International Journal of Information System & Technology
Akreditasi No. 36/E/KPT/2019 | Vol. 4, No. 1, (2020), pp. 489-495

Decision Making In Determining CV. Sinar Siantar With The TOPSIS Technique

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Abstract

The aim of this research is to build a decision support system in ranking the routes that are passed by public transportation. Pematangsiantar (often abbreviated as Siantar only) is one of the cities in North Sumatra Province, and the second largest city in the province after Medan. Due to the strategic location of Pematangsiantar, the Trans Sumatra toll road was crossed. The city has an area of 79.97 km2 and a population of 240,787 people (2010). Public transportation is one of the transportation used by the community together and pay the fare. So far, public transportation is part of urban transportation which has an important role in people's lives. However, this problem is still hampered by problems of the route that must be traversed by public transportation, especially Sinar Siantar. Decision support systems are interactive systems that support decisions in decision interpretation with alternatives obtained from tabulation of data, information and model planning. In this research, the method used is Technique For Order Preference By Similarity To Ideal Solution (TOPSIS). The TOPSIS method is based on the concept that the best alternative chosen not only has the shortest distance from the positive ideal solution, but also has the farthest distance from the negative ideal solution. The TOPSIS method has several advantages including simple and easy to understand concepts, efficient computing, and the ability to measure the relative performance of alternatives in simple mathematical decision making.Based on the calculation, the value of the V3 process which has the highest value is obtained, so that this route is the best alternative through the CV. Sinar Siantar is the alternative route to A3, namely Jalan Jawa because the alternative criteria best meet all the other alternatives. This decision support system is expected to assist in determining public transport routes to become more efficient so that the end result is the determination of public transport routes.

Keywords: *Decision Support System, Line, Public Transport, TOPSIS*

1. Introduction

Pematangsiantar (often abbreviated Siantar only) is one of the cities in North Sumatra province, and the second largest city in the province after Medan. Because of pematangsiantar location is very strategic, it was passed by trans – sumatran highway._This city has an area of 79.97 km2 and a population of as many as 240 787 people (2010). Urban public transport is part of the urban transport system which has an important role in espousing the mobility of society. The role of making urban public transport as a strategic aspect and is expected to accommodate all community activities. However, it is yet to be realized related to various constraints. One of these pathways problem that must be passed by the freight. Public transport is a strategic factor in promoting development in the city Pematangsiantar. Development of public transport field is intended for moving the various potential areas, development of transport infrastructure and better reach out to various regions, especially integrating the downtown area with suburbs Pematangsiantar. From the data Dinar (Dishub) Siantar city in 2014 there are 24 (twenty four) brand of transport registered in the Department of Transportation (Transportation) City

ISSN : 2580-7250

Siantar which amounted to 2,155 units. From 2155 the transport unit, which operates about 1,240 units every day. The 24 brands of public transport, namely cooperatives Banyan (KPB), CV. Indah Sari, CV. Sinar Siantar, CV. Pepabri, CV. Bandar Jaya, Fa Siantar Bus, CV. GMSS Jaya, CV. Ria Jaya, Fa Sinar Pure, CV. Intra, CV. Japaris, CV. Putra Gok, CV. Sinar Bangun, CV. GMSS, Fa Agree, CV. Siantar Jaya Trans, Fa Wolves, Banyan Indah, CV. Agree to Work Together (SKB), CV. Rama Indah, CV. Promise Maria, CV. Ganda, CV. Sinar Golkar, Fa GOK.

Problems often occur on public transport this is the complexity of dealing with the route to be traveled by public transport itself, especially on public transport CV. Sinar Siantar. The condition of the city center on merdeka street around Horas Markets always subscribed to congestion for all public transport in the city Pematangsiantar. Therefore, it must be determined that the best path for the public transport, especially on public transport lines CV. Sinar Siantar in order to avoid bottlenecks for Pematangsiantar. To determine the best route for the transportation it is used decision support systems using TOPSIS (Technique for Order Preference by Similarity to Ideal Solution). This study aims to assist in choose best alternative for public transit lines CV. Sinar Siantar. Many studies related to decision support systems have been carried out in solving problems [1]–[4], especially the TOPSIS method in making decisions [5]–[7]. Where the TOPSIS method can help process data as a weight for the suitability of alternative approaches that will produce the best assessment in determining the public transport route of CV. Sinar Siantar. To focus the study, the scope of the problem only includes:

a) The assessment is used to support decision-making public transport route selection method Siantar CV. Sinar Technique for Order Preference by Similarity to Ideal Solution (TOPSIS).
b) Rating suitability of each alternative on each criterion and the level of interest on every criterion in supporting the decision is determined by the numerical value (numeric).

The purpose of this study is expected the application of TOPSIS method in the selection decision support system of public transport lanes CV. Sinar Siantar be one decision support system that can be relied upon to facilitate the decision making process of the selection of public transport lines CV. Sinar Siantar.

2. Research Methodology

2.1. Defines Problems

The first step to find a formulation of the problem is how to determine the path that is ideal for public transport and examine more deeply about the problems that exist today.

2.2. Analyze Problems

Steps to understand the problems that have been specified in the scope or limit, where the issue that arises is how to determine the path that is ideal for public transport CV. Sinar Siantar based on existing data using TOPSIS method.

2.3. Set goals

Based on the analysis and understanding of the problem, then set goals to be achieved from the research is mainly to solve the existing problems.

2.4. Data collection

Collecting is done by direct interview with the relevant part, observation or direct observation to the field to know clearly and in detail the problems that exist in particular determination of the ideal public transport lines CV. Sinar Siantar and

studying literature by reading journals or books and proceedings relating to research to support the analysis of the data.

2.5. System Design

Showing how the system is designed based on analysis of data collected. After that the design and determine the ideal path on KPUM with TOPSIS method and design an application using Visual Studio 2008 programming language.

2.6. Implementation

Based on the results of the selected system design is then implemented into SPK determining the appropriate path to the source of knowledge and data obtained. In implementing the use Windows7 Operating System, Microsoft Office 2007, Microsoft Visual Studio 2008 and Xampp.

2.7. Testing

Displaying the data processing with manual testing through the existing formula, testing using Visual Studio 2008 and comparing the manual testing using formulas and testing using Visual Studio 2008.

3. Result and Discussion

3.1. Data analysis

In designing this CMS required supporting data that alternative data and data criteria, where alternative data comprising data of the road route public transportation CV. Sinar Siantar that originated from Merdeka Street (In front of Horas Market) Pematangsiantar. The data consists of the criteria for Transport conditions, number of passengers, road conditions, distance to go, fees and Regions. To more clearly can be seen in Table 1 below:

Table 1. List Criteria for Determining Line Public Transport CV. Sinar Siantar

Name	Criteria	Value
C1 = Transport Conditions	Sufficient	0.4
	Good	0.6
	Very Good	0.8
C2 = quantity of passanger	Low	0.5
	Sufficient	0.7
	High	0.9
C3 = Road Condition	Bad	0.2
	Sufficient	0.4
	Good	0.8
C4 = travelled distance	Near	0.9
	Medium	0.7
	Far	0.3
	Very Far	0.1
C5 = cost	Low	0.8
	Sufficient	0.6
	High	0.2
	Very High	0.1
C6 = Zone	General	0.3
	Solid Population	0.7

3.2. Data collection

The data used are primary data and secondary data. Primary data were obtained from the direct survey by distributing a questionnaire to 10 public transport drivers CV. Sinar Siantar. While secondary data derived from interviews to PR CV. Sinar Siantar.

3.3. SPK architecture Public Transport Line

This decision support system architecture describes the process flow system decision support public transit lines. Where the database contains data transport conditions, the data many passengers, road condition data, the data mileage, cost data and cost data to be processed in the database, then the data will be processed back tersebt using TOPSIS method in order to get results.

3.4. Determination Criteria

Path traversed by public transport CV. Sinar Siantar from Merdeka Street (Horas Market) – Sisingamangaraja street, divided into 4 Routes:
Route 1: --- passed adam malik street
Route 2: --- passed kartini street
Route 3: --- passed jawa street
Route 4: --- passed gereja street

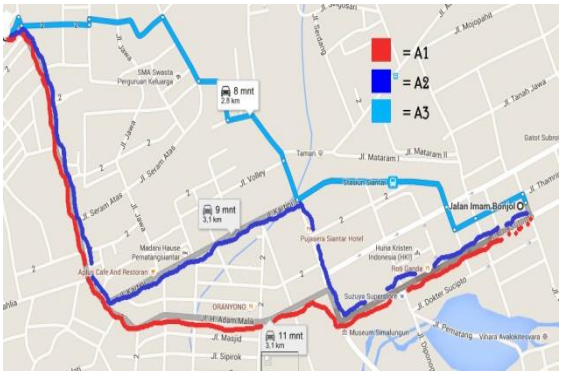

Figure 1. The route A1, A2, A3

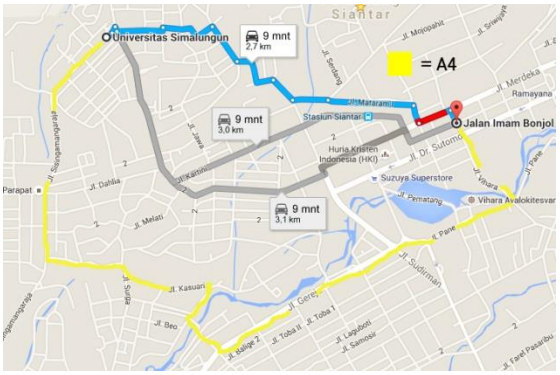

Figure 2. The route A4

The criteria that the reference there are six criteria, namely:
C1 = Transport Conditions
C2 = Number of Passengers
C3 = Road Condition
C4 = distance to be Taken
C5 = Cost
C6 = Regions

Based on these criteria a level of importance of criteria based on a predetermined weight values into fuzzy numbers. Rating suitability of each alternative on any criteria as follows:

Very Low	= 0.1
Low	= 0.3
sufficient	= 0.5
Good	= 0.75
Very Good	= 0.9

Then stripped weight krtiteria which has been converted by fuzzy numbers. Then the resulting ranking matches each alternative on each criterion. Sample calculations for phase differential test data can be seen in Table 1, the data weighting criteria (w) = 0.9,

0.3, 0.75, 0.75, 0.5, 0.9 and types of criteria are C2 and C5 are the benefits and C1, C3 and C4 is cost. that is:

Table 3. Ranking Match Any alternative on each criterion

No	Alternative	Criteria				
		C1	C2	C3	C4	C5
1	A1	0.6	0.7	0.4	0.7	0.3
2	A2	0.6	0.9	0.2	0.7	0.7
3	A3	0.6	0.7	0.4	0.1	0.7
4	A4	0.6	0.5	0.4	0.3	0.3

3.5. Calculation results TOPSIS

TOPSIS calculation results:

a) Determine the normalized decision matrix.

By using equation 1, the obtained results were normalized decision matrix like Table 3 below:

Table 4. Matrix of Decision normalized

No	Alternative	Criteria				
		C1	C2	C3	C4	C5
1	A1	0.5	0.4901	0.5547	0.6736	0.2785
2	A2	0.5	0.6301	0.2774	0.6736	0.6499
3	A3	0.5	0.4901	0.5547	0.0962	0.6499
4	A4	0.5	0.3501	0.5547	0.2887	0.2785

b) Calculate the weighted normalized decision matrix.

By using equation 2, obtained a weighted normalized decision matrix as Table 4 below:

Table 5. Weighted normalized Decision Matrix

No	Alternative	Criteria				
		C1	C2	C3	C4	C5
1	A1	0.45	0.1470	0.4160	0.3368	0.2507
2	A2	0.45	0.1890	0.2080	0.3368	0.5849
3	A3	0.45	0.1470	0.4160	0.0481	0.5849
4	A4	0.45	0.1050	0.4160	0.1443	0.2507

c) Calculate the ideal solution matrix of positive and negative ideal solution matrix.

By using equations 3 and 4, obtained positive and negative ideal solution matrix

Table 6. Matrix ideal solution + and -

Positive ideal solution (A+)

A+	0.45	0.1890	0.2080	0.0481	0.5849

Positive ideal solution (A-)

A-	0.45	0.1050	0.4160	0.3368	0.2507

d) Calculate the distance between the value of each alternative with the ideal solution matrix positive and negative ideal solution matrix.

By using equations 7 and 8, obtained distance matrix ideal solution alternative with positive and negative

Table 7. Distance alternative to the ideal solution matrix + and –

Distance Solution Ideal Positive (A +)	
D1	0.48999
D2	0.28868
D3	0.21221

D4	0.41390

Table 8. Advanced Distance alternative to the ideal solution matrix + and –

Distance Solution Ideal Positive (A-)	
D1	0.04201
D2	0.40256
D3	0.44365
D4	0.19245

e) Calculate the value of the preference for each alternative
By using Equation 9, obtained the preference value for each alternative as shown in Table 8 below:

Table 9. Preference value for each Alternative

Alternative	Results
V1	0.07896
V2	0.58238
V3	0.67644
V4	0.31739

Based on these calculations, the process diperolehlah value V3 which has the highest value, then the best path to be followed public transportation CV. Sinar Siantar based calculation TOPSIS is an alternative path A3, namely jawa street because the alternative criteria that best meets all of the other alternatives.

4. Conclusion

Based on the formulation of the problem that has been discussed in previous chapters, the authors draw the conclusion, in which the conclusion would later be useful to the reader, so that the writing of this study can be useful and beneficial. The conclusion – these conclusions are as follows:

a) Designing a system by using TOPSIS method can help the government, especially the Department of Transportation and Public Relations of PT Sinar Siantar parties in the decision to determine the path of public transport.
b) TOPSIS (Technique for Order Preference by Similarity to Ideal Solution) can is used to determine the path of public transit by determining any criteria and alternatives so as to obtain the ideal path for the public transport.
c) Application of TOPSIS method for the determination of public transport lanes especially CV. Sinar Siantar starts from defining criteria and alternatives, then calculating the weighting criteria with alternative in order to obtain the ideal result for the path to be followed by the transport

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