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The intelligent approach is used by decision support systems for tourist destinations in North Sumatra

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ABSTRACT

The sheer amount of tourism attractions in North Sumatra makes it difficult for visitors to choose where they wish to travel. Tourists can select the ideal place, but they must also deal with a number of issues, such as time and financial limits, which can significantly influence the selection. Therefore, the goal of this study is to assist travelers in selecting the top tourist destination in North Sumatra based on their time and financial constraints. The Simple Attribute Rating Technique (SMART) technique is employed in this study to choose tourist attractions based on four criteria: the measurement of the distance to tourist locations from the city center, the quantity of public tourist facilities, the cost of entrance tickets to attractions, and the daily average of visitors to attractions. The study's findings show that the Decision Support System is competent at handling data and making the best suggestions for tourism attractions. The findings revealed that Sibolangit Forest was the superior alternative in general. Sipiso-piso In addition, waterfall was chosen as the best substitute for places with waterfalls, Lake Toba was chosen as the best substitute for destinations with lakes, and Dua Rasa River was chosen as the best substitute for destinations with rivers. One piece of advice is to compare it to other decision support system techniques and add other factors, such as cleanliness, safety, age, tour kind, and ease of access to tourist attractions.

Keywords: Decision support system; SMART Method; tourist attractions

1. INTRODUCTION

One of the most well-liked travel locations in Indonesia is North Sumatra. In addition to its exceptional natural beauty, North Sumatra offers a variety of tourism activities. North Sumatra, one of the most well-liked tourist destinations in Indonesia, provides visitors with a variety of locations and things to do, including taking in several natural and cultural attractions [1].

The sheer amount of tourism attractions in North Sumatra makes it difficult for visitors to choose where they wish to travel. When picking a destination for a vacation, travelers must overcome a number of challenges. Strong travel inspiration aids in selecting the ideal location, but time and financial constraints might significantly affect that decision. Due to this, vacation time and available funds should be taken into consideration while making travel plans. When selecting a travel destination, the major challenges such distance, amenities, ticket costs, and the quantity of visitors must also be taken into account. So, a system that enables travelers to select vacation spots that fit their schedules and budgets is required. Because of this, a Decision Support System (DSS) may be the ideal remedy for this issue.

An interactive information system known as a decision support system shows, models, and manipulates data to aid decision-makers in semi-structured and unstructured circumstances. The system is made to offer tools that may be used to evaluate opportunities, solve problems, and run different models. However, this system is designed to support decision makers in acquiring the essential

information from pertinent processed information and using that information to make decisions regarding an issue, not to replace automated decision making [2]–[5].

The placement of a new sales branch was successfully recommended by several related research [6], selection of concentration interests [7], potential life partner [8], scholarship selection [9] as well as boarding recommendations [10] by using the Simple Attribute Rating Technique (SMART).

This study uses the SMART technique and a set of criteria parameters, including distance, public amenities, ticket costs, and the number of visitors per day, to assist travelers in selecting the best tours in North Sumatra based on their time and budget. This approach of picking tourism attractions is quite straightforward and offers excellent accuracy. The total value for each tourist attraction is then determined using this procedure, which assigns a weight or value to each significant criterion. The ideal tourist attraction to select is the one with the highest overall value. It is envisaged that by adopting this approach, it will be possible to give tourists the proper suggestions for selecting tourist attractions that meet their needs and tastes.

2. METHOD

The research approach is a methodical approach that is based on science [11]. It was created for this study by creating an easy-to-implement research plan. **Figure 1** shows the research methodology.

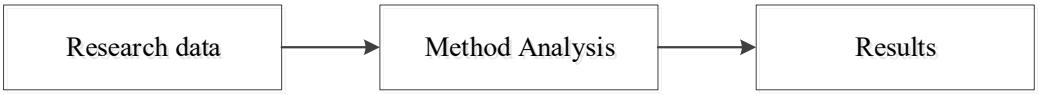

Figure 1. Image of the research method

2.1 Research data

The North Sumatra Province's tourism office provided the information for the study, which was then collected. The information required includes distance, specifically the distance from the city center to the tourist destination, the amenities offered there, the number of visitors, the cost of tickets, and inquiries about potential recommendations gleaned from a variety of sources, including books, websites, or other information.

2.2 Tourist attractions.

The purpose of tourist visits is to experience the natural beauty, cultural diversity, and man-made artifacts, so all tourist objects must be brand new, high quality, and have a variety of attributes. A tourism object is an example of human creativity that includes history, social expression, habitat, and specific locations or circumstances that draw tourists [12].

2.3 Decision support system.

An interactive computer-based information system called a "decision support system" was created to help decision-makers select an alternate option from the many available ones when faced with a challenge. Models, people, processes, software, databases, telecommunications, and other structured technologies make up SPK. Solving business issues with a level of structure that is either partially specified or undefined is the primary goal of SPK [13]. among other things, decision support system characteristics [14]:

- Decision support systems are created to help decision makers solve problems with different degrees of structure, including semi-structured and unstructured situations.
- The decision support system is made so that even users without extensive computer experience can utilize it with ease.
- High flexibility and adaptability are priorities when designing decision support systems, allowing for quick adjustments to changing user requirements and environmental conditions.

2.4 Simple multi attribute rating technique.

The Simple Multi Attribute Rating Technique (SMART) is a multi-criteria decision-making approach based on the idea that the alternatives are composed of a number of essential criteria, each of which has a weight that indicates how significant it is in relation to other criteria. The objective of applying this weight is to examine each choice and identify the optimal one **[15]**. The SMART technique has the following phases [16]:

- Establish criteria. A decision-making problem must first be solved while determining the criteria to be applied. Data from decision makers or parties with authority or expertise over the issue at hand must be gathered in order to establish the proper criteria.

- Giving each existing criterion a weight value on a scale of 1 to 100, where a larger weight implies a more significant priority or competency with reference to the situation at hand, is the first stage in calculating the weight of the criteria.
- Giving each existing criterion a weight value on a scale of 1 to 100, where a higher weight implies a more essential priority, is the first stage in calculating the weight of the criterion:

$$w_i = \frac{w_i'}{\sum_{j-1}^{m} w_j} \quad (1)$$

Information:

- w_i : It is the i-th criterion for normalized criterion weights
- w_i' : Is the value of the weight of the i-criterion
- w_j : Is the value of the weight of the j-criterion
- j : Is an index that can be worth 1,2,3, ..., m which represents the number of existing criteria

- Offer parameter values for every requirement. Specifically, calculating the parameter values for each criterion, whether it be by providing a criterion value for each alternative criterion using qualitative or quantitative data (in the form of numbers). If the criterion value is qualitative, it must be transformed into quantitative data by setting the relevant criterion's parameter values.
- Supply parameter values for every criterion. Specifically, establishing the parameter values for each criterion, whether it be by giving a criterion value for each alternative criterion using quantitative data (in the form of numbers) or qualitative data. If the criterion value is qualitative, it must be transformed into quantitative data by changing the parameter values of the relevant criteria.
- Provide parameter values for each need. Specifically, calculating the parameter values for each criterion, whether it be by providing a criterion value for each alternative criterion using quantitative data (in the form of numbers) or qualitative data. It is important to convert the criterion value from qualitative to quantitative data if it is in the form of qualitative data by setting the relevant criteria's parameter values.

$$u(a_i) = \sum_{j-1}^{m} w_j * u_j(a_i) \quad (2)$$

Information

- $u(a_i)$: Is the total value of each alternative i
- w_i : Is the weight of the normalized value of the j-criterion
- $u_j(a_i)$: Is the utility value of each jth criterion for each i-alternative

- Arrange the values of each option. The final score will be calculated and then arranged in descending order, starting with the greatest value and moving down to the lowest. The option with the highest final score will be displayed as the best option.

3. RESULTS AND DISCUSSION

In this part, the Simple Multi Attribute Assessment Technique (SMART) approach is used to calculate and test a decision support system. These are the steps:

3.1 Defining the criteria and assigning weights to the criteria.

Table 1. Definition of criteria and criteria weight

No.	Criteria	Criteria Weight
C1	Distance	100
C2	Public facilities	75
C3	Ticket price	50
C4	Number of visitors	25
		250

The distance (C1), public amenities (C2), ticket costs (C3), and number of visitors (C4) are the four defined criteria in **Table 1**. Additionally, each criterion's weight is set, and a larger weight denotes a criterion's greater influence on decision-making compared to other criteria. The weighted average for all criteria in this study is 250.

3.2 Normalize the weight of the criteria

Table 2. The results of normalizing the weight of the criteria

Criteria	Normalization
Distance	100/250 = 0,4
Public facilities	75 / 250 =0,3
Ticket price	50 / 250 = 0,2
Number of visitors	25 / 250 = 0,1
	1

The outcomes of leveling the criteria weights are displayed in **Table 2**. In order to assess the relative weights between criteria equally, the predetermined criteria weights will be normalized to ensure that the weight assigned to each criterion has a total of 1 **[17]**. It is possible to compare the criteria used in the evaluation of decision support systems in a way that is more objective by normalizing the weights of the criteria. Originally, the weight scales were relative and varied.

3.3 Determine parameter values and criteria values for each tourism object

Table 3. Criteria weight parameters

Criteria	Parameter	Parameter	Criteria Weight
Distance	Less than 50KM	1	1
	50 – 150 KM	2	0.5
	More than 150KM	3	0
Public facilities	More than 5	1	1
	4 – 5	2	0.5
	Less than 4	3	0
Ticket price	Less than IDR 10000	1	1
	Rp.10000 – Rp.50000	2	0.5
	More than IDR 50000	3	0
Number of visitors	More than 200 people	1	1
	100 – 200 people	2	0.5
	Less than 100 people	3	0

The characteristics and weighting of the criteria used in the evaluation of tourist attractions are detailed in **Table 3**. The distance, public amenities, ticket pricing, and quantity of tourists are the four variables that are evaluated. There are various factors for each criterion that explain the traits or circumstances of the tourist attraction in connection to these criteria. Three parameters are available for the Distance criterion: "Less than 50 KM" with priority 1 and criteria weight 1, "50-150 KM" with priority 2 and criteria weight 0.5, and "More than 150 KM" with priority 3 and criteria weight 0. Additionally, there are three parameters for the public facilities criteria: "More than 5" with priority 1 and criteria weight 1, "4-5" with priority 2 and criteria weight 0.5, and "Less than 4" with priority 3 and criteria weight 0. Three characteristics make up the ticket price criteria: "Less than Rp.10000" with priority 1 and a weight of 1, "Rp.10000-Rp.50000" with priority 2 and a weight of 0.5, and "More than Rp.50000" with priority 3 and a weight of 0. Three factors are listed under the "Number of Visitors" criterion: "More than 200 people" with priority 1 and criterion weight 1, "100-200 people" with priority 2 and criterion weight 0.5, and "Less than 100 people" with priority 3 and criterion weight 0.

3.4 Datasets

Table 4. Datasets

Tourist attraction	Distance	Public facilities	Ticket price	Number of Visitors per day
Sipiso-piso Waterfall	103,7 KM	Parking lots, lodging, photo spots, public toilets, places to eat	Rp. 6000	± 300 Person
Waterfall of two colors	48,5 KM	Parking Lot, Gazebo, Lodging, Photo Spot	Rp. 25000	±100 Person
Sikulikap Waterfall	53.7 KM	Camping ground, parking area, photo spot	Rp. 5000- Rp. 20.000	±100 Person

Tourist attraction	Distance	Public facilities	Ticket price	Number of Visitors per day
Lake Toba	90.1 km	Lodging, Parking Lava, Warung, Gazebo, Souvenir Shop	Rp. 5000	±6000 Person
Lake Aek Natonang	180 KM	Lodging, Parking Lava, Warung, Gazebo, Souvenir Shop	Rp. 5000	±200 Person
Lau Kawar Lake	70 KM	Parking lots, lodging, camping grounds, public toilets, food stalls, gazebos	Rp. 10.000	±100 Person
Liang Dahar Cave	40 KM	Culinary Tourism, Cave Exploration	Rp. 13.000	±50 Person
Sibolangit Forest	38 KM	Waterfalls, protected forests, nature reserves, parking lots, gazebos, lodging	Rp. 10.000	±100 Person
Tarutung Soda Water	325 KM	Lodging, warm pool water, places to eat, parking lava	Free (voluntary)	±100 Person
Sorake Island	480 KM	Lodging, warm pool water, places to eat, parking lava	Rp. 5.000	±150 Person
Island of Idols	100 KM	Turtle hatchery, canteen or place to eat, gazebo, lodging, public toilets	Rp. 250.000	±50 Person
Tureluto Beach	450 KM	Culinary tours, public toilets, gazebos, parking lots	Rp. 10.000	±50 Person
Tureluto Beach	177,5 KM	Places to eat, gazebo, lodging parking area, parking area	Gratis	±100 Person
Bukit Lawang	90 km	Places to eat, gazebos, lodging parking areas, parking areas	Rp. 5.000	±100 Person
Gundaling Hill	69 KM	Cattle farm, restaurant, strawberry/orange garden, dining area	Rp. 5.000	±100 Person
River of Two Flavors	57.3 KM	Cattle farm, restaurant, strawberry/orange garden, dining area	Rp. 2.000	±50 Person
Sari Laba Biru River	25 KM	Cattle farm, restaurant, strawberry/orange garden, dining area	RP. 10.000-15.000	±50 Person

Ticket prices for attractions, the number of public facilities owned by attractions, and the number of visitors per day on tourist objects are all listed in **Table 4**, which is a collection of information about tourist objects and related attributes. These details will be used in the following stage to evaluate and calculate using the SMART method in a decision support system.

3.5 Providing alternative values

Table 5. Alternative values

No	Alternative	Priority Criteria			
		Distance	Public facilities	Ticket price	Number of Visitors per day
A1	Sipiso-piso Waterfall	2	1	1	1
A2	Waterfall of two colors	1	2	2	2
A3	Sikulikap Waterfall	2	3	2	2
A4	Lake Toba	2	1	1	1
A5	Lake Aek Natonang	3	1	1	1
A6	Lau Kawar Lake	2	1	2	2
A7	Liang Dahar Cave	1	3	2	3
A8	Sibolangit Forest	1	1	2	2
A9	Tarutung Soda Water	3	2	1	2
A10	Sorake Island	3	3	1	2

No	Alternative	Priority Criteria			
		Distance	Public facilities	Ticket price	Number of Visitors per day
A11	Island of Idols	2	1	3	3
A12	Tureluto Beach	3	2	2	3
A13	Free Beach	3	1	1	2
A14	Bukit Lawang	2	2	1	2
A15	Gundaling Hill	2	2	1	2
A16	River of Two Flavors	2	1	1	3
A17	Sari Laba Biru River	1	3	2	3

The following phase is to provide alternative values for each tourist attraction based on the criteria and parameters that have been set once the parameters, priority criteria, and datasets have been established. **Table 5** provides alternate values based on priority criteria for each tourist attraction.

3.6 Determine the final grade

Table 6. Final value

Alternative No	Value Calculation	Final score
A1	= (0.4 * 0.5) + (0.3 * 1) + (0.2 * 1) + (0.1 * 1)	= 0.8
A2	= (0.4 * 1) + (0.3 * 0.5) + (0.2 * 0.5) + (0.1 * 0.5)	= 0.5
A3	= (0.4 * 0.5) + (0.3 * 0) + (0.2 * 0.5) + (0.1 * 0.5)	= 0.35
A4	= (0.4 * 0.5) + (0.3 * 1) + (0.2 * 1) + (0.1 * 1)	= 0.8
A5	= (0.4 * 0) + (0.3 * 1) + (0.2 * 1) + (0.1 * 1)	= 0.6
A6	= (0.4 * 0.5) + (0.3 * 1) + (0.2 * 0.5) + (0.1 * 0.5)	= 0.65
A7	= (0.4 * 1) + (0.3 * 0) + (0.2 * 0.5) + (0.1 * 0)	= 0.5
A8	= (0.4 * 1) + (0.3 * 1) + (0.2 * 0.5) + (0.1 * 0.5)	= 0.85
A9	= (0.4 * 0) + (0.3 * 0.5) + (0.2 * 1) + (0.1 * 0.5)	= 0.4
A10	= (0.4 * 0) + (0.3 * 0) + (0.2 * 1) + (0.1 * 0.5)	= 0.25
A11	= (0.4 * 0.5)+(0.3 * 1) + (0.2 * 0) + (0.1 * 0)	= 0.5
A12	= (0.4 * 0) + (0.3 * 0.5) + (0.2 * 0.5) + (0.1 * 0)	= 0.25
A13	= (0.4 * 0) + (0.3 * 1) + (0.2 * 1) + (0.1 * 0.5)	= 0.55
A14	= (0.4 * 0.5) + (0.3 * 0.5) + (0.2 * 1) + (0.1 * 0.5)	= 0.6
A15	= (0.4 * 0.5) + (0.3 * 0.5) + (0.2 * 1) + (0.1 * 0.5)	= 0.6
A16	= (0.4 * 0.5) + (0.3 * 1) + (0.2 * 1) + (0.1 * 0)	= 0.7
A17	= (0.4 * 1) + (0.3 * 0) + (0.2 * 0.5) + (0.1 * 0)	= 0.5

After offering alternative values based on specified criteria and parameter parameters for each tourist attraction, the value for each option is calculated by multiplying multiple weights by the value of the relevant criteria. The final grade is calculated using four weights: 0.4, 0.3, 0.2, and 0.1. The value in the first criterion is multiplied by the first weight, the value in the second criterion by the second weight, the value in the third criterion by the third weight, and the value in the fourth criterion by the fourth weight. The ultimate score for each option in the table can be determined by multiplying the results of each weight and value assigned to these criteria and adding them up. The results of the calculations are provided in **Table 6** together with the final score for each possibility.

3.7 Ranking

Table 7. Ranking

Alternative No	Alternative	Rank
A1	Sipiso-piso Waterfall	2
A2	Waterfall of two colors	10
A3	Sikulikap Waterfall	15
A4	Lake Toba	2
A5	Lake Aek Natonang	6
A6	Lau Kawar Lake	5
A7	Liang Dahar Cave	10

Alternative No	Alternative	Rank
A8	Sibolangit Forest	1
A9	Tarutung Soda Water	14
A10	Sorake Island	16
A11	Island of Idols	10
A12	Tureluto Beach	16
A13	Free Beach	9
A14	Bukit Lawang	6
A15	Gundaling Hill	6
A16	River of Two Flavors	4
A17	Sari Laba Biru River	10

Table 7is a ranking table that includes a list of tourism alternatives and their ranks. This information is used to compare and order the many existing tourism alternatives in terms of priority.

A8—Sibolangit Forest—is chosen as a tourist attraction that will be used as a recommendation for the best tourist attraction in determining customers based on established criteria by calculating a decision support system using the SMART method based on the results of calculating the final value of the best alternative that has the greatest preference.

4. CONCLUSION

Several significant conclusions have been reached as a consequence of the research that was conducted on the Implementation of Decision Support Systems at Tourist Attractions in North Sumatra using the Simple Multi-Attribute Rating Technique Method. First, the SMART approach is used by this decision support system to choose clients based on four primary factors: distance, public amenities, ticket prices, and the number of visitors. Tourists should take these factors into account when selecting the ideal tourist attraction. Additionally, the decision support system employed in this study has the capacity to correctly interpret data on tourism objects and offer pertinent recommendations for tourist objects. Sibolangit Forest was determined to be the overall top choice after evaluation. Sipiso-piso Waterfall was selected as the best substitute for places with waterfalls, Lake Toba as the best substitute for destinations with lakes, and the Dua Rasa River as the best substitute for destinations with rivers. Several recommendations might be made to further research development. The addition of criteria like cleanliness, safety, the age of tourist attractions, the sorts of tourism on offer, and ease of access to tourist destinations is one of them. In order to get a more thorough and in-depth understanding of tourism attractions in North Sumatra, comparisons with other decision support system techniques are also important.

REFERENCE

[1] A. A. B. Ginting and D. P. Utomo, "Perancangan Aplikasi Catalog Wisata Di Sumatera Utara Menggunakan Algoritma Rabin-Karp," *KOMIK (Konferensi Nasional Teknologi Informasi dan Komputer)*, vol. 3, no. 1, 2019.

[2] I. Ikmah and A. S. Widawati, "Sistem Pendukung Keputusan Pemilihan Tempat Wisata Purworejo Menggunakan Metode SAW," *Semnasteknomedia Online*, vol. 6, no. 1, pp. 2–8, 2018.

[3] A. Ikhwan and N. Aslami, "Decision Support System Using Simple Multi-Attribute Rating Technique Method in Determining Eligibility of Assistance," *Building of Informatics, Technology and Science (BITS)*, vol. 3, no. 4, pp. 604–609, 2022.

[4] M. Mukhtar and M. Munawir, "Aplikasi Decision Support System (DSS) dengan Metode Fuzzy Multiple Attribute Decission Making (FMADM) Studi Kasus: AMIK Indonesia Dan STMIK Indonesia," *Jurnal JTIK (Jurnal Teknologi Informasi dan Komunikasi)*, vol. 2, no. 1, pp. 57–70, 2018.

[5] R. E. Putra and S. Djasmayena, "Metode Simple Multi Attribute Rating Technique Dalam Keputusan Pemilihan Dosen Berprestasi yang Tepat," *Jurnal Informasi dan Teknologi*, pp. 1–6, 2020.

[6] A. Nawawi, S. Ramadhani, and A. Sihombing, "A Decision Support System To Determine The Location Of A New Sales Branch At Star East Shop With The Smart Method," *Journal of Artificial Intelligence and Engineering Applications (JAIEA)*, vol. 2, no. 2, pp. 41–47, 2023.

[7] W. N. Alimyaningtias, I. Rosita, and N. Indrayani, "Analysis of the Decision System for Selecting Interest in Concentration Using the SMART Method," *Journal of Computer Networks, Architecture and High Performance Computing*, vol. 5, no. 1, pp. 100–109, 2023.

[8] D. Destinasari, D. Gustian, and S. Saepudin, "Sistem Pendukung Keputusan Pada Rekomendasi Pasangan Hidup Dengan Simple Additive Weigthing," *JTKSI (Jurnal Teknologi Komputer dan Sistem Informasi)*, vol. 3, no. 1, pp. 26–31, 2020.

[9] R. M. Sinaga, F. A. A. Harahap, A. Tasari, and D. Y. Niska, "IMPLEMENTASI DECISION SUPPORT SYSTEM METODE SIMPLE MULTI ATTRIBUTE RATING TECHNIQUE DALAM PEMILIHAN RUMAH KOST DISEKITAR KAMPUS UNIVERSITAS NEGERI MEDAN," *Jurnal Teknologi Informasi, Komputer, dan Aplikasinya (JTIKA)*, vol. 4, no. 2, pp. 134–143, 2022.

[10] A. N. Nafisa, E. N. D. B. Purba, N. A. Putri, and D. Y. Niska, "Penentuan Kriteria Penerima Beasiswa Berprestasi Menggunakan Metode Analytical Hierarchy Process," *Jurnal Informatika*, vol. 9, no. 2, pp. 103–108, 2022.

[11] C. M. Q. Ramos, P. J. S. Cardoso, H. C. L. Fernandes, and J. M. F. Rodrigues, "A Decision-Support System to Analyse Customer Satisfaction Applied to a Tourism Transport Service," *Multimodal Technologies and Interaction*, vol. 7, no. 1, p. 5, 2022.

[12] A. Y. Haki and A. E. Budianto, "IMPLEMENTASI METODE SMART PADA SISTEM PENDUKUNG KEPUTUSAN OBJEK WISATA DI KABUPATEN TIMOR TENGAH UTARA," *Kurawal-Jurnal Teknologi, Informasi dan Industri*, vol. 4, no. 2, pp. 82–91, 2021.

[13] K. P. Tripathi, "Decision support system is a tool for making better decisions in the organization," *Indian Journal of Computer Science and Engineering (IJCSE)*, vol. 2, no. 1, pp. 112–117, 2011.

[14] D. M. Khairina, M. R. Asrian, and H. R. Hatta, "Decision support system for new employee recruitment using weighted product method," in *2016 3rd International Conference on Information Technology, Computer, and Electrical Engineering (ICITACEE)*, IEEE, 2016, pp. 297–301.

[15] V. Rosalina, W. Agustiawan, and A. Purnamasari, "A Decision Support System for Determining the Best Customer Using the Simple Multi-Attribute Rating Technique (SMART)," *International Journal of Information Technology and Computer Science Applications*, vol. 1, no. 1, pp. 58–65, 2023.

[16] M. N. Amalia and M. Ary, "Sistem Pendukung Keputusan Pemilihan Supplier Dengan Menggunakan SMART Pada CV. Hamuas Mandiri," *Jurnal Sains dan Informatika*, vol. 7, no. 2, pp. 127–134, 2021.

[17] A. D. U. Siregar, N. A. Hasibuan, and F. Fadlina, "Sistem Pendukung Keputusan Pemilihan Sales Marketing Terbaik di PT. Alfa Scorph Menggunakan Metode COPRAS," *Jurnal Sistem Komputer dan Informatika (JSON)*, vol. 2, no. 1, pp. 62–68, 2020.