

Decision Support System for Extracurricular Determination to Increase Student Involvement in Activities Outside the Classroom Using the AHP Method

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Abstract

SMK Dharma Pancasila Medan is a private school located at Jl. Dr. T. Mansyur No.71 C Medan, Kel. PB Selayang. Currently, the selection of extracurricular activities at the school relies on a conventional manual system, lacking a formal system to identify the best extracurricular activities among the available options. This study aims to develop a Decision Support System (DSS) using the Analytical Hierarchy Process (AHP) method to evaluate and prioritize extracurricular activities based on four main criteria: achievement, short-distance running, height, and discipline. The system is designed to provide objective and measurable recommendations, facilitating students in choosing the most suitable extracurricular activities to enhance their success in out-of-class activities. The research findings demonstrate that the DSS developed with the AHP method is effective in providing accurate recommendations and increasing student engagement in extracurricular activities. The analysis and assessment process using AHP results in more targeted decisions aligned with the goal of enhancing student involvement. Overall, the system not only aids students in optimal extracurricular selection but also contributes to the development of better extracurricular activity strategies at SMK Dharma Pancasila Medan. This research enriches educational theory and practice by offering practical solutions to the challenges in extracurricular selection and enhances the overall educational experience for students.

Keywords: Decision Support System, Analytical Hierarchy Process, Extracurricular Activities, Students, SMK.

1. Introduction

SMK Dharma Pancasila Medan is one of the vocational high schools in the city of Medan, which is located at Jl. Dr. Mansyur Blok C No.71, Padang Bulan Selayang I, Kec. At SMK Dharma Pancasila Medan school, there are several kinds of extracurriculars that are determined. The problem that occurs today when students of SMK Dharma Pancasila Medan want to choose extracurriculars that are suitable for them is that there is no achievement data and other information from various kinds of extracurriculars that have been determined. To optimize extracurricular selection at SMK Dharma Pancasila Medan, a system was created that helps students to see what types of extracurricular activities exist at the school, and students can also find out which type of extracurricular is the best from SMK Dharma Pancasila Medan. The Decision Support System for extracurricular elections has also been carried out on. Santa Maria Cirebon High School is one of the Private High Schools in Cirebon City that always strives to bring out and develop the potential of its students not only through academic activities but also from non-academic activities, in the process of applying the SMART method with 4 criteria, namely, criteria: Interest, Talent, Experience and Achievement [1]. The Faculty of Science and Technology at Labuhan Batu University also implements SPK using the MOOSRA (Multi-Objective Optimization based on Ratio Analysis) method. In selecting trainers for extracurricular activities, a Decision Support System is designed using the MOOSRA (Multi-Objective Optimization based on Ratio Analysis) method using 4 criteria, namely: experience, achievement, academics, skills, and leadership [2]. In a study conducted by [3] with the title "Comparison of SAW and WP Methods in the Decision Support System for the Selection of Extracurricular Activities" stated that Extracurricular is an activity that is carried out outside of class hours. Extracurricular activities are also activities that can support student learning activities that aim to enrich and expand themselves. Expanding oneself can be done by increasing knowledge or insight as well as instilling attitudes or values.

2. Theoretical Foundations

2.1. Decision Support System

The Decision Support System (SPK) is an information system that provides information in the form of modeling and data manipulation that is used to help decision-makers in semi-structured situations where no one knows exactly how decisions should be made [3]

2.2. Extrakurikuler

Extracurricular activities are activities that are carried out outside of school or at school to expand students' horizons and knowledge, according to extracurricular activities are a very important tool to achieve meaningful educational goals and not just to be sources of entertainment for students, Meanwhile according to in the implementation of curricular programs state that extracurricular programs are a program that can supporting the achievement of educational goals, where things cannot be solved [2].

2.3. Student

The definition of student in the Indonesian Language Dictionary is a person/child who is teaching (studying, attending school). According to Prof. Dr. Shafique Ali Khan) the definition of a student is a person who comes to an institution to obtain or learn some type of education. Meanwhile, according to Sardiman, the definition of a student is a person who comes to school to obtain or learn some type of education [4].

2.4. AHP Method

The Analytical Hierarchy Process (AHP) is a method to solve a complex and unstructured situation into several parts in a hierarchical order, namely by assigning a subjective value to the relative importance of each variable, and determining which variable has the highest priority to comply with the outcome in a given situation. The main equipment of AHP is to have a functional hierarchy with the main input being human perception. By creating a hierarchical table, a complex and unstructured problem can be solved into groups and arranged into a form of hierarchy [5].

2.5. Database

According to Indrajani, in the journal "a database is a collection of data that is logically interconnected and designed to get the data needed by an organization". Based on the understanding according to Indrajani, it can be concluded that a database is data that can be designed and integrated so that it can meet the needs of users in a company or organization [6].

In an information system, a database functions as a storage center for necessary data and information. In application development, databases play a role as an important component that facilitates data storage, retrieval, and processing. Therefore, the use of databases in application development is very important and strategic [7].

2.7. Mysql

According to Kustiyahningsih, in the journal MySQL is a database that contains one or a number of tables. A table consists of a number of rows and each row contains one or a number of tables [8]. According to Wahana, in the journal MySQL is an open source server database that is quite popular for its existence. With its various advantages, making this database software widely used by practitioners to build a project. The existence of an API (Application Programming Interface) facility owned by Mysql allows various computer applications written in various programming languages to access the MySQL [9].

3. Analysis and Design

3.1. Analysis with the AHP Method

SMK Dharma Pancasila Medan in carrying out the extracurricular selection process determines 4 assessment criteria in the application of the Extracurricular Election Decision Support System using the Analytical Hierarchy Process (AHP) method.

Table 1: Criteria Table

Information	Criterion Name
C1	Achievement
C2	Short Distance Running
C3	Height
C4	Discipline

Information:

The Hierarchy Structure formed in the extracurricular selection process consists of 4 hierarchies where, the first hierarchy is the target of this study, the second hierarchy is the 4 criteria in this study, Achievement, Short Distance Running, Height and Discipline while the third hierarchy is the number of candidates or alternatives in this study.

Table 2: Level of Importance

Weight	Information	Explanation
1	Just as important as	Two factors have the same influence on the goal
3	A Little More Important than	One factor is slightly more influential than the other
5	More Important than	One factor is more influential than the other
7	Very Important from	One factor is very influential than the other
9	Absolutely Very Important	One factor is much more influential than the other
2,4,6,8	Analyze the above values	The inverse value of the above conditions

Table 3: Matriks Perbandingan Kriteria

Criterion	Achievement	Short Distance Running	Height	Discipline
Achievement	1	5.00	3.00	5.00
Short Distance Running	0.20	1	0.30	3.00
Height	0.33	3.33	1	3.00
Discipline	0.20	0.33	0.33	1
Sum	1.73	9.67	4.63	12.00

Information:

1. The value of 1 in the table above is the determination value in the AHP method.
2. A value of 5.0 in the table above means More Important than.
3. A value of 0.2 in the table above means a backcomparison of the criteria.
4. A value of 3.0 in the table above means that it is slightly more important than.
5. The value of 0.3 in the table above means the backcomparison of the criteria.

Furthermore, the results of matrix multiplication are obtained as shown in the table below:

Table 4: Matrix of Priority Values Comparison Criteria

Compare	Achievement	Short Distance Running	Height	Discipline	Sum	Priority
Achievement	0.577	0.517	0.647	0.417	2.158	0.540
Short Distance Running	0.115	0.103	0.065	0.250	0.534	0.133
Height	0.192	0.345	0.216	0.250	1.003	0.251
Discipline	0.115	0.034	0.072	0.083	0.305	0.076

Information:

The value in the Achievement table is 0.577 (this value is obtained from the multiplication of the weights in the first table x the sum of the weights in the first table) $1 / 1.73 = 0.577$. For the second table in you the number of weights in the second table, and so on until the final table.

Result of the number of rows = $0.557 + 0.517 + 0.647 + 0.417 = 2.158$

a. Priority Result = $2.158/4 = 0.540$

Next, create a matrix of summing each row

Table 5: Summing Matrix of Each Line

Addition	Achievement	Short Distance Running	Height	Discipline	Sum
Achievement	0.540	0.667	0.752	0.381	2.340
Short Distance Running	0.108	0.133	0.075	0.229	0.545
Height	0.180	0.445	0.251	0.229	1.104
Discipline	0.108	0.044	0.084	0.076	0.312

Information:

The values in the Achievement table and other tables can be obtained by multiplying the value of the weight x the value of the priority result ($1 \times 0.540 = 0.540$) and so on.

Next look for the consistency ratio:

Table 6: Consistency Ratio

Consistency Ratio	Sum	Sum	Result
Achievement	2.340	0.540	2.880
Short Distance Running	0.545	0.133	0.679
Height	1.104	0.251	1.355
Discipline	0.312	0.076	0.389
Sum			5,303
Final Result (X max)			1.325

Result:

N (criteria) = 4 (5,303/4)

Final Result (X max) = 1,325

IR = 0,9

CI = $CI = (\lambda \text{ Max} - n) / (n - 1)$

= $1,325 - 4/3$

= 0.892

CR = CI / IR

= $0.892/0,9 = 0.991$

Since $CR < 1$, the consistency of the calculation is acceptable.

Table 7: Table of Alternative Values

Alternative	Value
Paskib	89.25
Futsal	88
Pramuka	88.25
PMR	83.75

Table 8: Comparison of Alternative Achievements

Achievement	Paskib	Futsal	Pramuka	PMR
Paskib	1	3.0	3.0	5.0
Futsal	0.3	1	0.2	3.0
Pramuka	0.3	5.0	1	3.0
PMR	0.2	0.3	0.3	1
Sum	1.9	9.3	4.5	12.0

Table 9: Priority Between Alternative Achievements

Compare	Paskib	Futsal	Pramuka	PMR	Priority
Paskib	0.536	0.321	0.662	0.417	0.484
Futsal	0.179	0.107	0.044	0.250	0.145
Pramuka	0.179	0.536	0.221	0.250	0.296
PMR	0.107	0.036	0.074	0.083	0.075

Table 10: Comparison of Short-Distance Running Alternatives

Short Distance Running	Paskib	Futsal	Pramuka	PMR
Paskib	1	3.0	3.0	5.0
Futsal	0.3	1	0.2	3.0
Pramuka	0.3	5.0	1	3.0
PMR	0.2	0.3	0.3	1
Sum	1.9	9.3	4.5	12.0

Table 11: Priority Between Short-Distance Running Alternatives

Compare	Paskib	Futsal	Pramuka	PMR	Priority
Paskib	0.536	0.321	0.662	0.417	0.484
Futsal	0.179	0.107	0.044	0.250	0.145
Pramuka	0.179	0.536	0.221	0.250	0.296
PMR	0.107	0.036	0.074	0.083	0.075

Table 12: Comparison of Height Alternatives

Height	Paskib	Futsal	Pramuka	PMR
Paskib	1	3.0	3.0	5.0
Futsal	0.3	1	0.2	3.0
Pramuka	0.3	5.0	1	3.0
PMR	0.2	0.3	0.3	1
Sum	1.9	9.3	4.5	12.0

Table 13: Priority Between Height Alternatives

Compare	Paskib	Futsal	Pramuka	PMR	Priority
Paskib	0.536	0.321	0.662	0.417	0.484
Futsal	0.179	0.107	0.044	0.250	0.145
Pramuka	0.179	0.536	0.221	0.250	0.296
PMR	0.107	0.036	0.074	0.083	0.075

Table 14: Comparison of Alternative Disciplines

Discipline	Paskib	Futsal	Pramuka	PMR
Paskib	1	3.0	3.0	5.0
Futsal	0.3	1	0.2	3.0
Pramuka	0.3	5.0	1	3.0
PMR	0.2	0.3	0.3	1
Sum	1.9	9.3	4.5	12.0

Table 15: Priorities Between Discipline Alternatives

Compare	Paskib	Futsal	Pramuka	PMR	Compare
Paskib	0.536	0.321	0.662	0.417	0.484
Futsal	0.179	0.107	0.044	0.250	0.145
Pramuka	0.179	0.536	0.221	0.250	0.296
PMR	0.107	0.036	0.074	0.083	0.075

Information:

1. The value of 1 is the value of the
2. 1.0 is equally important
3. A grade of 2.0 has a meaning close to a little more important than
4. A value of 0.2 has a meaning that is slightly closer to no more important than
5. A value of 3.0 is a little more important than
6. A value of 0.3 means little less important than
7. A grade of 5.0 is more important than
8. A value of 0.5 means nothing more important than

To find the priority value, the result of all the comparison values between the alternatives is divided by the number of alternatives, for example: $0.536 + 0.321 + 0.662 + 0.417 = 1.936 : 4 = \mathbf{0.484}$. After the priority values of all the alternatives are obtained, the next step is to compare the alternatives and criteria.

Table 16: Alternative Comparison Values and Criteria

Alternative	Criterion			
	Achievement	Short Distance Running	Height	Discipline
	0.540	0.133	0.251	0.076
Paskib	0.484	0.484	0.484	0.484
Futsal	0.145	0.145	0.145	0.145
Pramuka	0.296	0.296	0.296	0.296
PMR	0.075	0.075	0.075	0.075

Information:

The final result is obtained by multiplying the alternative priority value and the priority value between the criteria: $0.484 \times 0.540 = \mathbf{0.261}$

Table 17: Final Result

Alternative	Kriteria				
	Achievement	Facilities	Participant Distance	Activity Facilities	Final Result
Paskib	0.261	0.065	0.121	0.037	0.484
Futsal	0.078	0.019	0.036	0.011	0.145
Pramuka	0.160	0.040	0.074	0.023	0.296
PMR	0.040	0.010	0.019	0.006	0.075

Table 18: Ranking

Alternate ID	Alternative	Value	Value
A001	Paskib	0.302	1
A006	Futsal	0.168	3
A007	Pramuka	0.061	2
A008	PMR	0.051	4

4. Interface Discussion

4.1. Implementation

This section discusses the results of the trial of the calculation of the application of the ahp method in the extracurricular election decision support system. This test is to find out if the system that has been created is running well and can be used after designing the system that has been created in the previous chapter. And in this chapter we will discuss how the appearance and content of the program that has been designed after it is run.

4.2. Login Page

The login page is a crucial element in the information system because it functions as the main gateway that controls access to features and data in the application. On the login page, users are expected to enter their credentials, i.e. username and password, to access the system. The purpose of this login page is to ensure that only authorized users can access the information and features contained in the app. The following is a picture of the login page on the designed system:

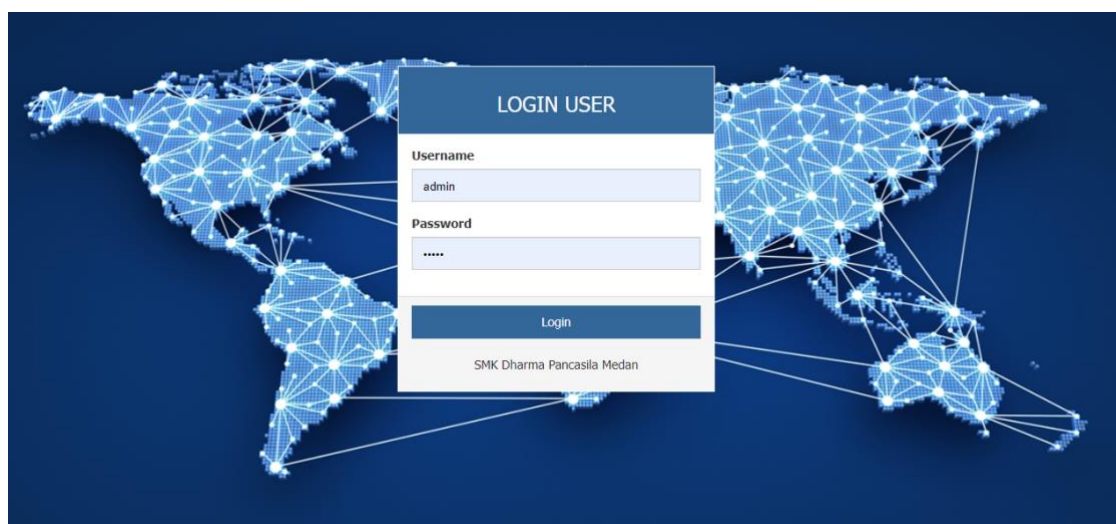


Fig. 1: Login Page

4.3. Main Menu

The main menu is a central component in the navigation of information systems that facilitates user access to various features and functions of the application. These menus are designed to provide efficient and intuitive navigation, so users can easily find and access various parts of the system without any difficulty. Here is an image of the main menu on the system:

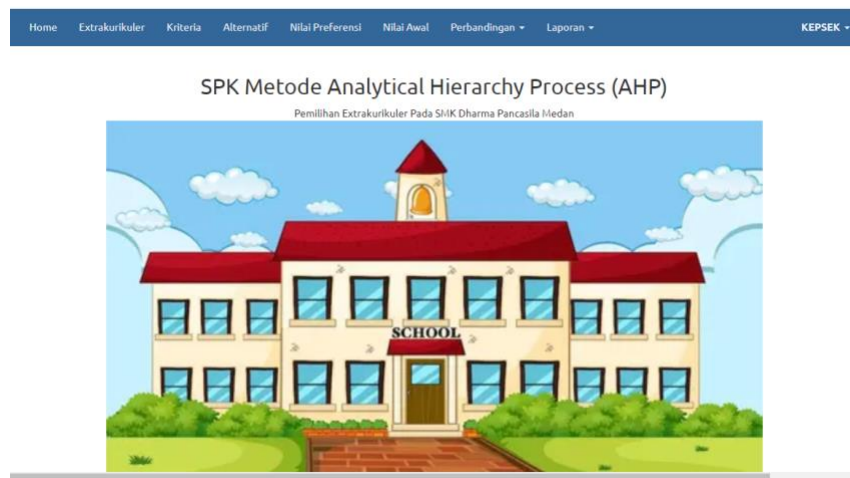


Fig. 2: Home

4.4. Criteria Menu Page

The Criteria Menu Page is an important component in the information system used to manage and display criteria or parameters relevant to the application's functionality. On this page there is data on the criteria that have been set. The design of this page aims to provide users with an efficient and effective way of managing the various necessary criteria. Here's what the criteria page looks like in the system:

ID Kriteria	Nama Kriteria	Bobot Kriteria	Aksi
C1	Prestasi	0.540	[Edit] [Delete]
C2	Lari Jarak Pendek	0.133	[Edit] [Delete]
C3	Tinggi Badan	0.251	[Edit] [Delete]
C4	Kedisiplinan	0.076	[Edit] [Delete]

Fig. 3: Criteria Page

4.5. Alternate Pages

This alternative page is designed to be a place to fill in alternative data (extracurricular) that has been set at SMK Dharma Pancasila Medan, in this page there are alternative initial grades and the number of students who participate in the extracurricular. Here's what an alternate page looks like on the built system:

ID Alternatif	Extrakurikuler	Jumlah Siswa	Nilai	Aksi
A002	Futsal	18	88 (B)	[Edit] [Delete]
A001	Paskib	40	89.25 (B)	[Edit] [Delete]
A004	PIIR	10	83.75 (B)	[Edit] [Delete]
A003	Pramuka	18	88.25 (B)	[Edit] [Delete]

Fig 4: Alternate Pages

4.6. Final Result

This section presents the final results of the evaluation and analysis process that has been carried out. The final result includes a summary of the assessment of the criteria that have been set, a comparison between alternatives and criteria, here is what the final results page looks like in the system:

Home Kriteria Alternatif Nilai Preferensi Nilai Awal Perbandingan Laporan KEPEK				
Data Bobot				
Alternatif	Kriteria			
	Prestasi	Lari Jarak Pendek	Tinggi Badan	Kedisiplinan
	0.550	0.249	0.118	0.083
Paskib	0.514	0.484	0.484	0.484
Futsal	0.170	0.145	0.145	0.145
Pramuka	0.251	0.296	0.296	0.296
PMR	0.065	0.075	0.075	0.075
Hasil Akhir				
Alternatif	Kriteria			
	Prestasi	Lari Jarak Pendek	Tinggi Badan	Kedisiplinan
	0.283	0.120	0.057	0.040
Paskib	0.283	0.120	0.057	0.040
Futsal	0.093	0.036	0.017	0.012
Pramuka	0.138	0.074	0.035	0.024
PMR	0.036	0.019	0.009	0.006

Fig. 5: Final Result

4.7. Ranking

This section of the page displays the rankings or ratings of the various alternatives based on the scores obtained from the criteria analysis. This ranking helps in determining which alternative is the most suitable or optimal based on the evaluation criteria that have been set. The following is a picture of the ranking page:

Home

Kriteria

Alternatif

Nilai Preferensi

Nilai Awal

Perbandingan

Laporan

KEPEK

Hasil Perankingan

Tahun 2022

ID Alternatif	Nama	Hasil Akhir	Ranking
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Tahun 2023

ID Alternatif	Nama	Hasil Akhir	Ranking
A001	Paskib	0.501	1
A003	Pramuka	0.272	2
A002	Futsal	0.158	3
A004	PMR	0.069	4

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Fig. 6: Ranking

5. Conclusion

This research aims to design and develop a Decision Support System (SPK) that utilizes the Analytical Hierarchy Process (AHP) method to determine the most appropriate extracurricular activities for students at SMK Dharma Pancasila Medan. With this SPK, it is hoped that it will make it easier for students to choose the best extracurricular activities based on the criteria that have been set. Based on the analysis and application of the AHP method in this system, several conclusions can be drawn as follows:

Decision Support Systems designed using the AHP method have proven to be effective in helping students choose appropriate extracurricular activities. By compiling criteria such as achievement, sprinting, height, and discipline, the system is able to provide objective and measurable recommendations based on students' preferences and needs. The AHP method has been successfully applied to determine extracurricular priorities by considering various important criteria. AHP provides a systematic structure in the decision-making process, so that schools can choose extracurriculars that best suit students' potential and interests. The application of this method shows that the resulting decisions are more directed and in accordance with the goal of increasing student involvement in activities outside the classroom. Criterion Analysis and Assessment: The analysis and assessment process using the AHP method provides consistent and accountable results. The criteria used in this system allow for a comprehensive and objective assessment of a wide range of extracurricular alternatives.

References

- [1] Andika, S. G., Kusnadi, K., & Sokibi, P. (2020). Sistem Pendukung Keputusan Pemilihan Kegiatan Ekstrakurikuler Untuk Siswa Sma Menggunakan Metode Simple Multi Attribute Rating Technique (Studi Kasus: Sma Santa Maria Cirebon). *Jurnal Digit*, 9(1), 59. <https://doi.org/10.51920/jd.v9i1.133>
- [2] Dedek Cahyati Panjaitan, Hengki Juliansa, Robi Yanto. (2021). Perbandingan Metode Saw Dan Wp Pada Sistem Pendukung Keputusan Dalam Kasus

- Pemilihan Kegiatan Ekstrakurikuler. *Jurnal Ilmiah Binary STMIK Bina Nusantara Jaya Lubuklinggau*, 3(1), 30–38. <https://doi.org/10.52303/jb.v3i1.38>
- [3] Ismai. (2020). Perancangan Basis Data Sistem Informasi Perwira Tugas Belajar (Sipatubel) Pada Kementerian Pertahanan. *Senamika*, 1(2), 222–233.
- [4] Kurniawan, H., Apriliah, W., Kurnia, I., & Firmansyah, D. (2021). Penerapan Metode Waterfall Dalam Perancangan Sistem Informasi Penggajian Pada Smk Bina Karya Karawang. *Jurnal Interkom: Jurnal Publikasi Ilmiah Bidang Teknologi Informasi Dan Komunikasi*, 14(4), 13–23. <https://doi.org/10.35969/interkom.v14i4.78>
- [5] Normah, Rifai, B., Vambudi, S., & Maulana, R. (2022). Analisa Sentimen Perkembangan Vtuber Dengan Metode Support Vector Machine Berbasis SMOTE. *Jurnal Teknik Komputer AMIK BSI*, 8(2), 174–180. <https://doi.org/10.31294/jtk.v4i2>
- [6] Riyadli, H., Arliyana, A., & Saputra, F. E. (2020). Rancang Bangun Sistem Informasi Keuangan Berbasis WEB. *Jurnal Sains Komputer Dan Teknologi Informasi*, 3(1), 98–103. <https://doi.org/10.33084/jsakti.v3i1.1770>
- [7] Sitinjak Daniel Dido Jantce TJ, M., & Suwita, J. (2020). Analisa Dan Perancangan Sistem Informasi Administrasi Kursus Bahasa Inggris Pada Intensive English Course Di Ciledug Tangerang. *Ipsikom*, 8(1), 1–19.
- [8] Suhartini, S., Sadali, M., & Kuspandi Putra, Y. (2020). Sistem Informasi Berbasis Web Sma Al- Mukhtariyah Mamben Lauk Berbasis Php Dan Mysql Dengan Framework Codeigniter. *Infotek : Jurnal Informatika Dan Teknologi*, 3(1), 79–83. <https://doi.org/10.29408/jit.v3i1.1793>
- [9] Widana, A., Sihombing, V., & Munthe, I. R. (2023). Sistem pendukung keputusan pemilihan pelatih kegiatan ekstrakurikuler menggunakan metode moosra. *Jurnal TEKINKOM*, 6(02), 532–539. <https://doi.org/10.37600/tekinkom.v6i2.1018>