Decision Support System for Selecting Social Assistance Recipients using The Preference Selection Index Method

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Abstract:

This research aims to solve the problem of selecting social assistance recipients in the Nagori Moho area, Java Marajah Bah Subdistrict, Jambi, Simalungun District; in order to obtain the right targeted recipients of social assistance, the Nagori office carries out the selection of its residents, this selection is carried out by implementing a computer-based decision support system (DSS). The decision support system uses the PSI method. The criteria used in this method consist of economic condition, income, jobs, age, and dependents of the school children. The results obtained from this research are recommendations for the population receiving aid with results consisting of rank 1 with the alternative value S_Purba with a value of 0.9286, then rank two with the alternative F_Azhar with a value of 0.7599, and rank 3 is Jumiati with a value of 0.7163. This decision support system can make it easier for the Nagori office to select residents worthy of assistance.

Keywords: DSS, PSI Method, Recipients, Social Assistance, residents selection

1. INTRODUCTION

The World Health Organization (WHO) declared COVID-19 to be a pandemic in October 2020; over 210 countries and territories had reported over 2,000,000 cases; of those, over 195,755 had resulted in deaths, and over 781,109 had recovered. The various socioeconomic issues caused by the coronavirus impacted the community. Public awareness of the socioeconomic COVID-19-related problems is growing due to businesses and entrepreneurs cutting down on employees (PHK) in anticipation of the impact of business suspensions in an indeterminate amount of time. The Corona case in Indonesia has nearly completely paralyzed people's economic activities and resulted in a high rate of poverty. Furthermore, because of this coronavirus case, workers in the unorganized sector are also severely disadvantaged. Even informal workers, who typically make an hourly rate, are finding it harder and harder to make enough to survive these days. Those who work depend on their daily income, such as merchants, shop staff members, construction workers, and casual daily laborers.

Moreover, to deal with the financial effects of the pandemic, the Indonesian government launched The Family Hope, also known as Program Keluarga Harapan (PKH), which offers monetary support. Also, the government provides non-cash support called '*Bantuan Pemerintah Non-Tunai*' (BPNT), which comes in the form of necessities— launched both social assistance programs to support weak households' human

development and reduce poverty. The Indonesian government launched this program, which targets low-income families.

Both programs came across ongoing difficulties despite their amazing goals, especially with the effective identification and selection of recipients of assistance. Wrong targets in the distribution of social assistance can occur due to problems in the process of identifying and selecting aid recipients by local governments, which is still done manually. This is due to a lack of transparency and lack of use of appropriate systems, such as computer-based decision support systems, which can result in a distribution that is not fully directed. This can trigger public dissatisfaction and cause social injustice.

The same is true of the local government, the Nagori Government, especially Gamot. As we know, the distribution of social assistance cannot be separated from problems. Namely, in determining who the right community is, manual selection is still carried out so that the distribution is not fully targeted and causes social jealousy in the community. In a sense, there are still residents/communities who should receive cash social assistance (CSA) but do not receive it. On the other hand, those who should not accept it include those still working in the formal sector, having a fairly capable economy, passing away, and so on. Moreover, Multiple technologies have been combined in the current technological era to help solve issues in day-to-day living [1]–[9], [10]–[15]. Using computer-based decision support systems is one of them [16]–[23]. In the domains of education, health, and other public areas, decision support systems have been widely used to assist decision-making in solving a variety of problems [24]–[29], [30]–[32].

In this problem, the Author chooses the PSI (Preference Selection Index) method to facilitate the process of selecting recipients of cash social assistance (CSA) needed by Nagori Moho so that a Decision Support System is designed for the Selection of Cash Social Assistance (BSA) recipients using the PSI (Preference Selection) method. Index) in Nagori Moho, Java Marajah Bah Subdistrict, Jambi, Simalungun District.

2. METHOD

Several obstacles often occur in determining the community's eligibility for cash social assistance (CSA) recipients. Difficulties occur because no detailed criteria are used to select recipients of cash social assistance (CSA) to the community. So Nagori Moho, especially Gamot, will find it difficult to find who is worthy as the recipient of cash social assistance (CSA) so that the assistance is truly on target and there is no more social jealousy in the midst of society that can cause new problems. This is a problem that is faced and must be solved with a method so that the results are better and there is no social jealousy in society; for that, the Author uses the PSI method. The objective of this study was to compare the performance of the Preference Selection Index (PSI) method with other well-known MCDM decision-making methods to demonstrate and validate the application of the PSI method. Moreover, Criteria, Descriptions, and Types can be seen in Table 1. The classification of economic conditions or sub-criteria is in Table 2, and the alternative criteria are in Table 3.

Table 1. Criteria, Description, and Types

Criteria	Description	Types
C1	Economic condition	Benefit
C2	Incomes	Benefit
C3	Jobs	Benefit
C4	Age	Benefit
C5	Dependents of the school kids	Benefit

Table 2. Classification of Economic conditions or Sub Criteria

Economic Condition	Earnings criteria	Job Criteria	Age	Value
Rich	8.000.000 IDR and over	Police / Civil Servants	18–30	1
Capable	5.000.000 IDR - 7.999.999 IDR	Self-Employed	30-40	2
Poor	3.000.000 IDR - 4.999.999 IDR	Employee	40–50	3
Indigent	1.500.000 IDR - 2.999.999 IDR	Farmer / Labourer	50–60	4
	300.000 IDR - 1.499.999 IDR	Taking care of household	60<	5

Table 3. Alternative of Criteria

No	Identification Number	Name	Criteria				
			Economy Condition	Earnings/Month	Jobs	Age	Depending of the School kids
1	1208216405020002	EIVU_Damanik	Capable	1.850.000 IDR	Self-Employed	19	0
2	1208192708780002	Siswanto	Indigent	1.550.000 IDR	Self-Employed	43	1
3	1208196808800001	Jumiati	Poor	1.250.000 IDR	Taking care of Household	41	0
4	1208191504900003	SH_Ismail	Capable	2.035.000 IDR	Farmer	31	1
5	1208192205980001	I_Fahlefi	Poor	1.500.000 IDR	Labourer	23	0
6	1208192303660001	P_Manurung	Capable	2.050.000 IDR	Employee	51	1
7	1208196512680001	V_Fazirah	Capable	2.300.000 IDR	Employee	23	0
8	1208196707400001	S_Purba	Indigent	300.000 IDR	Taking care of Household	81	0
9	1208190912800001	T_Hermasyah	Capable	2.500.000 IDR	Employee	41	2
10	1208190407760001	F_Azhar	Indigent	1.200.000 IDR	Labourer	46	4
11	1208191612780002	M_Safrijal	Poor	1.500.000 IDR	Labourer	43	4
12	1208191404810001	R_Pangabean	Capable	3.125.000 IDR	Civil Servants	40	2
13	1208191202720001	Noto	Capable	3.540.000 IDR	Employee	49	2
14	1208190901850001	I_Lasmana	Capable	3.250.000 IDR	Self-Employed	36	1
15	1208192006700001	M_Ewin	Rich	10.000.000 IDR	Self-Employed	41	1

3. Result and Analysis

Table 4 displays the suitability rating of each alternative on each criterion; in this table, you can find an assessment of how well each alternative option performs concerning specific criteria. It provides a structured comparison of the alternatives based on various factors or attributes. The suitability Rating of Each Alternative in each criterion is specifically shown in Table 4. Moreover, from the results of the analysis with equation 1, the values of the NJ and N parameters are obtained in Table 5, the Ø value in Table 6, and the θ Parameter, and finally, the final result or Value For Each Alternative is shown in Table 8.

Table 4. Suitability Rating of Each Alternative On Each Criteria

No	Alternative	Criteria				
		Economy Condition	**Earnings/Month**	**Jobs**	**Age**	**Depending on the School, kids**
1	EIVU_Damanik	2	4	2	1	1
2	Siswanto	4	4	2	3	2
3	Jumiati	3	4	5	3	1
4	SH_Ismail	2	3	4	2	2
5	I_Fahlefi	3	4	4	1	1
6	P_Manurung	2	3	3	4	2
7	V_Fazirah	2	3	3	1	1
8	S_Purba	4	5	5	5	1
9	T_Hermasyah	2	3	3	3	3
10	F_Azhar	4	4	4	3	5
11	M_Safrijal	3	4	4	3	5
12	R_Pangabean	2	3	1	3	3
13	Noto	2	2	3	3	3
14	I_Lasmana	2	3	2	2	2
15	M_Ewin	1	1	2	3	2

The decision matrix formed from the match table is as follows:

$$\mathcal{X}_{ij} = \begin{bmatrix} 2 & 4 & 2 & 1 & 1 \\ 4 & 4 & 2 & 3 & 2 \\ 3 & 4 & 5 & 3 & 1 \\ 2 & 3 & 4 & 2 & 2 \\ 3 & 4 & 4 & 1 & 1 \\ 2 & 3 & 3 & 4 & 2 \\ 2 & 3 & 3 & 1 & 1 \\ 4 & 5 & 5 & 5 & 1 \\ 2 & 3 & 3 & 3 & 3 \\ 4 & 4 & 4 & 3 & 5 \\ 3 & 4 & 4 & 3 & 5 \\ 2 & 3 & 1 & 3 & 3 \\ 2 & 2 & 3 & 3 & 3 \\ 2 & 3 & 2 & 2 & 2 \\ 1 & 1 & 2 & 3 & 2 \end{bmatrix}$$

Furthermore, a normalized matrix can be seen in Equation 1.

$$R = \frac{x_{ij}}{x_{ijmax}} \tag{1}$$

$$
Rij = \begin{bmatrix}
0,4 & 0,8 & 0,4 & 0,2 & 0,2 \\
0,8 & 0,8 & 0,4 & 0,6 & 0,4 \\
0,6 & 0,8 & 1 & 0,6 & 0,2 \\
0,4 & 0,6 & 0,8 & 0,4 & 0,4 \\
0,6 & 0,8 & 0,8 & 0,2 & 0,2 \\
0,4 & 0,6 & 0,6 & 0,8 & 0,4 \\
0,4 & 0,6 & 0,6 & 0,2 & 0,2 \\
0,8 & 1 & 1 & 1 & 0,2 \\
0,4 & 0,6 & 0,6 & 0,6 & 0,6 \\
0,8 & 0,8 & 0,8 & 0,6 & 1 \\
0,6 & 0,8 & 0,8 & 0,6 & 1 \\
0,4 & 0,6 & 0,2 & 0,6 & 0,6 \\
0,4 & 0,4 & 0,6 & 0,6 & 0,6 \\
0,4 & 0,6 & 0,4 & 0,4 & 0,4 \\
0,2 & 0,2 & 0,4 & 0,6 & 0,4
\end{bmatrix}
$$

Table 5. NJ and N result value

N_{J1}	**7.6**	N_1	**0.5066**
N_{J2}	10	N_2	0.6666
N_{J3}	9.4	N_3	0.6266
N_{J4}	8	N_4	0.5333
N_{J5}	6.8	N_5	0.4666

Table 6. $\varnothing$ Parameter result value

$\varnothing J11$	**0.0114**
$\varnothing J21$	0.0086
$\varnothing J12$	0.0178
$\varnothing J13$	0.0514
$\varnothing J14$	0.1111
$\varnothing J24$	0.0044
$\varnothing J15$	0.0642
$\varnothing J25$	0.0028

$$
N_{ij} = \begin{bmatrix}
0,0114 & 0,0178 & 0,0514 & 0,1111 & 0,0642 \\
0,0860 & 0,0178 & 0,0514 & 0,0044 & 0,0028 \\
0,0087 & 0,0178 & 0,1394 & 0,0044 & 0,0642 \\
0,0114 & 0,0044 & 0,0300 & 0,0178 & 0,0028 \\
0,0087 & 0,0178 & 0,0300 & 0,1111 & 0,0642 \\
0,0114 & 0,0044 & 0,0007 & 0,0711 & 0,0028 \\
0,0114 & 0,0044 & 0,0007 & 0,1111 & 0,0642 \\
0,0860 & 0,0111 & 0,1394 & 0,2178 & 0,0642 \\
0,0114 & 0,0044 & 0,0007 & 0,0044 & 0,0215 \\
0,0860 & 0,0178 & 0,0300 & 0,0044 & 0,2988 \\
0,0087 & 0,0178 & 0,0300 & 0,0044 & 0,2988 \\
0,0114 & 0,0044 & 0,1820 & 0,0044 & 0,0215 \\
0,0114 & 0,0711 & 0,0007 & 0,0044 & 0,0215 \\
0,0114 & 0,0044 & 0,0514 & 0,0178 & 0,0028 \\
0,0940 & 0,2178 & 0,0514 & 0,0044 & 0,0028
\end{bmatrix}
$$

$$\Sigma_{i=1}^{n} = \theta_{j11} + \theta_{j21} + \theta_{j31} + \theta_{j41} + \theta_{j51} + \theta_{j61} + \theta_{j71} + \theta_{j81} + \theta_{j91} + \theta_{j101} + \theta_{j111} + \theta_{j121}$$
$$+ \ \theta_{j131} + \theta_{j141} + \theta_{j151} \tag{2}$$

$$\Sigma_{i=2}^{n} = \theta_{j12} + \theta_{j22} + \theta_{j32} + \theta_{j42} + \theta_{j52} + \theta_{j62} + \theta_{j72} + \theta_{j82} + \theta_{j92} + \theta_{j102} + \theta_{j112} + \theta_{j122}$$
$$+ \theta_{j132} + \theta_{j142} + \theta_{j152} \tag{3}$$

$$\Sigma_{i=3}^{n} = \theta_{j13} + \theta_{j23} + \theta_{j33} + \theta_{j43} + \theta_{j53} + \theta_{j63} + \theta_{j73} + \theta_{j83} + \theta_{j93} + \theta_{j103} + \theta_{j113} + \theta_{j123}$$
$$+ \theta_{j133} + \theta_{j143} + \theta_{j153} \tag{4}$$

$$\Sigma_{i=4}^{n} = \theta_{j14} + \theta_{j24} + \theta_{j34} + \theta_{j44} + \theta_{j54} + \theta_{j64} + \theta_{j74} + \theta_{j84} + \theta_{j94} + \theta_{j104} + \theta_{j114} + \theta_{j124}$$
$$+ \theta_{j134} + \theta_{j144} + \theta_{j154} \tag{5}$$

$$\Sigma_{i=5}^{n} = \theta_{j15} + \theta_{j25} + \theta_{j35} + \theta_{j45} + \theta_{j55} + \theta_{j65} + \theta_{j75} + \theta_{j85} + \theta_{j95} + \theta_{j105} + \theta_{j115} + \theta_{j125}$$
$$+ \theta_{j135} + \theta_{j145} + \theta_{j155} \tag{6}$$

The results obtained from the calculations:

$$\Sigma_{i}^{n} \, Nij = \ [(0{,}4693),(\, 0{,}5333),(\, 0{,}7893),(\, 0{,}6933),(\, 0{,}9973)]$$

Calculating the total value:

$$\sum \Omega j = 0{,}5306 + 0{,}4666 + 0{,}2106 + 0{,}3066 + 0{,}0026$$
$$= 1{,}5173$$

After the values are totaled, the weight of each criterion will be searched for the Wj value.

$$Wj = (0{,}3497),(\, 0{,}3075 \,),(\, 0{,}1388 \,),(\, 0{,}2021 \,),(\, 0{,}0017 \,)$$

The last step is to calculate the ranking value with the equation 7.

$$1 \times Rij \times Wj \tag{7}$$

Table 7. The θ Parameter result

θ Parameter	Value Result
θ 1	0.4822
θ 2	0.7033
θ 3	0.7163
θ 4	0.517
θ 5	0.6077
θ 6	0.5701
θ 7	0.4485
θ 8	0.9286
θ 9	0.53
θ 10	0.7599
θ 11	0.6899
θ 12	0.4745
θ 13	0.4685

θ Parameter	Value Result
θ 14	0.4615
θ 15	0.3089

Table 8. Value For Each Alternative

Alternative	Name	Score	Ranking
A1	EIVU_Damanik	0,4822	10
A2	Siswanto	0,7033	4
A3	Jumiati	0,7163	3
A4	SH_Ismail	0,517	9
A5	I_Fahlefi	0,6077	6
A6	P_Manurung	0,5701	7
A7	V_Fazirah	0,4485	14
A8	S_Purba	0,9286	1
A9	T_Hermasyah	0,53	8
A10	F_Azhar	0,7599	2
A11	M_Safrijal	0,6899	5
A12	R_Pangabean	0,4745	11
A13	Noto	0,4685	12
A14	I_Lasmana	0,4615	13
A15	M_Ewin	0,3089	15

4. CONCLUSION

Based on the decision support system for selecting social assistance recipients using the preference selection index method that has been developed, it can be concluded that this method can help speed up the selection of potential aid recipients. Through this research, a system was produced that can help make it easier for the office of Nagori Moho, Java Marajah Bah Subdistrict Jambi, Simalungun District, to select residents worthy of receiving social assistance on target. Using the PSI method, you can produce calculated weights to find the best alternative. The criteria used in this method consist of economic condition, income, jobs, age, and dependents of the school children. The results obtained from this research are recommendations for the population receiving aid with results consisting of rank 1 with a value of 0.9286, rank 2 with a value of 0.7599, and rank 3 with a value of 0.7163.

AUTHOR CONTRIBUTIONS

All Author is responsible for building Conceptualization, Methodology, analysis, investigation, data curation, writing—original draft preparation, writing—review and

editing, visualization, supervision of project administration, funding acquisition, and have read and agreed to the published version of the manuscript.

CONFLICTS OF INTEREST

The authors declare no conflict of interest.

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