TEST Engineering & Management

July-August 2020
ISSN: 0193-4120 Page No. 3594 - 3598

Decision Support System for Granting Business Domicile Certificate with Simple Additive Weighting (SAW) Method

Sri Haryati[1*], Muhammad Syahid Pebriadi[2], Heldalina[3], Emy Iryanie[4]
[1,2,3,4] Computerized Accounting, Politeknik Negeri Banjarmasin, Indonesia.
*Correspondent author e-mail: iie_koto@akuntansipoliban.ac.id

Article Info
Volume 83
Page Number: 3594 - 3598
Publication Issue:
July-August 2020

Article History
Article Received: *25 April 2020*
Revised: *29 May 2020*
Accepted: *20 June 2020*
Publication: *10 August 2020*

Abstract

This research is to solve the problems faced by the community, especially business actors in making business domicile certificates because most people do not understand the procedures that must be completed so that business actors can be said to be eligible to obtain business domicile certificates. This decision support system was designed using the Simple Additive Weighting (SAW) method which is the basic concept find a method SAW weighted summation of the performance ratings of all the attributes of each alternative.

Keywords: *Decision Support System, Simple Additive Weighting, Business domicile certificate.*

1. Introduction

Domicile of business is a certificate issued by the regional government in which the location of the place of business. The letter was issued by the village office and was also recorded in the sub-district. Business Domicile Certificate is the basis of the issuance of all business licenses, tax registration and company registration in other agencies, so that it is required both in the maintenance of trade business licenses and company registration certificates.

In managing domicile certificates there are still many polemics where the conditions given by the sub-district differ, besides making this business domicile certificate takes a long time because of the inspection of the feasibility file to be issued a certificate of domicile of this business. The cost of making a certificate of domicile varies at the district level, this is often the case of fraudulent practices committed by irresponsible persons. To be able to overcome this problem, the author wants to design a decision support system to make it easy for businesses to test their eligibility for obtaining a certificate of business domicile.

Decision support system (Decision Support System) is an interactive information system that provides information, modeling and manipulation of data. The system is used to help decision-making in semi-structured situations and unstructured situations where no one knows for certain how a decision should be made[1],[5],[6]

The basic concept of the SAW method is to find the weighted sum of performance ratings on each alternative and on all attributes that require the process of normalizing the decision matrix (X) to a scale compa- rable to all existing alternative ratings. This method is chosen because it is able to select the best alternative from a number of alternatives that exist based on the criteria specified. The research is done by finding the weight value for each attribute then done ranking which will determine the optimal alternative[2],[7],[10]

July-August 2020
ISSN: 0193-4120 Page No. 3672 - 3680

2. Methodology

2.1. *Decision Support System*

Stated that the stage of making a Decision Support System, namely [3],[8]:

1. Search (intelligence) Is the stage of defining the information needed that is related to the problems faced and the decisions that will be taken. This step really determines the accuracy of the decisions that will be taken, because before an action is taken, of course the problems faced must be clearly formulated first.

2. Design (Design) It is the analysis phase in terms of finding or formulating alternative problem solvers. After the problem is well formulated, the next step is to design or build a problem solving model and arrange various alternative problem solvers[9].

3. Election (Choice) By referring to the formulation of objectives and expected results, then management selects the alternative solutions that are estimated to be most appropriate The choice of this alternative will be easy to do if the desired results are measured or have certain quality values.

4. Implementation (Implementation) Is the implementing stage of the decisions that have been taken. At this stage a series of planned actions need to be formulated, so that the results of the decisions can be monitored or resolved if improvements are needed

2.2. *Simple Additive Weighting*

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[4]

$$r_{ij} = \frac{x_{ij}}{Max(x_{ij})} \quad (1)$$

$$r_{ij} = \frac{Min(x_{ij})}{x_{ij}} \quad (2)$$

If j is an attribute benefit then using the formula number one. If the attribute j cost then using the formula number two:

$$w = \frac{c1}{c1+\cdots+cn} x\ 100\% \quad (3)$$

$$V_i = \sum_{j-1}^{n} = 1\ w_j\ r_{ij} \quad (4)$$

The weights of all criteria are obtained by using the formula number three. With *rij* is the normalized performance rating of alternatives on attribute Ci Ai; i = 1,2, ..., n and j = 1,2, ..., n. Preference value alternative (vi) using the formula number four.

3. RESULT AND DISCUSSION

the criteria used in this decision support system are as follows ;

Table 1 Criteria

Criteria	Applicant Criteria	Score
C1 (COST)		
Business has been established	≥ 5 th	5
	3 - 4 th	4
	1- 2 th	2
	≤ 1 th	1
C2 (BENEFIT)		
Monthly income	≥ 100.000.000	5
	50.000.000 - 99.000.000	4
	10.000.000 - 49.000.000	3
	1.000.000 - 10.000.000	2
	≤ 1.000.000	1
C3 (COST)		
Distance Location with City Center	≥ 20 km	5
	10-19 km	4
	5 - 9km	3
	≤ 5 km	1
C4 (BENEFIT)		
Deed of Establishment of Business Entity	Available	5
	on proses	3
	not available	1
C5 (BENEFIT)		

July-August 2020
ISSN: 0193-4120 Page No. 3672 - 3680

Proof of Ownership of Business Place	Owned (Land certificate)	5
	Lease (Lease Agreement)	3
	not available	1

After the criteria is determined, the next step is to provide a weight value (w) in accordance with the established conditions. seen in table 4.2 as follows;

Table 2 Weight Criteria

Criteria	Weight	
C1	10	0.1
C2	20	0.2
C3	25	0.25
C4	20	0.2
C5	25	0.25
Total	100	1

From the table above we get the weight value (w) as follows:W = [0.1, 0.2, 0.25, 0.2, 0.25].

The next step is to provide an alternative value, which is a sample of 5 alternatives where the alternative is the applicant who wants to get a certificate of business domicile, we can see in table3 as follows;

Table 3 Weighting of alternatives according to criteria

Applicant	**Criteria**				
	C1	**C2**	**C3**	**C4**	**C5**
A1	2	1	1	2	4
A2	1	2	4	3	3
A3	1	3	3	4	3
A4	3	1	1	5	3
A5	5	3	5	3	1

The first table (alternative weighting to criteria) is converted into a matrix

$$Z = \begin{bmatrix} 2 & 1 & 1 & 2 & 4 \\ 1 & 2 & 4 & 3 & 3 \\ 1 & 3 & 3 & 4 & 3 \\ 3 & 1 & 1 & 5 & 3 \\ 5 & 3 & 5 & 3 & 1 \end{bmatrix}$$

The benefit criteria are (C2, C4 and C5). For normalizing values, if the benefit criterion factor is used the formula:

$$R_{ii} = (X_{ij} / \max\{X_{ij}\})$$

From column C2 the maximum value is ‘3’, so each row from column C2 is divided by the maximum value of column C2:

R12 = 1 / 3 = 0.33
R22 = 2 / 3 = 0.67
R32 = 3 / 3 = 1
R42 = 1 / 3 = 0.33
R52 = 3 / 3 = 1

From column C4 the maximum value is ‘5’, so each row from column C4 is divided by the maximum value of column C4:

R14 = 2 / 5 = 0.4
R24 = 3 / 5 = 0.6
R34 = 4 / 5 = 0.8
R44 = 5 / 5 = 1
R54 = 3 / 5 = 0.6

From column C5 the maximum value is '4', so each row from column C5 is divided by the maximum value of column C5:

R15 = 4/4 = 1
R25 = 3/4 = 0.75
R35 = 3/4 = 0.75
R45 = 3/4 = 0.75
R55 = 1/4 = 0.25

The cost criteria are (C1 and C3). For normalizing values, if the cost criteria are used the formula:

$$R_{ii} = (\min\{X_{ij}\} / X_{ij})$$

From column C1 the minimum value is ‘1’, so each row from column C1 becomes the denominator of the maximum value of column C1:

R11 = 1/2 = 0.5
R21 = 1/1 = 1
R31 = 1/1 = 1
R41 = 1/3 = 0.33
R51 = 1/5 = 0.2

July-August 2020
ISSN: 0193-4120 Page No. 3672 - 3680

From column C3 the minimum value is '1', so each row from column C3 becomes the denominator of the maximum value of column C3:

R13= 1/ 1 = 1
R23 = 1 /4= 0.25
R33 = 1 /3= 0,33
R43 = 1/ 1= 1
R53= 1/ 5 = 0,2

Enter all the calculation results into the normalized factors table:

Table 4 Normalized factors

0.5	0.33	1	0.4	1
1	0.67	0.25	0.6	0.75
1	1	0.33	0.8	0.75
0.33	0.33	1	1	0.75
0.2	1	0.2	0.6	0.25

Criteria weights that have been previously declared with the formulation:

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

Where :

Vi = ranking for each alternative
wj = the weight value of each criterion
rij = value normalized performance rating

The greater Vi indicates that the alternative Ai is preferred. Weight w that has been given W = [0.1, 0.2, 0.25, 0.2, 0.25]

V1 = (0.1*0.5) +(0.2*0.33) +(0.25*1) + (0.2*0.4) + (0.25 * 1)
V1 = 0.05+0.066+0.25+0.08+0.25
V1 = 0.696
V2 = (0.1*1) +(0.2*0.67) +(0.25*0.25) + (0.2*0.6) + (0.25 * 0.75)
V2 = 0.1+0.134+0.0625+0.12+0.1875
V2 = 0.604
V3 = (0.1*1) +(0.2*1) +(0.25*0.33) + (0.2*0.8) + (0.25 * 0.75)
V3 = 0.1+0.2+0.0825+0.16+0.1875
V3 = 0.73
V4 = (0.1*0.33)+(0.2*0.33)+(0.25*1) + (0.2*1) + (0.25 * 0.75)
V4 = 0.033+0.066+0.25+0.2+0.1875
V4 = 0.7365
V5= (0.1*0.2)+(0.2*1)+(0.25*0.2) + (0.2*0.6) + (0.25 * 0.25)
V5 = 0.02+0.2+0.05+0.12+0.0625
V5 = 0.4525

The final value is obtained as follows.

Table5 SAW Result

Alternatif	Result
A1	0.696
A2	0.604
A3	0.73
A4	0.7365
A5	0.4525

Then the alternative that has the highest value and can be chosen is alternative A4 with a value of 0.7365 then followed by alternative A3 with a value of 0.73.

4. CONCLUSION

Based on the results of the analysis that has been done, it can be concluded that the Simple Additive Weighting (SAW) method can resolve the problem in overcoming the delay in granting a business domicile certificate for the most appropriate business actor in accordance with predetermined criteria.

5. REFERENCES

1. I. S. Budi and M. Syahrizal, "Decision Support System In Sous Chef De Partie Selection Using Simple Method Additive Weighting (SAW)," vol. 2, no. 1, pp. 20–25, 2018.
2. N. Setiawan *et al.*, "Simple additive weighting as decision support system for determining employees salary," *Int. J. Eng. Technol.*, vol. 7, no. 2.14 Special Issue 14, pp. 309–313, 2018.
3. S. Wulandari and A. P. Wibowo, "DEVELOPMENT OF SAW (SIMPLE

July-August 2020
ISSN: 0193-4120 Page No. 3672 - 3680

ADDITIVE WEIGHTING) METHOD FOR DECISION SUPPORT SYSTEM OF SEMBAKO PRICE CONTROL (Case Study of the Office of Agriculture , Fisheries and Forestry , Sleman Regional Government),” *Int. J. Eng. Technol. Nat. Sci.*, vol. 1, no. 1, pp. 1–8, 2019.

4. N. Nurmalini and R. Rahim, “Study Approach of Simple Additive Weighting For Decision Support System,” *Int. J. Sci. Res. Sci. Technol.*, vol. 3, no. 3, pp. 541–544, 2017.
5. S.Abadi, F. Latifah, “Decision Support Sistem Penilaian Kinerja Karyawan Padda Perusahaan Menggunakan Metode SAW” Journal TAM, STMIK Pringsewu 37-43 2016
6. S. Abadi. at all, Identification of sundep, leafhopper and fungus of paddy by using fuzzy SAW method, International Journal of Pharmaceutical Research, vol1, number 11, 695-699, 2019.
7. Abadi S, Mat The K, Nasir B, Huda M, Ivanova N, Sari T, Maseleno A, Satria F, Muslihudin M, “Application model of k-means clustering: Insights into promotion strategy of vocational high school” *International Journal of Engineering and Technology(UAE) (2018) 7(2.27 Special Issue 27) 182-187.2018*
8. Abadi S, Widyarto S, “The designing criteria and sub-criteria of University Balance Scorecard using Analytical Hierarchy Process method” International Journal of Engineering and Technology(UAE) (2018) 7(2.29 Special Issue 29) 804-807, DOI: 10.14419/ijet.v7i2.29.14260, 2018,
9. Ayshwarya B, Soim A, Nguyen P, Shankar K, Hashim W, Abadi S, Maseleno A “Web based-decision support system to diagnose hepatitis disease using SAW method” International Journal of Innovative Technology and Exploring Engineering (2019) 8(9 Special Issue 3) 117-123, 2019 DOI: 10.35940/ijitee.i3024.0789s319
10. Abadi S, Widyarto S, Shukor N, “Customer and stakeholder perspective using analytical hierarchy process method for evaluation performance of higher education” International Journal of Supply Chain Management (2019) 8(3) 1057-1064 2019