

Implementation of Topsis Method In Web Based System Recommendations For Students Laptop Selection (Case Study: Bhinneka.com)

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Abstract- Computer needs at work are very helpful and make easier for human to complete his work. The usage of laptops growing rapidly with increasing mobility of the community who uses laptop to run the activities. In addition, laptop continues to update its technology with the variation of the specification so that it can attract the interest of consumers, especially for students, but the variety of laptops is confusing for some users to choose. Based on a survey that has been done to the students, it concluded that laptop is 80% more interesting than desktop computer. Some students really need a recommendation system for choosing a laptop. In making a recommendation system, using TOPSIS method is the recommended one because the concept is simple, easy to understand, efficient, and have the ability to measure the relative performance of alternatives decision. According to the implementation, the recommendation system with TOPSIS method has 70% accuracy rate.

Index Terms—System Recommendation, TOPSIS, Laptop,

I. INTRODUCTION

Computer usage at the works is very helpful and makes easier for people to complete his work, but lately the use of laptops becomes favorites than desktop computer [1]. The use of laptops is getting rapidly with increasing mobility of the community who use a laptop to run their activities [2]. In addition, the laptop continues to update its technology with the variation of the specification so that it can attract the interest of consumers in particular students, but variety also make its users difficulties in choosing a laptop.

Students as part of the community in its activities require laptops have difficulty in determining the appropriate laptop needs and information regarding the appropriate laptop [3].

Bhinneka.com, as an e-commerce site in running his business, provides online chat and direct consultation as well as recommendations for the users who confuse to choose laptop, but constrained by the effort capacity and time available in provides recommendations so that required a recommendation system.

There is previous research on recommendation system selection laptop entitled Design Application System Recommendations for Laptop purchase with Fuzzy Method Database Model Tahani Web based (case study: Store Ricky's Computer) give advice that the criteria used are added and customized to the user where the previous criteria given by the seller [4]. In this research, there are differences in the methods used and the criteria. The criteria used are obtained from the student through the survey.

Then there is another research, entitled Comparison of Weighted Product Method with Technique Method For Order Preference By Similarity To Ideal Solution (TOPSIS) in Decision support system on Student Recruitment of internship (Case Study: PT Telecommunication Industry Indonesia)" [5]. The study compares the weighted product method with TOPSIS for the selection of students who will conduct internship and the results of the study concluded that TOPSIS method has a higher accuracy than Weighted Product.

II. THEORETICAL BASIS

A. Recommendation System

According to Kamus Besar Bahasa Indonesia (KBBI), recommendations are suggestions that advocate (justify, strengthened). In other words, these recommendations are a way to help people with lack of knowledge to take some decision that can be trusted. And a recommendation system is a system

that can be used to inform and convince the user to make choices against period.

B. TOPSIS Method

TOPSIS is one of the multi criteria method of the decision maker was first introduced by Yoon and Hwang in 1981. This method is widely used to solve decision making because the concept is simple, easy to understand, computationally efficient, and have the ability to measure the relative performance of decision alternatives [6].

There is some sequence of steps that are used to implement method TOPSIS [7], as follow:

1. Make a decision matrix (X), which refers to an alternative that is evaluated based on the n criteria.
2. Make a normalized decision matrix (R)

$$r_{ij} = \frac{x_{ij}}{\sqrt{\sum_{i=1}^m x_{ij}^2}}$$

Description:

i = 1,2,3,...,m; and j = 1,2,3,...,n;

r_{ij} are elements from decision matrix normalized (R).

x_{ij} are elements from decision matrix X.

3. Creating weighted normalized decision Matrix (Y).

$$y_{ij} = w_j r_{ij}$$

Description:

w_j are the weights that have been determined,

r_{ij} are elements from decision matrix normalized (R).

And y_{ij} are elements weighted normalized (Y)

4. Determining the ideal solution both positive and negative ideal solution matrix.

$$y_i^+ = \begin{cases} \max_i & y_{ij} \\ \min_i & y_{ij} \end{cases}$$

$$y_i^- = \begin{cases} \min_i & y_{ij} \\ \max_i & y_{ij} \end{cases}$$

Where:

y_i^+ = max, if i is the criterion of advantage (benefit)

y_i^+ = min, if i is the costs criterion (cost)

y_i^- = min, if i is the criterion of advantage (benefit).

y_i^- = max, if i is the costs criterion (cost)

Based on the equations 4 and 5 above, then determined the positive ideal solution (A^+) and negative (A^-) with equations 5 and 6.

$$A_j^+ = \max(y_1^+, y_2^+, \dots, y_n^+)$$

$$A_j^- = \min(y_1^-, y_2^-, \dots, y_n^-)$$

A^+ is the maximum value of each criteria.

A^- is the minimum value of each criteria.

5. Determining the distance between the (separation) of each alternative with positive ideal solution and negative ideal solution.

$$D_i^+ = \sqrt{\sum_{j=1}^n (y_{ij} - A_j^+)^2}$$

$$D_i^- = \sqrt{\sum_{j=1}^n (y_{ij} - A_j^-)^2}$$

Description :

D_i^+ is an ideal solution calculation of the distance from the positive (y_j^+) and the normalized weighted matrix elements (y_{ij}), and a calculation of the distance from the negative ideal solution (y_j^-) and the normalized weighted matrix (y_{ij}),

6. Determining the value of a preference for each alternative (V_i)

$$V_i = \frac{D_i^-}{D_i^+ + D_i^-}$$

Description :

V_i is the preference value for each alternative of calculating the value of a positive distance (D_i^+) and negative distance value (D_i^-).

III. RESEARCH RESULT

A. Recommendation Process

The system consists of several parts such as front-end, back-end, and TOPSIS method. The front-end section is the part that will be used by the user, the back-end part is the part that will be used by Admin and TOPSIS method is a step in doing the calculation of decision making to rank alternative according to value that have been calculated. Here is a flowchart front-end system:

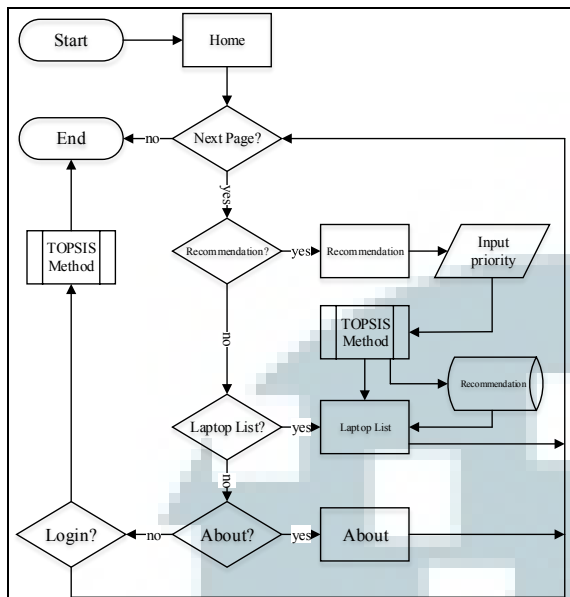


Figure 1. System Flowchart

When accessing the recommendation website will display the home page, recommendations, laptop list, about, and login. For the recommendation page, user has to determine the priority scale that will use in the TOPSIS method calculation. For the login page, specifically access admin/back-end page used to add, change and / or delete laptop data

Recommendation process using simple random sampling consisted of 30 data types and criteria. The criteria consist of the screen, RAM, hard drive, price, weight, battery life and warranty. Then modified by the term by using a scale of criteria in Table 1. For processor criteria is used basic speed, not speed turbo (upto). For criteria used screen size in in inches. Hard disk criteria referring to a regular hard disk capacity, instead of the SSD.

Table 1. Criteria and Value

Criteria	Conditions	Value
Processor (Speed)	Less than 1,5 GHz	1
	1.5 GHz to 2 GHz	3
	2 GHz to 2,5 GHz	4
	Equal or more than 2,5 GHz	5
Screen (Size)	Less than 12 inch	1
	12 inch to 13 inch	2
	13 inch to 14 inch	3
	14 inch to 15 inch	4
	Equal or more than 15 inch	5
RAM (Capacity)	Less than 1 GB	1
	2 GB to 3 GB	2
	4 GB to 7 GB	3
	8 GB to 15 GB	4
	Equal or more than 16 GB	5
Harddisk (Capacity)	Less than 250 GB	1
	250 GB to 500 GB	2
	500 GB to 750 GB	3
	750 GB to 1000 GB	4
	Equal or more than 1000 GB	5
Price	More than 20 juta	1
	15 juta to 20 juta	2
	10 juta to 15 juta	3
	5 juta to 10 juta	4

Weight	Less than 5 juta	5
	More than 2,5 kg	1
	1,5 kg to 2,5 kg	3
	Less than 1,5 kg	5
Battery	Less or equal than 2 cell	1
	2 cell to 4 cell	2
	4 cell to 5 cell	3
	6 cell to 7 cell	4
	More or equal than 8 cell	5
	None	1
Warranty	1 months to 12 months	2
	13 months to 24 months	3
	25 months to 36 months	4
	More than 36 months	5

After changing the laptop data with the provisions of scale criteria in Table 1, and then obtained such a decision matrix that contains the value of any laptop based on the criteria in Table 1. After that, created a normalized decision matrix. For example of calculation of a normalized decision on the criteria for a laptop processor with the value criteria: 5 Processor, Screen 3, RAM 5, Hard Drive 3, Price 5, Weight 4, Battery 3, and Warranty 4.

$$r_{ij} = 5 : \sqrt{5^2 + 5^2 + 5^2 + 3^2 + \dots + x_{ij}^2} = 0.243108319$$

From normalized decision matrix and then converted into weight normalized decision matrix, was obtained:

$$y_{ij} = 0.24310831916316 * 5 = 1.2155415958158$$

Next step is determine the positive ideal solution and negative ideal solution for each criteria. After, get the positive ideal solution and negative ideal solution, can be calculate the positive separation and the negative separation. Here's an example of calculation for positive ideal solution

$$D^+ = \sqrt{(0.4862)^2 + (0.6537)^2 + (0.6226)^2 + (0.2841)^2 + (0.2344)^2 + 0^2 + (0.2813)^2 + (0.1875)^2} = 0.97167263904494$$

As an example for negative separation :

$$D^- = \sqrt{0^2 + 0^2 + (-0.3113)^2 + 0^2 + (-0.7032)^2 + (-0.3751)^2 + (-0.1406)^2 + (-0.1875)^2} = 1.1859749435949$$

Final, calculate value preferences of each laptop, and giving rank in order of highest to lowest value. As an example for the Value Preference:

$$: V_i = \frac{1.1859749435949}{0.97167263904494+1.1859749435949} = 0.5496610999577$$

B. Decision Making Accuracy

In the calculation process of accuracy, there are two variables which are compared to determine the degree of match, the ranking system and ranking manual. For the ranking system, the use of calculation ranking system has been made in research, while for the manual ranking used calculations from the Bhinneka. The results of accuracy is 70%, obtained from 21 data from 30 data generated by the system equal to the calculation of Bhinneka.

C. System Evaluation

The minimum sample number of respondents required in a questionnaire is 30 samples [8]. Questions are based on End User Computing Satisfaction (EUCS). There are five factors: content, accuracy, design, ease of use, and timeliness. Example for the factor of accuracy is made to question Do the results of the recommendations produced by the system are in accordance with the expected? The survey result is shown in table below.

Table 2. Survey Result

Question	Less	Enough	Good	Very good
content	17	60	23	-
accuracy	23	57	20	-
design	10	47	33	-
Ease of use	13	60	20	7
timeliness	-	63	37	

From table 1, the average of the results are good dan enough.

IV. CONCLUSION

TOPSIS method successfully implemented into the recommendation system for the selection of the laptop by using the tools Notepad ++ and Bootstrap. The system accuracy rate of 70% of the data that has been tested and compared to manual calculation. And the satisfaction level of respondents on the system recommendation with a average rate value is enough and good.

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