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Decision Support System For Prospective Recipients Of The Healthy Indonesia Card (Kis) In The Village Of Bah Sidua Dua With The Analytical Hierarchy Process (AHP) Method

Elpridawati Purba[1], Hengki Tamando Sihotang[2]

[1,2] Informatics Engineering Study Program,
STMIK Pelita Nusantara, 1 Iskandar Muda Street, Medan, Nort Sumaatera, Indonesia

E-mail :elprridawatipurba@yahoo.com, hengki_tamando@yahoo.com

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ABSTRACT

This study discusses how to discuss a support system that is used to assist the village government in negotiations for potential beneficiaries in the village of Bah Sidua dua as serdang bedagai regencies. The method used in this research is Analyticah Hierarchy Process (AHP), because this method is widely used in solving problems involving multi criteria. SPK is a system that can help someone to make decisions of various types that are done accurately and in accordance with the desired goals.

1. Introduction

The development of technology, especially computers in recent years is very rapid. In the past, people wrote using stationery such as pens or pencils. Nowadays, manual writing can be replaced by using a computer. Simply by pressing the keyboard, the letter or number you want will appear on the screen. As for each institution, the computer becomes a tool to facilitate performance for each staff or employee who works in it [8].

In a previous study in a journal written by Agus Nafiuddin, Andik Adi Suryanto, Suprapto entitled Decision Support System for Determining Healthy Indonesian Card Recipients (KIS) using Electre. The difference from the research conducted by the author with the journal is on his method, the author uses the AHP method, while the journal uses the Electre method [13].

2. Theory

2.1 Decisions Support System

Decision Support System is a computer-based support system for management decision makers who deal with unstructured problems. Decision Support System (DSS) is intended to be a tool for decision makers to expand their capabilities, but not to replace their judgment[1][5][6][10][11][15].

2.2 Method Analytical Hierarchy Process (AHP)

In essence AHP is a comprehensive model of decision making by taking into account qualitative and quantitative matters. In the decision-making model with AHP basically trying to cover all the flaws of the system and the environment into interacting components and then unite them by measuring and regulating the impact of components of the system error[1][2][3][7][14].

The steps to solve the problem with the Analytical Hierarchy Process (AHP) method, namely:

a) Define the problem and determine the desired solution, then arrange the hierarchy of the problem at hand. The arrangement of the hierarchy is to set goals which are the overall system goals at the top level.

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b) determine the priority of the element
c) Synthesis
d) measure Consistency
e) Calculate the Consistency Index (CI) with the formula:
CI = (λ max-n) / n
Where n = number of elements
f) calculate the Consistency Rastio (CR) with the formula:
CR = CI / RC
Where CR = Consistency Ratio
CI = Consistency Index
IR = Random Consistency Index

check the consistency of the hierarchy. If the value is more than 10%, then the judgment judgment data must be improved. But if the consistency ratio (CI / IR) is less or equal to 0.1, then the calculation results can be declared correct[1][2][7][14].

3. Research Method

The framework that will be carried out by researchers in an effort to find information data that will help in making research is as follows :

a) Collecting Data
This research data collection method is a questionnaire method with direct studies or surveys. This method uses a number of closed questions or statements with the answer choices provided.
b) Data Analysis Stage
Analyzing data using questionnaires conducted directly by guiding respondents who are Durian villagers, so it is expected that the results obtained will be more accurate and describe the condition and the population as a whole.

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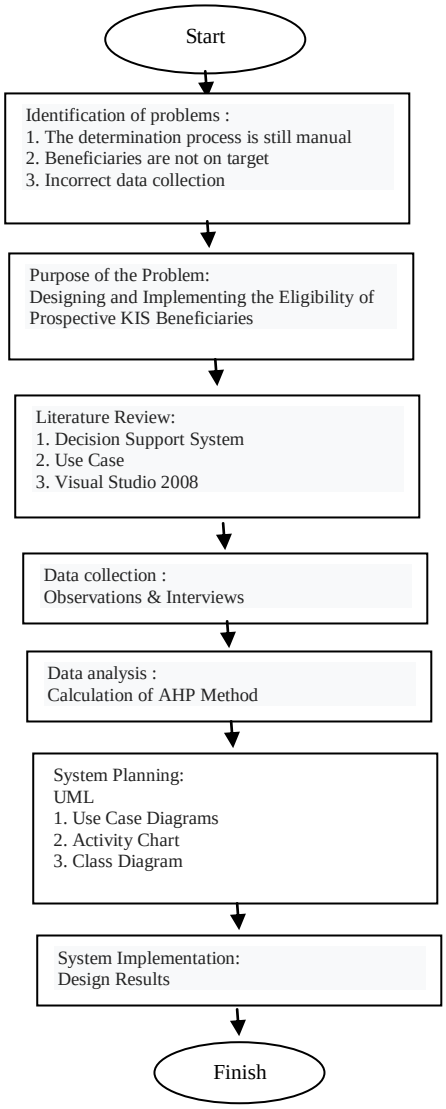

Figure 1. Research Framework

4. Analysis

4.1 Completion Algorithm

To complete decision making based on AHP algorithm calculations, the first thing to do is

a) Defining the Problem and the Desired Goals

Based on the results of data collection, it can be seen that there are four basic criteria that are currently used in the determination of KIS beneficiary candidates in Bah Sidua Village two namely: Type of House Building (K1), Land Area (K2), Income (K3) and Dependents (K4).

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a. Determine Priority of Elements

Table 1.
Element Prorities

Criteria	K_1	K_2	K_3	K_4
K_1	1	2	2	**3**
K_2	0,5	1	2	**2**
K_3	0,5	0,5	1	**2**
K_4	0,33	0,5	0,5	**1**
Total	2,33	4	5,5	**8**

b) Synthesis

Table 2.
Average Value/ Priorities

Criteria	K_1	K_2	K_3	K_4	Total	Priorities
K_1	0,429	0,500	0,364	0,3755	1,668	**1,668/4=0,417**
K_2	0,214	0,250	0,364	0,250	1,078	**1,078/4=0,270**
K_3	0,214	0,125	0,182	0,250	0,771	**0,771/4=0,193**
K_4	0,1433	0,125	0,091	0,125	0,484	**0,484/4=0,121**

c) Measure Consistency

Table 3.
Calculation of Consistency Ratio

Criteria	K_1	K_2	K_3	K_4	Total	Priorities	The Result
K_1	0,429	0,500	0,364	0,3755	1,668	1,668/4=0,417	**2,085**
K_2	0,214	0,250	0,364	0,250	1,078	1,078/4=0,270	**1,348**
K_3	0,214	0,125	0,182	0,250	0,771	0,771/4=0,193	**0,964**
K_4	0,1433	0,125	0,091	0,125	0,484	0,484/4=0,121	**0,605**
			Total				**5,002**

d) Calculate the Consistency Index (CI)

λ max = (2,085 + 1,348 + 0,964 + 0,605) / 4 = 1,250
CI = (1,250 – 4) / 4 = -0,687

e) Calculate the Consistency Ratio (CR) with the formula:

CR = CI / IR
= -0,687/0,90 = -0,764

Because the CR value is below 0.10, the criteria comparison matrix is considered consistent. After calculating the priority criteria, the priority criteria are also calculated according to the steps above. The sub-criteria priority steps are as follows:

a. Calculate the priority of sub criteria from the Building Type criteria

a) Make a pairwise comparison matrix

Table 4.
Comparison Matrix

	Very Decent	Worthy	Not Feasible
Very Decent	1	3	5
Worthy	0,333	1	3
Not Feasible	0,200	0,333	1
Total	1,533	4,333	9

b) Create criteria values

Table 5.
Criteria Value Matrix

Criteria	Very Decent	Worthy	Not Feasible	Total	Priorities	The Result	Priority Sub Criteria
Very Decent	0,652	0,692	0,556	1,900	0,633	2,533	1
Worthy	0,217	0,231	0,333	0,781	0,260	1,041	0,411
Not Feasible	0,130	0,077	0,111	0,318	0,106	0,424	0,167

Amount (sum of yield values): 3,998
N (number of criteria): 3
λ max (number / n): 1,333
CI = (λ max - n) / (n): -0,556
CR = CI / RI = -0,556 / 0.58 = -0,958
Therefore CR <0.1, the consistency ratio of the calculation is acceptable.

b. Calculate the priority of sub criteria from the area criteria

a) Make a pairwise comparison matrix

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Table 6.
Pairwise Comparison Matrices Area Area

	Very Decent	Worthy	Not Feasible
Very Decent	1	2	6
Worthy	0,5	1	2
Not Feasible	0,167	0,5	1
Total	1,667	3,5	9

b) Create Criteria Values

Table 7.
Criteria Vaue Matriks

Criteria	Very Decent	Worthy	Not Feasible	Total	Priorities	The Result	Priority Sub Criteria
Very Decent	0,600	0,571	0,667	1,838	0,613	2,45	**1**
Worthy	0,300	0,286	0,222	0,808	0,269	1,077	**0,439**
Not Feasible	0,100	0,143	0,111	0,269	0,118	0,472	**0,192**

Amount (sum of yield values): 4,000
N (number of criteria): 3
λ max (number / n): 1,333
CI = (λ max - n) / (n): -0,556
CR = CI / RI = -0,556 / 0.58 = -0,958
Therefore CR <0.1, the consistency ratio of the calculation is acceptable.

c. Calculate priority sub-criteria from Income criteria

a) Make a pairwise comparison matrix

Table 8.
Income Criteria Comparison Matrix

	Very Decent	Worthy	Not Feasible
Very Decent	1	3	**4**
Worthy	0,333	1	**3**
Not Feasible	0,250	0,333	**1**
Jumlah	1,583	4,333	**8**

b) Create Criteria Values

Table 9.
Criteria Vaue Matriks

Criteria	Very Decent	Worthy	Not Feasible	Total	Priorities	The Result	Priority Sub Criteria
Very Decent	0,632	0,692	0,500	1,824	0,608	2,432	**1**
Worthy	0,210	0,231	0,375	0,816	0,272	1,080	**0,447**
Not Feasible	0,158	0,077	0,125	0,360	0,120	0,480	**0,197**

Amount (sum of yield values): 4,000
N (number of criteria): 3
λ max (number / n): 1,333
CI = (λ max - n) / (n): -0,556
CR = CI / RI = -0,556 / 0.58 = -0,958
Therefore CR <0.1, the consistency ratio of the calculation is acceptable.

d. Calculate the sub-criteria priority from the Dependency criteria

a) Make a pairwise comparison matrix

Table 10.
Matrix of Comparison of Dependent Criteria

	Very Decent	Worthy	Not Feasible
Very Decent	1	2	**5**
Worthy	0,500	1	**2**
Not Feasible	0,200	0,500	**1**
Jumlah	1,700	3,500	**8**

b) Create Criteria Values

Table 11.
Criteria Vaue Matriks

Criteria	Very Decent	Worthy	Not Feasible	Total	Priorities	The Result	Priority Sub Criteria
Very Decent	0,588	0,571	0,625	1,784	0,57	2,379	**1**

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Worthy	0,294	0,286	0,250	0,830	0,777	1,107	**0,466**
Not Feasible	0,118	0,143	0,125	0,386	0,129	0,515	**0,217**

Amount (sum of yield values): 4,001
N (number of criteria): 3
λ max (number / n): 1,334
CI = (λ max - n) / (n): -0.55
CR = CI / RI = -0,555 / 0.58 = -0,958
Therefore CR <0.1, the consistency ratio of the calculation is acceptable.

After determining the value of criteria and sub criteria, the priority of the calculation results on the criteria and sub criteria is then set forth in the results matrix.

e. Calculating Results

The priority calculation results in steps 1 and 2 are then outlined in the results shown in the following Table.

Table 12.
Calculating Results

Building Type	Land Area	Income	Dependents
0,417	0,270	0,193	0,121
Very Decent	Very Decent	Very Decent	Very Decent
1	1	1	1
Worthy	Worthy	Worthy	Worthy
0,411	0,439	0,447	0,466
Not Feasible	Not Feasible	Not Feasible	Not Feasible
0,167	0,197	0,197	0,17

f. Determination of KIS Assistance Candidates Using the AHP Method
Checking Consistency of Hierarchy and Overall Value of Alternative Priorities

Table 13.
Set Alternative

Alternative	Building Type	Land Area	Income	Dependents
Rodiaman Damanik	Worthy	Very Decent	Worthy	**Worthy**
Juniamin Purba	Worthy	Worthy	Worthy	**Worthy**
Pardindingan Manalu	Worthy	Worthy	Worthy	**Very Decent**
Surip	Very Decent	Very Decent	Very Decent	**Not Feasible**
Gokkon Aritonang	Not Feasible	Not Feasible	Worthy	**Worthy**

Then the results of the determination that Worthy received KIS assistance, then calculated as the final value of the decision as in the table below.

Table 14.
Final Results of the AHP Method

Alternative	Building Type	Land Area	Income	Dependents	Total	Information
Rodiaman Damanik	0,41	1	0,45	0,59	2,45	**Worthy**
Juniamin Purba	0,41	0,44	0,45	0,59	1,89	**Not Feasible**
Pardindingan Manalu	0,41	0,44	0,45	01	2,3	**Not Feasible**
Surip	1	1	1	0,17	3,17	**Worthy**
Gokkon Aritonang	0,17	0,19	0,45	0,59	1,4	**Not Feasible**

From the table above we get the value of the product of the priority value multiplied by the value of the sub priority, the results obtained for each criterion are obtained for each criterion added to produce a total value. Then the highest value that Worthy as the recipient of KIS assistance is Rodiaman Damanik and Surip.

4.2 System Planning

1. Use Case Diagram

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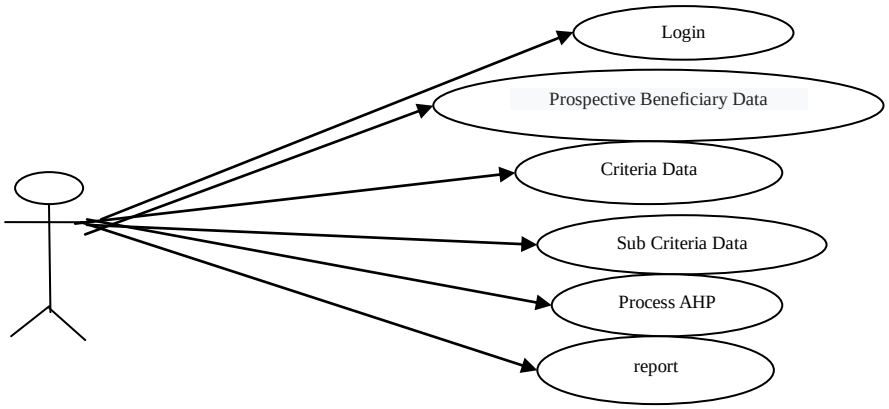

Figure 1. Use Case Diagram

5. System Implementation

5.1 Citizens data

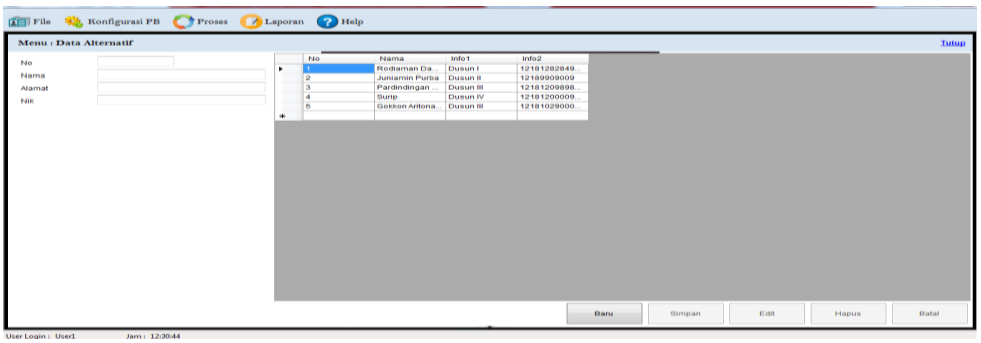

Figure 2. Citizen Data

5.2 Assesment Form

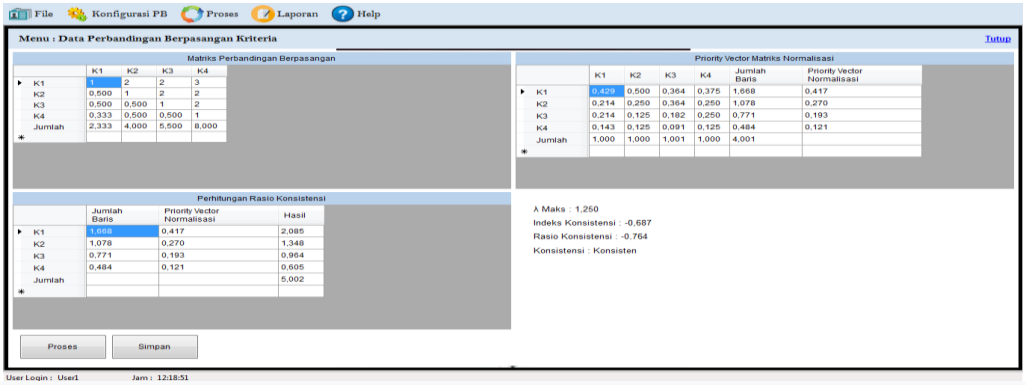

Figure 3. Page Design Assessment Process

5.3 Hasil Penilaian

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Figure 4. Page Design of Assessment Results Data

5.4 Report

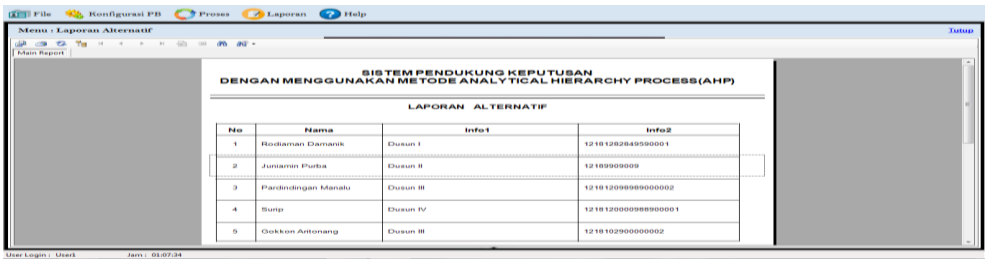

Figure 6. Report Page

6. Conclusion

At the writing of this thesis, the author makes an application that functions as a system that can help in the determination of KeWorthyan for prospective beneficiaries of the Indonesia Healthy Card in the village of Bah Sidua, two Districts of Serba So the following is the conclusion:

1) Problems that occur in relation to determining whether or not Worthy residents receive assistance can be solved by applying the Analytical Hierarchy Process (AHP) Method.
2) By applying the Analytical Hierarchy Process (AHP) Method to determine the prospective recipients of the Indonesia Healthy Card (KIS) aid in Bah Sidua Village two can be adjusted according to the criteria set together through deliberation and using weights to be used with the algorithm.
3) With an application that has been made and in accordance with the obstacles it can facilitate the user in determining the Northyan for prospective beneficiaries, and enough user frendly for users to use this application.

7. Reference

[1] Am, Ebedia Hilda, et al, Penerapan Metode *Analytical Hierarchy Process* (AHP) Pada Sistem Pendukung Keputusan Pemilihan Mahasiswa Berpretasi menggunakan *Framework Laravel*, Vol.3 , No.1, Desember 2015.
[2] Aminudin, Nur, et al.”The family hope program using AHP method, international journal of engineering & technology”, 7(2.27)(2018).
[3] Astuti, Yuli, et al. “Sistem Pendukung Keputusan untuk Pemilihan Perguruan Tinggi Komputer Swasta”, V0l 12 No. 1 Maret 2011.
[4] Budi Laksono, Sularso, et al.”Sistem Pendukung Keputusan Pemilihan Perguruan Tinggi Swasta Program Studi Teknik Informatika di Propinsi DKI Jakarta dengan Metode AHP dan Promethee”.
[5] Cahyadi, Kadek.”Rancang Bangun Sistem Pendukung Keputusan Pemilihan Handphone Berbasis Web Dengan Metode FMADM”, Vol.2,No 1, Januari 2016.”Jurnal Teknologi Informasi dan Komputer, pp 178-186.
[6] Charolina, Yanthi.”Sistem Pendukung Keputusan Untuk Menentukan Pemberian Bonus Tahunaan Menggunakan Metode Fuzzy Logic Tipe Mamdani”, Vol 12, No. 2 Agustus 2016.
[7] Dr.Kusrini,M.Kom,Konsep dan Aplikasi sistem Pendukung Keputusan, Vol 2. 2018.

[8] Faisal, et al. "Sistem Penunjang Keputusan Pemilihan Sekolah Mengah Kejuruan Teknik Komputer dan Jarinngan yang Terfavorit dengan menggunakan Multi-Criteria Decision Making" Vol.2, No 1, April 2015.
[9] Harpad, Bartolomius, Salmon."Penerapan Metode Analytical Hierarchy Process (AHP) Pada pemilihan Staf Laboratorium Komputer STMIK Widya Cipta Dharma Samarinda.
[10] Laengge, Iwan, et al. "Sistem Pendukung Keputusan Dalam menentukan Dosen Pembimbing Skripsi", Vol.9,No 1, 2016.
[11] Lumban Batu, Katen, Novriyeni."Perancangan Sistem Pendukung Keputusan Pemilihan Benih Taanaman Perkebunan Menggunakan Metode Decision Tree (Studi Kassus PT Rata Makmur)", Vol 6, No. 2 Januari 2013.
[12] Mutia, Intan, Luh Putu Widya Adnyani."Perancangan Sistem Pendukung Keputusan Instrukstur Ternaik Berdasarkan Kinerja Dengan Metode Analytical Hierarchy Process(AHP)", Factor Exacta 11(1): 75-83, 2019.
[13] Nafiuddin, Agus et al, Sistem Pendukung Keputusan Menentukan Warga Penerima Kartu Indonesia Sehat (KIS) menggunakan *Electre*. Vol 3, 2018.
[14] Pratama, Angga Agus , Nurmalasari."Sistem Pendukung Keputusan Pemilihan *Supplier* Menggunakan metode AHP pada PT. Transcoal Pacific Jakarta",. Vol 4 No. 2 Agustus 2018.
[15] Risanty, Rita Dewi, et al."Perancangan Sistem Pendukung Keputusan Prediksi Jumlah Produksi dan Tenaga Kerja Menggunakan Metode Fuzzy Sugeno".
[16] Setiawan, M. Nurfalah. "Sistem Pendukung Keputusan Pemilihan Karyawan Teladan di STMIK Balikpapan Berbasis Website",Vol.1 No. 1 2017.
[17] Sanusi, Yanuar, et al."The Implementation of AHP for Determining Dominant Criteria in Higher Education Competitiveness Development Strategy Based ON Information Technology", Vol 3, No. 1 June 2019 pp 25-33.