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IMPLEMENTATION OF TOPSIS AND SAW METHODS FOR THE SELECTION OF THE BEST HOTEL

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Abstract: The city of Surakarta is one of the cities that is busy with local and foreign tourists because there are various kinds of interesting cultural tourism. The large number of hotels with many services and facilities makes tourists confused in choosing a hotel, so prospective hotel guests need a long time to choose the best hotel according to their desired criteria. The aim of this research is to create a tool for prospective hotel guests in making decisions on hotel selection recommendations using the TOPSIS and SAW methods. This research uses 8 hotel data points in Laweyan District, Surakarta, and hotel data obtained from the Tourism Office. The results of the McCall Test with 5 indicators, namely accuracy, reliability, efficiency, integrity, and usability, average 86%, so this system is categorized as very good.

Keywords: hotel selection; TOPSIS; SAW; decision supporter system

Abstrak: Kota Surakarta menjadi salah satu kota yang ramai dikunjungi wisatawan lokal maupun mancanegara karena terdapat berbagai macam wisata budaya yang menarik. Banyaknya hotel dengan pelayanan dan fasilitas yang banyak membuat wisatawan kebingungan dalam memilih hotel, sehingga calon tamu hotel memerlukan waktu yang lama untuk memilih hotel terbaik sesuai kriteria yang diinginkan. Tujuan dari penelitian ini adalah membuat suatu alat bantu bagi calon tamu hotel dalam pengambilan keputusan rekomendasi pemilihan hotel menggunakan metode TOPSIS dan SAW. Penelitian ini menggunakan 10 titik data hotel yang ada di Kecamatan Laweyan Surakarta dan data hotel yang diperoleh dari Dinas Pariwisata. Hasil Uji McCall dengan 5 indikator yaitu akurasi, reliabilitas, efisiensi, integritas, dan kegunaan rata-rata 86%, maka sistem ini dikategorikan sangat baik.

Kata kunci: pemilihan hotel; TOPSIS; SAW; sistem penunjang keputusan

INTRODUCTION

The rapid development of information technology has a great impact on various aspects of people's lives, especially tourism. Restrictions on public mobility from the government during the pandemic have also greatly impacted the hotel industry.[1] The impact of Covid-19 in Surakarta includes the cancellation of 20% of prospective hotel guests[2], there are 12 hotels that are closed[3], a decrease in the number of foreign guests from 2019-2020 by 16%[4], the Solo City Government lost around 50% of hotel and restaurant tax revenues, and during the pandemic, the tourism sector was the worst, where hotel

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occupancy was only 30%–40%, and the Solo City Government lost half. [5]. After the decline in the positive rate of the COVID-19 virus in Indonesia, especially in Surakarta, this city has become one of the cities that has begun to be visited by local and foreign tourists again because of the variety of interesting cultural tourism. The interest of tourists from the millennial generation is a niche market for tourism managers and developers, especially in the new normal era that focuses on tourism revitalization. [1].

The current obstacle to choosing a hotel is the large number of services and benefits offered, making tourists confu sed in choosing a hotel, so a system is needed to support decisions in determi ning the desired hotel.[6]

Decision Support Systems (DSS) are designed to support all stages of decision-making, from identifying proble ms, selecting relevant information, determining approaches to be used in the decision-making process, and evaluating alternative options. In the early 1970s, Scott Morton proposed the concept of DSS with the term "Management Decision System", where this system helps decision-making by using data and models to solve unstructured problems. [7][8]. A decision support system is a system that assists people in determining things based on mathematical calcula tions.[8]

The purpose of this study is to utilize the Technique for Others Reference by Similarity to Ideal Solution (TOPSIS) and Simple Additive Weighti ng (SAW) methods in supporting the decision to choose the best hotel. Prospe ctive visitors can determine the hotel that fits the desired criteria, such as room rental price, location, facilities, and class.

TOPSIS method, which is one of the multi-criteria decision-making methods. [9], This method is to choose the best alternative among many alternatives. The alternative that has the smallest distance from the best or positive ideal outcome and has the furthest distance from the worst or negative ideal outcome is considered the best alternative. [10]. SAW has the basic concept of seeking the weighted sum of performance ratings on each alternative on all attributes, the process of normalizing the decision matrix (X) to a scale comparable to all existing alternative ratings. [11].

The application of the ranking method to the decision support system can help in determining hotel selection using the combination of the TOPSIS and SAW methods. This research was conducted by finding the normalized matrix value R for each attribute using the SAW method, then continuing with the TOPSIS method to find the selected alternative solution.

METHOD

Research data comes from the place of research, in the form of primary and secondary data, while collecting data by observation at the research destina tion, namely the tourism office, through interviews, location observa tions, and literature studies. The research framew ork is as shown in Image 1.

Image 1. Crips Form

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The use of the TOPSIS and SAW methods is because both methods have a simple, easy-to-understand, and efficient computing concept. They can also measure the relative performance of any decision alternative in a simple mathema tical form.[12], easy to understand, and effective computing to measure the performance of each alternative[13].

The SAW method was used to give preference weights and criterion weights, then continued with ranking using the TOPSIS method.

The first step in using the SAW method is to determine the criteria, determine the suitability rating of each alternative for each criterion, create a decision matrix based on the criteria, then normalize the matrix based on the equation adjusted to the type of attribute to obtain a normalized matrix R.

$$r_{ij} = \begin{cases} \frac{X_{ij}}{\underset{i}{Max}\, X_{ij}} & If\ j\ is\ a\ profit\ attribute\ (benefit) \\ \frac{\underset{i}{Min}\, X_{ij}}{X_{ij}} & If\ j\ is\ a\ cost\ attribute\ (cost) \end{cases} \quad (1)$$

Information :
Rij : Normalized performance rating
Maxij:The maximum value of each row and column
Minij:Minimum value of each row and column
Xij: rows and columns of the matrix
Where Rij is the normalized performance rating of alternative Ai on attribute Cj; i = 1, 2,...,m and j = 1, 2,...,n.

Cost is a type of criteria that prioritizes the lowest value, or the smaller the better. While benefit is a type of criteria that prioritizes the highest value, the bigger the better as a reference for selection.[14]

The next step using the TOPSIS method is to create an r matrix, which is a normalized decision matrix, and normalize the rij values using equation (2).

$$\boldsymbol{r_{ij}} = \frac{\boldsymbol{X_{ij}}}{\sqrt{\sum_{\boldsymbol{i=1}}^{\boldsymbol{m}} \boldsymbol{x_{ij}}}} \quad \text{.....(2)}$$

Information:
r_{ij} = Normalized matrix
X_{ij} = conversion in fuzzy form

Normalized matrix weighting: each column in the R matrix is multiplied by its weight (wj) to produce a matrix using equation (3).

$$yij = WjRij \quad \text{.....(3)}$$

Information :
W = Weight value
R = Normalized matrix

Determine the value of the positive ideal solution (A+) and the negative ideal solution (A-) using equation (4).

$$A+= \max((y1 + y2+, \dots, yn+)$$
$$A-= \max(y1 - y2-, \dots, yn-)$$

y = matrix on equation two .....(4)

Calculating the Distance Between a Positive Ideal Solution (D+) and a Negative Ideal Solution (D-)

$$D_i^+ \sqrt{\sum_{j=1}^{n} \left(A_i^+ - y_{ij}\right)^2};\ i = 1,2,\dots,m. \dots (5)$$

A+ = Positive Ideal Solution Value
A- = negative ideal solution value

Calculating the preference value of each alternative.

$$V_i = \frac{D_i^-}{D_i^- + D_i^+} \quad \dots\dots(6)$$

i=1,2,3,...m

Information :
D+= Positive Ideal Solutio
D- = Negative Ideal Solution

The McCall method is one model that describes the software quality factor. This model has three main perspectives, namely product operation, product revision, and product transition. [15].

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RESULT AND DISCUSSION

The criteria and weights of each criterion, as shown in Table 1, are considered by customers in determining the hotel.

Table 1. Preference Criteria and Weights

Criteria	Cost/ Benefit	Preference Weights (W)
Price (C1)	Cost	4
Location C2)	Benefit	5
Facilities C3)	Benefit	3
Class (C4)	Benefit	2

Use of Likert scales as per importance after weighing the preferences of each criterion. The weights and alternative criteria used are as in Table 2.

Table 2. Criteria Weighting

C1 Price	Information	Criteria Value
	20–100	1
	100–300	2
	300 –500	3
	500–800	4
	>800	5
C2 Location	≥5 km	1
	4 KM	2
	3 KM	3
	2 KM	4
	≤1 KM	5
C3 Facilities	0 - 0.2	1
	0.201 – 0.4	2
	0.401 – 0.6	3
	0.601 – 0.8	4
	0.801 - 1	5
C4 Class	0 (Non Star)	1
	1	2
	Star Hotels 2-3	3
	4	4
	5	5

Table 3. shows the hotels used as a sample, namely 5 hotels in the Laweyan Surakarta area.

Table 3. Hotel Data and Its Criteria

No	Hotel Name	Price (C1) (in thousands of rupiah)	Location (C2)	Facilities (C3)	Class (C4)
1	H1	770–1.700	Close to Hospitals, Malls, Military Regional Commands, Stations, and Tourist Destination Centers.	Restaurant, swimming pool. Meeting Room, Fitness Center, Wi-Fi	5
2	H2	450–950	Hospitals,Police Stations,Stations, Banks, and Money Changers	Restaurant, Swimming Pool, Meeting Room, Fitness Center, Wi-Fi	4
3	H3	350–650	Stations, hospitals, tourist centers, banks, and police stations	Restaurant, Swimming Pool, Meeting Rooms, Wi-Fi	4
4	H4	264–560	Among banks, delivery services, tourism centers, and shopping centers	Restaurant, Meeting Room, Wi-Fi	3
5	H5	280–555	Delivery Services, Stations, Police Stations, and Hospitals	Restaurant, Swimming Pool, Meeting Room, Wi-Fi	3

The decision matrix R is normalized using Formula (1). The normalized performance rating values (rij) form the normalized matrix (R) in Table 4.

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Table 4. SAW normalization results

Alternative	Criteria			
	C1	C2	C3	C4
H1	0.4	1	1	1
H2	0.5	1	1	0.8
H3	0.667	1	0.8	0.8
H4	0.667	0.8	0.8	0.6
H5	0.667	0.8	0.6	0.6

The results of the calculation of the weighted normalized matrix using formula (2), with the results shown in Table 5.

Table 5. Weighted Normalized Matrix

Alternative	Criteria			
	C1	C2	C3	C4
H1	1.6	5	3	2
H2	2	5	3	1.6
H3	**2,667**	5	2.4	1.6
H4	**2,667**	4	1.8	1.2
H5	**2,667**	4	2.4	1.2

Table 6 shows the results of determining the positive ideal solution matrix (A) and the negative ideal matrix (A-) using Formula (4).

Table 6. Matrix of Positive and Negative Ideal Solutions

A+	4	5	3	2
A-	1,6	2	0,6	0,4

Determining the distance between the positive D+ ideal solution and the negative D+ ideal solution using Formula (5) with the results as in Table 7.

Table 7. Distance of positive ideal solution and negative ideal solution

Alter-native	Positive Distance D+	Negative Distance D-
H1	2.4	4.16173040933696
H2	2.03960780543711	4.04474968323134
H3	1.51584226678694	3.84938667553388
H4	2.20403670064221	2.68659222394798
H5	1.9436506316151	3.00296150121472

Determination of preference values for each alternative using Formula (6) and calculation results as in Table 8.

Table 8. Final Results of Ranking

No	Hotel	Preference Weight Value	Rank
V_1	H1	0.634242821590942	3
V_2	H2	0.664778440577219	2
V_3	***H3***	**0.717469229536505**	***1***
V_4	H4	0.549334710396804	5
V_5	H5	0.607074381531671	4

From the value of V in table 8, the results of Hotel H3 (V3) are obtained, which have the largest value of other alternatives, so it can be concluded that Hotel H3 is the best choice according to the weight of the criteria.

Program Implementation

Alternative hotel data entered by the admin is the hotel name code, selection date, and description; besides that, the data can be changed or deleted.

The Criteria page is used to input existing criteria, change criteria, or delete criteria.

The Alternate Relationship menu (weights) in Image 2 contains a list of hotels that have been entered, then sorted according to the weight values that have been written in the crips data above, then sorted from lowest to highest.

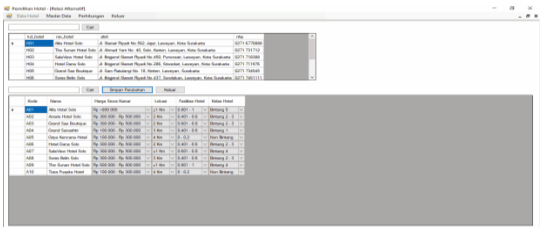

Image 2. Criteria Weight Form

The calculation form is used to find the selection results. At this stage, the program uses the SAW and Topsis methods in the process shown in Image 3.

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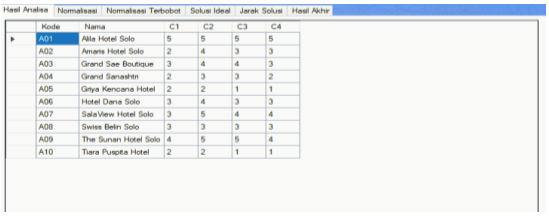

Image 3. Selection Process Form

The selection result form in Image 4 is used to report the selection result data by displaying the selection of images on the screen according to the desired results according to the criteria.

Image 4. Selection Results Report Display

System Testing

System testing with McCall, testing only tests from a product operation perspective. The respondents used were eight people. The instrument used in this study was a Likert scale with a score between 1 and 5. The weight (w) of each criterion (0.1<= w <=0.4) is based on importance. They range from very unimportant to very important.

Table 9 is an assessment of the quality of software using the McCall method, namely by determining the average value of the software quality assessment obtained from respondents.

Table 9. Software Quality Assessment

Indicator	Information	Weight	Criteria Value
Correctness	information is complete.	0,3	3,5
	Information as needed	0,3	3,5
	The existing features work well.	0,4	4,38
Reliability	Displaying information correctly	0,3	4,13
	Reporting is easy to understand.	0,3	4,25
	Consistency in data storage	0,4	4,13
Efficiency	Easy to understand language	0,3	4,25
	display information well and quickly	0,3	4,25
	Speed in data storage	0,4	4,25
Integrity	The login process works fine.	0,3	4,25
	Availability of access rights	0,4	4,88
	Control over the use of access rights	0,4	4,25
Usability	The function of each button is clear.	0,3	4,13
	Existence of system documentation	0,3	4,38
	There is a message if there is an error.	0,4	4,63

The calculation of each factor based on the criteria is as follows:

Correctness
=(0,3x3,5)+(0,3x3,5)+(0,4*4,38) = 3,85

Reliability
=(0,3x4,13)+(0,3x3,25)+(0,4*4,13)=4,16

Efficiency
=(0,3x4,25)+(0,3x4,25)+(0,4*4,25)= 4,25

Integrity
=(0,3x4,25)+(0,4x4,88)+(0,4*4,25)=4,93

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Usability
=(0,3x4,13)+(0,3x4,38)+(0,4*4,63)=4,40

From the results obtained from the calculations above, the quality factor value is then changed into a percentage using the equation :

$$Percentage \frac{Value\ Obtained}{Maximum\ Value} x100$$

The calculation results by the McCall method are as shown in Table 10.

Tabel 10. Hasil Uji McCall

No	Indicator	McCall Test Results
1.	Correctness	77%
2.	Reliability	83%
3.	EEfficiency	85%
4.	Integrity	99%
5.	Usability	88%
	Average	86%

If the percentage of McCall Test Results with 5 indicators, namely accuracy, reliability, efficiency, integrity, and use, averages 86%, then this system is categorized as very good.

CONCLUSION

The best hotel selection application uses the SAW and TOPSIS methods as a decision-making tool for prospective hotel guests to choose the desired hotel based on the criteria of room rental price, location, facilities, and class.

Based on the results of validity testing, the first rank was obtained from H2 with a value of 0.717469229536505, the second was obtained from H3 with a value of 0.664778440577219, and the third was obtained from H1 with a value of 0.634242821590942.

McCall Test Results with 5 indicators, namely accuracy, reliability, efficiency, integrity, and usability, average 86%, then this system is categorized as very good. This application can be developed by adding budget criteria for prospective guests, and the application is made mobile-based.

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BIBLIOGRAPHY

[1] S. Marini, L. R. Aprilia, and A. J. M. Intan, "Tren Solo Traveler Dalam Minat Berwisata Di Era New Normal : Perspektif Generasi Milenial," *J. Kaji. Bhs. dan Pariwisata*, vol. 9, no. 2, pp. 78–98, 2022, doi: 10.34013/barista.v9i02.837.

[2] C. I. Sushmita, "Corona di Solo, Pengusaha Hotel Sambat Banyak Tamu CancelNo Title," Solopos.com. Accessed: Jul. 24, 2024. [Online]. Available: https://soloraya.solopos.com/corona-di-solo-pengusaha-hotel-sambat-banyak-tamu-cancel-1051974

[3] N. Rahmawati, "Dampak Covid-19, Sejumlah Hotel di Solo Tutup," *Gatra*, 2020. Accessed: Jul. 24, 2024. [Online]. Available: https://www.gatra.com/news-475362-ekonomi-dampak-covid-19-sejumlah-hotel-di-solo-tutup.html

[4] E. O. Amelia, J. Pramono, and D. Suhita, "Strategi Dinas Pariwisata dalam pengembangan pariwisata Kota Surakarta di masa pandemi Covid-19," *Publisia J. Ilmu Adm. Publik*, vol. 7, no. 1, pp. 66–76, 2022, doi: 10.26905/pjiap.v7i1.7356.

[5] M. Ricky PD, "Pemkot Solo Kehilangan 50% Pendapatan Pajak

Hotel dan Restoran Gara-Gara Pandemi," Solopos.com. Accessed: Jan. 13, 2023. [Online]. Available: https://www.solopos.com/pemkot-solo-kehilangan-50-pendapatan-pajak-hotel-dan-restoran-gara-gara-pandemi-1087940

[6] Y. S. Pasaribu, "Sistem Pendukung Keputusan Pemilihan Hotel Bintang Lima Terbaik Di Kota Medan Menggunakan Metode Promethee," *J. Pelita Inform.*, vol. I, no. 1, pp. 395–403, 2019.

[7] E. Turban, J. E. Aronson, and T. P. Liang, "Decision Support and Intelligrnt System ." 2007.

[8] R. W. Putra and U. D. Rosiani, "Sistem Pendukung Keputusan Rekomendasi Pekerjaan Bagi Fresh Graduate Dengan Penggabungan SAW Dan TOPSIS," *POSITIF J. Sist. dan Teknol. Inf.*, vol. 7, no. 1, pp. 44–50, 2021, doi: 10.31961/positif.v7i1.1092.

[9] Y. Çelikbilek and F. Tüysüz, "An in-depth review of theory of the TOPSIS method: An experimental analysis," *J. Manag. Anal.*, vol. 7, no. 2, pp. 281–300, 2020, doi: 10.1080/23270012.2020.1748528.

[10] M. Mathew, R. K. Chakrabortty, and M. J. Ryan, "A novel approach integrating AHP and TOPSIS under spherical fuzzy sets for advanced manufacturing system selection," *Eng. Appl. Artif. Intell.*, vol. 96, no. October, p. 103988, 2020, doi: 10.1016/j.engappai.2020.103988.

[11] N. Setiawan *et al.*, "Simple additive weighting as decision support system for determining employees salary," *Int. J. Eng. Technol.*, vol. 7, no. 2.14 Special Issue 14, pp. 309–313, 2018.

[12] A. Faiz, "Pengembangan Sistem Pendukung Keputusan Untuk Seleksi Penerimaan Beasiswa Dengan Metode Saw Dan Topsis : Studi Kasus Universitas Muhammadiyah Tangerang," *JIKA (Jurnal Inform.*, vol. 4, no. 1, p. 49, 2020, doi: 10.31000/jika.v4i1.2424.

[13] S. Rismayanti, S. Adi Wibowo, and Y. Agus Pranoto, "Implementasi Kombinasi Metode Saw Dan Topsis Untuk Seleksi Beasiswa Kartu Indonesia Pintar," *JATI (Jurnal Mhs. Tek. Inform.*, vol. 5, no. 1, pp. 349–356, 2021, doi: 10.36040/jati.v5i1.3288.

[14] J. Sapitri, Y. Vitriani, E. Haerani, and F. Kurnia, "Sistem Pendukung Keputusan untuk Rekomendasi Pemilihan Guru Terbaik Menggunakan Metode Simple Additive Weighting," *Indones. J. Innov. Multidisipliner Res.*, vol. 2, no. 2, pp. 312–330, 2024, doi: 10.69693/ijim.v2i2.139.

[15] Fahmi Sulaiman, Nana Suarna, and Iin, "Pengukuran Kualitas Perangkat Lunak Sistem Informasi Pengarsipan Dokumen Laporan Jalan Tol Menggunakan Metode Mccall," *INFOTECH J.*, vol. 8, no. 1, pp. 34–40, 2022, doi: 10.31949/infotech.v8i1.2234.