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Decision support system for electric car selection using AHP and SAW Methods

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ABSTRACT

In Indonesia, the current development of electric cars has become an interesting topic of discussion. As conveyed by the President at the 2020 annual event of the financial services industry in the grand ballroom of The Ritz Carlton Pacific Place (PP), electric cars are the only ones that may someday pass the IKN (presumably a specific route or infrastructure). In this study, the author proposes the AHP (Analytical Hierarchical Process) and SAW (Simple Additive Weighting) methods to determine decisions in choosing four-wheeled vehicles. Several criteria for weighting in this research are based on battery, design, price, country of origin, and speed. The AHP problem-solving procedure includes stages such as problem definition, element prioritization, synthesis, and consistency measurement, while SAW determines decision outcomes by normalizing and weighting each alternative based on the criteria. Based on the analysis and data processing using the AHP method, the first rank goes to Tesla S with a value of 0.4978, followed by Hyundai Kona in second place with a value of 0.2499, and Nissan Kicks E-Power in third place with a value of 0.2496. Meanwhile, using the SAW method, the first rank is obtained by Tesla S with a value of 3.5, followed by Hyundai Kona in second place with a value of 3.25, and Nissan Kicks E-Power in third place with a value of 3.125. This research is expected to be a recommendation to users or consumers who use electric cars in determining the type of Tesla car based on five main criteria used as criteria for selecting electric cars based on battery, price, design, speed and place of manufacture.

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1. INTRODUCTION

The automotive industry plays an important role in supporting the Indonesian economy because it involves various stages from component manufacturing, vehicle production and assembly, distribution through networks, to sales and services to the public (Syaputri & Cakranegara, 2021). In Indonesia the development of electric cars is currently an interesting conversation (Putra et al., 2015)). Competition for car manufacturing companies is increasing and competing with each other to market the latest output with various specifications (Awalinah et al., 2017). Some of the criteria in determining the choice of choosing a car, of course, must be based so that the criteria match what you want. Usually several criteria or benchmarks in choosing a car vehicle such as the engine, body, interior, frame and engine numbers, tax papers, and of course price are the criteria that are taken into consideration when deciding to buy a car (Setiadi, 2019).

Decision Support Systems (DSS) are designed to solve certain problems, both structured and unstructured (Umar et al., 2018) the aim is to provide information in decision making that can be implemented in computer programs (Nawawi et al., 2021). In addition to providing an SPK information system, it is a data model that can be modified (Manurung, 2017). The results provided by the system serve as decision support to provide alternative solutions to existing problems, which lead to better decisions (Sanyoto et al., 2017).

In this study the authors propose the AHP method in determining the decision to choose a four-wheeled vehicle. Determination of the method of taking and calculating the weight of AHP. Logic with the AHP method is a hierarchy of input based on human views (Umar et al., 2018). The advantage of the AHP method is in weighting (Mahendra & Indrawan, 2020). In the system (AHP weight survey) the hierarchical process is carried out in parallel so that the resulting weights can follow the wishes of the user (Kurniady & Munggana, 2013). The highest score will determine the earliest value in applying the AHP method (Trisnawati et al., 2022).

A number of criteria for weighting in this study for the selection of four-wheeled electric vehicles are based on battery, design, price, origin and speed. Research on the AHP method as a decision support was carried out by (Saputra & Kusuma, 2020) in determining the decision to choose a used car to recommend the type of used car based on the criteria used in this system, namely the criteria for completeness of vehicle documents, engine condition, physical condition, and year of release .

Furthermore, the SPK using the AHP method is also a recommendation from research conducted by (Setiadi, 2019) A decision support system using the AHP method can select used cars quickly and accurately according to established criteriaNava successful motor showroom which is used as the object of research.

Similar research on choosing car comparison information in making decisions using the AHP method is carried out parallel in the system (AHP weight survey) so as to produce recommendations according to the wishes of the user (Kurniady & Munggana, 2013). Research on the decision to choose the best school in Jambi province using the SAW method results in the process of selecting the best school being easier based on many input criteria so that it is able to evaluate things that need to be improved on several choices that are the object of research (Ibrahim & Surya, 2019).

Decision Support System (DSS) for the selection process so that the results are fast and on target (Khasanah et al., 2020), In addition, the decision support system provides a recommendation system in a systematic and objective manner in providing recommendations (Pranoto et al., 2022).

The difference in this research from several previous studies is that we try to focus more on the criteria we choose to get a ranking of the alternatives we provide.

Some of the criteria that we take as a reference in processing data using the AHP and SAW methods include battery life, design, price, artificial origin, and speed.

Therefore the selection of the method is very important in deciding in choosing the best electric car using the decision support system method as discussed in this study by determining five criteria, namely battery, price, speed, design and made in for three choices or alternatives, namely Tesla S, Hyundai Kona, Nissan Kicks E-Power which is the object of research.

2. RESEARCH METHOD

Explaining In order to support structured and directed research, a research methodology is necessary (Mustopa et al., 2020). In this study, we propose a research method as illustrated in Figure 1.

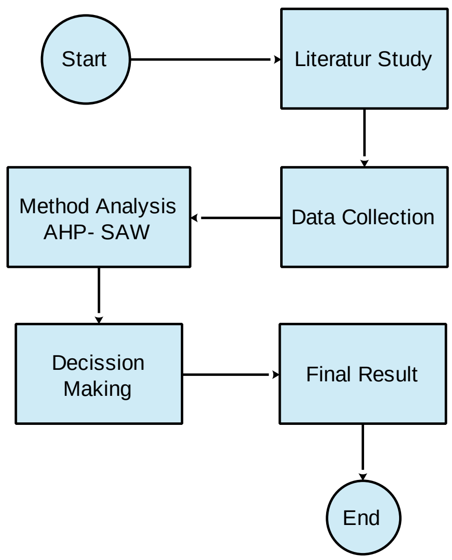

Figure 1. Research Methods

In Figure 1, the research process is described, starting with a literature review on the researched object to obtain the final outcome in the form of best recommendations based on the proposed decision-making methods in this study.

a. Literature Review

The literature review is essential to gather relevant sources based on previous research findings (Liani et al., 2020). In this stage, we conducted research by collecting relevant sources to support the background of the studied problem.

b. Data Collection

In the data collection stage, we obtained data by distributing questionnaires randomly to several respondents to create a sample for testing the research (Purwandani & Syamsiah, 2021). The questionnaire we gave consisted of questions about the criteria we used in this study. In addition, we also asked the weight of the comparison between existing alternatives based on criteria.

c. Method Analysis

In the data analysis stage, respondents' data is presented as alternatives, and their responses are recorded as criteria (Nurlela et al., 2019). The analysis process involves using the proposed decision-making methods, which are AHP and SAW. The AHP method provides results to address the issues in the object of the research (Yanto, 2021). It works by creating paired matrices for comparing input values (Mulyadin & Winarso, 2019). The AHP method produces calculations based on average scores, consistency index, consistency ratio, and hierarchical context checks to determine the final decision (Agustina et al., 2021). On the other hand, the fundamental principle used in the SAW method is to find the total weight of performance assessments for each alternative across all attributes (Simanullang & Simorangkir, 2021). It works by determining alternative values, assigning ratings to each criterion, normalizing them, and weighting the importance level of each criterion (Rusliyawati et al., 2020).

d. Decision Making

In the decision-making stage, whether using the AHP or SAW method, the alternative with the highest rating or evaluation is recommended for each decision and considered the best outcome (Kusumantara et al., 2019).

e. Final Result

The expected result of this research is to obtain selected recommendations for the tested alternatives based on input criteria. These recommendations are derived from the data analysis and decision-making processes

3. RESULTS AND DISCUSSIONS

Before conducting the analysis, the first step is to determine the research object, which in this case is electric cars. We have chosen three alternatives in making decisions to find the best alternative based on the choices made by the respondents. The detailed alternatives selected for this research are explained in Table 1.

Table 1. Research Objects/Alternatives

Type (Alternative)	Criteria				
	Battery	Design	Price	Made in	Speed
Tesla S	Tesla Supercharger 250W) Battery Capacity: 100 kWh (400 V)	Width: 1850 mm, Height: 1443 mm	2,2 Milyar	Amerika	249 kmph
Hyundai Kona	Gamma 1.6 T-GDI with 16 valve MLA. Charging time estimation: 19 hours Battery Capacity: 220 v	4.180 mm P x 1.800 mm L x 1.570 mm THeight: 1443 mm	742 Jt	Jepang	Acceleration : 9,7 second. Maximum Speed167 km/hours
Nissan Kicks E-Power	Charging time estimation fast: 19 hours Battery Capacity: 220 v	Width 1760 mm dan Height 1615 mm	482 Jt	Thailand	Acceleration : 127,2 second. Maximum Speed: 165 km/ hours

In Table 1, there are three Tesla car options that are used as research subjects. The selected criteria are based on the 5 main criteria for choosing electric cars, which are battery, design, price, origin, and speed.

Furthermore, the data is implemented in a matrix in selecting electric cars with the hierarchical structure of the AHP model in outline presented in Figure 2.

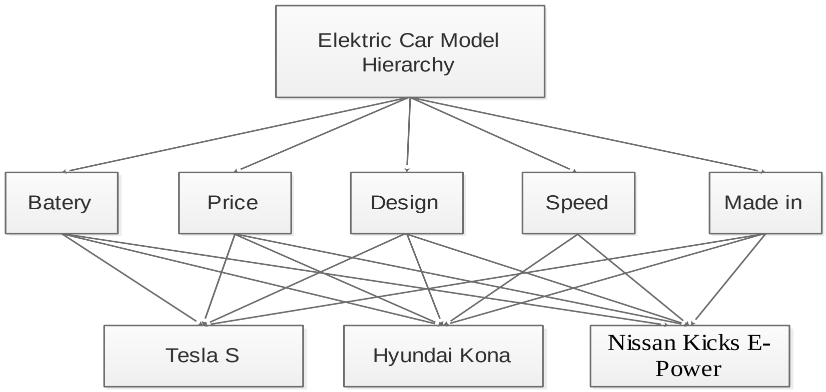

Figure 2. Hierarchy of selecting the best four-wheeled electric car

In Figure 2, there is a hierarchical relationship between the alternatives, which are electric cars, and the predetermined criteria: battery, price, design, speed, and place of manufacture. Next, a paired comparison matrix is created based on the input from alternatives to criteria using the scale weighting values from 1 to 9. The detailed paired comparison matrix is explained in Table 2.

Table 2. Paired Comparison Matrix with AHP Model

In Selecting the Best Four-Wheeled Electric Vehicle, Which Criteria Are More Important Compared to the Following Criteria:																		
Criteria A	Rating Scale																	Criteria B
Battery	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Price
Battery	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Design
Battery	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Made in
Battery	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Speed
Price	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Design
Price	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Made in
Price	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Speed
Design	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Made in
Design	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Speed
Made in	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Speed

In table 2. Matrix decisions are made to get input from the results of distributing questionnaires that compare one criterion with another using the current comparison scale. The time scale is described in table 3.

Table 3. Saaty's Scale of Comparison

1	Equally important	2,4,6,8	The value between two considerations
3	Slightly more important	7	Much more important than
5	More important than	9	Absolutely more important than

Source: (Trisnawati et al., 2022)

In table 3, the current comparison scale consists of six groups of values, each of which has been categorized. As an example to assess the hierarchy between criteria compared to battery attributes in table 4.

Table 4. Rating Scale for Battery Criteria

In choosing the best four-wheeled electric vehicle based on the "Battery" criteria, which alternative is more important than the following alternatives:																		
Criterion A	Scoring scale																	Criterion B
Tesla s	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Hyundai Kona
Tesla s	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Nissan Kicks E-Power
Hyundai Kona	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Nissan Kicks E-Power

In Table 4, criteria A are compared with criteria B, and respondents determine the values based on their choices. The expected outcome is to obtain a pairwise comparison matrix of criteria A against criteria B from the compared alternatives. In the example of Table 3, the specific criterion being considered is "Battery."

After obtaining the pairwise comparison matrix using the AHP method, the next steps are as follows: (a) Summing the values of each column in the matrix. (b) Dividing each value in the column by the total of that column to obtain the normalized matrix. (c) Summing the values of each row and dividing them by the number of elements to get the average value for each main criterion.

The results obtained from the pairwise comparison of the matrix values for criteria one against the other criteria are presented in Table 5.

Table 5. Synthesis Based on Main Criteria.

Criteria	Battery	Price	Design	Speed	Made in	Average
Baterry	0,25	0,40	0,22	0,15	0,21	0,25
Price	0,17	0,24	0,39	0,32	0,23	0,27
Design	0,22	0,12	0,20	0,31	0,23	0,22
Made in	0,18	0,09	0,07	0,11	0,18	0,12
Speed	0,18	0,16	0,13	0,10	0,16	0,14
Eigen Vector						1.00

From table 5 it can be concluded as: The price criterion has the highest priority with a weight of 0.27, The Battery Criterion has the second priority with a weight of 0.25, Design Criteria has the third priority with a weight of 0.22, The Speed Criterion has the fourth priority with a weight of 0.14, The Artificial Origin criterion has the lowest priority with a weight of 0.12.

So that the order of synthesis is based on the main criteria for selecting a four-wheeled electric vehicle, namely price, battery, design, speed and made in Then calculate the synthesis at the second level based on the order of the main criteria, namely price, battery, design, speed and artificial origin of the alternative choices. In detail described in table 6.

Table 6. Comparison of criteria against alternatives

No.	Synthesis criteria based on				
	Battery	Price	Design	Speed	Made in
1	Tesla S	Tesla S	Tesla S	Tesla S	Tesla S
2	Hyundai Kona	Nissan Kicks E-Power	Hyundai Kona	Nissan Kicks E-Power	Hyundai Kona
3	Nissan Kicks E-Power	Hyundai Kona	Nissan Kicks E-Power	Hyundai Kona	Nissan Kicks E-Power

In Table 6, each criterion is compared with alternatives to obtain the consistency of each criterion towards the alternatives. When making decisions, it is essential to assess the consistency of those decisions. The most critical aspect at this stage is multiplying each value in the first column with the relative priority of the first element.

Based on the final processing by performing a synthesis calculation for each alternative, the values are obtained based on the eigen vector using the AHP method and arranged as follows: Tesla S has the highest priority weight with a value of 0.4978. Hyundai Kona has the second priority weight with a value of 0.2499., Nissan Kicks E-Power has the third priority weight with a value of 0.2496.

Therefore, based on the AHP method, the decision resulting from the electric cars with the highest priority weight concerning the criteria of battery, price, design, speed, and place of manufacture is Tesla S.

Next, in the SAW method, the criteria are structured in a table format to create a matrix that is processed to make decisions based on input from the criteria for the alternatives. The criteria table 7 is as follows:

Table 7. List of Criteria

No	Name	Characteristic
1	Battery	Cost
2	Price	Benefit
3	Design	Benefit
4	Speed	Benefit
5	Origin of Manufacture	Benefit

In Table 7, the selection criteria for determining decision characteristics of each criterion are provided. In Table 7, "Battery," "Design," "Speed," and "Made In" are categorized as benefit characteristics, while "Price" is categorized as a cost characteristic.

After that, each alternative is assigned values based on the average of the input values chosen by the respondents. The results are shown in Table 8.

Table 8. Alternative Values for Criteria

Alternative	Criteria				
	Battery	Price	Design	Speed	Made in
Tesla S	0.25	0.5	0.75	0.75	1
Hyundai Kona	0.5	0.75	0.75	0.5	1
Nissan Kicks E-Power	0.5	0.5	0.75	0.5	1

In table 8 the average value is entered from each alternative to the criteria for further ranking in table 9.

Table 9. Alternative Ranking

Alternative	Criteria					Result
	Battery	Price	Design	Speed	Made in	
Tesla S	0.5	0.5	0.75	0.75	1	3.5
Hyundai Kona	0.25	0.75	0.75	0.5	1	3.25
Nissan Kicks E-Power	0.125	1	0.50	1	0.50	3.125

In table 9 to get the ranking of each alternative against the selected criteria using the SAW method produces the first order of decisions Tesla S, Hyundai Kona and Nissan Kicks E-Power rank 3rd based on the final score.

Based on the results of the data process for ranking electric cars with 5 criteria the results obtained are using the AHP method, the best electric car sequence is the first Tesla S with a score of 0.4978, the second Hyundai Kona with a score of 0.2499 and the third is Nissan Kicks E-Power. Whereas with the SAW method, the order of the best electric cars is the first Tesla S with a score of 3.5, the second is the Hyundai Kona with a score of 3.25, and the third is Nissan Kicks E-Power with a score of 3.125.

4. CONCLUSION

Based on data analysis and processing using the Analytical Hierarchical Process (AHP) and Simple Additive Weighting (SAW) methods of selecting electric cars based on five main criteria being compared: battery, price, design, speed, and country of manufacture, the result is that Tesla S ranks first with an AHP score of 0.4978 and a SAW score of 3.5.

The second position is held by the Hyundai Kona with an AHP score of 0.2499 and a SAW score of 3.25. Nissan Kicks E-Power is in third place with an AHP score of 0.2496 and a SAW score of 3.125. From the results of this study, it is hoped that people can consider buying three choices of electric cars which are the object of our research based on the criteria we use. This research has limitations, namely only taking three alternatives and limited to two methods so that the comparisons obtained are not many and less complex. Researchers hope that for the development of further research to add more alternatives with different methods to provide more comprehensive results.

REFERENCES

Agustina, F., Sumpala, A. T., & Arysespajayadi, A. (2021). SPK Pemilihan Jurusan Siswa Baru Menggunakan Metode AHP dan MOORA Pada SMKN 1 Kolaka. *Jurnal Sains Dan Informatika*, *7*(1), 87–96. https://doi.org/10.34128/jsi.v7i1.292

Awalinah, A. A., Arifin, S. P., & Saf, M. R. A. (2017). Sistem Pendukung Keputusan Pembelian Mobil dengan Membandingkan Metode Analytic Hierachy Process dan Fuzzy Associative Memory. *Jurnal Nasional Teknologi Dan Sistem Informasi*, *3*(1), 89–100. https://doi.org/10.25077/teknosi.v3i1.2017.89-100

Ibrahim, A., & Surya, R. A. (2019). The Implementation of Simple Additive Weighting (SAW) Method in Decision Support System for the Best School Selection in Jambi. *Journal of Physics: Conference Series*, *1338*(1). https://doi.org/10.1088/1742-6596/1338/1/012054

Khasanah, F. N., Trias Handayanto, R., Herlawati, H., Thamrin, D., Prasojo, P., & Hutahaean, E. S. H. (2020). Decision support system for student scholarship recipients using simple additive weighting method with sensitivity analysis. *2020 5th International Conference on Informatics and Computing, ICIC 2020*. https://doi.org/10.1109/ICIC50835.2020.9288617

Kurniady, R. K., & Munggana, W. (2013). Sistem Perbandingan dan Penyediaan Informasi Kendaraan Mobil dengan Metode AHP. *Jurnal ULTIMA InfoSys*, *4*(1), 28–33. https://doi.org/10.31937/si.v4i1.239

Kusumantara, P. M., Kustyani, M., & Ayu, T. (2019). Pendukung Keputusan Pemilihan Wedding Organizer Di. *Teknika Engineering and Sains Journal*, *3*(I), 19–24.

Liani, D. A., Fikry, M., & J. Hutajulu, M. (2020). Analisa Metode Webqual 4.0 dan Importance-Performance Analysis (IPA) Pada Kualitas Situs Detik.com. *Jurnal Ilmiah Merpati (Menara Penelitian Akademika Teknologi Informasi)*, *8*(1), 34. https://doi.org/10.24843/jim.2020.v08.i01.p04

Mahendra, G. S., & Indrawan, I. P. Y. (2020). Metode Ahp-Topsis Pada Sistem Pendukung Keputusan Penentuan Penempatan Automated Teller Machine. *JST (Jurnal Sains Dan Teknologi)*, *9*(2), 130–142. https://doi.org/10.23887/jst-undiksha.v9i2.24592

Manurung, N. (2017). Sistem Pendukung Keputusan Pemberian Bonus Karyawan Menggunakan Metode Ahp. *Jurnal Teknologi Informasi*, *1*(1), 48. https://doi.org/10.36294/jurti.v1i1.42

Mulyadin, I., & Winarso, D. S. (2019). Sistem Pendukung Keputusan Pemilihan Smartphone Menggunakan Metode Simple Additive Weighting. *CAHAYAtech*, *7*(2), 88. https://doi.org/10.47047/ct.v7i2.13

Mustopa, A., Agustiani, S., Wildah, S. K., & Maysaroh, M. (2020). Analisa Kepuasan Pengguna Website Layanan Akademik Kemahasiswaan (LYKAN) UBSI Menggunakan Metode Webqual 4.0. *Jurnal Perspektif*, *18*(1), 75–81. https://doi.org/10.31294/jp.v18i1.7413

Nawawi, H. M., Yudhistira, Y., Mustopa, A., Wildah, S. K., Agustiani, S., & Iqbal, M. (2021). Sistem Pendukung Keputusan Pemilihan Tempat Usaha Potensial dengan Metode SAW (Studi Kasus : SahabatLink Tasikmalaya). *Indonesian Journal on Software Engineering (IJSE)*, *7*(1), 26–34. https://doi.org/10.31294/ijse.v7i1.9990

Nurlela, S., Akmaludin, A., Hadianti, S., & Yusuf, L. (2019). Penyeleksian Jurusan Terfavorit Pada Smk Sirajul Falah Dengan Metode Saw. *Jurnal Pilar Nusa Mandiri*, *15*(1), 1–6. https://doi.org/10.33480/pilar.v15i1.1

Pranoto, G. T., Pebrianti, D., Darwis, M., Yaddarabullah, & Krishnasari, E. D. (2022). Selection of Education Assistance Recipients Based on AHP and SAW. *2022 International Seminar on Intelligent Technology and Its Applications (ISITIA)*, 163–168. https://doi.org/10.1109/ISITIA56226.2022.9855329

Purwandani, I., & Syamsiah, N. O. (2021). Analisis Kualitas Website Menggunakan Metode Webqual 4.0 Studi Kasus: MyBest E-learning System UBSI. *Jurnal Sistem Dan Teknologi*

Informasi (Justin), *9*(3), 300. https://doi.org/10.26418/justin.v9i3.47129
Putra, B. S., Rusdinar, A., & Kurniawan, E. (2015). Desain Dan Implementasi Sistem Monitoring Dan Manajemen Baterai Mobil Listrik. *E-Proceeding of Engineering, Universitas Telkom*, *2*(2), 1909–1916.
Rusliyawati, R., Damayanti, D., & Prawira, S. N. (2020). Implementasi Metode Saw Dalam Sistem Pendukung Keputusan Pemilihan Model Social Customer Relationship Management. *Edutic - Scientific Journal of Informatics Education*, *7*(1), 12–19. https://doi.org/10.21107/edutic.v7i1.8571
Sanyoto, G. P., Handayani, R. I., & Widanengsih, E. (2017). Sistem Pendukung Keputusan Pemilihan Laptop Untuk Kebutuhan Operasional Dengan Metode AHP (Studi Kasus: Direktorat Pembinaan Kursus Dan Pelatihan Kemdikbud). *Jurnal Pilar Nusa Mandiri*, *13*(2), 167–174.
Saputra, A. R., & Kusuma, A. P. (2020). Sistem Penentuan Mobil Bekas Menggunakan Metode Analitycal Hierarchy Process (Ahp). *Jurnal Mnemonic*, *3*(2), 1–6. https://doi.org/10.36040/mnemonic.v3i2.2794
Setiadi, I. (2019). Sistem Pendukung Keputusan Pemilihan Mobil Bekas. *Jurnal String*, *3*(3), 247–257.
Simanullang, S. K., & Simorangkir, A. G. (2021). Sistem Pendukung Keputusan Penerimaan Calon Karyawan Menggunakan Metode Simple Additive Weighting. *TIN: Terapan Informatika Nusantara*, *1*(9), 472–478.
Syaputri, S. A., & Cakranegara, P. A. (2021). Comparative Analysis Of Financial Distress Methods In The Automotive Component Industry: Altman, Grover, And Zmijewski. *Jurnal Mantik*, *5*(2), 1737–1754.
Trisnawati, H., Veranita, V., & Tarigan, S. (2022). Penerapan Metode Ahp Untuk Pemilihan Toko Online Tas Wanita Pada Platform Shopee. *Jurnal Sistem Informasi Dan Informatika (Simika)*, *5*(2), 121–132. https://doi.org/10.47080/simika.v5i2.2005
Umar, R., Fadlil, A., & Yuminah, Y. (2018). Sistem Pendukung Keputusan dengan Metode AHP untuk Penilaian Kompetensi Soft Skill Karyawan. *Khazanah Informatika: Jurnal Ilmu Komputer Dan Informatika*, *4*(1), 27. https://doi.org/10.23917/khif.v4i1.5978
Yanto, M. (2021). Sistem Penunjang Keputusan Dengan Menggunakan Metode Ahp Dalam Seleksi Produk. *Jurnal Teknologi Dan Sistem Informasi Bisnis*, *3*(1), 167–174. https://doi.org/10.47233/jteksis.v3i1.161