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Measuring Supply Chain Smart Village Headman Performance

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Abstract—The supply chain management as the general tool can be used for supporting and delivering the goods to the villages. The village head is the leader of the village government. The tenure of the village head is 6 years, and can be extended for another one term is expected to run the government with a good performance in providing services to the community. So with the proper use of the supply chain the needs of the villages can be provide by the government. The Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) method can help decision making in determining the performance index of the village head. This research is conduct by looking for the performance of positive and negative ideal solutions. Applications with the highest V value will occupy the top size in this system. Then the criteria in determining the performance index of the head of the village are: timeliness, discipline, responsibility, leadership, presence, value. The results of the decision-making system resulted in 6 alternative suggested performance indexes of village heads, with the highest score of Sending Agung Village.

Keywords— *Supply Chain, DSS; TOPSIS; performance; Central Lampung.*

1. Introduction

Managing the city or the villages need supply chains they can rely on for ensuring product availability where and when needed. Implementing supply chain performance indicators or metrics is one of the simplest, least expensive. The village head is the leader of the village government. The tenure of the village head is 6 years, and can be extended for another one term. UUD NO 110 year 2016 article 46 performance of head of village explain about BPD doing supervision on performance of village head. Implementation of supervision as referred to in paragraph (1) shall be conducted through: (a) planning of village government activities; (b) implementation of activities; and (c) reporting on the administration of village government. The forms of BPD supervision as referred to in paragraph (1) shall be in the form of monitoring and evaluation. Article 47 the results of the performance of the village head's performance supervision as referred to in article 46 paragraph (1) shall be part of the performance report of BPD.

Research conducted by [1] This research explains about the determination of the performance of village head according to education level in replace Sub-district, Gresik Regency. Implementation of local government regulations on village governance has shown that village heads, especially Replace Sub-district, have different backgrounds or educational attitudes. as well as irrefutable, the village head in Replace Sub-district produced a variety of performance in running the government in his village.

Research conducted by This research describes the performance index analysis in the rehabilitation of Pungkit Sub-district of Lopok District of Sumbawa Regency using PDSDA-PAI Software Version 1.0. The rapid growth of Indonesian population in one side raises a problem of increasing the need for food so that it is necessary to think about efforts to increase the production of food crops. To assist the rehabilitation process, it is necessary to calculate the performance index in accordance with Ministerial Regulation No.32 of 2017.

Based on this, this research will help a decision support system for assessment of performance index of village head of Sendang Agung Central Lampung using TOPSIS method, TOPSIS is one of the decision making method where the chosen alternative is the best alternative that has the closest distance from the ideal solution and furthest from the ideal negative solution [2-7].

Given the performance of the Village Head's assessment of the competency aspect, the head of the village can improve his performance as we

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know that the village head develops his duties as a village leader and serves the community. For the village head who has the best performance index based on predetermined criteria will get rewards / rewards in the form of salary, allowances from the government [8-10].

2. Literature Review

2.2 Head of Village

The supply chain management is one of the main issues in the providing the goods for the villages. The village head is the head of government at the village level is expected to be able to run the government with good performance in providing services to the community. So that when the government apparatus in the high village show a good performance in organizing the government. it will affect the performance of the government at the district, provincial and central levels. The Village Head is also the leader of his way of governance affairs in the village which is the organizer and also responsible for the way the wheels of government and development within its territory [2], [3], [11- 17].

2.3 Decision Support System

Decision Support System (DSS) is an approach or methodology to support the decision. The Decision Support System employs a flexible, interactive and adaptable CBIS (Computer Based Information System), developed to support solutions to specific unstructured management problems. SPK uses data, provides an easy user interface and can incorporate decision maker thinking [4], [5]. Decision Support System typically uses a variety of models and is built by an interactive and iterative process. It supports all decision-making phases and can incorporate a knowledge component [6], [18].

2.4 Fuzzy Multiple Attribute Decision Making

Fuzzy Multiple Attribute Decision Making (FMADM) is a method used to find the optimal alternative of a number of alternatives with certain criteria[7]-[9]. The core of FMADM is to determine the weight value for each attribute, then proceed with the ranking process which will select the alternatives already given[10]. There are several methods that can be used to solve FMADM problems they are :

a. Simple Additive Weighting Method (SAW)
b. Weighted Product (WP)
c. ELECTRE
d. Technique for Order Preference by Similarity to Ideal Solution (TOPSIS)
e. Analytic Hierarchy Process (AHP)[11][12].

2.5 TOPSIS Method

Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) is based on the concept that the best chosen alternative not only has the shortest distance from the ideal solution, but also has the longest distance from the ideal solution. MADM troubleshooting steps with TOPSIS :

a. Create a normalized decision matrix.
b. Create a normalized weighted decision matrix.
c. Determine the matrix of positive ideal solutions & matrices of ideal solutions negatively.
d. Determine the distance between the value of each alternative with a positive ideal solution matrix & the ideal negative solution matrix.
e. Specifies the preference value for each alternative [13], [19].

Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) is based on the concept that the best chosen alternative not only has the shortest distance from the ideal solution, but also has the longest distance from the ideal solution. In general, TOPSIS procedure uses the completion steps in this way [14]-[16].

1. TOPSIS requires performance rating of each alternative Ai on each of the normalized Cj criteria, ie:

$$r_{ij} = \frac{X_{IJ}}{\sqrt{\sum_{i-l}^{m} x_{ij}^2}} \quad \text{..... (1)}$$

by i=1,2,...,m; and j = 1,2,...,n.

2. The ideal solution of A + and the ideal solution of negative A- can be determined based on the normalized weighted rating (yij) as:

$$y_{ij} = w_{ij}\ r_{ij} \quad \text{..... (2)}$$

dengan i=1,2,...,m; dan j = 1,2,...,n.

$$A^{+}=(y_1^{+}, y_2^{+}, \dots, y_n^{+}); \quad \text{..... (3)}$$

$$A^{+}=(y_1^{+}, y_{\bar{2}}, \dots, y_n^{-});$$

Where: j = 1,2,..,n.

3. Determine the spacing between the value of each alternative with a matrix of positive ideal solutions and the matrix of ideal solutions negatively The distance between the value of each alternative with the ideal solution matrix is defined as :

$$D_i^{+} = \sqrt{\sum_{j-i}^{n} (y_1^{+} - y_{ij})^2} \quad (4)$$

$$D_I^{-} = \sqrt{\sum_{-i}^{n} (y_{ij} - y_i)^2} \quad (5)$$

4. Determining the preference value for each alternative The preference value for each alternative (Vi) is defined as :

$$V_i = \frac{D_i^{-}}{D_i^{-} + D_i^{-}}, \quad \text{..... (6)}$$

Where i = 1,2, ……m

3. Analysis and Discussion

3.1 Manual Test

The ranking research table used for each performance index criteria is like the table below:

Table 1. Weight Value

Value	Information
1	Very bad
2	Bad
3	Good enough
4	Good
5	Very good

Table 2. Value Weight Criteria

Code	Criteria	Weight Value
C1	Punctuality	25 %
C2	Discipline	20 %
C3	Responsible	15 %
C4	Leadership	20 %
C5	Presence	10 %
C6	Value	10 %

3.2 Specify a Match Rating

The first step determines the alternative first with the criteria value that has been determined, alternative to be studied are as follows:

Alternative :

A1 : Head of Sendang Agung Village

A2 : Head of Sendang Asri Village

A3 : Head of Sendang Mulyo Village

A4 : Head of Sendang Mukti Village

A5 : Head of Sendang Rejo Village

Table 3. Alternative

Alternative	C1	C2	C3	C4	C5	C6
A1	1	0,8	1	0,8	0,4	1
A2	0,8	0,4	0,8	1	0,4	0,4
A3	0,2	1	0,2	0,4	0,8	0,4
A4	0,4	0,6	0,8	0,4	1	0,2
A5	0,2	0,4	0,4	1	0,2	0,6

Cj = Timeliness (C1), Discipline (C2), Responsibility (C3), Leadership (C4), Presence (C5), Value (C6).

Tabel 4. Normalized matrix (R)

Normalized Matrix						
Alternative	**C1**	**C2**	**C3**	**C4**	**C5**	**C6**
A1	0,729	0,525	0,635	0,465	0,283	0,762
A2	0,583	0,263	0,508	0,581	0,283	0,305
A3	0,146	0,657	0,127	0,232	0,565	0,305
A4	0,292	0,394	0,508	0,232	0,707	0,152
A5	0,146	0,263	0,254	0,581	0,141	0,457

Positive Ideal Solutions (A +) and Negative Ideal Matrix (A-) :

Yi	Ideal Solution	Max	Min
Y1	0,729; 0,583; 0,146; 0,292; 0,146	0,729	0,146
Y2	0,5252; 0,2626; 0,6565; 0,3939; 0,2626	0,6565	0,2626
Y3	0,635; 0,508; 0,127; 0,508; 0,254	0,635	0,127
Y4	0,4649; 0,5812; 0,2324; 0,2324; 0,5812	0,5812	0,2324
Y5	0,2828; 0,2828; 0,5646; 0,7071; 0,1414	0,7071	0,1414
Y6	0,7624; 0,30499; 0,30499; 0,152498; 0,457495	0,7624	0,152498

Having determined the positive and negative values it will produce:

A+	0.729324957	0.656532164	0.635000635	0.591238194	0.707106781	0.762492852
A-	0.145864991	0.262612866	0.127000127	0.232495277	0.141421356	0.15249857

Preference Value for Any Alternative

$V1 = \frac{18.95382823}{18,95382823 + 5.504721349} = 0,774936722$

$V2 = \frac{14.32886497}{14,32886497 + 10,85937856} = 0,568871146$

$V3 = \frac{9.077144205}{9,077144205 + 18.50430638} = 0,32910322$

$V4 = \frac{9,211716148}{9,211716148 + 15.38681389} = 0,374482383$

$V5 = \frac{7.84729294}{7,84729294 + 18,67614893} = 0,295862542$

V1 = 0,774936722

V2 = 0,568871146

V3 = 0,374482383

V4 = 0,32910322

V5 = 0,295862542

From the result, it can be concluded that the best alternative of village head of Sendang Agung village is Sendang Agung Village V1 = 0,774936722.

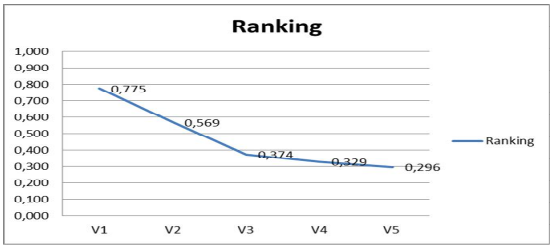

Figure 1. Graph Ranking Alternative Value

3.3 Result of Research

New Management techniques and business models such as outsourcing, sell direct, supply hubs, e-retail are needed. The results of testing application of TOPSIS method on the system is in accordance with the calculation manually. The calculation of decision support using TOPSIS method in the system resulted in the best alternative that is the assessment of performance index of head of village in Sendang Agung, with value of alternative (v1) 0,774936722 biggest in alternative head of Sendang Agung village.

4 Conclusion

Results and literature review confirmed the efficiency of the supply chain system in villages by considering the cost and time. From the results of the discussion above can be concluded that the decision to determine the performance index head of the village using Technique for Order Preference by Similarity to Ideal Solution by using criteria of timeliness, discipline, responsibility, leadership, attendance, and value.

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