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Decision Support System in Selection of Tourism Packages for Semarang Region Using the Elimination Et Choix Traduisant La Realita Method

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Abstract**—***Semarang has become a tourist destination city because of the diversity of its tourist attractions. The large number of tourist destinations makes it difficult for tourists to choose which destination to go according to their wishes and needs. In this era of globalization, tourists need an up-to-date information quickly, efficiently, and practically to make it easier to determine location and tourist object to be addressed according to their financial and time capabilities. It takes a system that is automatically able to help provide information for decision making. Electre method is one of the solutions used to form a decision-making system, this method compares alternatives in pairs for each relevant criteria by normalizing matrix obtained from the cost, distance, time, and review data which then obtains the best final alternative, an alternative of tour packages in Semarang.*

Keywords**—** *Semarang, Tourism, Decision Support System, Electre*.

I. INTRODUCTION

Tourism sector is a sector that has the potential to be developed in this globalization era, where tourism sector has been proven to be able to elevate people's lives and is able to move wheels of the economy at every level of society and provide a direct impact on people's welfare, as well as being able to encourage development growth and regional development. Tourism sector is very attractive to tourists because it requires an atmosphere and place that can provide a sense of comfort, pleasure, and relaxation after being tired from doing daily work activities. Tourism has a broad meaning, namely traveling from one place to another, temporary, single or group work, to seek balance or harmony and happiness, with environmental, social, cultural, natural, and scientific dimensions [1]. Tourism is a kind of travelling by people within a certain period and is carried out from one place to another, leaving the original place with a plan, and the goal is not to make a living [2]. Tourism can also be said as a variety of activities that occur when someone travels which includes everything from planning a trip, staying for a while to returning along with the memories that are obtained for certain purposes due to tourist attraction of the tourist destination, its facilities, and others [3]. In this digital era, tourists always need an up-to-date information in efficient and practical way to get locations of the tourist objects to go to and want to easily plan tourist destinations according to their financial and time capabilities.

Semarang has become a tourist destination city because of the diversity of its tourist attractions. With an area of 373.70 square kilometres. Administratively, Semarang is divided into 16 sub-districts and 177 sub-districts. Being the Capital of Central Java, Semarang offers many attractive tourist destinations for tourists and makes it one of the tourist destinations in Indonesia which is visited by many local and foreign tourists. Various tourist destinations that can be visited include Lawang Sewu, Kota Lama Semarang, Sam Poo Kong Temple, Dusun Semilir, and many other destinations which if explored require a lot of time and a fairly large budget. Many tourists are confused in determining the tourist attractions to visit including determining the location, cost, time, distance, and reviews of tourist attractions. To make it easier for tourists to find many tourist attractions with accurate information and recommendations for selecting tourist objects that are in accordance with the selected criteria, a system is needed that contains all information on tourist areas which are expected to be used to obtain information and support the decision to select tourist objects effectively [4]. This decision support system provides a form of model from results of the observations of user's condition, with the aim of making it easier for user to make the right decision in determining the product, in this case the tourist destination to be chosen [5].

This research focused on the application of the ELimination Et Choix Traduisant la Realité (ELECTRE) method, which is a system that uses a multi-criteria decision-making method based on the outranking concept using pairwise comparisons of alternatives based on each appropriate criteria [6]. This research produces alternative recommendations for Semarang City tour packages which provide information of recommendation to tourists based on the criteria of cost, time, distance, and reviews with the aim of making it easier for tourists to determine tourist attractions they want to go to and manage expenses, time, and satisfaction when traveling to tourist destination in Semarang.

II. LITERATURE REVIEW

A. *Decision Support System*

Decision Support System (DSS) is generally defined as a system that can provide problem solving and communication skills for semi-structured problems. Specifically, Decision Support System (DSS) is defined as a system that supports the work of a manager or a group of managers on semi-structured problems by providing information or suggestions that lead to certain decisions [7].

Decision Support Systems are computer-based information that uses data and models to produce various decision-making

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alternatives to address various structured and unstructured problems [8].

The purpose of Decision Support System (DSS) was stated by Peter G.W Keen and Scott Morton in the book Models and Information Systems [9]:

1. Help managers load decisions to solve semi-structured problems;
2. Support manager's judgment without replacing it; and
3. Increasing effectiveness of manager decision making compared to efficiency.

The DSS is a system for assembling and integrating every intellectual resource from individuals with computer skills to improve quality of the resulting decisions. Understanding DSS and its use as a system that supports decisions is carried out through a relative review of the roles of humans and computers to find out the respective functional areas, their strengths, and weaknesses. The purpose of forming an effective DSS is to take advantage of the advantages of the two elements, namely humans and electronic devices [10].

Basically, 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 alternative choices. The decision-making process consists of three phases, namely as follows [11]:

1. Intelligence: This stage is the process of tracing and detecting the scope problems and the problem recognition process. Input data is obtained, processed, and tested to identify problems.
2. Design: this stage is the process of finding, developing, and analysing alternative actions that can be taken. This stage includes the process of understanding the problem, deriving a solution, and testing the feasibility of the solution.
3. Choice: at this stage a selection process is carried out among various possible action alternatives. The election results are then implemented in the decision-making process.

B. Elimination Et Choix Tradusiant La Realita (ELECTRE)

Decision Support System (DSS) is defined as an information system to assist middle-level managers for semi-structured decision-making processes to be more effective by using analysis models and available data [12]. One method in decision-making system is the Electre. Electre is a multi-criteria decision-making method based on the concept of outranking by comparing pairs of alternatives based on each appropriate criteria [13]. Electre can be used in conditions where alternatives that do not fit the criteria are eliminated and suitable alternatives can be generated, in other words Electre can be used for cases with many alternatives but only a few criteria involved.

ELECTRE is a system method for making multi-criteria decisions based on the concept of outranking by using pairwise comparisons of alternatives for each appropriate criteria [13]. The ELECTRE method is used when alternative conditions do not match the criteria and are eliminated, and suitable alternatives can be generated. In other words, ELECTRE is used when there are cases with many alternatives but only a few criteria are involved [14]. An alternative is said to dominate other alternatives if one or more criteria exceed the other alternative criteria and are the same as the other remaining criteria [15].

The problem-solving steps in Electre are shown in Figure 1 [15].

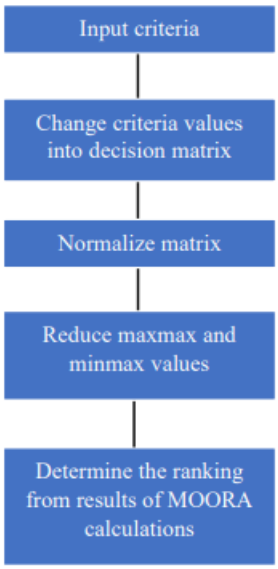

Figure 1. Problem-solving steps using Electre [15]

Figure 1 explains the steps taken in solving problems using Electre method, where each stage is defined as follows:

1. Normalization of the decision matrix.
   Each attribute is changed to a comparable value.
2. Weighting on the matrix that has been normalized.
   After normalization, each column of the R matrix is multiplied by the weight (w) determined by the decision maker.
3. Determine the set of concordance and discordance indexes.
   For each pair of alternatives k and l (k, l= 1,2,3, …, m and $k \neq l$) the set of J criteria is divided into two subsets, namely concordance and discordance.
4. Calculate the concordance and discordance matrixes.
   Calculating the concordance matrix, to determine value of the elements in the concordance matrix is to add up weights included in the concordance set mathematically. Determining value of the elements in the discordance matrix is by dividing the maximum difference in the criteria included in the discordance subset by the maximum difference in the values of all existing criteria.
5. Determine the dominant matrix of concordance and discordance.
   Determining the dominant concordance matrix and discordance matrix F as the dominant concordance matrix can be built with the help of a threshold value, which is by comparing each element value of the concordance matrix with the threshold value. Calculating the dominant discordance matrix, the G matrix as the dominant discordance matrix can be built with the help of a threshold value.
6. Determine the aggregate dominance matrix

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Matrix E as an aggregate dominance matrix is a matrix in which each element is a product of the elements of the F matrix with the corresponding G matrix elements.

7. Eliminate less favourable alternatives.

Matrix E provides the order of choice of each alternative, i.e., if then the alternative is a better alternative than Al. Thus, the row in matrix E that has the least number can be eliminated. Thus, the best alternative is the alternative that dominates the other alternatives.

C. *Tourist Attraction*

Tourist attraction is everything that exists in tourist destination area which is an attraction so that people want to come to visit the place. Tourist attractions are all places or natural conditions that have tourism resources that are built and developed so that they have attractiveness and are cultivated as places visited by tourists. Tourist attractions can be in the form of natural attractions such as mountains, lakes, rivers, beaches, sea or in the form of building objects such as museums, forts, historical heritage sites, and others. For a place or area to be said as a tourist attraction, it must meet the following basic requirements:

a. There is something to see. The point is something interesting to look at.
b. There is something to buy. The point is something interesting and distinctive to buy.
c. There is something to do. The point is an activity that can be done in that place.

Several tourist attractions in Semarang ranging from the biggest playground in Central Java, to Instagram able natural attractions, are all in Semarang, among others are:

1. Lawang Sewu: Formerly the headquarters of the Dutch East Indies Railway Company, this building was also used as office of the Republic of Indonesia Railways Office and Office of the Regional Military Command Infrastructure Agency. Lawang Sewu has been revitalized and converted into a museum and tourist spot. Lawang Sewu is one of the most popular tourist attractions in Semarang, and is famous for its many doors, so people call it Lawang Sewu, which means the Thousand Doors.
2. Kota Lama: It is an area that is separated from the surrounding area so that it looks like a separate city and is like the urban landscape in Europe and the canals that surround it, making Kota Lama given the nickname "Little Netherland". Kota Lama is a prima donna icon in Semarang with 50 ancient buildings that are still standing strong.
3. Sam Poo Kong Temple: This is a Chinese community temple which is now used as a place of prayer and worship as well as a place for pilgrimage. Sam Poo Kong has also become a tourist icon for the city of Semarang.

III. Research Methodology

This section describes the research methods used and the concept of calculations to obtain the results of selecting alternative tour packages as a form of recommendation for tourist destinations to be selected or used. The stages in this research are shown in Figure 2.

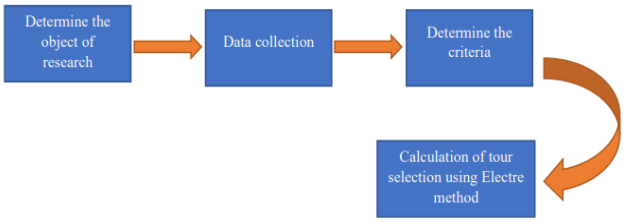

Figure 2. Research Stages in Determining Tour Packages

The research stages shown in Figure 2 consist of five parts, namely:

A. *Determination of Tourism Objects*

Research object in this study is tourist spot in Semarang. Some of the selected tourist attractions, namely, Grand Maerakaca, Sam Poo Kong Temple, Kampung Pelangi, Koeta Toea, Lawang Sewu, Mandala Bhakti Museum, Central Java Grand Mosque, Kota Lama Museum, Tirang Beach, Marina Beach, Simpang Lima, and Wilis Park.

This research was carried out by analysing comparison of the criteria for the entrance fee, travel time, distance travelled, and reviews of these tourist attractions, which then will get results of the tourist package that was selected as a package of tourist attractions that are very affordable and worth visiting.

B. *Data Collection*

In this research, we used primary and secondary data. The secondary data collection was carried out by collecting data on tourist attractions in Semarang through internet networks. Then calculate the distance between tourist attractions and estimated travel time using Google Maps, as well as reviews from people about tourist attractions through Google Reviews. Primary data in this study were collected directly by direct observation of tourist attractions in Semarang based on data on tourist attractions that had been obtained from the internet with a focus on observations on the entrance fee to tourist attractions.

C. *Determination of Criteria*

The criteria used in Semarang City tour packages are cost. In this case, price of entrance tickets to tourist attractions, time which is travel time between tourist attractions, and distance between tourist attractions, and reviews from other visitors. In this research, three alternatives tour package data were used, which consisted of four tourist destinations, namely:

1. Lawang Sewu, Wilis Park, Marina Beach, Mandala Bhakti Museum.
2. Sam Poo Kong Temple, Central Java Grand Mosque, Tirang Beach, Simpang Lima
3. Kampung Pelangi, Koeta Toea, Kota Lama Museum, Grand Maerakaca.

The ELECTRE process stages by determining the suitability rating of each alternative on each criterion, with a value of one to five, namely:

1 = Very bad
2 = Bad
3 = Enough

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4 = Good
5 = Very good
Level of importance of the criteria (preference weight) is also assessed from one to five, namely:
1 = Very low
2 = Low
3 = Enough
4 = High
5 = Very high
In this research, Semarang City tour packages as decision makers give preference weights as follows:

a. Cost criteria = 5
b. Time criteria = 4
c. Distance criteria = 3
d. Review criteria = 2

So, W = (5, 4, 3, 2).

D. Tour Selection Calculation Process Using Electre Method

Stages of completing ELECTRE method are as follows:

1. Normalize the decision matrix.

At this stage, each attribute is changed to a comparable value or normalized the decision matrix with the equation:

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

With $i = 1,2,3, \dots, m$ and $j = 1,2,3, \dots, n$

So, we get the R matrix of normalization results.

$$R = \begin{bmatrix} r_{11} & r_{12} & \dots & r_{1n} \\ r_{21} & r_{22} & \dots & r_{2n} \\ \dots & & & \\ r_{m1} & r_{m2} & \dots & r_{mn} \end{bmatrix}$$

R is a normalized matrix with m representing alternatives, n representing criteria and r_{ij} is a normalized measurement of choice of the i alternative in relation to j criteria.

2. Bottling on the normalized matrix.

After normalization, each column of the R matrix is multiplied by the weight (W_j) determined by the decision maker. So that a weighted normalized matrix is formed, which is $V = R.W$

$$V = \begin{bmatrix} v_{11} & v_{12} & \dots & v_{1n} \\ v_{21} & v_{22} & \dots & v_{2n} \\ \dots & & & \\ v_{m1} & v_{m2} & \dots & v_{mn} \end{bmatrix} = \begin{bmatrix} w_1 r_{11} & w_2 r_{12} & \dots & w_n r_{1n} \\ w_1 r_{21} & w_2 r_{22} & \dots & w_n r_{2n} \\ \dots & & & \\ w_1 r_{m1} & w_2 r_{m2} & \dots & w_n r_{mn} \end{bmatrix}$$

With

$$W = \begin{bmatrix} w_1 & 0 & 0 & 0 \\ 0 & w_2 & 0 & \\ \dots & & & \\ 0 & 0 & 0 & w_n \end{bmatrix}$$

and $\sum_{i=1}^{n} w = 1$

3. Determine the set of concordance and discordance

For each pair of k alternatives and $l\ (k, l = 1,2,3, \dots, m$ and $k \neq l)$ a criteria in an alternative including concordance if:

$$c_{kl} = \{j | v_{kj} \geq v_{ij}\} \text{ for } j = 1,2,3, \dots, n$$

And criteria including discordance if :

$$D_{kl} = \{j | v_{kj} < v_{ij}\} \text{ for } j = 1,2,3, \dots, n$$

4. Calculating the concordance and discordance matrix

a. Concordance

Determining values of the elements in concordance matrix is done by adding up weights in the concordance set, which is:

$$C_{kl} = \sum_{j \in C_{kl}} W_j$$

So that it produces concordance matrix

$$C = \begin{bmatrix} - & c_{12} & c_{13} & \dots & c_{1n} \\ c_{21} & - & c_{23} & \dots & c_{2n} \\ \dots & & & & \\ c_{m1} & c_{m2} & c_{m3} & \dots & - \end{bmatrix}$$

b. Discordance

Determining values of the elements in discordance matrix is done by dividing the maximum difference in the criteria included in the discordance subset by the maximum difference in the values of all existing criteria, which is :

$$D_{kl} = \frac{\{\max(v_{mn} - v_{mn-1n})\}; m, n \in D_{kl}}{\{\max(v_{mn} - v_{mn-1n})\}; m, n = 1,2,3, \dots}$$

So that it produces discordance matrix

$$D = \begin{bmatrix} - & d_{12} & d_{13} & \dots & d_{1m} \\ d_{21} & - & d_{23} & \dots & d_{2m} \\ \dots & & & & \\ d_{m1} & d_{m2} & d_{m3} & \dots & - \end{bmatrix}$$

5. Determine the dominant matrix of concordance and discordance

a. Concordance

The dominant concordance matrix is made with the help of a threshold by comparing each element value of the concordance matrix with the threshold value.

$$C_{kl} \geq c$$

With threshold

$$c = \frac{\sum_{k=1}^{n} \sum_{l=1}^{n} c_{kl}}{m(m-1)}$$

So that elements in matrix F are determined as follows :

$$f_{kl} = 1 \text{ if } c_{kl} \geq c \text{ and } f_{kl} = 0 \text{ if } c_{kl} < c$$

b. Discordance

To make dominant discordance matrix also uses the help of a threshold value

$$d = \frac{\sum_{k=1}^{n} \sum_{l=1}^{n} d_{kl}}{m(m-1)}$$

So that elements in matrix G are determined as follows :

$$g_{kl} = 1 \text{ if } d_{kl} \geq d \text{ and } g_{kl} = 0 \text{ if } d_{kl} < d$$

6. Determine aggregate dominance matrix

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Matrix *E* as an aggregate dominance matrix is a matrix in which element is a multiplication between the elements of matrix *F* with the corresponding matrix *G*, so that it can be stated

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

7. Eliminate less favourable alternatives

Matrix E provides the order of choice of each alternative, which is if $e_{kl} = 1$ then alternative A_k is a better choice than A_l. So that the row in matrix E that has the least amount $e_{kl} = 1$ can be eliminated. Thus, the best alternative is the one that dominates the other alternatives.

Basically, ELECTRE method is a method that normalizes matrix which is then weighted and searched for the concordance and discordance matrixes and in the end, it is eliminated which alternative is less favourable. Tests were carried out to find out which alternative Semarang City tour packages best fit the criteria, namely cost, time, distance, and reviews.

E. Calculation Results of Recommended Travel Packages

In this research, a process of calculating recommendations for Semarang City tour packages using the Electre method were carried out, produces a ranking obtained from Normalization matrix based on the criteria of travel costs, distance, and travel time, as well as user reviews, resulting a recommendation for a tour package with an Aggregate Dominance Matrix worth one.

IV. Result and Discussion

This research describes a case study in the selection of tour packages in Semarang.

TABLE 1. Tour Package 1 Entrance Fee and Review

Package 1	Entrance Fee (Rp)	Rate
Lawang sewu	15,000	4,6
Wilis Park	Free	4,5
Marina Beach	5,000	4,2
Mandala Bhakti Museum	Free	4,7
Total	**20,000**	**4,5**

TABLE 2. Tour Package 2 Entrance Fee and Review

Package 2	Entrance Fee (Rp)	Rate
Sam Poo Kong	20,000	4,5
Central Java Grand Mosque	Free	4,7
Tirang Beach	5,000	3,9
Simpang Lima	Gratis	4,7
Total	**25,000**	**4,45**

TABLE 3. Tour Package Entrance Fee and Review

Package 3	Entrance Fee (Rp)	Rate
Kampung Pelangi	3,000	4,3
Koeta Toea	10,000	4,3
Kota Lama Museum	Free	4,6
Grand Maerakaca	20,000	4,4
Total	**33,000**	**4,4**

TABLE 4. Criteria

Alternative Package	Price	Distance	Time	Rate
Package 1	20,000	19,87	64minutes	4,5
Package 2	25,000	28,1	100minutes	4,45
Package 3	33,000	23,1	55minutes	4,4

Known criteria:

C_1 = Price
C_2 = Time
C_3 = Distance
C_4 = Review

With preference weights $W = (5, 4, 3, 2)$

TABLE 5. Alternative Tour Packages

Alternative Package	Criteria			
	C_1	C_2	C_3	C_4
Package 1 (A_1)	20.000	64	10,87	4,5
Package 2 (A_2)	25.000	100	28,1	4,45
Package 3 (A_3)	33.000	55	23,1	4,4

1. Create a normalized matrix, R :

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

$$x_1 = \sqrt{(20.000)^2 + (25.000)^2 + (33.000)^2}$$
$$= \sqrt{400.000.000 + 625.000.000 + 1.089.000.000}$$
$$= \sqrt{2.114.000.000}$$
$$= 45.978{,}255$$

$$r_{11} = \frac{20.000}{45.978{,}255} = 0{,}434$$

$$r_{21} = \frac{25.000}{45.978{,}255} = 0{,}543$$

$$r_{31} = \frac{33.000}{45.978{,}255} = 0{,}717$$

$$x_2 = \sqrt{(164)^2 + (100)^2 + (55)^2}$$
$$= \sqrt{4.096 + 10.000 + 3.025}$$
$$= \sqrt{17.121}$$
$$= 130{,}847$$

$$r_{12} = \frac{164}{130{,}847} = 0{,}489$$

$$r_{22} = \frac{100}{130{,}847} = 0{,}764$$

$$r_{32} = \frac{55}{130{,}847} = 0{,}420$$

$$x_3 = \sqrt{(19{,}87)^2 + (28{,}1)^2 + (23{,}1)^2}$$
$$= \sqrt{394{,}816 + 789{,}61 + 533{,}61}$$
$$= \sqrt{1.718{,}036}$$
$$= 41{,}449$$

$$r_{13} = \frac{19{,}87}{41{,}449} = 0{,}479$$

$$r_{23} = \frac{28{,}1}{41{,}449} = 0{,}677$$

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$$r_{33} = \frac{23,1}{41,449} = 0,557$$

$$x_4 = \sqrt{(4,5)^2 + (4,45)^2 + (4,4)^2}$$
$$= \sqrt{20,25 + 19,802 + 19,36}$$
$$= \sqrt{59,412}$$
$$= 7,707$$

$$r_{14} = \frac{4,5}{7,707} = 0,583$$

$$r_{24} = \frac{4,45}{7,707} = 0,577$$

$$r_{34} = \frac{4,4}{7,707} = 0,550$$

From results of the calculations above, a normalized matrix is obtained :

$$R = \begin{bmatrix} 0,434 & 0,489 & 0,479 & 0,583 \\ 0,543 & 0,764 & 0,677 & 0,577 \\ 0,717 & 0,420 & 0,557 & 0,570 \end{bmatrix}$$

2. Weighting on the normalized matrix.

$$V = R \times W$$

$$R = \begin{bmatrix} 0,434 & 0,489 & 0,479 & 0,583 \\ 0,543 & 0,764 & 0,677 & 0,577 \\ 0,717 & 0,420 & 0,557 & 0,570 \end{bmatrix}$$

$$W = (5 \quad 4 \quad 3 \quad 2)$$

$$V = \begin{bmatrix} 2,17 & 1,956 & 1,437 & 1,166 \\ 2,715 & 3,056 & 2,031 & 1,154 \\ 3,585 & 1,68 & 1,671 & 1,14 \end{bmatrix}$$

3. Determine concordance dan discordance set on index.

a. Concordance

$$C_{kl} = \{j | V_{kj} \geq V_{ij}\} \; for \; j = 1, 2, 3, \ldots, n.$$
$$C_{12} = \{4\}$$
$$C_{13} = \{2, 4\}$$
$$C_{21} = \{1, 2, 3\}$$
$$C_{23} = \{2, 3, 4\}$$
$$C_{31} = \{1, 3\}$$

b. Discordance

$$D_{kl} = \{j | V_{kj} < V_{ij}\} \; for \; j = 1, 2, 3, \ldots, n.$$
$$D_{12} = \{1, 2, 3\}$$
$$D_{13} = \{1, 3\}$$
$$D_{21} = \{4\}$$
$$D_{23} = \{1\}$$
$$D_{31} = \{2, 4\}$$
$$D_{32} = \{2, 3, 4\}$$

4. Determine Matrix.

a. Concordance

$$W = (5 \quad 4 \quad 3 \quad 2)$$
$$C_{12} = W_4 = 2$$
$$C_{13} = W_2 + W_4 = 4 + 2 = 6$$
$$C_{21} = W_1 + W_2 + W_3 = 5 + 4 + 3 = 12$$
$$C_{23} = W_2 + W_3 + W_4 = 4 + 3 + 2 = 9$$
$$C_{31} = W_1 + W_3 = 5 + 3 = 8$$
$$C_{32} = W_1 = 5$$

Matrix obtained:

$$C = \begin{bmatrix} - & 2 & 6 \\ 12 & - & 9 \\ 8 & 5 & - \end{bmatrix}$$

b. Discordance

$$d_{kl} = \frac{\max\{|V_{kj} - V_{ij}|\}}{max\{|V_{kj} - V_{ij}|\}}$$

$$d_{12} = \frac{\max\{|2,17 - 2,715|; |1,956 - 3,056|; |1,437 - 2,031|\}}{max\{|2,17 - 2,715|; |1,956 - 3,056|; |1,437 - 2,031|; |1,166 - 1,154|\}}$$
$$= \frac{\max\{0,545; 1,1; 0,594\}}{max\{0,545; 1,1; 0,594; 0,012\}}$$
$$= \frac{1,1}{1,1} = 1$$

$$d_{13} = \frac{\max\{|2,17 - 3,585|; |1,437 - 1,671|\}}{max\{|2,17 - 3,585|; |1,437 - 1,671|; |1,956 - 1,68|; 1,166 - 1,14|\}}$$
$$= \frac{\max\{1,415; 0,234\}}{max\{1,415; 0,234; 0,276; 0,026\}}$$
$$= \frac{1,415}{1,415} = 1$$

$$d_{21} = \frac{\max\{|1,154 - 1,166|\}}{max\{|2,715 - 2,17|; |3,056 - 1,956|; |2,031 - 1,437|; 1,154 - 1,166|\}}$$
$$= \frac{\max\{0,012\}}{max\{0,545; 1,1; 0,594; 0,012\}}$$
$$= \frac{0,012}{1,1} = 0,01$$

$$d_{23} = \frac{\max\{|2,715 - 3,585|\}}{max\{|2,715 - 3,585|; |3,056 - 1,68|; |2,031 - 1,671|; 1,154 - 1,14|\}}$$
$$= \frac{\max\{0,87\}}{max\{0,87; 1,888; 0,36; 0,014\}}$$
$$= \frac{0,87}{1,888} = 0,4608 \approx 0,461$$

$$d_{31} = \frac{\max\{|1,68 - 1,956|; |1,14 - 1,166|\}}{max\{|3,585 - 2,17|; |1,68 - 1,956|; |1,671 - 1,437|; 1,14 - 1,166|\}}$$
$$= \frac{\max\{0,788; 0,026\}}{max\{1,415; 0,276; 0,234; 0,026\}}$$
$$= \frac{0,788}{1,415} = 0,55689 \approx 0,557$$

Rifqi Arief Permana, Rizky Nurohmah, Kartono, and Sunarsih, "Decision Support System in Selection of Tourism Packages for Semarang Region Using the Elimination Et Choix Traduisant La Realita Method," *International Research Journal of Advanced Engineering and Science*, Volume 8, Issue 2, pp. 176-182, 2023.

$$d_{32} = \frac{\max\{|1{,}68-3{,}056|;|1{,}671-2{,}031|;|1{,}14-1{,}154|\}}{max\{|3{,}585-2{,}715|;|1{,}68-3{,}056|;|1{,}671-2{,}031|;|1{,}14-1{,}154|\}}$$
$$= \frac{\max\{1{,}376;0{,}36;0{,}014\}}{max\{0{,}87;1{,}376;0{,}36;0{,}014\}}$$
$$= \frac{1{,}376}{1{,}376} = 1$$

Matrix obtained :

$$D = \begin{bmatrix} - & 1 & 1 \\ 0{,}01 & - & 0{,}461 \\ 0{,}557 & 1 & - \end{bmatrix}$$

5. Calculate Concordance and Discordance Dominant Matrix.

$$f_{kl} = 1, \text{ if } C_{kl} \geq \underline{c}$$
$$f_{kl} = 0, \text{ if } C_{kl} < \underline{c}$$

a. Concordance

$$\underline{c} = \frac{\sum_{k=1}^{n}\sum_{l=1}^{n} C_{kl}}{m(m-1)} = \frac{2+6+12+9+8+5}{3(3-1)} = \frac{42}{6} = 7$$

Matrix obtained :

$$F = \begin{bmatrix} - & 0 & 0 \\ 1 & - & 1 \\ 1 & 0 & - \end{bmatrix}$$

b. Discordance

$$\underline{d} = \frac{\sum_{k=1}^{n}\sum_{l=1}^{n} d_{kl}}{m(m-1)} = \frac{1+1+0{,}01+0{,}461+0{,}557+1}{3(3-1)}$$
$$= \frac{3{,}028}{6}$$
$$= 0{,}5046 \approx 0{,}505$$

Matrix obtained:

$$G = \begin{bmatrix} - & 0 & 0 \\ 1 & - & 1 \\ 0 & 0 & - \end{bmatrix}$$

6. Determine Aggregate Dominance Matrix.

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

$$E_{12} = F_{12} \times G_{12} = 0 \times 0 = 0$$
$$E_{13} = F_{13} \times G_{13} = 0 \times 0 = 0$$
$$E_{21} = F_{21} \times G_{21} = 1 \times 1 = 1$$
$$E_{23} = F_{23} \times G_{23} = 1 \times 1 = 1$$
$$E_{31} = F_{31} \times G_{31} = 1 \times 0 = 0$$
$$E_{32} = F_{32} \times G_{32} = 0 \times 0 = 0$$

Matrix obtained:

$$E = \begin{bmatrix} - & 0 & 0 \\ 1 & - & 1 \\ 0 & 0 & - \end{bmatrix}$$

7. Matrix E provides the order of each alternative, which is if $E_{kl} = 1$, then alternative A_k is a better alternative than A_l. Because there us 1 in matrix E and its position is in A_2, then the chosen alternative is A_2 or Package 2.

V. Conclusions and Suggestions

Based on calculations and analysis, it can be concluded that ELECTRE method can help tourists to determine tour packages according to the criteria of cost, time, distance, and reviews. The calculation results of ELECTRE method recommend Package 2 which consists of Sam Poo Kong Temple, Central Java Grand Mosque, Simpang Lima, and Tiram Beach and can be used by tourists to determine destinations as their destinations.

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