Jurnal MIRTE
Manajemen, Informatika, Rekayasa Perangkat Lunak dan Teknologi Komunikasi
Vol. 3, No. 2, December 2024
E-ISSN : 2961-9467

Decision Support System For Determining Recipients Of Home Improvement Assistance Using The Weighted Product Method In Siantar Narumonda District

Jontinus manullang[1], Harmoko Lubis[2], Sastra Wandi Nduru[3], Sutrisno Situmorang[4]
[1,2,3,4]Manajemen Informatika, AMIK Medicom, Jl. Darat No 74 Medan, Indonesia

E-mail: jhoe6590@gmail.com

Abstract

A house is a building that functions as a residence or residence and a means of fostering a family. In rural areas there are still many residents' houses that are uninhabitable and this is caused by the standard of living of people who still live modestly and have incomes below the average, these conditions make many residents' houses uninhabitable that need to be renovated through house renovation assistance. Decision making is a system that is able to provide both problem-solving abilities and communication skills for semi-structured problems. This research system aims to design a system for determining recipients of home surgery assistance using the method, Weighted product which is one of the methods in SPK which uses a weighting method with a rating of an appraisal variable. The programming language used in making the system is PHP with a MySQL database. The results of the implementation of the system that has been made show that Parasman (A1), Hendra (A9), Ferdinand (A4) are candidates for receiving surgical assistance in Siantar Narumonda District.

Keywords*: Decision Support System,Weighted product, Recipients of home surgery assistance*

1. Introduction

Technology is currently developing rapidly and affecting almost all aspects of human life. Law No. 4 of 1992 concerning Housing and Settlements explains that a house is a building that functions as a residence or residence and a means of fostering a family. In rural areas there are still many residents' houses that are uninhabitable and this is due to the standard of living of people who still live modestly and have incomes below the average, these conditions make many residents' houses uninhabitable that need to be repaired through house renovation assistance. .

The Housing and Residential Area Service is an agency established by the Government that has a vision to realize integrated, controlled and dynamic spatial planning towards a developed country, including through a house renovation assistance program which is routinely held every year. Home renovation assistance programs should be provided to eligible recipients and deserve to receive them. The large number of people who are entitled to receive house renovation assistance has forced the Housing and Settlement Area Office to be very selective in providing house renovation assistance. The problem that often arises is the inaccuracy of distributing house renovation assistance to the community because of an element of kinship, for example people who actually do not

Article History: *Received :14-11-2024; Accepted :20-11-2024; Published : 01-12-2024*

deserve house renovation assistance but do get house renovation assistance, conversely, people who are entitled to house renovation assistance do not receive house renovation assistance. Quantitative assessments are often considered disappointing because of the difficulty in measuring the existing parameters. On the other hand, the Department of Housing and Settlement Areas wants data that is real or in accordance with the criteria so that it can provide quick feedback and improvements. The criteria for recipients of the house renovation program are in accordance with current Government Regulations, namely Indonesian citizens, income below the UMK (i.e. Rp. 2,600,000), already have a family, own or control land (less than 72 square meters), own a house that is uninhabitable (wooden floors have been brittle, the wooden walls are weathered, and the roof is brittle). These criteria will be taken into consideration to determine recipients of home renovation assistance,

The Weighted Product method is a method that is often used to assist in setting goals or decisions. The concept used is by weighting the rating of an appraisal variable. The Weighted Product (WP) method uses multiplication to relate attribute ratings, where the rating of each attribute must be raised to the first power of the attribute weight in question. The process is the same as normalization. The Weighted Product method can assist in making decisions, but calculations using the Weighted Product method only produce the largest value which will be selected as the best alternative.

To support this research, there are several researchers who have conducted research related to the decision support system for determining recipients of home renovation assistance. Research by Tri Rahmawati (2017) entitled "SPK Recipients of Home Improvement Assistance at the Housing and Settlement Area Services using the Topsis Method" Results The purpose of this research is to take into account all the criteria in order to speed up and simplify the process of providing more appropriate home renovation assistance to people who are entitled to receive home renovation assistance.Research was also conducted by Ridwan Halim Khouf (2017) entitled "SPK Eligibility for Candidates for Recipients of Home Improvement Assistance in Sambirejo District Using the SAW Method." The results of this study are a decision support system for determining recipients of home renovation assistance based on an accumulation of predetermined criteria.

2. Methodology

Based on references to both journals and thesis that I found. The modeling or flowchart flow in the system regarding the WP method can be described as follows. The flowchart below is also accompanied by a calculation formula from the WP method

1. Input data Prospective residents who receive home renovations
2. Converting citizen criteria input data into a match rating value
3. Make improvements to the value of the weight of the criteria
   $W_j = \frac{w_j}{\sum w_j}$ (1)
4. Find the preference value vector S
   $S_i = \prod_{j=1}^{n} x_{ij} w_j, dengan\ i = 1,2 \ldots, m$ (2)

5. Finding the Value of Vector V

$$V_i = \frac{\prod_{j=1}^{n} x_{ij} w_j}{\prod_{j=1}^{n} (x_i^w) \ \ w_j}, dengan\ i = 1,2 \ldots, m \quad (3)$$

6. Alternative output for residents who are prospective recipients of house renovations

3. Results and Discussion

Weighted Product Methodis a settlement method using multiplication to connect attribute ratings, where the rating must be raised to the first power of the attribute weight in question. This process is the same as the normalization process.

1. Determine Alternatives
   The alternative is residents who are eligible to receive housing renovation assistance.
2. Define Criteria

Table 1. Criteria for recipients of house renovation assistance

Criteria	Information	Type
C1	Indonesian citizens	Benefits
C2	Income below UMK	cost
C3	Already married	Benefits
C4	Master the land	Benefits
C5	Owning a house is not livable	Benefits

Table 2. Weight values

Weight value	Information
0	Very low
0.20	Low
0.40	Currently
0.60	Enough
0.80	Well
1.00	Very good

3. Determine Match Rating
   The criteria that must be met by prospective recipients of housing renovation assistance are as follows:

a. Criteria for Indonesian citizens (C1)
The criteria for Indonesian Citizens are requirements that are determined in decision making. Based on the provisions of the Housing and Settlement Area Service, those who are entitled to receive house renovation assistance are Indonesian Citizens (WNI).

Table 3. Weight Criteria for Indonesian Citizens

Criteria	Information	Weight
foreigners	Low	0.20
Indonesian citizens	Very good	1.00

b. Criteria for income below the UMK (C2)
The income criterion below the UMK is one of the requirements needed for decision making. The higher the income, the lower the weight

Table 4. Weight of Income criteria

Criteria	Information	Weight
Above UMK	Low	0.20
According to MSEs	Enough	0.60
Under UMK	Well	0.80

c. Criteria already has a family (C3)
The criterion of having a family is a requirement that is determined in decision making. Based on the provisions of the Department of Housing and Residential Areas, those who are entitled to receive house renovation assistance are residents who are already married

Table 5. Criteria weight already married

Criteria	Information	Weight
Not yet married	Low	0.20
Already married	Very good	1.00

d. Criteria for controlling land (C4)
The criterion for controlling land is a requirement that is determined in decision making. Based on the provisions of the Department of Housing and Residential Areas, those who are entitled to receive house renovation assistance are residents who own the land

Table 6. Criteria weight for controlling land

Criteria	Information	Weight
Do not own the land	Low	0.20
Disputed land	Currently	0.40
Master the land	Well	0.80

e. The criteria for having a house are not livable
The criteria for having an uninhabitable house are requirements that are determined in decision making. Based on the provisions of the Department of Housing and Settlement Areas, those who are entitled to receive house renovation assistance are residents who own houses that are uninhabitable

Table 7. The weight of the criteria for having an uninhabitable house (C5)

Criteria	Information	Weight
Have a livable home	Enough	0.60
Owning a house is not livable	Very good	1.00

4. Determine the Preference Weight or Interest level (W) for each criterion
W = [1.00 (C1); 0.80 (C2); 1.00 (C3); 0.80 (C4); 1.00 (C5)]
5. Make a match rating table from each alternative on each criterion
In the following, a sample of 10 data from prospective recipients of house renovation assistance will be tested based on predetermined criteria.

Table 8. Sample Data

Alternative	Indonesian citizens	Income below UMK	family	Master the land	Ownhouseuninhabitable
Parasman Psb(A1)	Indonesian citizens	IDR 2,000,000	family	Yes	Yes
Sartono Hth(A2)	Indonesian	IDR 3,000,000	Not yet married	Yes	Yes

	citizens				
Hulman Lubis (A3)	Indonesian citizens	IDR 1,800,000	Not yet married	Yes	Yes
Ferdinand Tbn (A4)	Indonesian citizens	IDR 2,200,000	family	Yes	Yes
Pardamean P (A5)	Indonesian citizens	IDR 2,600,000	family	Dispute	Yes
Jardiman Hth (A6)	Indonesian citizens	IDR 2,000,000	Not yet married	Yes	Yes
Wilmar S (A7)	Indonesian citizens	IDR 2,000,000	family	Yes	No
Binsar Pardosi (A8)	Indonesian citizens	IDR 2,300,000	family	No	Yes
Hendra Lubis (A9)	Indonesian citizens	IDR 2,250,000	family	Yes	Yes

Martamarbun (A10)	Indonesian citizens	IDR 1,600,000	family	No	Yes

Table 9. Weight of each criterion

Alternative	Criteria weight				
	C1	C2	C3	C4	C5
A1	1.00	0.80	1.00	0.80	1.00
A2	1.00	0.20	0.20	0.80	1.00
A3	1.00	0.80	0.20	0.80	1.00
A4	1.00	0.80	1.00	0.80	1.00
A5	1.00	0.60	1.00	0.40	1.00
A6	1.00	0.80	0.20	0.80	1.00
A7	1.00	0.80	1.00	0.80	0.60
A8	1.00	0.80	1.00	0.20	1.00
A9	1.00	0.80	1.00	0.80	1.00
A10	1.00	0.80	1.00	0.20	1.00

The steps in calculating the Weighted product (WP) method are as follows:
1. Normalization or improvement of weights
Perform calculations using the weighted product method, which begins by making improvements to the criteria weight according to the equation where the value of ΣWi = 1 .

$$W1 = = = 0.21 \frac{1,00}{1,00+0,80+1,00+0,80+1,00} \frac{1,00}{4,60}$$

$$W2 = = = 0.17 \frac{0,80}{1,00+0,80+1,00+0,80+1,00} \frac{0,80}{4,60}$$

$$W3 = = = 0.21 \frac{1,00}{1,00+0,80+1,00+0,80+1,00} \frac{1,00}{4,60}$$

$$W4 = = = 0.17 \frac{0,80}{1,00+0,80+1,00+0,80+1,00} \frac{0,80}{4,60}$$

W5= = = 0.21$\frac{1,00}{1,00+0,80+1,00+0,80+1,00}$ $\frac{1,00}{4,60}$

2. Determine the value of the vector S

The formula for determining the value of vector S is below

S1= $^{wij}\prod_{j=1}^{n} xij$

S1 = $(1,00^{0,21})(0,80^{(-0,17)})(1,00^{0,21})(0,80^{0,17})(1,00^{0,21})$
= 1

S2 = $(1,00^{0,21})(0,20^{(-0,17)})(0,20^{0,21})(0,80^{0,17})(1,00^{0,21})$
= 0.902

S3 = $(1,00^{0,21})(0,80^{(-0,17)})(0,20^{0,21})(0,80^{0,17})(1,00^{0,21})$
= 0.713

S4 = $(1,00^{0,21})(0,80^{(-0,17)})(1,00^{0,21})(0,80^{0,17})(1,00^{0,21})$
=1

S5 = $(1,00^{0,21})(0,60^{(-0,17)})(1,00^{0,21})(0,40^{0,17})(1,00^{0,21})$
=0.933

S6 = $(1,00^{0,21})(0,80^{(-0,17)})(0,20^{0,21})(0,80^{0,17})(1,00^{0,21})$
= 0.713

S7 = $(1,00^{0,21})(0,80^{(-0,17)})(1,00^{0,21})(0,80^{0,17})(0,60^{0,21})$
=0.898

S8 = $(1,00^{0,21})(0,80^{(-0,17)})(1,00^{0,21})(0,20^{0,17})(1,00^{0,21})$
=0.790

S9= $(1,00^{0,21})(0,80^{(-0,17)})(1,00^{0,21})(0,80^{0,17})(1,00^{0,21})$
=1

S10 = $(1,00^{0,21})(0,80^{(-0,17)})(1,00^{0,21})(0,20^{0,17})(1,00^{0,21})$
=0.790

3. Determine the value of Vector V

After obtaining the results from the search for the score value, then determine the vector value of each alternative. The vector value is obtained from the score of each alternative divided by the total number of scores according to the equation. The process of searching for vector values manually is as follows:

$$V_i = \frac{\prod_{j=1}^{n} x_{ij} w_j}{\prod_{j=1}^{n} (x_i^w) \quad w_j}$$

V1= $\frac{1}{1+0,902+0,713+1+0,933+0,713+0,898+0,790+1+0,790}$ = $\frac{1}{8,739}$ =0.114

V2= $\frac{0,902}{1+0,902+0,713+1+0,933+0,713+0,898+0,790+1+0,790}$ = $\frac{0,902}{8,739}$ =0.103

V3= $\frac{0,713}{1+0,902+0,713+1+0,933+0,713+0,898+0,790+1+0,790}$ = $\frac{0,713}{8,739}$ =0.081

V4= $\frac{1}{1+0,902+0,713+1+0,933+0,713+0,898+0,790+1+0,790}$ = $\frac{1}{8,739}$ = 0.114

$$V5=\frac{0,933}{1+0,902+0,713+1+0,933+0,713+0,898+0,790+1+0,790}=\frac{0,933}{8,739}=0.106$$

$$V6=\frac{0,713}{1+0,902+0,713+1+0,933+0,713+0,898+0,790+1+0,790}=\frac{0,713}{8,739}=0.081$$

$$V7=\frac{0,898}{1+0,902+0,713+1+0,933+0,713+0,898+0,790+1+0,790}=\frac{0,898}{8,739}=0.102$$

$$V8=\frac{0,790}{1+0,902+0,713+1+0,933+0,713+0,898+0,790+1+0,790}=\frac{0,790}{8,739}=0.090$$

$$V9=\frac{1}{1+0,902+0,713+1+0,933+0,713+0,898+0,790+1+0,790}=\frac{1}{8,739}=0.114$$

$$V10=\frac{0,790}{1+0,902+0,713+1+0,933+0,713+0,898+0,790+1+0,790}=\frac{0.790}{8,739}=0.090$$

Table 10. Calculation Results

No	Alternative	Vi
1.	A1	V1 = 0.114
2.	A2	V2 = 0.103
3.	A3	V3 = 0.081
4.	A4	V4 = 0.114
5.	A5	V5 = 0.106
6.	A6	V6 = 0.081
7.	A7	V7 = 0.102
8.	A8	V8 = 0.090
9.	A9	V9 = 0.114
10.	A10	V10 = 0.090

Table 11 Ranking Table

Rank	Alternative	Vi
1.	A1	V1 = 0.114
2.	A4	V4 = 0.114
3.	A9	V9 = 0.114
4.	A5	V2 = 0.106
5.	A2	V7 = 0.103
6.	A7	V8 = 0.102
7.	A8	V10=0.090
8.	A10	V5=0.090
9.	A3	V3 = 0.081
10.	A6	V6=0.081

Then the alternatives for prospective beneficiaries who are eligible to receive house renovation assistance are alternative A1, alternative A4 and alternative A9.

4. Conclusion

1. The decision support system for determining beneficiaries of house renovation using a computerized weighted product method and testing the results of determining recipients of house renovation assistance will be more easily known and will assist

the Housing and Settlement Area Office in completing tasks objectively and efficiently.
2. The weighted product method can help solve problems for determining beneficiaries of home surgery assistance.

References

Anita Diana,. & Dyah Retno Utari. 2016. *Penerapan Metode Analitycal Hierarchi Process (AHP) Dalam Sistem Penunjang Keputusan Pemilihan Vendor Desain Grafis*. TELEMATIKA MKOM, 8(2), 97-106.

Antonius Rachmat C,. & Aditya Wikan M. 2016. *Konsep & implemetasi pemrograman gui* (edisi I). Yogyakarta: Andi.

Eko Darmanto,. Noor Latifah,. & Nanik Susanti. 2014. *Penerapan Metode AHP (Analitycal Hierarchi Process) Untuk Menentukan Kualitas Gula Tumbu*. SIMETRIS, 5(1), 75-82.

Eva Rianti,. & Robby Noval Pratama. 2016. *Perancangan Aplikasi Sistem Pendukung Keputusan Pemilihan Peserta Olimpiade Sains Tingkat Kabupaten SMPN 7 Sijunjung Menggunakan Metode Analytical Hierarchy Process*. SAINS DAN INFORMATIKA, 51-60.

Tri Rahmawati.(2017).Sistem Pendukung Keputusan (SPK) Penerima bantuan Bedah Rumah pada Dinas Perumahan dan Kawasan Permukiman menggunakan *Metode Topsis.Pengembangan Fakultas Teknologi Informasi Universitas Stikubank (Unisbank) Semarang 17*, *2*(5), 2548–2964.http://jptiik.ub.ac.id

Ridwan Halim Khouf. (2017).Sistem Pendukung Keputusan (SPK) Calon Penerima Bantuan Bedah Rumah di Kec Sambirejo dengan Menggunakan Metode *Simple Additive Weighting(SAW).Pengembangan Program study InformatikaFakultas Komunikasi dan Informatika Universitas Muhammadiyah Surakarta*, *17*https://doi.org/10.24843/jik.2017.v10.i02.p03

Asbur, Y., K. (2018). 15668-39956-1-Pb (Artikel Yenni-Khairunnisyah).*Kultivasi*, *17*(1), 537–543. https://doi.org/https://doi.org/10.24198/kltv.v17i1

Luh Made Yulyantari, IGKG Puritan Wijaya ADH. 2019. Manajemen Model PadaSistemPendukungKeputusan.Yogyakarta : CV. ANDI OFFSET.

DickyNofriansyah, Prof. Dr. SarjonDefit. 2017. Multi Criteria Decision Making.Yogyakarta : DEEPUBLISH (Group Penerbitan CV BUDI UTAMA).

Ir. Munawar. November 2019. AnalisisPerancanganSistemBerorientasiObjekdengan UML.Penerbit :Iformatika Bandung.

Dr. Kusrini. 2017.KonsepdanAplikasiSistemPendukungKeputusan. Penerbit : CV ANDI OFFSET (Penerbit ANDI).