

DECISION SUPPORT SYSTEM FOR DETERMINING THE BEST STORE LOCATION AT PT. SUMBER ALFARIA TRIJAYA USING THE AHP (ANALYTICAL HIERARCHY PROCESS) METHOD

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Abstract

DSS is designed to support all stages of decision making starting from identifying problems, selecting relevant data, determining the approach used in the decision-making process, to evaluating the selection. AHP is a decision support model developed by Thomas L. Saaty. This decision support model will describe a complex multi-factor or multi-criteria problem into a hierarchy, the hierarchy is defined as a representation of a complex problem in a multi-level structure where the first level is the goal, followed by the factor level, criteria, sub-criteria, and so on down to the last level of the alternatives. With a hierarchy, a complex problem can be broken down into groups which are then arranged into a hierarchical form so that the problem will appear more structured and systematic, in order to compete with several similar companies, PT. Sumber Alfaria Trijaya must be able to provide optimal service not only for consumers, but also for staff and employees so that they can work optimally. To be able to answer these challenges, the technology used must be able to balance the need for this. Because this company is engaged in retail, problems will arise both in the store, in the warehouse or in the system used.

Keywords: Decision Support System, Location determination, Analytical Hierarchy Process

1. Introduction

Decision Support System is a computer-based interactive system that helps decision making using data and models to solve unstructured problems. Basically, the DSS is designed to support all stages of decision making starting from identifying problems, selecting relevant data, determining the approach used in the decision-making process, to evaluating the selection.

AHP is a decision support model developed by Thomas L. Saaty. This decision support model will describe a complex multi-factor or multi-criteria problem into a hierarchy, the hierarchy is defined as a representation of a complex problem in a multi-level structure where the first level is the goal, followed by the factor level, criteria, sub-criteria, and so on down to the last level of the alternatives. With a hierarchy, a complex problem can be broken down into groups which are then arranged into a hierarchical form so that the problem will appear more structured and systematic when compared to other methods such as SAW, TOPSIS. There are two mechanisms used in AHP computation including conventional manual methods which can involve the normalization process, and computerized ones such as expert choice. This study attempts to explore AHP calculations using both manual and Expert Choice applications, to obtain consistent decisions. Research related to the Keputusan support system using the AHP method is a study (Sri Siswanti, TIKomSiN Journal, April 2, 2014) with the title "Decision Support System for Telecommunication Operator Internet Package Selection with the AHP Method" Decision support system using the AHP method is the right method for solve the problem of selecting internet packages with many criteria offered by each operator.

Based on the problem description and discussion in the previous chapter regarding the decision support system for selecting telecommunication operator internet packages using the AHP method, it

can be concluded that the AHP (Analytical Hierarchy Process) method can be applied in the decision support system for selecting telecommunication operator internet packages by determining the main priorities of several existing criteria and alternatives for making a decision. In addition, there are other conclusions, namely, the results of calculations using AHP to determine priority options are very dependent on giving weight to the criteria and sub-criteria that exist at the criteria and sub-criteria assessment stage that will produce priority values, in order to compete with several similar companies, PT. Sumber Alfaria Trijaya must be able to provide optimal service not only for consumers, but also for staff and employees so that they can work optimally. To be able to answer these challenges, the technology used must be able to balance the need for this. Because this company is engaged in retail, problems will arise both in the store, in the warehouse or in the system used. Technology is needed in almost all aspects of the company, from managerial, production, financial, marketing, and site selection aspects. Especially regarding the site selection process, there are many things that must be considered in order to obtain a decision in accordance with company expectations. There are a number of criteria that determine whether the location is strategic or not. So far, the system used to review locations is still manual, namely through direct observation. The observation process was handled directly by the P&D (Property and Development) Department through the Location team. The location will determine the prospects of the store at a later date. So if the location chosen is not quite right, it is certain that the shop will suffer a loss. Therefore, determining this location must be very careful. However, what is happening now is that there are still a lot of shops which at the time of the location observation were carried out had good prospects. But after a while the shop was unable to deliver the results as expected. This is because in the process of determining the location, the team only relied on decision making based on the opinion from the company side and from the opinion of the local community. Opinions obtained from the right sources give good results, but in reality, it is not uncommon for the opinions obtained to come from incompetent sources such as agents or brokerage services. Not to mention the problem in terms of the time in which teams had to review the location in order to get the right results.

2. Literature View

The team that handles the location determination process is under the P&D (Property and Development) department called the Location Team. This team works by going directly to the field to be able to get results that are in accordance with the wishes of the assessment. This will take a long time because after the observation process is complete the team must formulate the criteria and potentials obtained for decision making materials. The existence of an update to the old system, namely by designing a decision-making system in determining the best store location, in order to be better at making decisions and helping the accounting party to make decisions quickly.

AHP method analysis on determining the best store location at PT. Sumber Alfaria Trijaya, namely determining the criteria and alternatives that will be considered in determining the location. By determining the existing criteria and alternatives, it can also be determined whether the location is feasible or not suitable for the construction of an Alfamart shop. The decision making process for the store location will be calculated using the AHP method, where in the calculation process there will be a matrix with weights created in pairs. The weights that will be included in the matrix calculation process come from both implicit and explicit criteria.

3. Result And Discussion

After analyzing and determining the above criteria, then the next step is to assign weights based on the above criteria as follows:

1. The weight scale given is between 0.5 to 1.
2. The number of points is a maximum of 70 outside the explicit points, which is 30 points, if added with the explicit points, the total is 100.

3. The highest number of weights to be selected as the best location is 1, if the weight does not reach 1 then the alternatives that have been determined will be given by subtracting the point value from the existing criteria, except for the implicit criteria value.

Table 1. Criteria INFORMATION

CRITERIA	INFORMATION	QUALITY
THE AREA OF LAND OR BUILDING	= 192 m ² - ≥ 324 m ²	1
	< 192 m ²	0,5
DENSELY POPULATED SETTLEMENTS	Cluster area	1
	Ordinary settlement	0,5
EASY ACCESS FOR MOTHERS	Reachable	1
	Difficult to reach or far away	0,5
TRAFIC	Be at an intersection (red light) or on a side street	1
	Not a crossroads or not on the side of the main road	0,5
FAKTOR PENDUKUNG	Close to hospitals, schools, airports, banks, offices or gas stations.	1
	There are no supporting factors	0,5
PUBLIC OPINION AND IMPLICIT CRITERIA	Permitted and near Indomaret	1
	Not permitted and no Indomaret. Allowed but no Indomaret.	0,5

Description of public opinion criteria and implicit criteria:

1. Criteria for public opinion: to find out about public opinion there will be a further observation process.
2. Implicit criteria: implicit criteria can facilitate the process of taking public opinion because if there is Indomaret then Alfamart is definitely allowed.

After determining the weights above, the next step is to determine the alternative. Determining alternatives is done based on the results of the weights, namely the total number of weights divided by the number of criteria. Then it will be adjusted to reduce the point value of each criterion. Until later several results will be found that will enter the decision-making process which is described in the following table:

Table 2. Alternative Quality Results

WEIGHT RESULT RANGE	ALTERNATIVE POINT CALCULATIONS	ALTERNATIVE DECISIONS
≥0,918 - ≤ 1	>70 point - =100 point	Worthy
≥0,834 - ≤ 0,917	> 60 point - ≤ 70 point	Worthy

$\geq 0,76 - \leq 0,833$	> 50 point - \leq 60 point	Worthy
$\geq 0,668 - \leq 0,75$	> 40 point - \leq 50 point	Worthy
$\geq 0,583 - \leq 0,667$	> 30 point - \leq 40 point	Worthy
$\leq 0,582$	0	Not Worthy

3.1 Logic of the Method *Analytical Hierarchy Process* (AHP)

In determining whether or not it is feasible to determine the location at PT. Sumber Alfaria Trijaya Tbk with the AHP method done with a matrix of pairs. Based on the provisions of the criteria, weights, and the determination of the alternative values above, the correctness can be tested, namely with the example cases below: There are three locations that want to be submitted to PT. Sumber Alfaria Trijaya Tbk. Here is the determination process: First Example: The first location is a vacant lot with a length of 16 meters and a width of 12 meters. Then the location is in a densely populated area adjacent to the SMP Negeri 1 Tg. Morawa, is right at the intersection between Sei Merah Village and Bangun Rejo Village, and the last 350 meters previously was the competitor shop Indomaret.

Known :

- The empty land area is 192 m².
- Located in a densely populated area
- Easy access for mothers who are just taking their children to school
- Close to the SMP Negeri 1 Tg. Morawa
- It's at a crossroads
- There are implicit or Indomaret criteria

Table 3. The First Case of Pairwise Comparison Comparison Hierarchy

	Luas Lahan	Pemukiman	Akses	Trafic	Faktor Pendukung	Implisit
Luas lahan	1	1	1	1	1	1
Pemukiman	$\frac{1}{1}$	1	1	1	1	1
Akses	$\frac{1}{1}$	$\frac{1}{1}$	1	1	1	1
Trafic	$\frac{1}{1}$	$\frac{1}{1}$	$\frac{1}{1}$	1	1	1
Faktor Pendukung	$\frac{1}{1}$	$\frac{1}{1}$	$\frac{1}{1}$	$\frac{1}{1}$	1	1
Implisit	$\frac{1}{1}$	$\frac{1}{1}$	$\frac{1}{1}$	$\frac{1}{1}$	$\frac{1}{1}$	1
Jumlah	6	6	6	6	6	6

3.2 Interface

1. Alternative input display

The alternative input display is a form display that is used to provide alternative choices for the number of weight criteria. So that each store location can receive a loan according to the weight it has. The following is an illustration of the alternative input display.

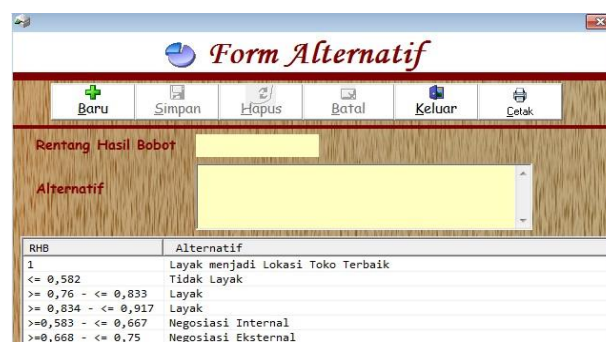


Figure 1. Alternative Input Display

2. Display of input Criteria Land area

The input display of land area criteria is a form designed to give a weighted value to the area of land that is owned or obtained by prospective store locations every month. The following is an illustration of how the input land area criteria will appear:

Kriteria Luas Lahan	Bobot
< 192	0.5
<= 192m - = 324m	1

Figure 2. Display of input land area criteria

3. Display of Input Criteria for Dense Settlements

The input display for residential density criteria is a form display that functions as a weighting value for the criteria for residential density owned by calon store locations. The following is a display form of the input criteria for solid settlement.

Kriteria Pemukiman	Bobot
komplek perumahan	1
Pemukiman Biasa	0.5

Figure 3. Input Criteria Display of Residential densities

4. Display Input Criteria Supporting factors.

Display of input criteria Supporting factors is a display used to provide weight values for different supporting factors. The following is an illustration of the input display criteria. Supporting factors.

Kriteria Status Kependudukan	Bobot
Berdekatan dengan Rumah Sakit	1
Berdekatan dengan Sekolah	1
Tidak ada rumah sakit	0.5
Tidak ada sekolah	0.5

Figure 4. Display Input Criteria Supporting Factors.

4. Conclusion

Based on the results of research and planning that have been described in previous chapters, it can be concluded as follows: In making the decision to determine the best store location at PT. Sumber Alfaria Trijaya is determined from the criteria that support the decision to determine the location of the best store for funds, such as land area, residential areas, access, traffic, supporting factors, and implicit, The system has been designed using the Microsoft Visual Basic 6.0 programming language with the MySQL database consisting of each form, table and report. This designed system can provide results in the form of whether or not a location is appropriate to be the best store location, using the Analytical Hierarchy Process calculation method.

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