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Selection of online shopping with the electree method

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Article Info	ABSTRACT
	E-Commerce stands for Electronic Commerce which means a marketing system by means of electronic media. E-Commerce is defined as the process of buying and selling of products, services and information that is done electronically using a computer network. One form of e-commerce is online shopping. The purpose of this study is to determine the best online shopping based on predetermined criteria. The criteria used in E-Commerce are the price of goods, completeness of goods, shipping costs, quality of goods, and length of delivery time. The Electre method is a multi-criteria decision-making method based on the concept of outranking using pairwise comparisons of alternatives based on each appropriate criterion. Based on the analysis using the Electric method, it is recommended that the best online shopping is TOKOPEDIA which dominates other alternatives.

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1. INTRODUCTION

Electronic Commerce (E-Commerce) is the process of buying, selling or exchanging products, services and information via computer networks. E-Commerce is part of E-Business, where the scope of E-Business is broader, not only for commerce but also includes collaboration with business partners, customer service, job vacancies and others. In addition to www network technology, E-Commerce also requires database or database technology, electronic mail (e-mail), and other forms of non-computer technology such as goods delivery systems, and payment instruments for E-Commerce (Irmawati , 2011).

Online shop selection decisions are made by consumers who use online shop services. The electree method is used to compare online that can meet the required criteria. Choosing the right online shop requires a system in the business field. The system is expected to be used to obtain information and make decisions based on criteria in the online shop effectively.

These problems can be classified into problems that are multiobjectivies (there are many objectives) and multicriteria (there are many criteria). To help solve the problem, a Decision Support System was created using the ELECTRE (Elimination Et Choix Traduisant la Reality) method.

According to Ranius (2015), decision-making systems are a branch of science that is located between information systems and intelligent systems. The decision making process from the various alternatives that exist requires a criterion. Each criterion must be able to answer one important question about how well an alternative can solve a problem at hand.

2. RESEARCH METHODE

This research is a quantitative study, data obtained using an online questionnaire with a random sample of OnlineShop in Indonesia. The results of the data are processed using the ELECTREE method, which is a method used in assessing and ranking based on strengths and weaknesses through pairwise comparisons on the same criteria.

Data analysis is the activity of grouping data based on variables after data from all respondents or data sources are collected. In this study, the steps taken to analyze data are as follows:

a.Determine the matching rating of each alternative on each criterion, rated with one to five. By determining the value, which is: 1 = Very Bad, 2 = Poor, 3 = Enough, 4 = Good, 5 = Very Good,

b. Determining the value of criteria (weighting preferences) can be determined by judging by one to five. 1 = Very Low, 2 = Low, 3 = Enough, 4 = High, 5 = Very High

3. RESULT AND ANALYSIS

3.1 System Analysis And Design

This study discusses the application of the ELECTREE method in determining online stores in Indonesia. After collecting data by means of online questionnaires or questionnaires at the University of Medan City, then an analysis is carried out on the data obtained.. The problem discussed in this study is how to determine the choice of online shop by using the ELECTREE method.

The criteria used in the online shop are the price of goods (C1), completeness of goods (C2), shipping cost (C3), quality of goods (C4) and length of time of delivery (C5). In this study, the alternatives chosen were Tokopedia, Shopee, Lazada, Bukalapak and Blibli.

3.2 System Implementation

The weight of the criteria 1 = 5

Criteria weight 2 = 3

Criteria weight 3 = 4

Criteria weight 4 = 5

The weight of the criteria 5 = 3

So that W = (5,3,4,5,3)

Determination of the range of criteria:

Table 3.1 Rating on Criteria

Criteria	Skor	Skor	Skor	Skor	Skor
Price	Very expensive 5	Expensive 4	moderate 3	cheap 2	Very Cheap 1
Completeness	Full 5	Complete 4	Good 3	Less complete 2	Incomplete 1
Shipping cost	Cheap Enough 5	Cheap 4	Expensive Enough 3	Expensice 2	Very Expensive 1
Quality	Not Good 1	Poorly 2	Passably 3	Good 4	Very Good 5
delivery time	Not Delayed 1	Delayed 2	On Time 3	Fast 4	Very Fast 5

Based on table 3.1 regarding the determination of the range of criteria, so the matching ratting table of each alternative to each criterion becomes:

Table 3.2 Ratting the suitability of each alternative to the criteria

Alternative	Criteria				
	Distance (C1)	Time (C2)	Cost (C3)	Security (C4)	Culinary (C5)
Tokopedia(A1)	2	4	2	4	3
Shoope (A2)	5	4	2	3	4
Lazada (A3)	4	3	3	4	3
Bukalapak (A4)	3	4	2	4	3
Blibli (A5)	5	4	3	4	3

The table above shows the suitability rating of each alternative on each criterion. Since each value assigned to each alternative in each criterion is a suitability value where the greatest value is the best, all the criteria given are assumed to be part of the profit criteria.

Decision making gives preference weight as:

$$W = (5,3,4,5,3)$$

The decision matrix formed from the suitability table is as follows:

$$x = \begin{bmatrix} 2 & 4 & 2 & 4 & 3 \\ 5 & 4 & 2 & 3 & 4 \\ 4 & 3 & 3 & 4 & 3 \\ 3 & 4 & 2 & 4 & 3 \\ 5 & 4 & 3 & 4 & 3 \end{bmatrix}$$

To solve the above problem with the Electre method, it will be done according to the steps previously described.

1. Calculate the normalized decision matrix

Normalization is done to eliminate duplication of data, to reduce complexity and to facilitate the modification of data, so that data can be described in tabular form and analyzed based on certain requirements. With the formula: $r_{ij} = \dfrac{x_{ij}}{\sqrt{\sum\limits_{i=1}^{m} x_{ij}^{2}}}$

(1)

The following calculates the elements of a normalized decision matrix.

$$r_{11} = \frac{x_{11}}{\sqrt{\sum_{i=1}^{m} x_{i1}^{2}}} = \frac{2}{\sqrt{2^2 + 5^2 + 4^2 + 3^2 + 5^2}} = \frac{2}{8,888} = 0,225$$

$$r_{12} = \frac{x_{12}}{\sqrt{\sum_{i=1}^{m} x_{i2}^{2}}} = \frac{4}{\sqrt{4^2 + 4^2 + 3^2 + 4^2 + 4^2}} = \frac{4}{8,544} = 0,468$$

$$r_{13} = \frac{x_{13}}{\sqrt{\sum_{i=1}^{m} x_{i3}^{2}}} = \frac{2}{\sqrt{2^2 + 2^2 + 3^2 + 2^2 + 3^2}} = \frac{2}{5,477} = 0,365$$

$$r_{14} = \frac{x_{14}}{\sqrt{\sum_{i=1}^{m} x_{i4}^{2}}} = \frac{4}{\sqrt{4^2 + 3^2 + 4^2 + 4^2 + 4^2}} = \frac{4}{8,544} = 0,468$$

$$r_{15} = \frac{x_{15}}{\sqrt{\sum_{i=1}^{m} x_{i5}^{2}}} = \frac{3}{\sqrt{3^2 + 4^2 + 3^2 + 3^2 + 3^2}} = \frac{3}{7,211} = 0,416$$

$$r_{21} = \frac{x_{11}}{\sqrt{\sum_{i=1}^{m} x_{i1}^{2}}} = \frac{5}{\sqrt{2^2 + 5^2 + 4^2 + 3^2 + 5^2}} = \frac{5}{8,888} = 0,562$$

$$r_{22} = \frac{x_{12}}{\sqrt{\sum_{i=1}^{m} x_{i2}^{2}}} = \frac{4}{\sqrt{4^2 + 4^2 + 3^2 + 4^2 + 4^2}} = \frac{4}{8,544} = 0,468$$

$$r_{23} = \frac{x_{13}}{\sqrt{\sum_{i=1}^{m} x_{i3}^{2}}} = \frac{2}{\sqrt{2^2 + 2^2 + 3^2 + 2^2 + 3^2}} = \frac{2}{5,477} = 0,365$$

$$r_{24} = \frac{x_{14}}{\sqrt{\sum_{i=1}^{m} x_{i4}^{2}}} = \frac{3}{\sqrt{4^2 + 3^2 + 4^2 + 4^2 + 4^2}} = \frac{3}{8,544} = 0,351$$

$$r_{25} = \frac{x_{15}}{\sqrt{\sum_{i=1}^{m} x_{i5}^{2}}} = \frac{4}{\sqrt{3^2 + 4^2 + 3^2 + 3^2 + 3^2}} = \frac{4}{7,211} = 0,554$$

$$r_{31} = \frac{x_{11}}{\sqrt{\sum_{i=1}^{m} x_{i1}^2}} = \frac{4}{\sqrt{2^2 + 5^2 + 4^2 + 3^2 + 5^2}} = \frac{4}{8,888} = 0,45$$

$$r_{32} = \frac{x_{12}}{\sqrt{\sum_{i=1}^{m} x_{i2}^2}} = \frac{3}{\sqrt{4^2 + 4^2 + 3^2 + 4^2 + 4^2}} = \frac{3}{8,544} = 0,351$$

$$r_{33} = \frac{x_{13}}{\sqrt{\sum_{i=1}^{m} x_{i3}^2}} = \frac{3}{\sqrt{2^2 + 2^2 + 3^2 + 2^2 + 3^2}} = \frac{3}{5,477} = 0,547$$

$$r_{34} = \frac{x_{14}}{\sqrt{\sum_{i=1}^{m} x_{i4}^2}} = \frac{4}{\sqrt{4^2 + 3^2 + 4^2 + 4^2 + 4^2}} = \frac{4}{8,544} = 0,468$$

$$r_{35} = \frac{x_{15}}{\sqrt{\sum_{i=1}^{m} x_{i5}^2}} = \frac{3}{\sqrt{3^2 + 4^2 + 3^2 + 3^2 + 3^2}} = \frac{3}{7,211} = 0,416$$

$$r_{41} = \frac{x_{11}}{\sqrt{\sum_{i=1}^{m} x_{i1}^2}} = \frac{3}{\sqrt{2^2 + 5^2 + 4^2 + 3^2 + 5^2}} = \frac{3}{8,888} = 0,337$$

$$r_{42} = \frac{x_{12}}{\sqrt{\sum_{i=1}^{m} x_{i2}^2}} = \frac{4}{\sqrt{4^2 + 4^2 + 3^2 + 4^2 + 4^2}} = \frac{4}{8,544} = 0,468$$

$$r_{43} = \frac{x_{13}}{\sqrt{\sum_{i=1}^{m} x_{i3}^2}} = \frac{2}{\sqrt{2^2 + 2^2 + 3^2 + 2^2 + 3^2}} = \frac{2}{5,477} = 0,365$$

$$r_{44} = \frac{x_{14}}{\sqrt{\sum_{i=1}^{m} x_{i4}^2}} = \frac{4}{\sqrt{4^2 + 3^2 + 4^2 + 4^2 + 4^2}} = \frac{4}{8,544} = 0,468$$

$$r_{45} = \frac{x_{15}}{\sqrt{\sum_{i=1}^{m} x_{i5}^2}} = \frac{3}{\sqrt{3^2 + 4^2 + 3^2 + 3^2 + 3^2}} = \frac{3}{7,211} = 0,416$$

$$r_{51} = \frac{x_{11}}{\sqrt{\sum_{i=1}^{m} x_{i1}^2}} = \frac{5}{\sqrt{2^2 + 5^2 + 4^2 + 3^2 + 5^2}} = \frac{5}{8,888} = 0,562$$

$$r_{52} = \frac{x_{12}}{\sqrt{\sum_{i=1}^{m} x_{i2}^2}} = \frac{4}{\sqrt{4^2 + 4^2 + 3^2 + 4^2 + 4^2}} = \frac{4}{8,544} = 0,468$$

$$r_{53} = \frac{x_{13}}{\sqrt{\sum_{i=1}^{m} x_{i3}^2}} = \frac{3}{\sqrt{2^2 + 2^2 + 3^2 + 2^2 + 3^2}} = \frac{3}{5,477} = 0,547$$

$$r_{54} = \frac{x_{14}}{\sqrt{\sum_{i=1}^{m} x_{i4}^2}} = \frac{4}{\sqrt{4^2 + 3^2 + 4^2 + 4^2 + 4^2}} = \frac{4}{8,544} = 0,468$$

$$r_{55} = \frac{x_{15}}{\sqrt{\sum_{i=1}^{m} x_{i5}^2}} = \frac{3}{\sqrt{3^2 + 4^2 + 3^2 + 3^2 + 3^2}} = \frac{3}{7,211} = 0,416$$

So the normalized matrix is as follows:

$$R = \begin{bmatrix} 0,225 & 0,468 & 0,365 & 0,468 & 0,416 \\ 0,562 & 0,468 & 0,365 & 0,351 & 0,554 \\ 0,45 & 0,351 & 0,547 & 0,468 & 0,416 \\ 0,337 & 0,468 & 0,365 & 0,468 & 0,416 \\ 0,562 & 0,468 & 0,547 & 0,468 & 0,416 \end{bmatrix}$$

1. Normalized weighting of the matrix

$$V_{ij} = W_j \, . \, X_{ij} \tag{2}$$

$$= \begin{bmatrix} 1,125 & 1,404 & 1,46 & 2,34 & 1,248 \\ 2,81 & 1,404 & 1,46 & 1,755 & 1,662 \\ 2,25 & 1,053 & 2,118 & 2,34 & 1,248 \\ 1,685 & 1,404 & 1,46 & 2,34 & 1,248 \\ 2,81 & 1.404 & 2,118 & 2,34 & 1,248 \end{bmatrix}$$

2. Determine the set of concordance index and discordance index

a. Concordance. A criterion in an alternative if:

$$C_{kl} = \{j, v_{kj} \geq v_{ij}\} \text{ if } j = 1,2,3,...,n \qquad (3)$$

The results obtained are:

A	1	2	3	4	5
TP	-	12	11	15	11
SH	15	-	11	15	11
LZ	17	9	-	17	12
BL	20	12	11	-	11
BB	20	17	20	20	-
Total			287		
Threshold C			14,35		

b. Discordance. A criterion in an alternative if:

$$D_{kl} = \{j, v_{kj} < v_{ij}\} \text{ if } j = 1,2,3,...,n \qquad (4)$$

The results obtained are:

A	1	2	3	4	5
TP	-	1	1	1	1
SH	0,347	-	1	0,52	1
LZ	0,312	0,851	-	0,533	1
BL	0	1	1	-	1
BB	0	0,629	0	0	-
Total			13,192		
Threshold D			0,66		

5. Calculating the dominant concordance and discordance

     a. Calculates the dominant concordance matrix

$$f_{kl} = \begin{cases} 1, if\ c_{kl} \geq \underline{c} \\ 0, if\ c_{kl} < \underline{c} \end{cases}$$

Table 3.5. Concordance Dominant Matrix

A	1	2	3	4	5
TP	-	0	0	1	0
SH	1	-	0	1	0
LZ	1	0	-	1	0
BL	1	0	0	-	0
BB	1	1	1	1	-

b. Calculate the dominant discordance matrix

$$g_{kl} = \begin{cases} 1, if\ d_{kl} \geq \underline{d} \\ 0, if\ d_{kl} < \underline{d} \end{cases}$$

Table 3.6. Discordance Dominant Matrix

A	1	2	3	4	5
TP	-	1	1	1	1
SH	0	-	1	0	1
LZ	0	1	-	0	1
BL	0	1	1	-	1
BB	0	0	0	0	-

6. Determine the aggregate dominance matrix

$$e_{kl} = f_{kl} \times g_{kl}$$

Table 3.7. *Aggregate Dominance Matrix*

A	1	2	3	4	5	Total
TP	-	0	0	1	0	1

SH	0	-	0	0	0	0
LZ	0	0	-	0	0	0
BL	0	0	0	-	0	0
BB	0	0	0	0	-	0

7. Eliminate alternatives that are less favorable:

The matrix provides a sequence of choices for each alternative, that is, if the alternative is a better alternative than the alternative. So that the rows in the matrix E that have the least numbers can be eliminated. In the matrix E, the first row has the number 1, while the other rows have no value. So based on the results of calculations that have been done using the ELECTREE method, the selection of online stores in the alternative is Tokopedia

3. CONCLUSIOON

Nowadays, many companies producing goods, both small and large, use Online Shop as a medium for marketing goods to consumers. There are various kinds of online Shop that we often encounter in Indonesia. The decision support system in selecting Online Shop using the electre method provides consideration for choosing superior online shop based on the criteria set for the alternatives to be selected.

The results of calculations using the Electree method can be used as a recommendation that E-Commerce consumers can use to choose the best Online Shop option. Based on the results of the analysis, by taking 5 alternatives as sample data, the best Online Shop recommendation is Tokopedia.

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