JURTEKSI (Jurnal Teknologi dan Sistem Informasi) ISSN 2407-1811 (Print)
Vol. IX No 4, September 2023, hlm. 597-604 ISSN 2550-0201 (Online)
DOI: https://doi.org/10.33330/jurteksi.v9i4.2422
Available online at http://jurnal.stmikroyal.ac.id/index.php/jurteksi

METHOD OF MAUT IN DETERMINING THE RANK OF CHILDREN AND HEALTHY ELDERLY AT PETATAL PUSKESMAS

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Abstract: The current development of information technology has had an impact on all fields, including the health sector. Many activities that were previously carried out conventionally or manually can now be carried out with the help of technology. Computers that were previously only used to process data now provide many services, applications, and programs that can help facilitate human activities. One of them is the Multi-Attribute Utility Theory (MAUT) method, which is a support system method that has been widely used to provide accurate and efficient results. This study aims to build a decision support system for choosing healthy toddlers and elderly at the Petatal Health Center, Talawi District, Asahan Regency. So far, the process of selecting healthy toddlers and elderly is done conventionally, without the help of applications or computer programs. So the time needed is longer and the results are also less objective. The calculation process uses the MAUT method with an alternative of 13 toddlers and 15 elderly. The criteria used are body weight, nutritional status, potassium content, protein content, and carbohydrate content. Assessment weight 1-5. The results are 3 Toddlers with the highest total score Laila (17) Putri Sundar (14.25) and Tiara with a score of 12.25. The three people with the highest scores for healthy elderly are Rini Dewi with a score of 17, Joni with a score of 14.25, and Bejo Asmo with a value of 12.25.

Keywords: decision support system; MAUT; multi atribute utility theory; SPK

Abstrak: Perkembangan Teknologi informasi saat ini telah berdampak pada semua bidang, termasuk bidang kesehatan. Banyak kegiatan yang awalnya dilakukan secara konvensional atau manual kini dapat dilakukan dengan bantuan teknologi. Komputer yang tadinya hanya digunakan untuk mengolah data kini menyediakan banyak layanan, aplikasi dan program yang dapat membantu mempermudah kegiatan manusia. Salah satunya adalah metode Multi Atribute Utility Theory (MAUT) yang merupakan salah satu metode sistem pendukung yang telah banyak digunakan untuk memberikan hasil yang akurat dan efisien. Penelitian ini bertujuan membangun sistem pendukung keputusan pemilihan Balita dan Lansia Sehat di Puskesmas Petatal Kecamatan Talawi Kabupaten Asahan, selama ini proses pemilihan balita dan lansia sehat dilakukan secara konvensional, tanpa menggunakan bantuan aplikasi atau program computer. Sehingga waktu yang dibutuhkan lebih lama serta hasilnya juga kurang objektif. Proses perhitungan menggunakan Metode MAUT dengan alternative 13 Balita dan 15 lansia .Kriteria yang digunakan Berat Badan, Status Gizi, Kandungan Kalium, Kandungan protein dan kandungan karbohidrat. Bobot penilaian 1-5. Hasil adalah 3 Balita dengan total nilai tertinggi Laila (17) Putri Sundar (14,25) dan Tiara dengan nilai 12,25. Tiga orang dengan nilai tertinggi untuk Lansia sehat adalah Rini dewi dengan nilai 17, Joni dengan nilai 14,25 dan Bejo Asmo dengan nilai 12,25.

Kata kunci: multi atribute utility theory; MAUT; sistem pendukung keputusan; SPK

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INTRODUCTION

Along with the advancement of information technology today, the ability of computer technology is growing from just processing data or presenting information to becoming a provider of choices as a support for decision making, this can happen because of technological developments both in terms of hardware and software.

The rapid development of technology also has an impact on the health sector. Some of the positive impacts of technological advances include facilitating health services, helping doctors diagnose, and storing patient data more easily technology can also prevent the transmission of infectious diseases, for example with the care-protect application which can trace a person's whereabouts for the prevention of infectious diseases.

The Petatal Health Center, which is located on Jalan Lintas Sumatra, Km 131, Petatal Village, Talawi District, has activities to improve toddler nutrition and monitor the health of the elderly. Monitoring of toddler nutrition and elderly health is done manually without using applications/technology. Nutrition monitoring for toddlers is seen from several indicators, namely age group, weight, height, and nutritional status. Each toddler will be measured for weight and height, then recorded on the Health Card (KMS). Monitoring the health of the elderly can be seen from the seven indicators obtained from health checks, namely daily activities, body weight, nutritional status, blood pressure which will be obtained systolic and diastolic, cholesterol, uric acid, and blood sugar, which will then be recorded in the KMS for the elderly. After recording the KMS, the data on the KMS is recorded in a report book. Then a ranking is made based on which toddler or elderly is the healthiest to monitor their health development every month. For toddler data, ranking is divided into several age groups. At the end of the year, there will be a competition for healthy toddlers and elderly people, so the ranking data is needed. In sorting these rankings, until now Posyandu Cadres are still ranking by comparing toddlers and manual elderly. So the time needed is quite long, and sometimes there are errors in writing data. Based on these problems, a tool is needed to determine the nutrition rating for toddlers and the elderly's health, which is expected to help increase the effectiveness and efficiency of posyandu cadres in monitoring the development of healthy toddlers and elderly and also facilitate reporting. So we need a Decision Support System that can help determine Healthy Toddlers and the Elderly with the Multi-Attribute Utility Theory (MAUT) method. Decision support systems are used to provide a solution to solving relative problems in decision-making that can help solve a problem properly [1]. The MAUT method is a quantitative method that is used as a basis for decision-making through systematic procedures that identify and analyze several variables [2]. The MAUT method can help convert some interests into numerical values on a scale of zero to one, to get definite results, so that they can assist decision makers in making a final decision [3].

The purpose of this study was to design a decision support system for ranking healthy toddlers and elderly people at Petatal Public Health Centers. Computer-based decision support systems can assist decision-making by utilizing data and models to solve unstructured and semi-structured

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problems [4] . Decision support systems only expand leadership capabilities but do not replace leadership assessment [5].

Several previous studies supporting this research also used the Multi-Attribute Utility Theory (MAUT) method, including research conducted by Jamilah Nasution and Syahrizal Muhammad using the MAUT method as an election decision support system. candidate for the head of the Lama Sei Lepan Village Health Center, the results of his research show that the implementation of the MAUT method is a solution to the problems faced by the Pusk-esmas [6]. Research conducted by Hidayat, Jusia, and Amroni in hiring employees with using the MAUT method and its results, this method can provide clear calculations to be used as support for leadership decisions in selecting quality employees with the highest preference value of 14.75 [7]. Sunandar et al's research used the MAUT method to select an online learning method with the highest preference value of 0.597 [8]. The MAUT method is also used in decision support for selecting the best MSMEs because the selection process for providing assistance can be carried out more accurately and quickly in making decisions [9]. The MAUT method is also used in determining the best oil palm harvesting employees with the highest score of 96.67 [10].

METHOD

The Quantitative Method is used in this study as a process of extracting information with the following steps:

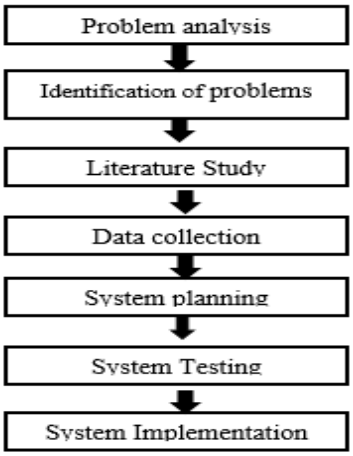

Image 1. Research Framework

First Problem Analysis. In this phase, an analysis of the problems experienced by the Petatal Health Center was carried out to determine the ranking of healthy toddlers and elderly

Second Problem Identification. From the initial survey conducted, several problems could be identified, namely the ranking of healthy toddlers and the elderly had not been carried out optimally because they did not yet have a decision support system that could help make the process faster and more accurate.

Third Literature Study. The literature that will be used is in the form of various theories, techniques, methods, and other findings that have been used by other people in overcoming the problems that occur. Fourth Data Collection. Data collection techniques used are observation, interviews, and literature search.

Fifth System Design. In designing this system the things that will be done are: Designing an object-oriented model using use case diagrams, *class* diagram, *sequence* diagram *dan activity* diagram, Input design and output design.

Sixth, System Testing, namely hardware and software testing.

The final step is system implementation implementing the results of the design that has been made including the

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stage of coding the program, translating data, or solving problems that have been designed into the programming language Microsoft Visual Studio 2010 and the MySQL database.

Calculation of the Multi-Attribute Utility Theory method

Calculating the matrix normalization utility value for each alternative according to its attributes:

$$U(x) = \frac{x - xi^{-}}{xi^{+} - xi^{-}} \dots\dots\dots\dots\dots (1)$$

Information:
U(x) = Normalized alternative weights
xi- = Minimum criterion value (worst weight)
xi+ = Maximum criterion value (best weight)
x = Alternative weight

Multiply the weight of the criteria with the utility value to determine the ranking value for each alternative:

$$V(x) = \sum_{i=1}^{n} Wi.Vi\,(x) \dots\dots\dots\dots\dots\dots (2)$$

Information:
v(x) is the evaluation value of the ith object, wi is the weight that determines the value of how important the ith element is to other elements. While n is the number of elements with the weight value used:

Table 1. Weight Value

Criteria	Criteria Name	Value Weight
C1	Weight	5
C2	Nutritional status	3
C3	Potassium content	4
C4	Protein Content	3
C5	Carbohydrate Content	3

RESULTS AND DISCUSSION

The data used in the recommendations for the Rating of Healthy Toddlers and Elderly at Petatal Public Health Centers.

Calculation of the MAUT Method for Healthy Toddlers

The first step is to determine the alternatives and criteria and determine the min and max values. The results are described in Table 2.

Table 2. Alternatives, Criteria, Max and Min Values for Healthy Toddlers

No	Toddler-dler-Name	Criteria				
		C1	C2	C3	C4	C5
1	Aridha Rama-dhani	5	2	2	3	3
2	Putri Fazira	4	1	4	3	5
3	Naura Mykaila	4	2	4	1	4
4	Latifah hanum	3	2	2	3	3
5	M Dzikri	3	2	5	3	3
6	Liana Afira	4	3	4	1	4
7	Dwi In-dah	3	3	4	3	3
8	Putri Sundari	5	4	5	4	2
9	Irma yani	5	1	3	3	3
10	Tiwi in-dayani	3	2	2	2	3
11	Tiara	5	4	1	4	4
12	Laiala	5	5	4	4	5
13	Fahrezi dwi	3	3	2	2	5
	Max	5	5	5	5	5
	Min	3	1	1	1	2

The next step is to calculate the matrix normalization utility value for each alternative according to its attributes and the results are:

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Table 3. Results of Matrix Normalized Utility Values

Alternative	C1	C2	C3	C4	C5
A1	1	0,25	0.25	0,666	0,333
A2	0,5	0	0,75	0,666	1
A3	0,5	0,25	0,75	0	0,666
A4	0	0,25	0,25	0,666	0,333
A5	0	0,25	1	0,666	0,333
A6	0,5	0,5	0,75	0	0,666
A7	0	0,5	0,75	0,666	0,333
A8	1	0,75	1	1	0
A9	1	0	0,5	0,666	0,333
A10	0	0,25	0,25	0,333	0,333
A11	1	0,75	0	1	0,666
A12	1	1	0,75	1	1
A13	0	0,5	0,25	0,333	1

The next step is to multiply the criteria weight with the utility value to determine the ranking value for each alternative. The results are described in Table 4.

Table 4. Ranking Results

Alternative	Criteria					Total	Rank
	C1	C2	C3	C4	C5		
A1	5	0,75	1	2	1	9,75	6
A2	2,5	0	3	2	3	10,5	4
A3	2,5	0,75	3	0	2	8,25	8
A4	0	0,75	1	2	1	4,75	12
A5	0	0,75	4	2	1	7,75	9
A6	2,5	1,5	3	0	2	9	7
A7	0	1,5	3	2	1	7,5	10
A8	**5**	**2,25**	**4**	**3**	**0**	**14,25**	**2**
A9	5	0	2	2	1	10	5
A10	0	0,75	1	1	1	3,75	13
A11	**5**	**2,25**	**0**	**3**	**2**	**12,25**	**3**
A12	**5**	**3**	**3**	**3**	**3**	**17**	**1**
A13	0	1,5	1	1	3	6,5	11
Weight	**5**	**3**	**4**	**3**	**3**		

Of the 13 Healthy Toddlers selected, 3 Healthy Toddlers are recommended, it can be obtained from the calculation of the Alternative Healthy Toddlers preferences above, the decision to choose from the alternative is chosen from the highest score, then the one selected as a recommendation in the Healthy Toddler Rating 1 is A12 (Laiala), Rank 2 is A8 (Putri Sundari), and Rank 3 is A11 (Tiara), which deserves to be recommended as a healthy toddler name.

Calculation of DEATH for Healthy Elderly

The first step is to determine alternatives, criteria and determine Min and Max vaues. The results are shown in Table 5.

Table 5. Alternatives, Criteria for Max and Min Values for Healthy Elderly

No	Elderly name	C1	C2	C3	C4	C5
1	Tuti Rubianti	5	2	2	3	3
2	Suyanti	4	1	4	3	5
3	Legiem	4	2	4	1	4
4	Susuwito	3	2	2	3	3
5	Rini	3	2	5	3	3
6	Ngatiem	4	3	4	1	4
7	Sutejo	3	3	4	3	3
8	Joni	5	4	5	4	2
9	Indro	5	1	3	3	3
10	Bambang	3	2	2	2	3
11	Bejo Asmo	5	4	1	4	4
12	Rini Dewi	5	5	4	4	5
13	Mala sari	3	3	2	2	5
14	Supratman	5	1	5	3	3
15	Lilis Suswati	3	5	1	2	4
	Max	5	5	5	4	5
	Min	3	1	1	1	2

Then calculate the matrix normalization utility value for each alternative according to its attributes and the results are:

Table 6 Results of Matrix Normalization Utility Values

Alternative	C1	C2	C3	C4	C5
A1	1	0,25	0,25	0,666	0,333
A2	0,5	0	0,75	0,666	1
A3	0,5	0,25	0,75	0	0.666
A4	0	0,25	0,25	0,666	0,333
A5	0	0,25	1	0,666	0,333
A6	0,5	0,5	0,75	0	0,666
A7	0	0,5	0,75	0,666	0,333
A8	1	0,75	1	1	0
A9	1	0	0,5	0,666	0,333
A10	0	0,25	0,25	0,333	0,333
A11	1	0,75	0	1	0,666
A12	1	1	0,75	1	1
A13	0	0,5	0,25	0,333	1
A14	1	0	1	0,666	0,333
A15	0	1	0	0,333	0,666

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The final step is to multiply the criterion weights with the utility values to determine the ranking value for each alternative. The results are described in Table 7.

Table 7. Ranking Results

Alternative	Criteria					Total	Rank
	C1	C2	C3	C4	C5		
A1	5	0,75	1	2	1	9,75	7
A2	2,5	0	3	2	3	10,5	5
A3	2,5	0,75	3	0	2	8,25	10
A4	0	0,75	1	2	1	4,75	14
A5	0	0,75	4	2	1	7,75	11
A6	2,5	1,5	3	0	2	9	8
A7	0	2,5	3	2	1	8,5	9
A8	**5**	**2,25**	**4**	**3**	**0**	**14,25**	**2**
A9	5	0	2	2	1	10	6
A10	0	0,75	1	1	1	3,75	15
A11	**5**	**2,25**	**0**	**3**	**2**	**12,25**	**3**
A12	**5**	**3**	**3**	**3**	**3**	**17**	**1**
A13	0	1,5	1	1	3	6,5	12
A14	5	0	4	2	1	12	4
A15	0	3	0	1	2	6	13
Weight	**5**	**3**	**4**	**3**	**3**		

The rating of Healthy Elderly is approximately 15 Healthy Elderly, for that the researcher took a sample (alternative), from the 15 Healthy Elderly selected to be 3 recommended Healthy Elderly, it can be obtained from the calculation of the alternative preference for Healthy Elderly above, the decision to choose from the alternative is to choose of the highest score, the one chosen to be recommended as a Healthy Elderly Rank 1 is A12 (Rini Dewi), Rank 2 is A8 (Joni), and Rank 3 is A11 (Bejo Asmo), which deserves to be recommended as a recommended patient name Healthy Elderly Rating.

User Interface Design

User interface design is needed to make it easier for Nutrition Officers to use this system. The following is the design of the Global DSS recommendation for the Rating of Healthy Toddlers and Elderly at Petatal Health Centers consisting of the homepage, criteria data, alternative data, MAUT, Password, and Log-out.

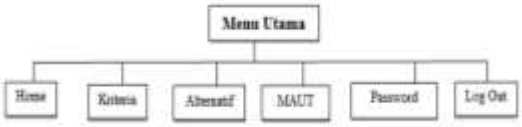

Image 2. Global Design

Criteria Input Design. Criteria input design is a criteria input form used by the Nutrition Officer to input criteria data. The criteria input design is a criterion input form used by the Nutrition Officer to input criteria data.

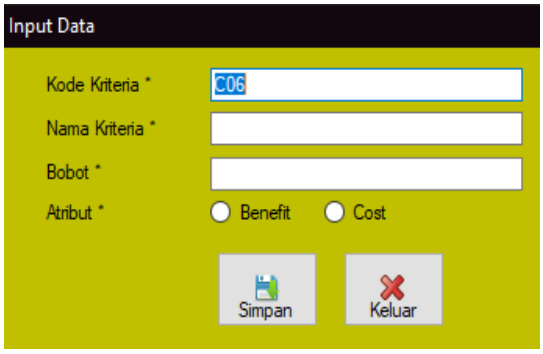

Image 3. Design Criteria Input

The alternative input design is an alternative input form used by the Nutrition Oficer to process alternative data.

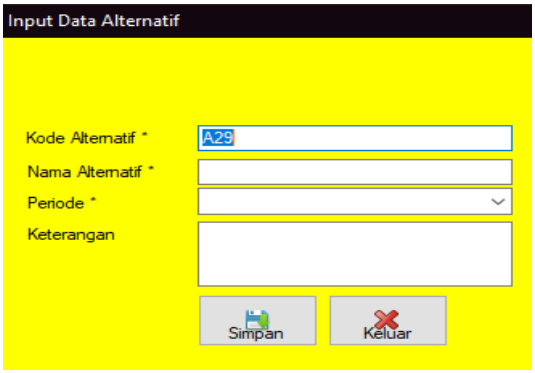

Image 4. Alternative Input Design

The alternative weight input design is an illustration of the alternative weight input form used by Nutrition Officers to process alternative weight data.

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Image 5. Weight input design Alternative

Calculation report output design Calculation report output design is the calculation report output form used by Nutrition Officers to issue reports.

Image 6. Report Output Design

CONCLUSION

Decision support systems are used to provide relative problem solving solutions in decision making that can help solve a problem well. And one of the methods of the decision support system is the Multi-Attribute Utility Theory (MAUT) method. The purpose of the research conducted at the Petatal Health Center in determining the ranking of Healthy Toddlers and Elderly with the MAUT method was to make it easier for Petatal Health Center staff to objectively determine the ranking of Healthy Toddlers and Elderly. In addition, it also saves time in the determination process. So that the results of the ranking of healthy toddlers and the elderly can be used as a recommendation or consideration for leaders in making decisions. And also can speed up the follow-up process on the results obtained.

BIBLIOGRAPHY

[1] M. M. Boangmanalu and B. Purba, "Implementasi Metode MAUT Dalam Seleksi Calon Marketing Retail dengan menerapkan pembobotan ROC," vol. 16, no. 2, pp. 81–91, 2022.

[2] W. Riyadi and X. Sika, "Sistem Penunjang Keputusan Penerimaan Beasiswa dengan Metode MAUT (Studi Kasus : STIKOM Dinamika Bangsa Jambi)," vol. 13, no. 2, pp. 1247–1259, 2018.

[3] N. Rahmadani and R. Risnawati, "the Comparison of VIKOR and MAUT Methods in the Selection of Used Cars," *J. Ris. Inform.*, vol. 3, no. 2, pp. 153–158, 2021, doi: 10.34288/jri.v3i2.193.

[4] J. H. Lubis, E. M. D. ; Shinta, and D. M. Simanjuntak, "Penerapan Metode Multi Attribute Utility Theory (MAUT) Dalam Pemilihan Karyawan yang di Non-Aktifkan di Masa Pandemi," vol. 6, no. April, pp. 969–978, 2022, doi: 10.30865/mib.v6i2.3909.

[5] H. A. Septilia, "Sistem pendukung keputusan pemberian dana bantuan menggunakan metode ahp," vol. 1, no. 2, pp. 34–41, 2020.

[6] J. Nasution and M. Syahrizal, "Sistem Pendukung Keputusan Rekomendasi Calon Kepala Puskesmas Mengunakan Metode Multi Attribute Utility Theory (Maut) (Studi Kasus: Puskesmas

Desa Lama Sei Lepan)," *KOMIK (Konferensi Nas. Teknol. Inf. dan Komputer)*, vol. 3, no. 1, pp. 176–182, 2019, doi: 10.30865/komik.v3i1.1586.

[7] M. Hidayat and P. A. Jusia, "Analisa dan Perancangan Sistem Pendukung Keputusan Untuk Penerimaan Karyawan PT . Dos Ni Roha Jambi Menggunakan Metode MAUT (Multi Attribute Utility Theory)," vol. 13, no. 1, 2018.

[8] H. Pristiwanto;Sunandar and B. Nadeak, "Penerapan Metode MAUT Terhadap Perkembangan Metaverse Untuk Media Pembelajaran Daring Dengan Pembobotan ROC," vol. 6, no. November, pp. 100–107, 2022, doi: 10.30865/komik.v6i1.5753.

[9] S. F. Pantatu, I. Colanus, and R. Drajan, "Sistem Pendukung Keputusan Penerima Bantuan UMKM Menggunakan Metode MAUT," vol. 5, no. 2, pp. 317–325, 2022.

[10] I. Permatasari, R. Hidayati, and U. Ristian, "Multi attribute utility theory," vol. 11, no. 01, pp. 42–50, 2023.