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APPLICATION OF GROUP DECISION MAKING IN DETERMINING CULINARY TOURISM WITH TOPSIS AND BORDA METHODS

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Abstract—*Makassar City is one of the destination cities for traveling. Makassar City offers a variety of interesting tours, one of which is culinary tourism. The determination of the best culinary tourism is based on the criteria set by the Makassar City Tourism Office. In managing culinary destinations, tourists are often faced with many choices, so they are confused about choosing the most attractive culinary destinations. This research uses the TOPSIS and BORDA methods. The TOPSIS method is used in determining culinary tourism alternatives based on criteria that become recommendations and the BORDA method is used in determining the selected alternatives based on several DMs who evaluate alternatives. The main objective of this research is to apply group decision making in selecting the best culinary tourism destinations in Makassar City based on group preferences and related criteria with TOPSIS and BORDA methods. This research has conducted 5 iterations involving 4 DMs from the Makassar City Tourism Office. Based on the results of the interview, 8 criteria and 35 alternatives were obtained. Where the Coto Nusantara alternative is ranked the highest with a value of 109,949. While Sop Saudara Irian is ranked last with a value of 62,896. The general benefit of this research is the application of group decision making in determining culinary tourism with the TOPSIS and BORDA methods can produce more objective and representative decision results. This can increase tourist satisfaction in determining culinary tourism.*

Keywords *: BORDA , culinary tourism, group decision making, TOPSIS.*

Intisari—Kota Makassar adalah salah satu kota tujuan untuk berwisata. Kota Makassar menawarkan beragam wisata yang menarik, salah satunya wisata kuliner. Untuk penentuan wisata kuliner terbaik didasarkan pada kriteria yang sudah ditetapkan oleh Dinas Pariwisata Kota Makassar. Dalam mengelola destinasi kuliner, wisatawan seringkali dihadapkan banyak pilihan, sehingga mereka bingung memilih destinasi kuliner yang paling menarik. Penelitian ini menggunakan metode TOPSIS dan BORDA. Metode TOPSIS digunakan dalam penentuan alternatif wisata kuliner berdasarkan kriteria yang menjadi rekomendasi dan metode BORDA digunakan dalam penentuan alternatif terpilih berdasarkan beberapa DM yang melakukan penilaian terhadap alternatif. Tujuan utama penelitian ini adalah untuk menerapkan *group decision making* dalam memilih destinasi wisata kuliner terbaik di Kota Makassar berdasarkan preferensi kelompok dan kriteria terkait dengan metode TOPSIS dan BORDA. Penelitian ini telah melakukan 5 kali iterasi yang melibatkan 4 orang DM dari Dinas Pariwisata Kota Makassar. Berdasarkan hasil wawancara didapatkan 8 kriteria dan 35 alternatif. Dimana alternatif Coto Nusantara menduduki peringkat tertinggi dengan nilai 109,949. Sedangkan Sop Saudara Irian berada di peringkat terakhir dengan nilai 62,896. Manfaat secara umum penelitian ini adalah penerapan group decision making pada penentuan wisata kuliner dengan metode TOPSIS dan BORDA dapat menghasilkan hasil keputusan yang lebih objektif dan representatif. Hal ini dapat meningkatkan kepuasan wisatawan dalam penentuan wisata kuliner.

Keywords *: BORDA, wisata kuliner, group decision making , TOPSIS.*

INTRODUCTION

Makassar City is one of the cities The fourth largest in Indonesia is in the Eastern region of Indonesia. Makassar City is a metropolitan city and also the capital of South Sulawesi Province. It is recorded that the city known as the Mammiri Wind was visited in July 2023 by 1.755 foreign tourists visiting South Sulawesi[1].

According to Government Law Number 10 of 2009 concerning Tourism. Tourism is a variety of tourist activities and is supported by various

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facilities and services provided by the community, entrepreneurs, government and local governments [2].

One of the things we can do when traveling is to enjoy the typical culinary delights of the area or what is called culinary tourism. The word culinary tourism comes from a foreign language, namely culinary travel, which means travel related to cooking. According to the International Culinary Tourism Association (ICTA). Culinary tourism is a unique eating and drinking activity carried out by every traveler who travels. Culinary is included in the accommodation sector. Which is one of the most important sectors in the tourism industry which consists of seven sectors. The accommodation sector involves not only a place to stay or temporary lodging but also the availability of food and beverages associated with it. The food aspect can have an impact on the level of satisfaction in a tourist trip, so that it can encourage tourists to return to visit and recommend the destination to others[3].

Makassar City offers a variety of interesting tours, one of which is culinary tourism [4]. Various typical dishes makes Makassar City an attractive culinary tourism destination, such as Coto Makassar, Sop Konro, Pallubasa, Sop Saudara, Mie Titi, Pisang Epe, Es Pisang Ijo, Es Palu Butung, Barongko, and Jalangkote[5]. Apart from that, Makassar City also has various other interesting tourism potentials that can be explored.

As the tourism industry grows, increasing the number of tourists and income from the tourism sector becomes important. However, in managing tourist destinations, there are often many choices and decisions that must be made, including determining the culinary tourism destinations that are most attractive to tourists. The large number of culinary tours in Makassar City often makes tourists confused about which culinary delights to visit. The Makassar City tourism determination system had previously been developed in research entitled "Application for Determining Tourist Trips for the Makassar Region South Sulawesi using the TOPSIS Method" by Filiol in 2017. However, the system developed was only able to accommodate 1 user. In fact, choosing and visiting tourist attractions such as culinary delights is usually not done alone and tends to be done together. Seeing this, this research carries out several developments on previous research to determine a tourist destination that meets the criteria, requiring the use of group decision making (GDM)[6]. This approach requires several decision makers (DM) to determine the best culinary tourism in Makassar City in a precise and objective way.

The system or modeling made is a group decision-making system in determining culinary tourism in Makassar City. This system is modeled using the Multi Criteria Decision Making (MCDM) method namely Technique for Order of Preference by Similarity to Ideal Solution (TOPSIS)[7]. TOPSIS is a multi-criteria decision support methods. TOPSIS uses the principle that the selected alternative must have the shortest distance from the positive ideal solution and have the farthest distance from the negative ideal solution from a geometric point using euclidean distance to determine the relative closeness between alternatives to the optimal solution[8]. The TOPSIS method is used in determining culinary tourism alternatives based on criteria that become recommendations for decision makers from several decision makers. After obtaining decisions from several decision makers, a group decision-making process is carried out with the voting method, namely BORDA. The BORDA method is used in determining the selected alternative based on several decision makers (DM) who carry out the assessment process of alternatives. So that it can produce the final ranking of each culinary tourism determination with the highest value which becomes a frequently visited culinary tour[9]. Both methods are used in this research to get the final result in determining culinary tourism in Makassar City. The TOPSIS method is used to determine more appropriate culinary tourism alternatives, while the BORDA method is used to select the best culinary tourism alternatives from the aggregated group decisions based on 4 decision makers. By using both methods, this research produces the best alternative that suits the interests of all parties.

There are 8 criteria and 35 alternatives used in this study. The criteria are transportation costs, food prices, public facilities, cleanliness of the place/resto, culinary taste, friendliness of waiters, menu variations, and operating time. In addition, the alternatives are sop saudara irian, coto maros, coto nusantara, coto crow, coto daeng sirua, pallubasa serigala, mie titi panakkukang, dinar, warung pangkep sop saudara, bravo, warung sop saudara ta assauna, warung sop konro bawakaraeng, warung sop saudara fly over, sop konro and grilled ribs sulawesi, sop konro karebosi Hj. Hanafi, sop saudara irian 2 pettarani, coto daeng tata, coto paraikatte, coto tamalanrea 1, coto anging mammiri, coto daeng sutte, coto makassar teuku umar, mie titi signature, mie hengky, mie titi irian, mie titi perintis, ulu juku restaurant, pallubasa rusa, muda mudi restaurant, pallubasa onta, sulawesi restaurant, apong restaurant, kampoeng popsa, kampoeng kuliner and warunk ropang perintis. This research will build a system for determining culinary tourism in Makassar City, where the system used uses the criteria used for problem solving in making decisions. The main objective of this

research is to apply group decision making in the process of choosing the best culinary tourism destination in Makassar City. The decision making is done based on group preferences and related criteria with TOPSIS and BORDA methods. By integrating the two approaches, it is expected to increase visitor satisfaction and support the development of the Makassar City tourism industry. Based on the explanation above, the development of determining culinary tourism trips with the TOPSIS method which was previously only intended for one user can be upgraded to multiuser with the application of the implementation of the TOPSIS and BORDA methods so that it can help tourists in determining the choice of culinary tourism that suits their wishes and budget. Therefore, the authors conducted research related to "Application of Group Decision Making on Culinary Tourism Determination with TOPSIS and BORDA Methods".

The contribution of this research is to provide recommendations to tourists regarding the best culinary tours in Makassar City according to the 8 criteria set by the Makassar City Tourism Office.

MATERIALS AND METHODS

A. Research Design

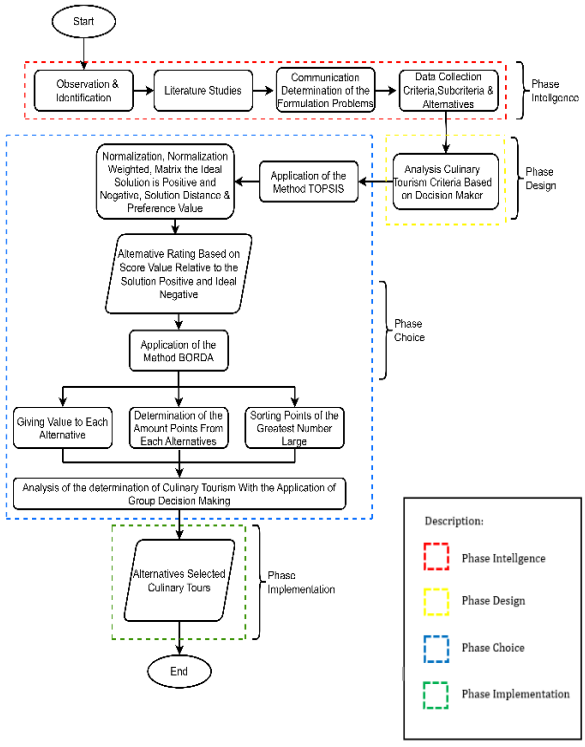

Figure 1. Research Stages

In Figure 1 is a flow chart of research carried out in accordance with the components of the decision support system which consists of 4 research stages, namely:

1. Phase Intelligence

The intelligence phase is the process of tracing and detecting the scope of the problem as well as the problem recognition process. The input data that has been obtained is processed and tested to identify problems. Where the intelligence phase in this research consists of several forms of activities including:

a. Observation and Identification

The first research stage that the author carried out was identifying the problem that was the focus of the research, namely in managing tourist destinations, there are often many choices and decisions that must be made, including determining the culinary tourism destination that is most attractive to tourists. The large number of culinary tours in Makassar City often makes tourists confused about which culinary delights to visit.

b. Study of literature

At this stage, look for several references related to the author's research that will be carried out. These references come from books, national journals and international journals.

c. Criteria, Subcriteria and Alternative Data Collection

Collecting criteria for determining culinary tourism in Makassar City which will be grouped into criteria and sub-criteria data to determine culinary tourism in Makassar City.

d. Communication for Determining Problem Formulation

Communicating between the author and the Makassar City Tourism Office. The author held a meeting with the Makassar City Tourism Office to thoroughly identify the potential and obstacles in developing culinary tourism.

2. Phase Design

The design phase is the process of developing and searching for alternative actions or solutions that can be taken into consideration. A validation and verification process is needed to determine the accuracy of the model in researching existing problems. Where the design phase of this research consists of several forms of activities including:

a. Analysis of Culinary Tourism Criteria based on Decision Makers

Analyzing the criteria used in selecting Makassar City culinary tourism by interacting directly with decision makers.

3. Phase Choice

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The Choice Phase is the stage for various alternative solutions that emerge at the planning stage, so that individuals can make choices by paying attention to criteria based on the goals to be achieved. Where the choice phase in this research consists of several forms of activities including:

a. Application of the Technique for order of preference (TOPSIS) method

Implementing the TOPSIS method in solving problems in determining culinary tourism in Makassar City which produces relevant culinary tourism data in Makassar City.

b. Normalization Calculations, Weighted Normalization, Positive and Negative Ideal Solution Matrix, Solution Distance and Preference Value

At this stage the author performs normalization calculations, weighted normalization, positive and negative ideal solution matrices, solution distances and preference values which produce an alternative ranking output based on score values relative to the positive ideal and negative ideal solutions.

c. Application of the BORDA Method

Implementing the BORDA method in solving problems in determining culinary tourism in Makassar City which produces relevant culinary tourism data in Makassar City.

d. Giving Value to each Alternative

At this stage the way to determine the winner is by giving a score to each alternative by each decision maker.

e. Determining the Number of Points for each Alternative

Calculate the total score of all decision makers.

f. Ordering Points from the Largest Number

The alternative that achieves the highest total score after addition is entitled to the top ranking, followed by the alternative with the second highest total score, and so on, until the alternative with the lowest total score. Scores or values are given for each alternative.

4. Implementation Phase

In the final stage, which is the Implementation Phase, where based on the intelligence phase, design phase and choice phase, recommendations for the best culinary tourism spots in Makassar City are obtained based on 8 criteria. Where the determination process is by applying the TOPSIS and BORDA methods.

B. Data Source

The author conducted case research on determining culinary tourism in Makassar City at the Makassar City Tourism Department through direct observation and interviews with 4 decision makers, namely DM 1 is the Head of the Tourism Department, DM 2 is the Head of the Tourism Destination and Industry Development Division, DM 3 is the Secretary of the Tourism Department and DM 4 is Adyatama Tourism and Creative Economy Young Expert. Where based on the results of interviews, 8 criteria were obtained including Transportation Costs(C1) obtained from the average cost of tourist transportation to the location, Food Prices(C2) obtained from comparing food prices with other places, Public Facilities(C3) obtained from tourist visits around the location, Cleanliness of the Place/Restaurant(C4) is obtained from tourists assessment of the location, Culinary Taste(C5) is obtained from tourist satisfaction, Friendliness/Ethics of Waiters(C6) is obtained from tourists' assessment of friendly service, Menu Variations(C7) is obtained from food which tourists like and Operational Time(C8) obtained from tourist visits.

The criteria used in this study were chosen based on the results of discussions with the Makassar City Tourism Office. This was done because there are many tourists who want to taste the culinary of Makassar City, but they do not know how to determine suitable criteria. Therefore, the Makassar City Tourism Office held a joint discussion to determine the right criteria. The total sub-criteria are 38 and there are 35 restaurants studied as alternatives that serve main courses and desserts. Apart from that, the author also uses primary data which the author uses based on the results of interviews with heads of divisions and employees of the Makassar City Tourism Office and secondary data used in this research is based on the results of reference articles from journals and books that are relevant to the objects and methods used in this research.

C. Data Collection Technique

The data collection techniques chosen by the author for data collection include:

1) Observation

The author collected data directly from the source through direct observation at the Makassar City Tourism Office and restaurants.

2) Literature Study (Library Research)

The author uses literature studies to support existing data and as comparison material. This approach is carried out by referring to journal references and data that is appropriate to the research topic.

3) Interview (Interview)
The author collected data and information directly from the Makassar City Tourism Office by interviewing department heads and employees.

4) Questionnaire (Questionnaire)
The author distributes a questionnaire in the form of a Google Form that can be accessed by the public which can help in providing assessments based on 8 criteria. The collected data was then processed in this research and applied to the TOPSIS and BORDA methods.

D. Research Methods

Research methods are the processes carried out in a study. The type of research used in this research is quantitative research. This research is about a decision support system for determining culinary tourism in Makassar City using the TOPSIS and BORDA methods. The TOPSIS method considers two solutions, namely a positive ideal solution and a negative ideal solution. The alternative chosen is the one that has a minimum distance to the positive ideal solution and a maximum distance to the negative ideal solution[10][11][12][13]. Overall, the steps in the TOPSIS procedure are as follows:

1) Create a normalized decision matrix.

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

with i=1,2 …,m and j=1,2,…,n.

2) Create a weighted normalized decision matrix. The positive ideal solution $\mathbf{A^+}$ and the negative ideal solution $\mathbf{A^-}$ can be determined based on the normalized weight rating ($\mathbf{y_{ij}}$) as:

$$\mathbf{y_{ij}} = \mathbf{w_i r_{ij}} \quad (2)$$

with i=1,2,…,m and j=1,2,…,n.

3) Create a positive ideal solution matrix and a negative ideal solution matrix.

$$\mathbf{A^+} = (\mathbf{y_1^+}, \mathbf{y_2^+}, \dots, \mathbf{y_n^+}) \quad (3)$$

$$\mathbf{A^-} = (\mathbf{y_1^-}, \mathbf{y_2^-}, \dots, \mathbf{y_n^-}) \quad (4)$$

with:

$$\mathbf{y_j^+} = \begin{cases} \mathbf{max_i y_{ij}} \text{ if j is a profit attribute} \\ \mathbf{max_i y_{ij}} \text{ if j is a cost attribute} \end{cases}$$

$$\mathbf{y_j^-} = \begin{cases} \mathbf{max_i y_{ij}} \text{ if j is a profit attribute} \\ \mathbf{max_i y_{ij}} \text{ if j is a cost attribute} \end{cases}$$

4) Determine the distance between the value of each alternative and the positive ideal solution matrix and negative ideal solution matrix.
Distance between alternatives $\mathbf{D_i}$ with a positive ideal solution formulated as:

$$\mathbf{D_i^+} = \sqrt{\sum_{j=1}^{n} (\mathbf{y_i^+} - \mathbf{y_{ij}})^2} \; i = 1,2, \dots,n, \quad (5)$$

The distance between alternative $\mathbf{A}_i$ and the negative ideal solution is formulated as:

$$\mathbf{D_i^-} = \sqrt{\sum_{j=1}^{n} (\mathbf{y_{ij}} - \mathbf{y_i^-})^2} \; i = 1,2, \dots,n, \quad (6)$$

5) Determine the preference value for each alternative. TOPSIS requires a performance rating of each Ai alternative on each normalized Cj criterion, namely:
The preference value for each alternative ($\mathbf{V_i}$) is given as

$$\mathbf{V_i} = \frac{\mathbf{D_i^-}}{\mathbf{D_i^- + D_i^+}} \quad (7)$$

The BORDA method is a vote collection technique used to determine the ranking of various criteria or alternatives. The main concept is to combine individual rankings made by a group of decision makers to produce an overall ranking. This combination is formed based on the accumulated scores of each individual ranking. Individual ratings are expressed on a numerical scale with integers from 0 to n-1, where n is the number of criteria. Each criterion is scored based on its ranking in individual preferences. The most commonly used approach is to assign a score of n-1 points to the criterion ranked first, n-2 points to the criterion ranked second, and so on until reaching 0 points for the lowest. The criterion with the highest final score will be the winner[11][14][15][16].

RESULTS AND DISCUSSION

A. Decision Making Model Using the TOPSIS Method

Determining the best culinary tourism in Makassar City can be done by using the TOPSIS method as an assessment criterion. The TOPSIS method bases its concept on finding a weighted sum of the assessment values for each alternative for all attributes. With the results of this calculation, decision makers can easily carry out evaluations using the TOPSIS method.

Based on the results of observations and interviews at the Makassar City Tourism Office, 8 criteria were obtained including:

Table 1. Criteria

Criteria	Criteria Name	Obtained
C1	Transportation Costs	From the average cost of tourist transportation to the location
C2	Food Prices	From comparing food prices with other places
C3	Public Facilities	From tourist visits around the location
C4	Cleanliness of the Place/Restaurant	From tourists' assessment of the location
C5	Culinary Taste	From tourist satisfaction
C6	Friendliness/Ethics of Waiters	From tourists assessment of friendly service
C7	Menu Variations	From the food that tourists like
C8	Operational Time	From tourist visits

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As consideration (criteria), there are 35 considerations used, namely:

Table 2. Alternative

Alternative	Alternative Name
A1	Sop Saudara Irian
A2	Coto Maros
A3	Coto Nusantara
A4	Coto Crow
A5	Coto Daeng Sirua
A6	Pallubasa Serigala
A7	Mie Titi Panakkukang
A8	Dinar
A9	Warung Pangkep Sop Saudara
A10	Bravo
A11	Warung Sop Saudara Ta Assauna
A12	Warung Sop Konro Bawakaraeng
A13	Warung Sop Saudara Fly Over
A14	Sop Konro and Grilled Ribs Sulawesi
A15	Sop Konro Karebosi Hj. Hanafi
A16	Sop Saudara Irian 2 Pettarani
A17	Coto Daeng Tata
A18	Coto Paraikatte
A19	Coto Tamalanrea 1
A20	Coto Anging Mammiri
A21	Coto Daeng Sutte
A22	Coto Makassar Teuku Umar
A23	Mie Titi Signature
A24	Mie Hengky
A25	Mie Titi Irian
A26	Mie Titi Perintis
A27	Restaurant Ulu Juku
A28	Pallubasa Rusa
A29	Muda Mudi Restaurant
A30	Pallubasa Onta
A31	Restaurant Sulawesi
A32	Restaurant Apong
A33	Kampoeng Popsa
A34	Kampoeng Kuliner
A35	Warunk Ropang Perintis

This research has carried out five iterations to analyze the TOPSIS and BORDA methods based on 4 decision makers, where the results can be seen in the table 3 and table 4.

Table 3. Five Iterated Assessment Results

	Results		
DM	1	2	3
DM1	0,736(Restaurant Ulu Juku)	0,770 (Coto Nusantara)	0,769 (Warung Sop Saudara Ta Assauna)
DM2	0,735 (Kampoeng Popsa)	0,793 (Coto Nusantara)	0,781 (Coto Paraikatte & Pallubasa Rusa)
DM3	0,744 (Pallubasa Rusa & Coto Paraikatte)	0,808 (Coto Nusantara)	0,766 (Sulawesi Restaurant)
DM4	1,000 (Warunk Ropang Perintis)	1,000 (Warunk Ropang Perintis)	1,000 (Warunk Ropang Perintis)

Table 4. Five Iterated Assessment Results (2)

	Results	
DM	4	5
DM1	0,734 (Coto Paraikatte)	0,754 (Warung Sop Saudara Ta Assauna)
DM2	0,765 (Coto Paraikatte)	0,779 (Warunk Ropang Perintis)
DM3	0,746 (Coto Paraikatte)	0,790 (Restaurant Sulawesi)
DM4	1,000 (Warunk Ropang Perintis)	1,000 (Warunk Ropang Perintis

Table 3 and table 4 shows the results of five iterations obtained based on the preference results, showing that Warunk Ropang Perintis is ranked first. In this case, Warunk Ropang Perintis is considered the best culinary tourism in Makassar City.

Table 5. Criteria for Determining Culinary Tourism

Criteria Code	Criteria	Subcriteria	Range	Weight
C1	Transportation costs	Very cheap	5,000 – 10,000	1
		Cheap	11,000 – 20,000	2
		Cheap enough	21,000 – 30,000	3
		Expensive	31,000 – 40,000	4
		Very expensive	41,000 – 50,000	5
C2	Food Prices	Very cheap	5,000 – 15,000	1
		Cheap	16,000 – 25,000	2
		Cheap enough	26,000 – 35,000	3
		Expensive	36,000 – 50,000	4
		Very expensive	51,000 – 100,000	5
C3	Public facilities	Sink		1
		Sink + Toilet		2
		Sink + Toilet + Parking		3
		Sink + Toilet + Parking + Prayer room		4
C4	Cleanliness of the Place/Restaurant	Not clean		1
		Not clean enough		2
		Clean		3
		Very clean		4
C5	Culinary Taste	Not good		1
		Not good		2
		Nice		3
		Very delicious		4
C6	Friendliness/Servant Ethics	Not friendly		1
		Not friendly		2
		Friendly		3
		Very friendly		4

Criteria Code	Criteria	Subcriteria	Range	Weight
C7	Menu Variations	Barongko + Jalangkote		1
		Epe Banana + Green Banana Ice + Palu Butung Ice		2
		Konro Soup + Coto Makassar + Pallubasa		3
		Konro Soup + Coto Makassar + Pallubasa + Brother Soup + Titi Noodles		4
C8	Operational Time	Morning		1
		Morning + Afternoon		2
		Morning + Afternoon + Evening		3
		Morning + Afternoon + Afternoon + Night		4

In Table 5 there are several sub-criteria obtained based on 8 criteria for determining culinary tourism. Table 6 is the weight of each criterion. It is known that the weight of each criterion is as follows:

Table 6. Weight of Each Criteria

Criteria	DM1	DM2	DM3	DM4
C1	5	4	3	2
C2	5	5	4	4
C3	3	3	3	3
C4	4	5	5	4
C5	4	5	5	5
C6	3	4	3	4
C7	3	3	3	4
C8	4	3	2	3

Table 7 is a match value rating where the value conversion process is in accordance with alternative data. From the alternative data obtained, the suitability value rating is then carried out as in the following table 7

Table 7. Rating of Suitability Value

Alternatives/ Criteria	C1	C2	C3	C4	C5	C6	C7	C8
A1	2	2	3	3	2	3	3	4
A2	2	2	3	2	2	2	3	4
A3	2	2	3	4	4	4	3	3
A4	3	3	3	2	3	3	3	4
A5	3	2	3	3	4	3	3	4
A6	3	3	3	3	4	4	3	4
A7	3	3	3	4	4	3	0	4
A8	3	4	3	4	4	3	2	4
A9	3	5	3	1	3	2	3	4
A10	5	2	3	2	3	3	2	4

Table 8 and table 9 is a normalized decision matrix, to get the value, the calculation is first carried out on each candidate based on the criteria. The calculation is done with equation 1.

Table 8. Normalized Decision Matrix

Alternatives/Criteria	C1	C2	C3	C4
Precriteria Rank Result	286	316	315	294
Root Result of Rank per Criteria	16,912	17,776	17,748	17,146

Table 9. Normalized Decision Matrix (2)

Alternatives/Criteria	C5	C6	C7	C8
Precriteria Rank Result	376	363	277	546
Root Result of Rank per Criteria	19,391	19,053	16,643	23,367

Table 10 and table 11 is the normalization data. The calculation is done by dividing the match value rating (Table 7) by the rank result per criteria (Table 8 and table 9).

Table 10. Normalized Data

Alternatives/ Criteria	C1	C2	C3	C4
A1	0,118	0,113	0,169	0,175
A2	0,118	0,113	0,169	0,117
A3	0,118	0,113	0,169	0,233
A4	0,177	0,169	0,169	0,117
A5	0,177	0,113	0,169	0,175
A6	0,177	0,169	0,169	0,175
A7	0,177	0,169	0,169	0,233
A8	0,177	0,225	0,169	0,233
A9	0,177	0,281	0,169	0,058
A10	0,296	0,113	0,169	0,117

Table 11. Normalized Data (2)

Alternatives/ Criteria	C5	C6	C7	C8
A1	0,103	0,157	0,180	0,171
A2	0,103	0,105	0,180	0,171
A3	0,206	0,210	0,180	0,128
A4	0,155	0,157	0,180	0,171
A5	0,206	0,157	0,180	0,171
A6	0,206	0,210	0,180	0,171
A7	0,206	0,157	0,000	0,171
A8	0,206	0,157	0,120	0,171
A9	0,155	0,105	0,180	0,171
A10	0,155	0,157	0,120	0,171

The weighted normalized decision matrix is obtained by multiplying the alternative value (Table 10 and table 11) for each criterion by the criterion weight value (Table 6). The calculation is carried out using equation 2. So we get a weighted normalized decision matrix which can be seen in table 12, table 13, table 14, table 15, table 16, table 17, table 18 and table 19 as follows:

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Table 12. DM1 Weighted Normalized Decision Matrix

Alternatives/Criteria	C1	C2	C3	C4
A1	0,591	0,563	0,507	0,700
A2	0,591	0,563	0,507	0,467
A3	0,591	0,563	0,507	0,933
A4	0,887	0,844	0,507	0,467
A5	0,887	0,563	0,507	0,700
A6	0,887	0,844	0,507	0,700
A7	0,887	0,844	0,507	0,933
A8	0,887	1,125	0,507	0,933
A9	0,887	1,406	0,507	0,233
A10	1,478	0,563	0,507	0,467

Table 13. DM1 Weighted Normalized Decision Matrix (2)

Alternatives/Criteria	C5	C6	C7	C8
A1	0,413	0,472	0,541	0,685
A2	0,413	0,315	0,541	0,685
A3	0,825	0,630	0,541	0,514
A4	0,619	0,472	0,541	0,685
A5	0,825	0,472	0,541	0,685
A6	0,825	0,630	0,541	0,685
A7	0,825	0,472	0,000	0,685
A8	0,825	0,472	0,361	0,685
A9	0,619	0,315	0,541	0,685
A10	0,619	0,472	0,361	0,685

Table 14. DM2 Weighted Normalized Decision Matrix

Alternatives/Criteria	C1	C2	C3	C4
A1	0,473	0,563	0,507	0,875
A2	0,473	0,563	0,507	0,583
A3	0,473	0,563	0,507	1,166
A4	0,710	0,844	0,507	0,583
A5	0,710	0,563	0,507	0,875
A6	0,710	0,844	0,507	0,875
A7	0,710	0,844	0,507	1,166
A8	0,710	1,125	0,507	1,166
A9	0,710	1,406	0,507	0,292
A10	1,183	0,563	0,507	0,583

Table 15. DM2 Weighted Normalized Decision Matrix (2)

Alternatives/Criteria	C5	C6	C7	C8
A1	0,516	0,630	0,541	0,514
A2	0,516	0,420	0,541	0,514
A3	1,031	0,840	0,541	0,385
A4	0,774	0,630	0,541	0,514
A5	1,031	0,630	0,541	0,514
A6	1,031	0,840	0,541	0,514
A7	1,031	0,630	0,000	0,514
A8	1,031	0,630	0,361	0,514
A9	0,774	0,420	0,541	0,514
A10	0,774	0,630	0,361	0,514

Table 16. DM3 Weighted Normalized Decision Matrix

Alternatives/Criteria	C1	C2	C3	C4
A1	0,355	0,450	0,507	0,875
A2	0,355	0,450	0,507	0,583
A3	0,355	0,450	0,507	1,166
A4	0,532	0,675	0,507	0,583
A5	0,532	0,450	0,507	0,875
A6	0,532	0,675	0,507	0,875
A7	0,532	0,675	0,507	1,166
A8	0,532	0,900	0,507	1,166
A9	0,532	1,125	0,507	0,292
A10	0,887	0,450	0,507	0,583

Table 17. DM3 Weighted Normalized Decision Matrix (2)

Alternatives/Criteria	C5	C6	C7	C8
A1	0,516	0,472	0,541	0,342
A2	0,516	0,315	0,541	0,342
A3	1,031	0,630	0,541	0,257
A4	0,774	0,472	0,541	0,342
A5	1,031	0,472	0,541	0,342
A6	1,031	0,630	0,541	0,342
A7	1,031	0,472	0,000	0,342
A8	1,031	0,472	0,361	0,342
A9	0,774	0,315	0,541	0,342
A10	0,774	0,472	0,361	0,342

Table 18. DM4 Weighted Normalized Decision Matrix

Alternatives/Criteria	C1	C2	C3	C4
A1	0,237	0,450	0,507	0,700
A2	0,237	0,450	0,507	0,467
A3	0,237	0,450	0,507	0,933
A4	0,355	0,675	0,507	0,467
A5	0,355	0,450	0,507	0,700
A6	0,355	0,675	0,507	0,700
A7	0,355	0,675	0,507	0,933
A8	0,355	0,900	0,507	0,933
A9	0,355	1,125	0,507	0,233
A10	0,591	0,450	0,507	0,467

Table 19. DM4 Weighted Normalized Decision Matrix (2)

Alternatives/Criteria	C5	C6	C7	C8
A1	0,516	0,630	0,721	0,514
A2	0,516	0,420	0,721	0,514
A3	1,031	0,840	0,721	0,385
A4	0,774	0,630	0,721	0,514
A5	1,031	0,630	0,721	0,514
A6	1,031	0,840	0,721	0,514
A7	1,031	0,630	0,000	0,514
A8	1,031	0,630	0,481	0,514
A9	0,774	0,420	0,721	0,514
A10	0,774	0,630	0,481	0,514

Table 20 and table 21 is the positive ideal solution matrix and negative ideal solution matrix. If the criteria are included in the benefit attribute, then the positive ideal solution is obtained by finding the maximum value for each criterion. Meanwhile, the negative ideal solution is obtained by finding the minimum value for each criterion.

If the criteria are included in the cost attribute, then the positive ideal solution is obtained by finding the minimum value for each criterion. Meanwhile, the negative ideal solution is obtained by finding the maximum value for each criterion. Calculations are carried out with equations 3 and 4.

Table 20. Positive Ideal Solution Matrix and Negative Ideal Solution Matrix

DM	Ideal Solution	C1 Cost	C2 Cost	C3 Benefits	C4 Benefits
DM 1	A+	0,296	0,281	0,507	0,933
	A-	1,478	1,406	0,507	0,233
DM 2	A+	0,237	0,281	0,507	1,166
	A-	1,183	1,406	0,507	0,292
DM 3	A+	0,177	0,225	0,507	1,166
	A-	0,887	1,125	0,507	0,292
DM 4	A+	0,118	0,225	0,507	0,933
	A-	0,591	1,125	0,507	0,233

Table 21. Positive Ideal Solution Matrix and Negative Ideal Solution Matrix (2)

DM	Ideal Solution	C5 Cost	C6 Cost	C7 Benefits	C8 Benefits
DM 1	A+	0,825	0,630	0,721	0,685
	A-	0,413	0,315	0,000	0,514
DM 2	A+	1,031	0,840	0,721	0,514
	A-	0,516	0,420	0,000	0,385
DM 3	A+	1,031	0,630	0,721	0,342
	A-	0,516	0,315	0,000	0,257
DM 4	A+	1,031	0,840	0,961	0,514
	A-	0,516	0,420	0,000	0,385

Table 22 and table 23 is the distance between the value of each alternative with the positive ideal solution matrix and the negative ideal solution matrix. Calculation of the distance between the value of each alternative and the positive ideal solution matrix and negative ideal solution matrix is carried out using equations 5 and 6.

Table 22. The distance between the value of each alternative with the Positive Ideal Solution Matrix and the Negative Ideal Solution Matrix

Alternative	DM1		DM2	
	D+	D-	D+	D-
A1	0,670	1,436	0,750	1,382
A2	0,828	1,369	0,975	1,269
A3	0,478	1,597	0,429	1,648
A4	0,992	1,053	1,012	1,022
A5	0,735	1,340	0,682	1,377
A6	0,868	1,214	0,811	1,277
A7	1,100	1,175	1,051	1,278
A8	1,103	1,128	1,053	1,235
A9	1,510	0,845	1,591	0,774
A10	1,376	0,997	1,247	1,027

Table 23. The distance between the value of each alternative with the Positive Ideal Solution Matrix and the Negative Ideal Solution Matrix (2)

Alternative	DM3		DM4	
	D+	D-	D+	D-
A1	0,700	1,185	0,698	1,175
A2	0,905	1,060	0,884	1,083
A3	0,349	1,470	0,373	1,426
A4	0,890	0,897	0,803	0,980
A5	0,565	1,230	0,513	1,255
A6	0,668	1,155	0,609	1,206
A7	0,934	1,180	1,108	1,037
A8	0,858	1,170	0,887	1,074
A9	1,378	0,702	1,287	0,812
A10	1,056	0,877	0,913	0,932

Table 24 and table 25 are the preference values for each alternative. This is the last step in the TOPSIS method. From the preference values, the alternatives will be sorted into the top order. The alternative that has the largest preference value will be the prioritized alternative for determining culinary tourism. The alternatives in this study consist of 35 restaurants serving main course and dessert in Makassar City. Based on the TOPSIS calculation using equation 7, the 10 best restaurants in Makassar City were successfully selected according to the criteria and sub-criteria that have been determined.

Table 24. Preference Value for each Alternative

Alternative	Preference Value DM1	Ranking	Alternative	Preference Value DM2	Ranking
A3	0,770	1	A3	0,793	1
A11	0,768	2	A11	0,749	2
A18	0,739	3	A18	0,730	3
A28	0,739	3	A28	0,730	3
A34	0,722	5	A34	0,728	5
A27	0,716	6	A29	0,693	6
A21	0,713	7	A27	0,691	7
A29	0,701	8	A21	0,673	8
A1	0,682	9	A5	0,669	9
A14	0,667	10	A1	0,648	10

Table 25. Preference Value for each Alternative (2)

Alternative	Preference Value DM3	Ranking	Alternative	Preference Value DM4	Ranking
A3	0,808	1	A35	1,000	1
A11	0,734	2	A3	0,793	2
A18	0,732	3	A11	0,734	3
A28	0,732	3	A18	0,732	4
A34	0,718	5	A28	0,732	4
A27	0,689	6	A5	0,710	6
A5	0,685	7	A27	0,704	7
A29	0,684	8	A33	0,677	8
A21	0,640	9	A34	0,675	9
A6	0,634	10	A21	0,669	10

B. Final Decision Making Model with the Application of Group Decision Making using the BORDA Method

Calculating the BORDA method, each alternative will be given a value based on the priority order for each DM. Values are given based on the order (Ranking) of the alternatives, where the alternative that is ranked first will be given a value of n (Number of Alternatives). Meanwhile, the alternative that ranks last will be given a value of 1.

Table 26. BORDA Points

Ranking	Mark
1	35
2	34
3	33
4	32
5	31
6	30
7	29
8	28
9	27
10	26

In table 27, table 28, table 29 and table 30 the calculation is done by multiplying the preference value of each alternative by the borda points obtained. After the alternative value is obtained then the value is summed up with each DM. The following is the calculation for DM1 (Head of the Tourism Office).

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Table 27. BORDA calculation for DM1

Ranking	Alternative	V	BORDA Points	Results
9	A1	0,682	27	18,414
14	A2	0,623	22	13,708
1	A3	0,770	35	26,939
24	A4	0,515	12	6,181
11	A5	0,646	25	16,144
19	A6	0,583	17	9,915
23	A7	0,516	13	6,713
25	A8	0,506	11	5,562
32	A9	0,359	4	1,435
31	A10	0,420	5	2,100

For DM2 calculations (Head of Destination Development and Tourism Industry)

Table 28. BORDA calculation for DM2

Ranking	Alternative	V	BORDA Points	Results
10	A1	0,648	26	16,851
19	A2	0,566	17	9,614
1	A3	0,793	35	27,771
28	A4	0,503	8	4,021
9	A5	0,669	27	18,059
14	A6	0,612	22	13,456
23	A7	0,549	13	7,133
24	A8	0,540	12	6,475
34	A9	0,327	2	0,655
31	A10	0,452	5	2,258

For DM3 calculations (Secretary of the Tourism Service)

Table 29. BORDA calculation for DM3

Ranking	Alternative	V	BORDA Points	Results
12	A1	0,629	24	15,084
26	A2	0,539	10	5,393
1	A3	0,808	35	28,283
29	A4	0,502	7	3,513
7	A5	0,685	29	19,874
10	A6	0,634	26	16,473
23	A7	0,558	13	7,254
20	A8	0,577	16	9,232
33	A9	0,337	3	1,012
31	A10	0,454	5	2,268

For DM4 calculations (Young Expert Tourism and Creative Economy Adyatama)

Table 30. BORDA calculation for DM4

Ranking	Alternative	V	BORDA Points	Results
16	A1	0,627	20	12,547
24	A2	0,550	12	6,605
2	A3	0,793	34	26,956
25	A4	0,550	11	6,046
6	A5	0,710	30	21,300
11	A6	0,665	25	16,614
31	A7	0,483	5	2,417
26	A8	0,548	10	5,477
32	A9	0,387	4	1,547
29	A10	0,505	7	3,535

After getting the value of the BORDA calculation for each DM, the next is to add up the value of each alternative in each DM so that the final value can be seen in table 31.

Table 31. Addition of Values for each DM

Alternative	DM1	DM2	DM3	DM4	The final result
A1	18,414	16,851	15,084	12,547	62,896
A2	13,708	9,614	5,393	6,605	35,320
A3	26,939	27,771	28,283	26,956	109,949
A4	6,181	4,021	3,513	6,046	19,760
A5	16,144	18,059	19,874	21,300	75,378
A6	9,915	13,456	16,473	16,614	56,459
A7	6,713	7,133	7,254	2,417	23,518
A8	5,562	6,475	9,232	5,477	26,747
A9	1,435	0,655	1,012	1,547	4,649
A10	2,100	2,258	2,268	3,535	10,162

From the total results, the alternatives will then be sorted from the highest value to the lowest value to obtain a ranking for determining culinary tourism. The alternative at the top is given the largest value, while the alternative at the bottom is given the smallest value. Table 32 is a ranking of alternatives.

Table 32. Alternative Ranking

Alternative	The final result	Ranking
A3	109,949	1
A11	100,755	2
A18	96,056	3
A28	96,056	3
A34	85,432	5
A27	82,586	6
A5	75,378	7
A29	75,177	8
A21	74,191	9
A1	62,896	10

In table 32 it can be seen that alternative A3 gets the largest value, namely 109,949. This shows that the alternative (Coto Nusantara) has the highest priority (feasible) and can help tourists in determining culinary tourism choices that suit their desires and budget. Meanwhile, alternative A9 got the lowest value, namely 62,896. This shows that there is an alternative (Sop Saudara Irian) has the lowest priority to be worthy of helping tourists in determining culinary tourism choices that suit their desires and budget.

CONCLUSION

This research shows that the Technique for Order of Preference by Similarity to Ideal Solution (TOPSIS) and BORDA methods are effective in determining culinary destinations in Makassar City. This method helps Decision Makers (DM) in making decisions regarding determining culinary tourism. The development of Group Decision Making (GDM) has succeeded in fulfilling the expected objectives, producing faster and more accurate calculations, so that the resulting information can be used as decision support.

In this research, five iterations were carried out involving 4 decision makers from the Makassar City Tourism Office. The assessment process is carried

out based on 8 criteria and 35 alternatives. The calculation results show that from the 8 criteria used, namely Transportation Costs, Food Prices, Public Facilities, Cleanliness of the Place/Restaurant, Culinary Taste, Friendliness/Ethics of Waiters, Menu Variations, and Operational Times, as well as 35 alternatives, namely Sop Saudara Irian, Coto Maros, Coto Nusantara, Coto Crow, Coto Daeng Sirua, Pallubasa Serigala, Mie Titi Panakkukang, Dinar, Warung Pangkep Sop Saudara, Bravo, Warung Sop Saudara Ta Assauna, Warung Sop Konro Bawakaraeng, Warung Sop Saudara Fly Over, Sop Konro And Grilled Ribs Sulawesi, Sop Konro Karebosi Hj. Hanafi, Sop Saudara Irian 2 Pettarani, Coto Daeng Tata, Coto Paraikatte, Coto Tamalanrea 1, Coto Anging Mammiri, Coto Daeng Sutte, Coto Makassar Teuku Umar, Mie Titi Signature, Mie Hengky, Mie Titi Irian, Mie Titi Perintis, Ulu Juku Restaurant, Pallubasa Rusa, Muda Mudi Restaurant, Pallubasa Onta, Sulawesi Restaurant, Apong Restaurant, Kampoeng Popsa, Kampoeng Kuliner and Warunk Ropang Perintis. Coto Nusantara was ranked highest with a score of 109,949. Meanwhile, Sop Saudara Irian is in last place with a score of 62,896. The suggestions given from the results of this study and can be developed for further research include; researchers can use other methods in finding weights, for example with AHP (Analytical Hierarchy Process). The application of AHP can help in the evaluation process and comparison of different culinary destinations. In addition, it is recommended to combine other methods in the process of assessing culinary destinations to enable comparison of the resulting weights or ratings.

REFERENCES

[1] BPS South Sulawesi, "Development of Tourism and Transportation in South Sulawesi July 2023," 2021.

[2] Indonesia, "Law Of The Republic Of Indonesia Number 10. Of 2009 Concerning Tourism," 2009.

[3] RS Saptaningtyas, T. Handayani, and NKAIP Mentari Indriani, "Study of the Culinary Tourism Potential of Ampenan Beach," *Sade J. Architecture, Planol. and Tech. Civil* , vol. 1, no. 1, pp. 14–19, 2021.

[4] FG Lubis, RK Dewi, and KC Brata, "Development of an Android Application for Recommendations for Shopping Tourist Attractions in Malang City with a Group Decision Support System and Location-Based," vol. 4, no. 3, pp. 874–882, 2020.

[5] RR Syams and AA Soebroto, "Tourism Recommendation System in Batu City Using the BORDA Voting Method Based on the TOPSIS and PROMETHEE Methods," *J. Pengemb. Technol. Inf. and Computer Science.* , vol. 3, no. 10, pp. 10207–10215, 2019.

[6] MB Hilmi, "Android Based Recommendations for Beach Tourism Around Malang Using Group Decision Support System and Location Based Service," vol. 4, no. 3, pp. 782–788, 2020.

[7] K. Y. Palilingan, "Multi Criteria Decision Making Using TOPSIS Method For Choosing Mate," *J. Tek. Inform.*, vol. 15, no. 4, pp. 283–290, 2020.

[8] D. Pribadi, R. A. Saputra, J. M. Hudin, and Gunawan, *Decision Support System*, First. Graha Ilmu, 2020.

[9] Nurjannah and D. P. Utomo, "Color Guard Selection Decision Support System for the Ginada Marching Band Using the Vikor and Borda Methods," JUKI J. Comput. and Inform., vol. 2, no. 1, pp. 35-48, 2020.

[10] Y. Sonatha, M. Azmi, and I. Rahmayuni, "Group Decision Support System Using AHP, TOPSIS and BORDA Methods for Loan Determination in Cooperatives," *Int. J. Informatics Vis.* , vol. 5, no. 4, pp. 372–379, 2021.

[11] E. Atmaca, E. Aktaş, and HN Öztürk, "Evaluated Post-Disaster and Emergency Assembly Areas Using Multi-Criteria Decision-Making Techniques: A Case Study of Turkey," *Sustain.* , vol. 15, no. 10, 2023.

[12] R. R. Menon and V. Ravi, "Using AHP-TOPSIS methodologies in the selection of sustainable suppliers in an electronics supply chain," *Clean. Mater.*, vol. 5, no. August 2022, pp. 1–15, 2022.

[13] A. Artyanto Saputra and R. Candra Noor Santi, "Selection of Culinary Business Locations in the West Semarang Region Using Web-Based SAW and TOPSIS Methods," *J. Tekno Kompak* , vol. 16, no. 2, pp. 44–58, 2022.

[14] CZ Radulescu, M. Radulescu, and R. Boncea, "A Hybrid Group Weighting Method based on the BORDA and the Group Best Worst Method with application for digital development indicators," *Procedia Comput. Sci.* , vol. 214, pp. 10–17, 2022.

[15] P. Sugiartawan, IGI Sudipa, and IKAG Wiguna, "GDSS Development of Bali Tourism Destinations With AHP and BORDA Algorithms Based on Tri Hita Karana," *IJCCS (Indonesian J. Comput. Cybern. Syst.* , vol. 16, no 3, p. 271, 2022.

[16] DH Ashaf, SW Hidayat, and A. Ahmadi, "Decision Support System Determines the Purchase of House Right Using Analytical Hierarchy Process (AHp) and BORDA Methods," *J. Asro* , vol. 10, no. 1, p. 1, 2019.