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**RESEARCH ARTICLE**

## Comparison of MARCOS and TOPSIS Methods in Determining Bali Tour Packages

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### ABSTRACT

Tour packages, or what can be called package tours or inclusive tours, are forms of travel that have one or more destinations and are supported by various travel facilities. Tour packages can usually be purchased through travel agents or on the spot at tourist destinations, for example, directly at tourist villages that have tour package offers. The tour packages offered vary with different prices and specifications. The various choices of tour packages offered sometimes make tourists confused about choosing the right tour package. This is because the prices are not in accordance with the tourist budget, and the schedule is not flexible. Tourists are required to be precise in making decisions so that the selected tour package is as desired. For this reason, it is necessary to have a system that helps in providing alternative choices of tour packages. A decision support system (DSS) is one of the tools that can be used in decision-making for decision-makers. From several decision-making methods in this study, a comparison of two methods, namely TOPSIS and MARCOS, was carried out to determine tour packages according to tourist criteria. These two methods were chosen because they have similarities in the calculation concept, which is related to the ideal solution and the anti-ideal solution. Comparisons are made using the total budget and total time parameters. The test was carried out using 10 trial data entered by tourists and then the tourist objects themselves, namely samples of natural, culinary, and shopping attractions in Badung Regency. The test results show that the MARCOS method is better than the TOPSIS method because it produces 7 test data with a better total budget and total time.

### KEYWORDS

Tour package, MARCOS Method, TOPSIS Method

### ARTICLE INFORMATION

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### 1. Introduction

A tour package, or what can be called a package tour or inclusive tour, is a form of travel that has one or more destinations and is supported by various travel facilities on a fixed trip and a single selling price for all components of the tour (Ahmad *et al.*, 2020). In a tour package, there must be a series of tourism components, one of which is a schedule of visits to tourist objects or tourist attractions (Brahmanto, 2015) (Azalea, 2021).

Tour packages can usually be purchased through travel agents or on the spot at tourist destinations, for example, directly at tourist villages that have tour package offers. The tour packages offered vary with different prices and specifications. The various choices of tour packages offered sometimes make tourists confused about choosing the right tour package. This is because the prices are not in accordance with the tourist budget, and the schedule is not flexible. Tourists are required to be precise in making decisions so that the selected tour package is as desired. For this reason, it is necessary to have a system that helps in providing alternative choices of tour packages.

Decision support system (DSS) is one of the tools that can be used in decision-making for decision makers (Mustafidah and Mayasari, 2019) (Iswari, Arini and Muslim, 2019) (Suwitama and Ramadhan, 2020). The decisions offered by the decision support system tend to be fast and quantitatively the best choice based on the level of importance/weight of the criteria given by the decision maker (Santiary *et al.*, 2018) (Muljadi, Khumaidi and Chusna, 2020). There are many methods that can be used in decision support systems, namely AHP, TOPSIS, SAW, MARCOS, ELECTRE, WASPAS, ARAS, and so on (Sahir, S. H. and Panjaitan, 2020). From several decision-making methods in this study, two methods were compared, namely TOPSIS and MARCOS. The TOPSIS method is to find the best alternative that has the shortest distance from the positive-ideal solution and the farthest distance from the negative-ideal solution. (Ho, Lin and Chen, 2020) (Ajmera, 2016). The MARCOS method concept is to define the relationship between alternatives and preference values where the best alternative is the closest alternative to the ideal solution and the farthest from the anti-ideal solution. (Ilieva *et al.*, 2020) (Lukić, 2022).

Referring to this, in this research, a comparison was made between the decision support system methods, namely the TOPSIS and MARCOS methods, in terms of determining tour packages. These two methods were chosen because they have similarities in the calculation concept, which is related to the ideal solution and the anti-ideal solution. Comparisons are made using the total budget and total time parameters.

**2. Literature Review**

Research related to the MARCOS method was carried out by (Puška *et al.*, 2020) under the title "Project Management Software Evaluation Using the Measurement of Alternatives and Ranking According to Compromise Solution (MARCOS) Method" the results of this study are the MARCOS method can determine the ranking of software solutions based on the relationship between alternatives and with reference values. Another study conducted (Stević and Brković, 2020) compared the results of sensitivity tests to several MCDM methods, namely MARCOS, SAW, ARAS, WASPAS EDAS, CoCoSo, and MABAC, and it was found that the MARCOS method was consistent for all alternatives and there was no change in ranking at all. Research related to the TOPSIS method has been carried out by (Zulqarnain *et al.*, 2020) (Ginting *et al.*, 2017) serta (Rahim *et al.*, 2018), which state that the use of the TOPSIS method in a decision support system can assist managerial parties in obtaining competent candidates and also minimized by data obtained from decision support systems. Another study by ((Abdal, 2020) tested the efficiency of the TOPSIS method, where the calculation time will increase slightly when the number of criteria increases but not more than 10 seconds.

**3. Methodology**

**3.1 MARCOS Method**

The MARCOS method is based on defining the relationship between alternatives and preference values (ideal and anti-ideal alternatives). On the basis of the defined relationships, the utility functions of the alternatives are determined, and a compromise ranking is made in relation to the ideal and anti-ideal solutions. The decision preference is determined based on the utility function. The utility function represents the alternative positions with respect to the ideal and anti-ideal solutions. The best alternative that can be chosen is the alternative that has the closest value to the ideal value and, at the same time, is farthest from the anti-ideal reference point. Decision preferences are defined based on utility functions. The utility function represents the alternative positions with respect to the ideal and anti-ideal solutions. The calculation steps for the MARCOS method are as follows (Ecer and Pamucar, 2021) (Do, 2021).

- a. *Forming the initial decision matrix*  
The multi-criteria model includes the definition of a set of criteria and alternatives. In the case of group decision making, a group of experts must be formed to evaluate alternatives according to the criteria. In the case of group decision making, the expert evaluation matrix is incorporated into the initial group decision making matrix.
- b. *Forming the initial matrix expansion*  
In this step, the expansion of the initial matrix is carried out by defining the ideal (AI) and anti-ideal (AAI) solutions.

$$X = \begin{matrix} & C_1 & C_2 & \dots & C_n \\ AAI & \begin{bmatrix} x_{aa1} & x_{aa2} & \dots & x_{aan} \\ A_1 & \begin{bmatrix} x_{11} & x_{12} & \dots & x_{1n} \\ A_2 & \begin{bmatrix} x_{21} & x_{22} & \dots & x_{2n} \\ \dots & \dots & \dots & \dots \\ A_m & \begin{bmatrix} x_{m1} & x_{22} & \dots & x_{mn} \\ AI & \begin{bmatrix} x_{ai1} & x_{ai2} & \dots & x_{ain} \end{bmatrix} \end{bmatrix} \end{bmatrix} \end{bmatrix} \end{matrix} \quad (1)$$

The anti-ideal solution (AAI) is the worst alternative, while the ideal solution (AI) is the alternative with the best characteristics. Depending on the nature of the criteria, AAI and AI are defined by applying Equations (2) and (3).

$$AAI = \min_i x_{ij} \text{ if } j \in B \text{ and } \max_i x_{ij} \text{ if } j \in C \quad (2)$$

$$AI = \max_i x_{ij} \text{ if } j \in B \text{ and } \min_i x_{ij} \text{ if } j \in C \quad (3)$$

Where B represents the benefit criteria group, while C represents the cost criteria group.

c. Normalization of the expansion matrix (X)

The elements of the normalized matrix  $N = [n_{ij}]_{m \times n}$  are generated by Equations (4) and (5).

$$n_{ij} = \frac{x_{ai}}{x_{ij}} \text{ if } j \in C \quad (4)$$

$$n_{ij} = \frac{x_{ij}}{x_{ai}} \text{ if } j \in B \quad (5)$$

Where the elements  $x_{ij}$  and  $x_{ai}$  represent the elements of the matrix X.

d. Form a weighted decision matrix V

A weighted matrix V is generated by multiplying the normalized matrix N by the weight coefficient  $w_j$  is calculated by Equation (6)

$$v_{ij} = n_{ij} \times w_j \quad (6)$$

e. Calculating the utility value of the alternative  $K_i$

The utility value of an alternative in relation to the anti-ideal and ideal solutions is calculated by Equations (7) and (8).

$$K_i^- = \frac{S_i}{S_{aai}} \quad (7)$$

$$K_i^+ = \frac{S_i}{S_{ai}} \quad (8)$$

Where  $S_i (i = 1, 2, 3, \dots, m)$  represents the number of elements of the V-weighted matrix in Equation (9)

$$S_i = \sum_{j=1}^n v_{ij} \quad (9)$$

f. Determine the utility function of the alternative  $f(K_i)$

The utility function is a compromise of the observed alternatives in terms of the ideal and anti-ideal solutions. The utility function of the alternatives is defined by Equation (10)

$$f(K_i) = \frac{K_i^+ + K_i^-}{1 + \frac{1-f(K_i^+)}{f(K_i^+)} + \frac{1-f(K_i^-)}{f(K_i^-)}} \quad (10)$$

Where  $f(K_i^-)$  represents the utility function associated with the anti-ideal solution, while  $f(K_i^+)$  represents the utility function associated with the ideal solution. Utility functions for ideal and anti-ideal values are generated using Equations (11) and (12).

$$f(K_i^-) = \frac{K_i^+}{K_i^+ + K_i^-} \quad (11)$$

$$f(K_i^+) = \frac{K_i^-}{K_i^+ + K_i^-} \quad (12)$$

g. Alternative ranking

It is based on the final value of the utility function. It is desirable that an alternative has the highest possible utility function value.

**3.2 TOPSIS Method**

The TOPSIS method is a method that produces the best alternative because it has the shortest distance from the positive ideal solution and the farthest distance from the negative ideal solution. The steps for calculating the TOPSIS method are as follows: (Yadav, Sharma, and Singh, 2018) (Zhang and Li, 2019).

a. Constructing a Decision Matrix

The decision matrix X refers to m alternatives that will be evaluated based on n criteria. The decision matrix X can be seen as follows

$$X = \begin{matrix} & \begin{matrix} x_1 & x_2 & x_3 & \dots & x_n \end{matrix} \\ \begin{matrix} a_1 \\ a_2 \\ a_3 \\ \vdots \\ a_m \end{matrix} & \begin{pmatrix} x_{11} & x_{12} & x_{31} & \dots & x_{n1} \\ x_{12} & x_{22} & x_{32} & \dots & x_{n2} \\ x_{13} & x_{32} & x_{33} & \dots & x_{n3} \\ \vdots & \vdots & \vdots & \dots & \vdots \\ x_{m1} & x_{m2} & x_{m3} & \dots & x_{mn} \end{pmatrix} \end{matrix} \quad (13)$$

b. Creating a Normalized Decision Matrix

The equation used to transform each element  $x_{ij}$  is as follows.

$$r_{ij} = \frac{x_{ij}}{\sqrt{\sum_{i=1}^m x_{ij}^2}} \tag{14}$$

c. Creating a Weighted Normalized Decision Matrix

With the weight  $w_j = (w_1, w_2, w_3, \dots, w_n)$ , where is the weight of the  $j$ th criterion and  $\sum_{j=1}^n w_j = 1$ , then the normalization of the weights of the matrix  $V$  is as follows.

$$v_{ij} = w_j r_{ij} \tag{15}$$

d. Determining the Matrix of Positive Ideal Solution and Negative Ideal Solution

The positive ideal solution is denoted  $A^+$ , while the negative ideal solution is denoted  $A^-$ . The following is the equation of  $A^+$  dan  $A^-$ .

$$A^+ = \{(\max v_{ij} | j \in J), (\min v_{ij} | j \in J'), i = 1, 2, 3, \dots, m\} \tag{16}$$

$$A^- = \{(\min v_{ij} | j \in J), (\max v_{ij} | j \in J'), i = 1, 2, 3, \dots, m\} \tag{17}$$

Calculating the Alternative Distance for Each Alternative to the Positive Ideal Solution ( $s_i^+$ ) and the Negative Ideal Solution ( $s_i^-$ ) is the alternative distance from the positive ideal solution defined as follows.

e. Calculating the Alternative Distance for Each Alternative to the Positive Ideal Solution ( $s_i^+$ ) and the Negative Ideal Solution ( $s_i^-$ )

$S^+$  is the alternative distance from the positive ideal solution defined as follows.

$$s_i^+ = \sqrt{\sum_{j=1}^n (v_{ij} - v_j^+)^2}, \text{ dengan } i = 1, 2, 3, \dots, m \tag{18}$$

$S^-$  is the alternative distance from the negative ideal solution defined as follows.

$$s_i^- = \sqrt{\sum_{j=i}^n (v_{ij} - v_j^-)^2}, \text{ dengan } i = 1, 2, 3, \dots, m \tag{19}$$

f. Calculating the Preference Value of Each Alternative

The preference value of each alternative based on the positive and negative distances possessed by each alternative can be calculated using the following equation.

$$C_i = \frac{s_i^-}{(s_i^- + s_i^+)}, 0 \leq C_i \leq 1, \text{ dengan } i = 1, 2, 3, \dots, m \tag{20}$$

#### 4. Results and Discussion

The test is carried out by comparing the results of the tour package recommendations produced using the MARCOS method and the TOPSIS method TOPSIS. The test was carried out using 10 trial data used to find tour packages in Badung Regency as a sample. The comparison parameters used are total budget and total time. The comparison of the results of ranking natural tourism objects, culinary tourism, and shopping tourism using the MARCOS method, TOPSIS method, and WASPAS method for 10 trial data can be seen in Table 1.

Table 1. Ranking Results and Preference Values of Test Data

Tourist Attraction	Test Data 1		Test Data 2		Test Data 3		Test Data 4		Test Data 5	
	M	T	M	T	M	T	M	T	M	T
Pantai Pandawa	4 (0.779)	6 (0.948)	3 (0.843)	6 (0.95)	3 (0.852)	6 (0.95)	3 (0.753)	4 (0.95)	3 (0.859)	6 (0.95)
Pantai Balangan	3 (0.788)	1 (1)	1 (0.849)	1 (1)	1 (0.857)	1 (1)	1 (0.764)	1 (1)	1 (0.864)	1 (1)
Pantai Labuan Sait	9 (0.589)	5 (0.965)	4 (0.837)	5 (0.97)	4 (0.847)	5 (0.97)	4 (0.742)	5 (0.95)	4 (0.854)	5 (0.97)
Garuda Wisnu Kencana	11 (0.544)	10 (0.723)	9 (0.545)	10 (0.72)	9 (0.537)	10 (0.70)	9 (0.613)	10 (0.65)	9 (0.530)	10 (0.72)
Pura Uluwatu	5 (0.779)	9 (0.894)	7 (0.551)	9 (0.88)	7 (0.542)	9 (0.83)	7 (0.624)	9 (0.74)	7 (0.535)	9 (0.88)
Pantai Jimbaran	6 (0.769)	4 (0.997)	6 (0.831)	4 (1)	6 (0.841)	4 (0.99)	6 (0.730)	6 (0.94)	6 (0.850)	4 (1)
Pantai Suluban	7 (0.598)	3 (0.998)	5 (0.837)	3 (1)	5 (0.847)	3 (1)	5 (0.742)	3 (0.96)	5 (0.854)	3 (1)
Pantai Kuta	1	2	2	2	2	2	2	2	2	2

	(0.797)	(1)	(0.849)	(1)	(0.852)	(1)	(0.764)	(1)	(0.864)	(1)
Waterboom	8 (0.598)	11 (0.003)	11 (0.460)	11 (0)	11 (0.444)	11 (0.01)	11 (0.592)	11 (0.06)	11 (0.432)	11 (0)
Sangeh	10 (0.797)	8 (0.927)	10 (0.545)	8 (0.91)	10 (0.537)	8 (0.84)	10 (0.613)	8 (0.75)	10 (0.530)	8 (0.91)
Pura Taman Ayun	2 (0.797)	7 (0.927)	8 (0.551)	7 (0.91)	8 (0.542)	7 (0.84)	8 (0.624)	7 (0.75)	8 (0.535)	7 (0.91)
Babi Guling Pak Dobiel	7 (0.449)	5 (0.707)	5 (0.534)	5 (0.71)	5 (0.636)	5 (0.74)	5 (0.699)	4 (0.78)	5 (0.537)	5 (0.71)
Nasi Ayam Bu Oki	4 (0.558)	3 (0.882)	3 (0.676)	3 (0.88)	3 (0.726)	3 (0.89)	3 (0.720)	1 (0.87)	3 (0.679)	3 (0.88)
Nasi Pedas Ibu Andika	6 (0.476)	4 (0.823)	4 (0.604)	4 (0.83)	4 (0.673)	4 (0.84)	8 (0.668)	7 (0.75)	4 (0.608)	4 (0.83)
Babi Guling Bu Dayu	10 (0.251)	6 (0.707)	6 (0.534)	6 (0.71)	6 (0.636)	6 (0.74)	6 (0.699)	5 (0.78)	6 (0.537)	6 (0.71)
Sate Babi Bawah Pohon	8 (0.415)	7 (0.648)	7 (0.512)	7 (0.65)	7 (0.625)	7 (0.69)	4 (0.712)	6 (0.76)	7 (0.513)	7 (0.66)
Menega Cafe	2 (0.750)	10 (0.002)	10 (0.280)	10 (0)	10 (0.355)	10 (0)	10 (0.517)	10 0.04	10 (0.274)	10 (0)
Babi Guling Pak Malen	1 (0.935)	8 (0.590)	8 (0.483)	8 (0.60)	8 (0.599)	8 (0.64)	7 (0.669)	8 (0.69)	8 (0.485)	8 (0.60)
Sate Babi Nyoman Bledor	5 (0.476)	1 (0.987)	1 (0.924)	1 (0.99)	1 (0.883)	1 (0.97)	1 (0.746)	3 (0.82)	1 (0.929)	1 (0.99)
Nook	9 (0.257)	9 (0.008)	9 (0.286)	9 (0.01)	9 (0.364)	9 (0.02)	9 (0.546)	9 (0.13)	9 (0.279)	9 (0.01)
Soto Ceker Pasar Kuta	3 (0.642)	2 (0.940)	2 (0.767)	2 (0.94)	2 (0.783)	2 (0.94)	2 (0.721)	2 (0.83)	2 (0.771)	2 (0.94)
Beachwalk	1 (0.671)	1 (1)	1 (0.670)	1 (1)	1 (0.672)	1 (1)	1 (0.688)	1 (1)	1 (0.670)	1 (1)
Discovery Shopping Mall	4 (0.669)	4 (0.8)	4 (0.669)	4 (0.80)	4 (0.670)	4 (0.80)	4 (0.679)	4 (0.80)	4 (0.668)	4 (0.80)
Lippo Mall Kuta	6 (0.669)	7 (0)	7 (0.667)	7 (0.60)	7 (0.668)	7 (0.60)	7 (0.671)	7 (0.60)	7 (0.667)	7 (0.60)
Mall Bali Galeria	2 (0.671)	2 (1)	2 (0.670)	2 (1)	2 (0.672)	2 (1)	2 (0.688)	2 (1)	2 (0.670)	2 (1)
Pasar Seni Kuta	3 (0.671)	9 (0)	9 (0.663)	9 (0)	9 (0.661)	9 (0)	9 (0.645)	9 (0)	9 (0.664)	9 (0)
Krisna Sunset Road	10 (0.662)	5 (0.8)	5 (0.669)	5 (0.80)	5 (0.670)	5 (0.80)	5 (0.679)	5 (0.80)	5 (0.668)	5 (0.80)
Park 23 Mall Kuta	5 (0.669)	8 (0.4)	8 (0.666)	8 (0.40)	8 (0.666)	8 (0.40)	8 (0.662)	8 (0.40)	8 (0.666)	8 (0.40)
Transmart Carrefour	9 (0.662)	6 (0.8)	6 (0.669)	6 (0.80)	6 (0.670)	6 (0.80)	6 (0.679)	6 (0.80)	6 (0.668)	6 (0.80)
Lippo Plaza Sunset	7 (0.667)	10 (0)	10 (0.663)	10 (0)	10 (0.661)	10 (0)	7 (0.671)	10 (0)	10 (0.664)	10 (0)
Joger Kuta	8 (0.666)	3 (1)	3 (0.670)	3 (1)	3 (0.672)	3 (1)	3 (0.688)	3 (1)	3 (0.670)	3 (1)

Nama Objek	Test Data 6		Test Data 7		Test Data 8		Test Data 9		Test Data 10	
	M	T	M	T	M	T	M	T	M	T
Pantai Pandawa	3 (0.844)	6 (0.95)	3 (0.844)	6 (0.95)	3 (0.772)	6 (0.95)	3 (0.839)	6 (0.95)	3 (0.837)	6 (0.95)
Pantai Balangan	1 (0.850)	1 (1)	1 (0.850)	1 (1)	1 (0.782)	1 (1)	1 (0.845)	1 (1)	1 (0.844)	1 (1)

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Pantai Labuan Sait	4 (0.838)	5 (0.97)	4 (0.838)	5 (0.97)	4 (0.762)	5 (0.97)	4 (0.833)	5 (0.97)	4 (0.831)	5 (0.97)
Garuda Wisnu Kencana	6 (0.544)	10 (0.72)	6 (0.544)	10 (0.72)	9 (0.600)	10 (0.72)	9 (0.548)	10 (0.71)	9 (0.550)	10 (0.66)
Pura Uluwatu	7 (0.550)	9 (0.89)	7 (0.550)	9 (0.89)	7 (0.610)	9 (0.89)	7 (0.554)	9 (0.86)	7 (0.556)	9 (0.76)
Pantai Jimbaran	6 (0.832)	4 (1)	6 (0.832)	4 (1)	6 (0.752)	4 (0.99)	6 (0.827)	4 (0.99)	6 (0.825)	4 (0.99)
Pantai Suluban	5 (0.838)	3 (1)	5 (0.838)	3 (1)	5 (0.762)	3 (1)	5 (0.833)	3 (1)	5 (0.831)	3 (0.99)
Pantai Kuta	2 (0.850)	2 (1)	2 (0.850)	2 (1)	2 (0.782)	2 (1)	2 (0.845)	2 (1)	2 (0.844)	2 (1)
Waterboom	11 (0.458)	11 (0)	11 (0.458)	11 (0)	11 (0.566)	11 (0.01)	11 (0.465)	11 (0.01)	11 (0.469)	11 (0.01)
Sangeh	10 (0.544)	8 (0.92)	10 (0.544)	8 (0.92)	10 (0.600)	8 (0.92)	10 (0.548)	8 (0.89)	10 (0.550)	8 (0.77)
Pura Taman Ayun	8 (0.550)	7 (0.92)	8 (0.550)	7 (0.92)	8 (0.610)	7 (0.92)	8 (0.554)	7 (0.89)	8 (0.556)	7 (0.77)
Babi Guling Pak Dobiel	5 (0.505)	5 (0.71)	5 (0.505)	5 (0.71)	5 (0.511)	5 (0.71)	5 (0.585)	5 (0.72)	5 (0.692)	5 (0.78)
Nasi Ayam Bu Oki	3 (0.661)	3 (0.88)	3 (0.661)	3 (0.88)	3 (0.657)	3 (0.88)	3 (0.700)	3 (0.89)	3 (0.748)	3 (0.90)
Nasi Pedas Ibu Andika	4 (0.585)	4 (0.82)	4 (0.585)	4 (0.82)	4 (0.577)	4 (0.82)	4 (0.636)	4 (0.83)	4 (0.704)	4 (0.85)
Babi Guling Bu Dayu	6 (0.505)	6 (0.71)	6 (0.505)	6 (0.71)	6 (0.511)	6 (0.71)	6 (0.585)	6 (0.72)	6 (0.692)	6 (0.78)
Sate Babi Bawah Pohon	7 (0.479)	7 (0.65)	7 (0.479)	7 (0.65)	7 (0.491)	7 (0.65)	7 (0.569)	7 (0.66)	7 (0.689)	7 (0.74)
Menega Cafe	10 (0.256)	10 (0)	10 (0.256)	10 (0)	10 (0.293)	10 (0)	10 (0.323)	10 (0)	10 (0.414)	10 (0.01)
Babi Guling Pak Malen	8 (0.449)	8 (0.59)	8 (0.449)	8 (0.59)	8 (0.455)	8 (0.59)	8 (0.540)	8 (0.61)	8 (0.663)	8 (0.70)
Sate Babi Nyoman Bledor	1 (0.936)	1 (0.99)	1 (0.936)	1 (0.99)	1 (0.911)	1 (0.98)	1 (0.900)	1 (0.98)	1 (0.843)	1 (0.95)
Nook	9 (0.261)	9 (0.01)	9 (0.261)	9 (0.01)	9 (0.303)	9 (0.01)	9 (0.331)	9 (0.01)	9 (0.427)	9 (0.03)
Soto Ceker Pasar Kuta	2 (0.763)	2 (0.94)	2 (0.763)	2 (0.94)	2 (0.749)	2 (0.94)	2 (0.772)	2 (0.94)	2 (0.780)	2 (0.94)
Beachwalk	1 (0.670)	1 (1)	1 (0.670)	1 (1)	1 (0.673)	1 (1)	1 (0.672)	1 (1)	1 (0.675)	1 (1)
Discovery Shopping Mall	4 (0.668)	4 (0.80)	4 (0.668)	4 (0.80)	4 (0.671)	4 (0.80)	4 (0.670)	4 (0.80)	4 (0.672)	4 (0.80)
Lippo Mall Kuta	7 (0.667)	7 (0.60)	7 (0.667)	7 (0.60)	7 (0.668)	7 (0.60)	7 (0.668)	7 (0.60)	7 (0.668)	7 (0.60)
Mall Bali Galeria	2 (0.670)	2 (1)	2 (0.670)	2 (1)	2 (0.673)	2 (1)	2 (0.672)	2 (1)	2 (0.675)	2 (1)
Pasar Seni Kuta	9 (0.664)	9 (0)	9 (0.664)	9 (0)	9 (0.660)	9 (0)	9 (0.661)	9 (0)	9 (0.658)	9 (0)
Krisna Sunset Road	5 (0.668)	5 (0.80)	5 (0.668)	5 (0.80)	5 (0.671)	5 (0.80)	5 (0.670)	5 (0.80)	5 (0.672)	5 (0.80)
Park 23 Mall Kuta	8 (0.666)	8 (0.40)	8 (0.666)	8 (0.40)	8 (0.665)	8 (0.40)	8 (0.666)	8 (0.40)	8 (0.665)	8 (0.40)
Transmart Carrefour	6 (0.668)	6 (0.80)	6 (0.668)	6 (0.80)	6 (0.671)	6 (0.80)	6 (0.670)	6 (0.80)	6 (0.672)	6 (0.80)
Lippo Plaza Sunset	10	10	10	10	10	10	10	10	10	10

	(0.664)	(0)	(0.664)	(0)	(0.660)	(0)	(0.661)	(0)	(0.658)	(0)
Joger Kuta	3 (0.670)	3 (1)	3 (0.670)	3 (1)	3 (0.673)	3 (1)	3 (0.672)	3 (1)	3 (0.675)	3 (1)

Table 2 shows the results of the comparison of rankings of natural tourism objects, culinary tourism, and shopping tourism using the MARCOS method and the TOPSIS method for 10 test data. The comparison results show that the ranking for each tourist attraction is different; this also causes the results of tour package recommendations that are not the same for each method. From the results of the ranking of tourism objects, a tour package was then made for 10 test data for each of the MARCOS and TOPSIS methods. The comparison of the results of the tour packages produced using the MARCOS method and the TOPSIS method for 10 test data can be seen in Table 2.

Table 2. Comparison of Tour Package Results

Test Data 1		Test Data 2	
MARCOS	TOPSIS	MARCOS	TOPSIS
Pantai Kuta	Pantai Balangan	Sate Nyoman Bledor	Sate Nyoman Bledor
Pura Taman Ayun	Pantai Kuta	Soto Ceker Pasar Kuta	Soto Ceker Pasar Kuta
Pantai Balangan	Pantai Suluban	Nasi Ayam Bu Oki	Nasi Ayam Bu Oki
Pantai Pandawa	Pantai Jimbaran	Nasi Pedas Ibu Andika	Nasi Pedas Ibu Andika
Pura Uluwatu	Pantai Labuan Sait	Babi Guling Pak Dobiel	Babi Guling Pak Dobiel
Pantai Jimbaran	Pantai Pandawa	Babi Guling Bu Dayu	Babi Guling Bu Dayu
Babi Guling Malen	Sate Nyoman Bledor	Pantai Balangan	Pantai Balangan
Menega Cafe	Soto Ceker Pasar Kuta	Pantai Kuta	Pantai Kuta
Soto Ceker Pasar Kuta	Nasi Ayam Bu Oki	Pantai Pandawa	Pantai Suluban
Nasi Ayam Bu Oki	Nasi Pedas Ibu Andika	Pantai Labuan Sait	Pantai Jimbaran
Sate Nyoman Bledor	Babi Guling Pak Dobiel	Pantai Suluban	Pantai Labuan Sait
	Babi Guling Bu Dayu	Pantai Jimbaran	Pantai Pandawa
Beachwalk	Beachwalk	Beachwalk	Beachwalk
Discovery Shopping Mall	Mall Bali Galeria	Mall Bali Galeria	Mall Bali Galeria
Lippo Plaza Sunsey	Joger Kuta	Joger Kuta	Joger Kuta
Mall Bali Galeria	Discovery Shopping Mall	Discovery Shopping Mall	Discovery Shopping Mall
	Krisna Oleh-Oleh Sunset Road	Krisna Oleh-Oleh Sunset Road	Krisna Oleh-Oleh Sunset Road
Rp. 1.975.000	Rp. 1.995.000	Rp. 1.995.000	Rp. 1.995.000
19 jam	19 jam	19 jam	19.5 jam
Test Data 3		Test Data 4	
MARCOS	TOPSIS	MARCOS	TOPSIS
Pantai Balangan	Pantai Balangan	Pantai Balangan	Pantai Balangan
Pantai Kuta	Pantai Kuta	Pantai Kuta	Pantai Kuta
Pantai Pandawa	Pantai Suluban	Pantai Pandawa	Pantai Suluban
Pantai Labuan Sait	Pantai Jimbaran	Pantai Labuan Sait	Pantai Pandawa
Pantai Suluban	Pantai Labuan Sait	Pantai Suluban	Pantai Labuan Sait
Pantai Jimbaran	Pantai Pandawa	Pantai Jimbaran	Pantai Jimbaran
Pura Uluwatu	Pura Taman Ayun	Pura Uluwatu	Pura Taman Ayun
Pura Taman Ayun	Sangeh	Sate Nyoman Bledor	Sate Nyoman Bledor
Sate Nyoman Bledor	Sate Nyoman Bledor	Soto Ceker Pasar Kuta	Soto Ceker Pasar Kuta
Soto Ceker Pasar Kuta	Soto Ceker Pasar Kuta	Nasi Ayam Bu Oki	Nasi Ayam Bu Oki
Nasi Ayam Bu Oki	Nasi Ayam Bu Oki	Nasi Pedas Ibu Andika	Nasi Pedas Ibu Andika
Nasi Pedas Ibu Andika	Nasi Pedas Ibu Andika	Beachwalk	Beachwalk
Sate Babi Bawah Pohon	Sate Babi Bawah Pohon	Mall Bali Galeria	Mall Bali Galeria
Babi Guling Pak Malen	Babi Guling Pak Malen		
Beachwalk	Beachwalk		
Mall Bali Galeria	Mall Bali Galeria		
Joger Kuta	Joger Kuta		

**Comparison of MARCOS and TOPSIS Methods in Determining Bali Tour Packages**

Discovery Shopping Mall	Discovery Shopping Mall		
Krisna Oleh-Oleh Sunset Road	Krisna Oleh-Oleh Sunset Road		
Transmart Carefour	Transmart Carefour		
Lippo Mall Kuta	Lippo Mall Kuta		
Rp. 2.990.000	Rp. 2.980.000	Rp. 995.000	Rp. 985.000
28 jam	28 jam	14 jam	12.5 jam
Test Data 5		Test Data 6	
MARCOS	TOPSIS	MARCOS	TOPSIS
Pantai Balangan	Pantai Balangan	Pantai Balangan	Pantai Balangan
Pantai Kuta	Pantai Kuta	Pantai Kuta	Pantai Kuta
Pantai Pandawa	Pantai Suluban	Pantai Pandawa	Pantai Suluban
Pantai Labuan Sait	Pantai Jimbaran	Pantai Labuan Sait	Pantai Jimbaran
Pantai Suluban	Pantai Labuan Sait	Pantai Suluban	Pantai Labuan Sait
Pantai Jimbaran	Pantai Pandawa	Pantai Jimbaran	Pantai Pandawa
Pura Uluwatu	Pura Taman Ayun	Pura Uluwatu	Pura Taman Ayun
Sate Nyoman Bledor	Sangeh	Pura Taman Ayun	Sangeh
Soto Ceker Pasar Kuta	Sate Nyoman Bledor	Garuda Wisnu Kencana	Pura Uluwatu
Nasi Ayam Bu Oki	Soto Ceker Pasar Kuta	Sate Nyoman Bledor	Garuda Wisnu Kencana
Nasi Pedas Ibu Andika	Nasi Ayam Bu Oki	Soto Ceker Pasar Kuta	Soto Ceker Pasar Kuta
Babi Guling Pak Dobiel	Nasi Pedas Ibu Andika	Nasi Ayam Bu Oki	Nasi Ayam Bu Oki
Babi Guling Bu Dayu	Babi Guling Pak Dobiel	Nasi Pedas Ibu Andika	Nasi Pedas Ibu Andika
Beachwalk	Babi Guling Bu Dayu	Babi Guling Pak Dobiel	Babi Guling Pak Dobiel
Mall Bali Galeria	Sate Babi Bawah Pohon	Babi Guling Bu Dayu	Babi Guling Bu Dayu
Joger Kuta	Babi Guling Pak Malen	Sate Babi Bawah Pohon	Sate Babi Bawah Pohon
Discovery Shopping Mall	Beachwalk	Babi Guling Pak Malen	Babi Guling Pak Malen
Krisna Oleh-Oleh Sunset Road	Mall Bali Galeria	Nook	Nook
Transmart Carefour	Joger Kuta	Beachwalk	Beachwalk
	Discovery Shopping Mall	Mall Bali Galeria	Mall Bali Galeria
	Krisna Oleh-Oleh Sunset Road	Joger Kuta	Joger Kuta
	Transmart Carefour	Discovery Shopping Mall	Discovery Shopping Mall
		Krisna Oleh-Oleh Sunset Road	Krisna Oleh-Oleh Sunset Road
		Transmart Carefour	Transmart Carefour
		Lippo Mall Kuta	Lippo Mall Kuta
		Park 23 Mall	Park 23 Mall
		Pasar Seni Kuta	Pasar Seni Kuta
Rp. 1.495.000	Rp. 1.480.000	Rp. 3.370.000	Rp. 3.390.000
25 jam	24 jam	35 jam	36 jam
Test Data 7		Test Data 8	
MARCOS	TOPSIS	MARCOS	TOPSIS
Pantai Balangan	Pantai Balangan	Pantai Balangan	Pantai Balangan
Pantai Kuta	Pantai Kuta	Pantai Kuta	Pantai Kuta
Pantai Pandawa	Pantai Suluban	Pantai Pandawa	Pantai Suluban



Pantai Labuan Sait	Pantai Jimbaran	Pantai Labuan Sait	Pantai Jimbaran
Pantai Suluban	Pantai Labuan Sait	Pantai Suluban	Pantai Labuan Sait
Pantai Jimbaran	Pantai Pandawa	Pantai Jimbaran	Pantai Pandawa
Pura Uluwatu	Pura Taman Ayun	Pura Uluwatu	Pura Taman Ayun
Pura Taman Ayun	Sangeh	Pura Taman Ayun	Sangeh
Sate Nyoman Bledor	Sate Nyoman Bledor	Beachwalk	Beachwalk
Soto Ceker Pasar Kuta	Soto Ceker Pasar Kuta	Mall Bali Galeria	Mall Bali Galeria
Nasi Ayam Bu Oki	Nasi Ayam Bu Oki	Joger Kuta	Joger Kuta
Nasi Pedas Ibu Andika	Nasi Pedas Ibu Andika	Sate Nyoman Bledor	Sate Nyoman Bledor
Babi Guling Pak Dobiel	Babi Guling Pak Dobiel	Soto Ceker Pasar Kuta	Soto Ceker Pasar Kuta
Babi Guling Bu Dayu	Babi Guling Bu Dayu	Nasi Ayam Bu Oki	Nasi Ayam Bu Oki
Beachwalk	Sate Babi Bawah Pohon		
Mall Bali Galeria	Babi Guling Pak Malen		
Joger Kuta	Beachwalk		
Discovery Shopping Mall	Mall Bali Galeria		
Krisna Oleh-Oleh Sunset Road	Joger Kuta		
Transmart Carefour	Discovery Shopping Mall		
	Krisna Oleh-Oleh Sunset Road		
	Transmart Carefour		
Rp. 1.495.000	Rp. 1.480.000	Rp. 4.985.000	Rp. 4.975.000
23 jam	24 jam	17.5 jam	17.5 jam
<b>Test Data 9</b>		<b>Test Data 10</b>	
<b>MARCOS</b>	<b>TOPSIS</b>	<b>MARCOS</b>	<b>TOPSIS</b>
Pantai Balangan	Pantai Balangan	Sate Nyoman Bledor	Sate Nyoman Bledor
Pantai Kuta	Pantai Kuta	Soto Ceker Pasar Kuta	Soto Ceker Pasar Kuta
Pantai Pandawa	Pantai Suluban	Nasi Ayam Bu Oki	Nasi Ayam Bu Oki
Pantai Labuan Sait	Pantai Jimbaran	Nasi Pedas Ibu Andika	Nasi Pedas Ibu Andika
Pantai Suluban	Pantai Labuan Sait	Babi Guling Pak Dobiel	Babi Guling Pak Dobiel
Pantai Jimbaran	Pantai Pandawa	Babi Guling Bu Dayu	Pantai Balangan
Pura Uluwatu	Pura Taman Ayun	Sate Babi Bawah Pohon	Pantai Kuta
Pura Taman Ayun	Sangeh	Pantai Balangan	Pantai Suluban
Garuda Wisnu Kencana	Pura Uluwatu	Pantai Kuta	Pantai Jimbaran
Sate Nyoman Bledor	Garuda Wisnu Kencana	Pantai Pandawa	Pantai Labuan Sait
Soto Ceker Pasar Kuta	Sate Nyoman Bledor	Pantai Labuan Sait	Beachwalk
Nasi Ayam Bu Oki	Soto Ceker Pasar Kuta	Pantai Suluban	Mall Bali Galeria
Nasi Pedas Ibu Andika	Nasi Ayam Bu Oki	Pantai Jimbaran	Joger Kuta
Babi Guling Pak Dobiel	Nasi Pedas Ibu Andika	Beachwalk	Discovery Shopping Mall
Babi Guling Bu Dayu	Babi Guling Pak Dobiel	Mall Bali Galeria	
Sate Babi Bawah Pohon	Babi Guling Bu Dayu	Joger Kuta	
Babi Guling Pak Malen	Sate Babi Bawah Pohon		
Nook	Babi Guling Pak Malen		
Beachwalk	Nook		
Mall Bali Galeria	Beachwalk		
Joger Kuta	Mall Bali Galeria		
Discovery Shopping Mall	Joger Kuta		

Krisna Oleh-Oleh Sunset Road	Discovery Shopping Mall		
Transmart Carefour	Krisna Oleh-Oleh Sunset Road		
Lippo Mall Kuta	Transmart Carefour		
Park 23 Mall	Lippo Mall Kuta		
Pasar Seni Kuta	Park 23 Mall		
	Pasar Seni Kuta		
Rp. 3.370.000	Rp. 3.290.000	Rp. 2.490.000	Rp. 2.490.000
35 jam	35 jam	15.5 jam	15.5 jam

Table 2 shows the results of the comparison of tour packages as well as the total budget and total time on tour packages generated by the MARCOS and TOPSIS methods for 10 test data. From the results of the tests carried out on the MARCOS method and the TOPSIS method, it can be seen that there are differences in the results of the tour package recommendations. This is because there are differences in the matrix normalization process of the two methods. The normalization of the matrix in the MARCOS method is done by dividing the alternative value by the maximum and minimum values according to the type of criteria, including benefits or costs. While the TOPSIS method normalizes the matrix by dividing the alternative value with the divisor value resulting from the square root of the sum of the existing alternative values. In addition, when compared in terms of the total budget and time parameters, the test results show that the tour packages produced by the MARCOS method are able to produce 7 test data with a better total budget and total time; meanwhile, the TOPSIS method is able to produce 3 test data.

**5. Conclusion**

This research objective is to compare the MARCOS method and the TOPSIS method in determining the best tour package recommendations according to the criteria desired by tourists. These two methods are compared because they have similar concepts in the calculation phase, which relate to positive and negative ideal solutions, although they have differences in the matrix normalization process, which have a significant impact on the calculation results. The test was carried out using 10 different test data in terms of price and time criteria entered by tourists. The results of user input are then used to filter the initial data so as to get a ranking of tourist objects, then proceed with the formation of tour packages. The test results show that of the 10 test data, the MARCOS method produces the 7 best tour packages while the TOPSIS method produces the 3 best tour packages tested based on the total price and time parameters. This shows that, in the formation of tour package recommendations, the MARCOS method is better than the TOPSIS method, so later, the MARCOS method can be used to determine other recommendations because this method has been proven to be more effective. Suggestions for further research are to compare other methods with different case studies and more input data so that it can be seen which method is more effective.

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