_i X_{ij}}{X_{ij}} & \text{jika } j \text{ adalah atribut biaya cost} \end{cases}$$

Where :

r_{ij} = Normalized performance rating

Max_i = Maximum value of each row and column

Min_i = Minimum value of each row and column

X_{ij} = rows and columns of a matrix

With r_{ij} is the normalized performance rating of alternatives on attribute $A_i C_j$; $i = 1, 2, \dots, m$ and $j = 1, 2, \dots, n$. Preference value for each alternative (V_i) is given as:

$$V_i = \sum_{j=1}^n w_j r_{ij}$$

Where :

V_i = Nilai akhir of alternative

w_j = The weights have been determined

r_{ij} = Normalization matrix

V_i larger value indicates that the alternative chosen.

2.3 Stage Research

In conducting this study the authors conducted several stages for collecting and managing data include:

- a) Doing Literature
The author conducted a study related to the research literature to get more information and references
- b) Observation and data collection
The author conducted a case study, the research by conducting observations and interviews to the practitioner or other authorized bodies of research to get the data needed in the research process.
- c) Data management
The author obtained and selecting the data that is needed for use in research.

3. Results and Discussion

Analysis and comparison of two methods will result in a decision in the form of advice to the Council of Justice to take the winner Decision MTQ.

In Musabaqah Tilawatil Qur'an there are several criteria including:

Table 1.
criteria MTQ

No.	Criteria	Information
1	C1	AdabFashohah
2	C2	tajwid
3	C3	Song
4	C4	Sound

Table 2
weights Preferences

No.	Description	Score	Weight
1	Very good	96-100	1
2	Well	91-95	0.75
3	Enough	81-90	0.5
4	Less	≤80	0.25

Table 3
Table Weight Criteria

No.	Criteria	Weight
1	AdabFashohah	25%
2	tajwid	35%
3	Song	20%
4	Sound	20%

Table 4
Results of Conversion Value Into weights Alternative Preferences

No.	Name	C1	C2	C3	C4
1	Mohammed Sidik	1	0.75	0.25	0.5
2	EkoKuswoyo	0.75	1	0.25	0.75
3	DianyarSaidatulHusna	0.25	0.25	0.75	1
4	Muhamad Ari	0.5	0.25	0.5	1
5	Risky Gani	0.75	1	0.25	0.5
6	M. Agung Permana	1	0.25	0.5	0.75
7	Sari Latifah Salma	0.25	0.75	1	0.25

3.1 Calculation Method MFEP

And the formula for calculating the Total Weight Evaluation is by adding up all the multiplication of Weight Factor with Factor Evaluation and can be described as follows:

$$\text{Total Weight Evaluation} = \sum \text{Weight Factor} \times \text{Factor Evaluation}$$

Calculation of Total Weight Evaluation will be conducted on each participant MTQ registered and participants who had the highest Total Weight Evaluation will be the champion. Berikut merupakan hasil perhitungan berdasarkan sample data contained in Tabel 3.4 albeit from masingpesrta:

Table 5
Total Weight Evaluation Mohammed Sidik

No.	Factor	factor weight	factor Evaluation	weight Evaluation
1	AdabFashohah	0:25	1	0.25
2	tajwid	0:35	0.75	0.26
3	Song	0:20	0.25	0.05
4	Sound	0:20	0.5	0.10
Total Weight Evaluation				0.66

Table 6
Total Weight Evaluation EkoKuswoyo

No.	Factor	factor weight	factor Evaluation	weighted Evaluation
1	AdabFashohah	0:25	0.75	0.19
2	tajwid	0:35	1	0.35
3	Song	0:20	0.25	0.05
4	Sound	0:20	0.75	0.15
Total Weight Evaluation				0.74

Table 7
Total Weight Evaluation Dianyar Saidatul Husna

No.	Factor	factor weight	factor Evaluation	weighted Evaluation
1	AdabFashohah	0:25	0.25	0.06
2	tajwid	0:35	0.25	0.09
3	Song	0:20	0.75	0.15
4	Sound	0:20	1	0.20
Total Weight Evaluation				0.50

Table 8
Total Weight Evaluation Mohammed Ari

No.	Factor	factor weight	factor Evaluation	weighted Evaluation
1	AdabFashohah	0:25	0.5	0.13
2	tajwid	0:35	0.25	0.09
3	Song	0:20	0.5	0.10
4	Sound	0:20	1	0.20
Total Weight Evaluation				0.51

Tabel.9
Total Weight Evaluation Risky Gani

No.	Factor	factor weight	factor Evaluation	weighted Evaluation
1	AdabFashohah	0:25	0.75	0.19
2	tajwid	0:35	1	0.35
3	Song	0:20	0.25	0.05
4	Sound	0:20	0.5	0.10
Total Weight Evaluation				0.69

Table 10
Total Weight Evaluation M. Agung Permana

No.	Factor	factor weight	factor Evaluation	weighted Evaluation
1	AdabFashohah	0:25	1	0.25
2	tajwid	0:35	0.25	0.09
3	Song	0:20	0.5	0.10
4	Sound	0:20	0.75	0.15
Total Weight Evaluation				0.59

Table 11
Weight Evaluation Sari Latifah Salma

No.	Factor	factor weight	factor Evaluation	weighted Evaluation
1	AdabFashohah	0:25	0.25	0.06
2	tajwid	0:35	0.75	0.26
3	Song	0:20	1	0.20
4	Sound	0:20	0.25	0.05
Total Weight Evaluation				0.58

The final results of the calculation method for the competitor MTQ MFEP which has the largest value that the winner of the race, the decision can be seen in the table below:

Table 12
Decision Methods MFEP

No.	Name	TWE	Information
1	Mohammed Sidik	0662	ranking 3
2	EkoKuswoyo	0745	ranking 2
3	DianyarSaidatulHusna	0504	-
4	Muhamad Ari	0515	-
5	Risky Gani	0693	ranking 2
6	M. Agung Permana	0595	-
7	Sari Latifah Salma	0581	-

3.2 Calculation Method SAW

Normalization Adab Fashohah (C1)

$$\begin{aligned}
 r_{11} &= \frac{X_{11}}{\max X_{11}, X_{21}, X_{31}, X_{41}} = \frac{1}{1; 0,75; 0,25; 0,5} = 1 \\
 r_{12} &= \frac{X_{12}}{\max X_{12}, X_{22}, X_{32}, X_{42}} = \frac{0,75}{0,75; 1; 0,25; 0,75} = 0,75 \\
 r_{13} &= \frac{X_{13}}{\max X_{13}, X_{23}, X_{33}, X_{43}} = \frac{0,25}{0,25; 0,25; 0,75; 1} = 0,25 \\
 r_{14} &= \frac{X_{14}}{\max X_{14}, X_{24}, X_{34}, X_{44}} = \frac{0,5}{0,5; 0,25; 0,5; 1} = 0,5 \\
 r_{15} &= \frac{X_{15}}{\max X_{15}, X_{25}, X_{35}, X_{45}} = \frac{0,75}{0,75; 1; 0,25; 0,5} = 0,75 \\
 r_{16} &= \frac{X_{16}}{\max X_{16}, X_{26}, X_{36}, X_{46}} = \frac{1}{1; 0,25; 0,5; 0,75} = 1 \\
 r_{17} &= \frac{X_{17}}{\max X_{17}, X_{27}, X_{37}, X_{47}} = \frac{0,25}{0,25; 0,75; 1; 0,25} = 0,25
 \end{aligned}$$

Normalization Tajweed (C2)

$$\begin{aligned}
 r_{21} &= \frac{X_{21}}{\max X_{11}, X_{21}, X_{31}, X_{41}} = \frac{0,75}{1; 0,75; 0,25; 0,5} = 0,75 \\
 r_{22} &= \frac{X_{22}}{\max X_{12}, X_{22}, X_{32}, X_{42}} = \frac{1}{0,75; 1; 0,25; 0,75} = 1 \\
 r_{23} &= \frac{X_{23}}{\max X_{13}, X_{23}, X_{33}, X_{43}} = \frac{0,25}{0,25; 0,25; 0,75; 1} = 0,25 \\
 r_{24} &= \frac{X_{24}}{\max X_{14}, X_{24}, X_{34}, X_{44}} = \frac{0,5}{0,5; 0,25; 0,5; 1} = 0,50 \\
 r_{25} &= \frac{X_{25}}{\max X_{15}, X_{25}, X_{35}, X_{45}} = \frac{1}{0,75; 1; 0,25; 0,5} = 1 \\
 r_{26} &= \frac{X_{26}}{\max X_{16}, X_{26}, X_{36}, X_{46}} = \frac{0,25}{1; 0,25; 0,5; 0,75} = 0,25 \\
 r_{27} &= \frac{X_{27}}{\max X_{17}, X_{27}, X_{37}, X_{47}} = \frac{0,75}{0,25; 0,75; 1; 0,25} = 0,75
 \end{aligned}$$

Voice Normalization (C3)

$$\begin{aligned}
 r_{31} &= \frac{X_{31}}{\max X_{11}, X_{21}, X_{31}, X_{41}} = \frac{0,25}{1; 0,75; 0,25; 0,5} = 0,25 \\
 r_{32} &= \frac{X_{32}}{\max X_{12}, X_{22}, X_{32}, X_{42}} = \frac{0,25}{0,75; 1; 0,25; 0,75} = 0,25 \\
 r_{33} &= \frac{X_{33}}{\max X_{13}, X_{23}, X_{33}, X_{43}} = \frac{0,75}{0,25; 0,25; 0,75; 1} = 0,75 \\
 r_{34} &= \frac{X_{34}}{\max X_{14}, X_{24}, X_{34}, X_{44}} = \frac{0,5}{0,5; 0,25; 0,5; 1} = 0,5 \\
 r_{35} &= \frac{X_{35}}{\max X_{15}, X_{25}, X_{35}, X_{45}} = \frac{0,25}{0,75; 1; 0,25; 0,5} = 0,25 \\
 r_{36} &= \frac{X_{36}}{\max X_{16}, X_{26}, X_{36}, X_{46}} = \frac{0,5}{1; 0,25; 0,5; 0,75} = 0,50 \\
 r_{37} &= \frac{X_{37}}{\max X_{17}, X_{27}, X_{37}, X_{47}} = \frac{1}{0,25; 0,75; 1; 0,25} = 1
 \end{aligned}$$

Normalization Songs (C4)

$$\begin{aligned}
 r_{41} &= \frac{X_{41}}{\max X_{11}, X_{21}, X_{31}, X_{41}} = \frac{0,5}{1; 0,75; 0,25; 0,5} = 0,50 \\
 r_{42} &= \frac{X_{42}}{\max X_{12}, X_{22}, X_{32}, X_{42}} = \frac{0,75}{0,75; 1; 0,25; 0,75} = 0,75 \\
 r_{43} &= \frac{X_{43}}{\max X_{13}, X_{23}, X_{33}, X_{43}} = \frac{1}{0,25; 0,25; 0,75; 1} = 1 \\
 r_{44} &= \frac{X_{44}}{\max X_{14}, X_{24}, X_{34}, X_{44}} = \frac{1}{0,5; 0,25; 0,5; 1} = 1 \\
 r_{45} &= \frac{X_{45}}{\max X_{15}, X_{25}, X_{35}, X_{45}} = \frac{0,5}{0,75; 1; 0,25; 0,5} = 0,50 \\
 r_{46} &= \frac{X_{46}}{\max X_{16}, X_{26}, X_{36}, X_{46}} = \frac{0,75}{1; 0,25; 0,5; 0,75} = 0,75 \\
 r_{47} &= \frac{X_{47}}{\max X_{17}, X_{27}, X_{37}, X_{47}} = \frac{0,25}{0,25; 0,75; 1; 0,25} = 0,25
 \end{aligned}$$

Table 13
normalized matrix

No.	Name	C1	C2	C3	C4
1	Mohammed Sidik	1	0.75	0.25	0.5
2	EkoKuswoyo	0.75	1	0.25	0.75
3	DianyarSaidatulHusna	0.25	0.25	0.75	1
4	Muhamad Ari	0.5	0.25	0.5	1
5	Risky Gani	0.75	1	0.25	0.5
6	M. Agung Permana	1	0.25	0.5	0.75
7	Sari Latifah Salma	0.25	0.75	1	0.25

After giving the value of each weight further criteria to calculate the value perengkungan preference for each alternative (Vi) with the following formula:

$$V_i = \sum_{j=1}^n w_j r_{ij}$$

Where:

Vi = The final value of the alternative

wj = Weights telahditentukan

r_{ij} = Normalisasimatriks

Vi larger value indicates that the competitor who will pass the selection race in kecamatan Perbaungan MTQ to the formula as below:

$$\begin{aligned}
 V1 &= (0.25 * 1) + (0.35 * 0.75) + (0.20 * 0.25) + (0.20 * 0.5) = .663 \\
 V2 &= (0.25 * 0.75) + (0.35 * 1) + (0.20 * 0.25) + (0.20 * 0.75) = 0.738 \\
 V3 &= (0.25 * 0.25) + (0.35 * 0.25) + (0.20 * 0.75) + (0.20 * 1) = 0.550 \\
 V4 &= (0.25 * 0.5) + (0.35 * 0.25) + (0.20 * 0.5) + (0.20 * 1) = 0.513 \\
 V5 &= (0.25 * 0.75) + (0.35 * 1) + (0.20 * 0.25) + (0.20 * 0.5) = 0.688 \\
 V6 &= (0.25 * 1) + (0.35 * 0.25) + (0.20 * 0.5) + (0.20 * 0.75) = 0.588 \\
 V7 &= (0.25 * 0.25) + (0.35 * 0.75) + (0.20 * 1) + (0.20 * 0.25) = 0.575
 \end{aligned}$$

Thus a calculated above makadapat drawn the conclusion that the value of the largest value becomes the winner of MTQ, using SAW algorithm as in the table below.

Table 14
Decision SAW Method

No.	Name	Vi	Information
1	Mohammed Sidik	0663	ranking 3
2	EkoKuswoyo	0738	ranking 1
3	DianyarSaidatulHusna	0500	-
4	Muhamad Ari	0513	-
5	Risky Gani	0688	ranking 2
6	M. Agung Permana	0588	-
7	Sari Latifah Salma	0575	-

4. Conclusion

From the above data it can be concluded that the method of SAW and MFEP have an accurate calculation. But for MFEP method has the steps - steps which is much shorter than the SAW method, it proves that the SAW method can be made to become the alternative valuation methods because the level of accuracy is much higher than the MFEP method. This is caused by the process of doing the calculation method of SAW in the normalization process in which this is not done on MFEP method.

5. Reference

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