



DECISION DESIGN SYSTEM FOR SELECTING PROMOTIONAL MEDIA AT SMA N 1 BANYUMAS USING ANALITYCHAL HIERARCHY PROCESS METHOD

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Abstract

Promotion is currently a very important thing in a business in the company. Competition with other providers of goods and services is the main reason for carrying out promotional activities in a company. Schools as educational service providers need to learn and have initiatives to increase customer (student) satisfaction, because education is a circular process that influences each other and is sustainable. Therefore, an education services marketing strategy is needed to win competition between schools and to increase the acceleration of improving the quality and professionalism of school management. The Decision Support System was created to assist users in making decisions. This research was conducted to create a decision support system for selecting promotional media at SMA N 1 Banyumas.



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I. INTRODUCTION

One of the promotional media is utilizing online media as a means of promotion, considering that the internet is an information center at this time. According to data from the Indonesian Internet Service Providers Association (APJII), internet users in Indonesia in 2014 reached 107 million people per day, it is even projected that in 2015 internet users in Indonesia will reach 139 million people per day, and will continue to increase from year to year [1]. Several previous studies that have been carried out previously and become a reference for this research are: Research from Dony Novaliendry (2009). Indonesian College of Computer Informatics (STMIK) Padang is a tertiary institution that is experiencing a significant growth in the total number of students. For example, in 2001, the number of students was 250 people, whereas in 2002, the number of students was 650 people. Under these conditions, STMIK Indonesia administrators need a system to determine the type of promotional media that is suitable and appropriate for use. The system is expected to be used to assist top-level management in choosing the right type of promotional media to use and have more value than others [2].

In the previous study, namely *Selection of Promotional Media*. using 4 criteria or dimensions, namely: Reach, Interesting, Informative, Efficient. In this study, 6 criteria will be used, namely: Media Production Costs, Distribution Range, Promotion Time, Promotion Media Distribution, Number of School Locations Reached, Target Achievement [3]. In this research I tried to use the AHP (*Analitychal Hierarchy Process*) method. This method provides convenience by providing multiple criteria with two comprehensive frameworks of thinking, considering a hierarchical process, which

then calculates the weight for each criterion in determining Promotional Media for SMA N 1 Banyumas.

In carrying out promotions for SMA N 1 Banyumas, they use various media, namely brochures, banners, posters, radio advertisements, newspaper advertisements, the internet. The level of effectiveness of each of these media is not known with certainty which one is more effective for promotion in the Banyumas area. The effectiveness of promotional media in each region is different, this is more due to cultural differences and people's habits. Therefore, SMA N 1 Banyumas really needs to evaluate promotional media to find out the efficiency of promotion while getting the maximum possible results. If it is known that the media are the most effective, then the media that are proven to be ineffective will be reduced so that they can reduce promotion costs without reducing results.

II. RESEARCH METHODS

2.1 Data Collection

In this study using several stages, as follows:

1. Observation Stage

The observation method is a method that is carried out by observing or seeing, researching directly to research objects regarding activities related to the title that researchers take, by analyzing, evaluating the system that is running and providing solutions through the information system to be built so that it can be more useful.

2. Interview Stage

The interview is a conversation between the researcher and the party concerned in order to obtain more detailed, clear and reliable information.

3. Library Stage

Is the stage of collecting data obtained by collecting data through references and previous research that is relevant to the problem at hand.

2.2 Analytical Hierarchy Process Method

Analytical Hierarchy Process (AHP). Developed by Thomas L. Saaty in the 1970s. This method is a multi-criteria decision-making model that can help the human frame of mind where logic, experience, knowledge, emotions and feelings are optimized into a systematic process. Basically, AHP is a method used to solve complex and unstructured problems into groups, by organizing these groups into a hierarchy, then entering numerical values as a substitute for human perception in making relative comparisons. With a synthesis it will be determined which element has the highest priority. To determine the priority of several criteria by conducting a pairwise comparison analysis of each criterion where to carry out the AHP calculation process it is necessary to first understand the working principle of AHP, as follows:[7]

The procedure for using the AHP method consists of several stages, namely:

1. Arrange a hierarchy of the problems encountered. Arrange a hierarchy, namely by determining which purpose is the goal of the system as a whole at the top level. The next level consists of criteria for assessing or considering existing alternatives and determining alternatives the. Each criterion can have sub-criteria below it and each criterion can have its own intensity value.
2. Determine the priority of elements with the following steps:
 - a. Make comparisons in pairs The first step in determining the priority of elements is to make comparisons in pairs, namely comparing elements in pairs according to the criteria given. For pairwise comparisons matrix form is used. The matrix is a simple, well-placed one that offers a framework for examining consistency, obtain additional information by making all possible comparisons and analyze the sensitivity of priorities as a whole to change considerations. To start the pairwise comparison process, starting from the highest level of the hierarchy to select criteria, for example C, then from the lower level the elements to be compared are taken, for example A1, A2, A3, A4, A5, then the arrangement of the elements in a matrix like table 1.

Table 1. Matrik perbandinganberpasangan

C	A1	A2	A3	A4	A5	A6
A1	1					
A2		1				

A3			1			
A4				1		
A5					1	
A6						1

- b. Fill in the comparison matrix in pairs. To fill in the pairwise comparison matrix, namely by use number for represents the relative importance of one element to the other elements referred to in the form of a scale from 1 to 9. This scale defines and explains the value 1 to 9 for consideration in pairwise comparisons of elements at each hierarchical level against a criterion at a higher level. If an element is in the matrix and compared to itself, it is given a value of 1. If compared to j gets a certain value, then j compared to i is the opposite. Table 2 provides a definition and explanation of a quantitative scale of 1 to 9 to assess the level of importance of an element with other elements.

Table 2. Quantitative scale in the system supporter's decision

Interest Intensity	Definition	Explanation
1	The two elements are the same importance	The two elements have the same influence on the goal
3	One element is slightly more important than the other elements	Experience and judgment slightly favor one element over the other
5	One element is more important than the other elements	Experience and judgment strongly favor one element over the other
7	One element is clearly more important than the other elements	A strong and dominant element is seen in practice
9	One element is absolutely important than the other elements	Evidence that supports one element over another has the highest possible affirmation level
2,3,4,6	Values between 2 adjacent judgment values	This value is given if there are two compromises between the 2 choices
opposite	If activity I gets one point compared to activity J, then J has the opposite value compared to I	

c. Synthesis

Considerations against

Pairwise comparisons are synthesized to obtain the overall priority with the following steps:

- Add up the values of each column in the matrix.
- Divide each value from the column by total column in question for get matrix normalization.
- Add up the values of each matrix and divide by the number of elements to get the average value.
- Measuring consistency

In making decisions, it is important to know how good the consistency is, because we don't want decisions based on considerations with low consistency. Because with low consistency, judgment will appear random and inaccurate. Consistency is important to get valid results in the real world. AHP measures the consistency of considerations with a consistency ratio. The Consistency ratio value must be less than 5% for 3x3 matrices, 9% for 4x4 matrices and 10% for larger matrices. If it is more than the ratio of that limit, then the comparison value matrix is redone.

steps calculate the value of the consistency ratio, namely:

1. Multiplies the values in the first column by the relative priority of the first element, the values in the second column by the relative priority of the second element, and so on.

2. Add up each row.
3. The result of the summation of the lines is distributed with the relative priority elements concerned.
4. Dividing the results above by the number of existing elements, the result is called the eigen value (λ_{max}).
5. Calculating the consistency index with the formula:

$$CI = (\lambda_{max} - n) / n$$

Where CI : Consistency Index

λ_{max} : EigenValues

n : Many elements

6. Calculating the consistency ratio (CR) with the formula:

$$CR = CI / RC$$

Where:

CR : Consistency Ratio

CI : Consistency Index

RC : Random Consistency

Random matrix with rating scale 1 to 9 and their reverse as random consistency (RC). Based on moment calculation using 500 samples, if you choose randomly from a scale of 1/9, 1/8, ..., 1, 2, ..., 9 you will get a consistent average for different matrices as shown in Table 3.

Table 3. The average value of consistency

Matrix size	Random Consistency
1	0.00
2	0.00
3	0.58
4	0.90
5	1.12
6	1.24
7	1.32
8	1.41
9	1.45
10	1.49

Table 1: Code and Terms of Criteria

Criteria Code	Criteria Terms
C1	Reach
C2	Interesting
C3	Informative
C4	Efficient
C5	Many locations reached
C6	Achievement of target targets

Criteria Weight Value

The following is a table of weight values for each criterion based on their level of importance, which can be seen in Table 2:

Table 2: Weighted Value

No	Weight	Score
1.	Reach	20
2.	Interesting	20
3.	Informative	20
4.	Efficient	15

5.	Many locations reached	15
6.	Achievement of target targets	10
	Total	100

Tested Alternatives

The following are the names of promotional media that will be tested to determine efficient promotional media:

Table 3: Alternative Codes and Promotional Media

No.	Alternative Code	Promotion media
1.	A1	Brochure
2.	A2	Banner
3.	A3	Poster
4.	A4	Radio advertisement
5.	A5	Newspaper Ads
6.	A6	Internet

III. RESULT

3.1 Manual Test

After creating the Hierarchy structure AHP, the next stage of making this application is to calculate the alternative weighting. This is done by compiling a paired matrix for alternatives for each criterion.

1. Alternative weighting for promotional media criteria

Enter data on the types of promotional media recommended in the form of a paired matrix

Table 4. Pairwise comparison matrix for brochure criteria

Criteria	C1	C2	C3	C4	C5	C6
Brochure	1	2	3	4	5	6
Banner	1/2	1	2	3	4	5
Poster	1/3	2/3	1	2	3	4
Radio advertisement	1/4	2/4	3/4	1	2	3
Newspaper Ads	1/5	2/5	3/5	4/5	1	2
Internet	1/6	2/6	3/6	4/6	5/6	1

*C = promotional media

The data matrix above is converted from fractional form to decimal form

Table 5. Provisional results of pairwise comparisons of alternative weighting for brochure criteria

Criteria	C1	C2	C3	C4	C5	C6
Brochure	1	2	3	4	5	6
Banner	0.5	1	2	3	4	5
Poster	0.33	0.66	1	2	3	4
Radio advertisement	0.25	0.5	0.75	1	2	3
Newspaper ads	0.2	0.4	0.6	0.8	1	2
Internet	0.17	0.33	0.5	0.67	0.83	1
Fri	2.45	4.90	7.85	11.47	15.83	21

*C = promotional media

After determining the number of values/temporary weights, each cell above is divided by the number of columns respectively, for example to fill in the second column of the second row is $(C1 : \sum \text{weight C1}) \rightarrow (1 : 2.45) = 0,4081$ (use the same method to fill in the other columns) so that the results are as shown in table 6.

Table 6. Paired Comparison Results of Alternative Weighting for Brochure Criteria

CRITERIA	C1	C2	C3	C4	C5	C6	FRI
C1	0.4081	0,4081	0,3821	0,3487	0,3158	0,2857	2,1485
C2	0,2040	0,2044	0,2547	0,2615	0,2526	0,2380	1,4152
C3	0,1346	0,1349	0,1273	0,1743	0,1895	0,1904	0,951
C4	0,1020	0,1022	0,0955	0,0871	0,1263	0,1428	0,6559
C5	0.0816	0.0817	0.0764	0.0697	0.0631	0.0952	0.4677
C6	0.0693	0.0674	0.0636	0.0584	0.0524	0.0476	0.3587

*C = media promotions

Reach criteria with the formula The number of comparison results divided by the number of promotional media. An example for filling in Priority Criteria for Candidate 1 is (\sum results of comparison: \sum candidates) \rightarrow (2.1458 / 6) = 0.3576 (use the same method to fill in the other columns) so that the results are as shown in table 7.

Table 7. Priority Results of Media Promotion Criteria based on brochures

Promotion media	Priority criteria	Rank
Brochure	0.3576	I
Banner	0.2358	II
Poster	0.1585	III
Radio advertisement	0.1093	IV
Newspaper Ads	0.0779	V
Internet	0.0597	VI

2. Banner Criteria

Calculating alternative weighting for banner criteria , the method used is the same as calculating alternative weighting for brochure criteria. The result will look like below

Criteria	C1	C2	C3	C4	C5	C6
Brochure	1.00	0.5	3.00	4.00	0.33	6.00
Banner	2.00	1.00	4.00	3.00	2.00	0.33
Poster	0.5	0.66	1.00	0.75	0.6	0.5
Radio advertisement	4.00	0.5	3.00	1.00	0.25	0.66
Newspaper ads	0.2	0.5	0.75	0.8	1.00	0.5
Internet	0.17	0.33	0.5	0.67	0.83	1.00
Fri	7,87	3.49	12.25	10,22	5.01	8.99

* C = promotional media

of Promotional Media Criteria Based on Banners

Promotion media	Priority criteria	Rank
Brochure	0.2732	I
Banner	0.2660	II
Poster	0.0971	IV
Radio advertisement	0.1862	III
Newspaper Ads	0.0938	V
Internet	0.0832	VI

3. Alternative weighting for poster criteria

Calculating alternative weighting for poster criteria uses the same method as calculating alternative weighting for brochure criteria . The result will look like below:

Criteria	C1	C2	C3	C4	C5	C6
Brochure	1.00	2.00	0.33	0.25	0.2	0.17
Spanduk	0.5	1.00	0.66	0.5	0.33	2.00

Poster	0.33	0.66	1.00	1.33	1.67	2.00
Iklan radio	0.25	0.5	0.75	1.00	1.25	1.5
Newspaper ads	0.2	0.4	0.6	0.8	1.00	1,2
Internet	0.17	0.33	0.5	0.66	0.83	1.00
Fri	2.45	4.89	3.84	4.54	5,28	7,87

* C = promotional media

Table 9. Priority Results Criteria for promotional media Based on posters

Promotion media	Priority criteria	Rank
Brochure	0.1695	III
Banner	0.1678	IV
Poster	0.2321	I
Radio advertisement	0.1744	II
Newspaper Ads	0.1935	V
Internet	0.1160	VI

4. Radio Adversiting Criteria

Calculating alternative weighting for radio advertising criteria uses the same method as calculating alternative weighting for brochure criteria . The result will look like below:

Criteria	C1	C2	C3	C4	C5	C6
Brochure	1.00	0.5	0.33	0.22	0.2	0.26
Spanduk	0.5	1.00	1.5	2.00	2.5	3.00
Poster	0.66	0.5	1.00	0.33	4.00	0.5
Iklan radio	4.00	2.00	1.33	1.00	0.8	0.66
Newspaper ads	2.00	1.5	0.6	3.00	1.00	0.5
Internet	0.33	0.33	6.00	0.22	0.5	1.00
Fri	8,49	5,83	10,76	6,77	9.00	5.92

* C = promotional media

Table 10. Priority Results for Media Promotion Criteria Based on a radio commercial

Promotion media	Priority criteria	Rank
Brochure	0.0554	VI
Banner	0.2415	I
Poster	0.1389	V
Radio advertisement	0.2142	II
Newspaper Ads	0.1978	III
Internet	0.1516	IV

5. Newspaper Adversiting Criteria

Criteria	C1	C2	C3	C4	C5	C6
Brochure	1.00	0.5	3.00	4.00	5.00	6.00
Spanduk	2.00	1.00	0.5	0.66	0.4	033
Poster	3.00	0.66	1.00	3.00	0.5	0167
Iklan radio	4.00	2.00	1.33	1.00	0.8	0.66
Newspaper ads	0.2	25	0.33	0.66	1.00	0.4
Internet	0.167	1.5	2.00	0.66	0.83	1.00
Fri	10.36	8,16	8,16	9.98	8.53	8.55

* C = promotional media

Table 11 . Results Priority Criteria Media Promotion Based on a newspaper ad

Promotion media	Priority criteria	Rank
Brochure	0.3689	I
Banner	0.0880	VI
Poster	0.1452	III
Radio advertisement	0.1775	II
Newspaper ads	0.0993	V
Internet	0.1208	IV

6. Internet Criteria

Calculating alternative weighting for internet criteria uses the same method as calculating alternative weighting for brochure criteria . The result will look like below:

Criteria	C1	C2	C3	C4	C5	C6
Brochure	1.00	2.00	3.00	4.00	5.00	6.00
Banner	0.33	1.00	0.66	0.5	0.4	0.33
Poster	3.00	1.5	1.00	4.00	2,5	3.00
Radio advertisement	0.25	0.66	2.00	1.00	1.5	0.33
Newspaper ads	5.00	2,5	1.66	1.25	1.00	0.83
Internet	0.167	0.33	0.5	0.66	0.83	1.00
Fri	9,747	7.99	8,82	11.41	11.23	11.49

* C = promotional media

Table 12 . Results Priority Criteria Media Promotion Based on the internet

Promotion media	Priority criteria	Rank
Brochure	0.3351	I
Banner	0.0569	V
Poster	0.2404	II
Radio advertisement	0.0974	IV
Newspaper Ads	0.2141	III
Internet	0.0556	VI

Table 13. Results of Global Priority media promotion

Promotion media	Priority criteria	Rank
Brochure	0.2599	I
Banner	0.176	V
Poster	0.1687	III
Radio advertisement	0.1836	II
Newspaper ads	0.1460	IV
Internet	0.0978	VI

From the results of the global priority calculation above, a ranking of the six candidate types of promotional media can be produced, namely brochures occupying the first place with a priority value of 0.2 599. The second place with a priority value of 0.1836 is occupied by radio advertisements , then for the third place is occupied by Posters with a priority value of 0.1687 , for the fourth place is occupied by newspaper advertisements with a priority value of 0.1 460. The fifth place with a priority value of 0.176 is fulfilled by banner. And the sixth place is fulfilled by the internet with a priority value of 0.0978.

IV. CONCLUSION

The conclusions from the results of the above research are as follows, from the results of testing the system developed using the AHP model, it can be concluded that the system has been running properly, so this system can be used to assist schools in carrying out promotional media selection . The decision-making system for selecting promotional media uses the AHP method, this method

uses 6 criteria factors, namely reach , attractive , informative, efficient, many locations reached and target achievement . The use of these 6 criteria is so that the school does not only use brochures, but the school can use other promotional media such as banners, posters, radio advertisements, newspaper advertisements and the internet.

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