Implementation of TOPSIS Methods in Determining Makassar Special Culinary Business Location

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***Abstract*—A typical Makassar culinary business that offers a variety of benefits such as typical food is sought after by tourists visiting the city of Makassar, and typical Makassar food has been widely known by the public. Nevertheless, culinary business is not infrequently failing, one of the causes is location. The selection of locations that do not meet certain criteria directly impacts the failure of the culinary business. During this time, the determination of the feasibility of the business location for the object under study still uses conventional methods that require time and cost to conduct a location determination survey, therefore, it is important to choose a method to determine the proper location of the business and supported by the appropriate calculation pattern. In this study, the TOPSIS method was used to build a system that can solve the Multi Criteria Decision Making (MCDM) problem for the feasibility of the best culinary business location, by calculating 5 criteria and 10 alternatives, the positive ideal solution value is 11.66, the negative solution value the ideal is 13.41, and the Closeness Relative value is 0.535.**

Keywords—TOPSIS, business location, food, culinary

I. INTRODUCTION

Along with the development of the city of Makassar, Culinary Business became one of the types of business that are in great demand by the community, especially the typical Makassar culinary business, as well as the large number of tourists visiting the city of Makassar so that many trading businesses sell typical food of Makassar city. The culinary business in the city of Makassar sells various types of culinary that highlight the uniqueness of its products as a distinctive feature of Makassar City. One of Makassar's culinary efforts is *Coto* and *Konro*.

With the development of the Makassar City population which is increasing, the desire to fulfill food needs is also increasing. So many people try their luck by opening a culinary business. With the above problems, to determine strategic and appropriate location selection decisions that are expected to be able to use assistance TOPSIS method. The TOPSIS method is chosen because the concept is simple and easy to understand, its computation is efficient and has the ability to measure the relative performance of decision alternatives in a simple mathematical form [1], [2]. This method is expected to help the selection of strategic locations and those that are as expected, because the assessment in ranking is based on the predetermined criteria and weights [3].

One factor that contributes to the failure of the culinary business is the selection of locations. This reflects the fact that the location can affect the smooth running of the business, because the location determines the success or failure of the business in the future. It is important to determine the feasibility of the right business location, because not infrequently new locations that are determined cannot provide optimal benefits. During this time, the determination of the feasibility of the business location for the object under study still uses conventional, non-directional and non-concrete ways to produce the feasibility status of the business location. Based on the explanation, it is necessary to study and improve the current method as a solution for multi criteria decision making (MCDM) for determining the feasibility of business location. There are several MCDM methods that can be implemented into a system for determining business location feasibility. Among them are TOPSIS, is a conceptual method for choosing the best alternative by considering the shortest distance from the positive ideal solution and the farthest distance from the ideal negative solution [4], [5].

The business location is considered very important because the location is the control of business revenue and budget. Therefore, the location has the power to strengthen or weaken the company's business strategy. Location is the place where a business or business activity is carried out. An important factor in the development of a business is the location of the location of the urban area, the way of achieving and the travel time of the location to the destination. A good factor is relative to each different type of business.

With the increasingly rapid competition and the number of similar businesses that are currently emerging, the selection of business locations is not possible by trial and error. Because in this way culinary business will lose in competition [6], [7]. Besides time must continue to race, also efficiency in the cost field needs to get attention. Therefore, the selection of business locations is carried out and decided through a number of considerations accompanied by concrete and complete facts. Factors influencing site selection are closeness to consumers, closeness to schools / universities, housing / settlement, proximity to competitors, available parking, proximity to roads, rental prices. However, the research conducted in determining culinary locations uses criteria such as population density, traffic crowds, and market segments [8], surrounding supporters such as campuses, schools and offices, availability of parking lots [9].

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II. RESEARCH METHODS

A. Image Segmentation

The method used in making the software in this study uses the Linear Sequential Waterfall Model. Phases in the Waterfall Model, including [10], [11].

1) System / Information Engineering and Modeling

For system modeling, the first thing to do is to analyze the needs of all systems that will be built in the form of applications, because the system to be built must be able to interact with users, what users need, including the information needed from the application and how to use the user interface.

2) Design

In the Design Stage the process is to change the results of the needs analysis into a modeling system that is created using the Unified Modeling Language. This design will be a reference in the next stage, in addition to the design can describe the system model that will be built and all documents needed by the application.

3) Coding

Activities in this stage are how to implement a system model that has been built in the previous stage into a programming language that can be understood by the machine so that an application can be created. This stage is the stage carried out by the programmer to change the design into a programming language.

4) Testing / Verification

This stage is a stage to find out what deficiencies and errors are contained in the application that has been built, whether there is no error, and whether the application that has been built is in accordance with user needs.

III. IMPLEMENTATION

The TOPSIS method is one of the multi-military methods in decision making. This method is widely used in the completion of practical decision making, where the decision-making chooses the best alternative that has the shortest distance from the positive ideal solution and the farthest distance from the negative ideal solution, Table I.

TABLE I. CRITERIA VALUE

Criteria	Weight	Attribute
Population density	25	Benefit
Traffic Crowd	15	Benefit
Market Segment	30	Benefit
Neighborhood Support	20	Benefit
Parking lot	10	Benefit

From the above criteria, then an assessment information from each criterion and value is prepared, Table II.

TABLE II. ASSESSMENT INFORMATION

Criteria	Value	Information
Population density	1	< 1.500 relatives
	2	1.500 – 1800 relatives
	3	1800 - 2200 relatives
	4	2300 – 2500 relatives
	5	2500 relatives >
Traffic Crowd	1	Very low
	2	Low
	3	Enough
	4	High
	5	Very high
Market Segment	1	< 400 relatives
	2	400 – 700 relatives
	3	700 – 800 relatives
	4	900 – 1000 relatives
	5	>1000 relatives
Neighborhood Support	1	none
	2	1 – 2
	3	3 – 4
	4	5 – 6
	5	>= 6
Parking lot	1	2 x 5 m
	2	4 x 10 m
	3	8 x 15 m
	4	8 x 18 m
	5	> 8 x 18 m

Then determine the range of assessment to be used as a reference of the results obtained after completion of the calculation, Table III.

TABLE III. ASSESSMENT RANGE

Range Value	Information
0.9 – 1	Worthy
0.7 – 0.8	Be considered
0 – 0.6	Not feasible

After determining the criteria, values and range of values, then compile the value of each alternative location that will be tested for location feasibility, Table IV.

TABLE IV. ALTERNATIVE VALUES

Alternative	Population density	Traffic Crowd	Market Segment	Neighborhood Support	Parking lot
Alt-1	3	4	4	2	2
Alt-2	4	4	2	4	5

Steps that must be done.

- Step 1: Calculating the Criteria Rank, Table V.

TABLE V. RESULTS OF CRITERIA RANK

Alternative	Population density	Traffic Crowd	Market Segment	Neighborhood Support	Parking lot
Alt-1	3	4	4	2	2
Alt-2	4	4	2	4	5
Criteria rank results	25	32	20	20	29
Square root	5	5.6569	4.4721	4.4721	5.3852

- Step 2: Normalized Decision Matrix

Data on the weight of each alternative criteria / root of the rank of criteria. The results can be seen in Table VI.

$$Alt = \frac{CRITERIA\ RANK\ RESULTS}{SQUARE\ ROOT} \quad (1)$$

TABLE VI. RESULTS OF NORMALIZATION

Alternative	Population density	Traffic Crowd	Market Segment	Neighborhood Support	Parking lot
Alt-1	0.6	0.7071	0.8944	0.4472	0.3714
Alt-2	0.8	0.7071	0.4472	0.8944	0.9285

- Step 3: Look for max and min from weighted normalized decision matrix

If the Criteria are Benefit (the greater the better) then Y + = max and Y- = min

If the Criteria are Cost (the smaller the better) then Y + = min and Y- = max. The results can be seen in Table VII.

TABLE VII. WEIGHTED NORMALIZATION TABLE

Alternative	Population density	Traffic Crowd	Market Segment	Neighborhood Support	Parking Lot
Alt-1	15	10.6065	26.833	8.9443	3.7139
Alt-2	20	10.6065	13.4165	17.8887	9.2847
Max	20	10.6065	26.833	17.8887	9.2847
Min	15	10.6065	13.4165	8.9443	3.7139

- Step 4: Calculation of Positive Ideal Solutions and Negative Ideal Solutions, Table VIII.

a) Ideal Positive

$$Alt = \sqrt{\begin{matrix}(15\text{-}20)^2 + (10.6065\text{-}10.6065)^2 + (26.833\text{-}26.833)^2 \\ + (8.9443\text{-}17.8887)^2 + (3.7139\text{-}9.2847)^2\end{matrix}}$$

b) Ideal Negative

$$Alt = \sqrt{\begin{matrix}(15\text{-}15)^2 + (10.6065\text{-}10.6065)^2 + (26.833\text{-}13.4165)^2 \\ + (8.9443\text{-}8.9443)^2 + (3.7139\text{-}3.7139)^2\end{matrix}}$$

TABLE VIII. IDEAL POSITIF AND IDEAL NEGATIF

Alternative	Ideal Positive+	Ideal Negative
Alt-1	11.6634	13.4165
Alt-2	13.4165	11.6634

- Step 5: Final Results (Relative Closeness)

$$Alt = \frac{IDEAL\ NEGATIVE}{(IDEAL\ NEGATIVE) + (IDEAL\ POSITIVE)} \quad (2)$$

The results can be seen in Table IX.

TABLE IX. FINAL RESULTS

Alternative	Final Results
Alt-1	0.535
Alt-2	0.465

IV. RESULTS AND DISCUSSION

To provide a general description of how the working mechanism of the system to be built, it is necessary to model the appropriate system to design a system in accordance with user needs. This system modeling aims to facilitate and streamline the performance of all work activities of the system to be built, Fig. 1.

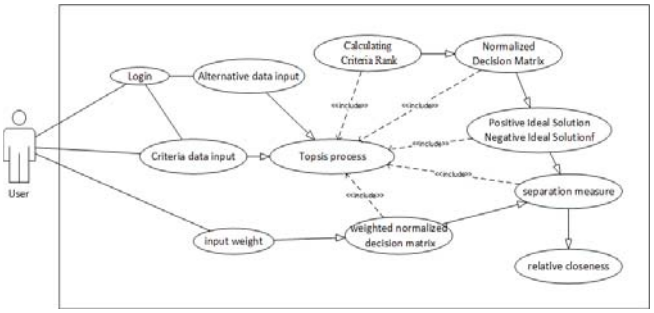

Fig. 1. Use case diagram

First Rare to do is input the alternative location to be selected, then the criteria and weight values used, determine the location using the TOPSIS method and display the processed TOPSIS results. Then, the display alternative submission data input location which is one menu to determine location, Fig. 2.

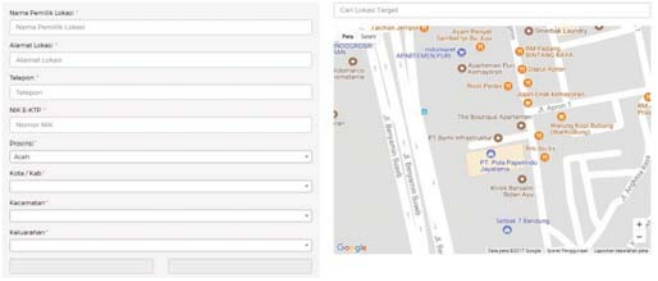

Fig. 2. Input Location

The menu is used for locations that are candidates that will be processed by TOPSIS to determine the best candidate or suitable for use as a culinary business location. The next one will display the candidate as shown in Fig. 3.

Tanggal Seleksi : 2017-09-07
ID Seleksi : 2017-09-07/9I52BGOEE1252191834
Jumlah Lokasi : 2 Lokasi

Provinsi : Sulawesi Selatan
Kab / Kota : KOTA MAKASSAR
Kecamatan : Panakukkang
Kelurahan : Paropo

Informasi Client

Nama Pemilik	Telepon	Nik E-KTP	Alamat Lokasi	Provinsi	Kota	Kecamatan	Kelurahan
IRDAM IRSYANDI	082112236782	3502176706960001	Jalan Toddopuli Raya	Sulawesi Selatan	KOTA MAKASSAR	Panakukkang	Paropo
ANDI SOFYAN	082134455757	3502177010700004	Jalan Abdullah Daeng Sirua	Sulawesi Selatan	KOTA MAKASSAR	Panakukkang	Paropo

Hasil Survey Lokasi & Penilaian

Nama Pemilik	Segmen Pasar	Kepadatan Penduduk	Pendukung Sekitar	Keramaian Lalulintas	Lahan Parkir	Nilai	Keterangan
IRDAM IRSYANDI	>1000 KK	2500 KK >	Lebih dari 6	Sangat Tinggi	> 8 x 18 m	1	Layak
ANDI SOFYAN	400 – 700 KK	2300 – 2500 KK	Ada 5 – 6	Tinggi	> 8 x 18 m	0	Tidak Layak

Fig. 3. Location candidates

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Fig. 4. Results of the TOPSIS process

After inputting the entire candidate location, the criteria used along with the assessment weight will then be processed using the topsis method which produces as shown in Fig. 4.

Based on the implementation simulation of TOPSIS Method in determining the location of culinary business and discussion is done by looking at the relationship of the system with the user's needs for the information obtained. Based on the results of the assessment on the simulation system include: Ease for users to select locations that are candidates that use more efficient time compared to using conventional methods. With this system the user can see the results with a priority scale according to the final value obtained.

V. CONCLUSION

By calculating the 5 criteria and 10 alternatives, the positive ideal solution value is 11.66, the ideal negative solution value is 13.41, and the Relative Closeness value is 0.535. The TOPSIS method can be used for the selection of culinary business locations and other businesses that require location analysis and other determinations that require criteria and alternatives for the best choice. With the use of the TOPSIS method on the system, it can make it easier for users to choose the location of the culinary business by providing the choice of the best location data alternatives according to the needs of the user. So that it can be used as a consideration in decision making. The use of decision support criteria derived from several determinants of value can help in determining the best location.

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