DECISION SUPPORT SYSTEM FOR THE SELECTION OF PENCAK SILAT ATHLETES USING AHP - TOPSIS

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ABSTRAK

Nama Persaudaraan Setia Hati Terate mengandung makna mengutamakan hubungan antar sesama yang tumbuh dari hati yang tulus, ikhlas, dan bersih. Selain itu juga dijelaskan bahwa semua anggota Persaudaraan Setia Hati Terate adalah satu saudara yang tidak membedakan pangkat, derajat, dan martabat serta suku, agama, ras dan antar golongan (SARA). Adapun faktor kendala selksi altet pencak silat ini yaitunya minimnya sumbar daya kepelatihan yang memiliki kemampuan dalam menyelksi atlet, Meninjau dari segala alasan permasalahan di tempat penelitian, harus dibuat sistem yang dapat pendukung dalam diri pelatih ataupun tim seleksi secara terang-terangan sehingga membantu dalam men yeleksi atlet untuk mendapatkan atlet yang paling potensial guna mencapai prestasi yang maksimal. Sis tem Sele ksi atl et pen cak si lat ini akan digu nakan metode AHP yang dapat me ng uraikan masa lah men jadi su atu hi erarki sehingga m udah da lam penye lesaiannya, Se dangkan TOPSIS adal ah sa lah s atu met ode peran gkingan yang mem i liki kelebi han y aitu mengan ggap solusi terb aik tida k hanya so lusi yang paling me ndekati so lusi solusi id eal, tapi juga yang paling jauh dari solusi negatif. Metode yang digunakan adalah metode *An-alytical Hiera-rchy Proc-ess* (AHP) dan *Tech-nique For Order Prefere-nce By Sim-ilarty To I deal Solut ion* (TOPSIS) den gan ba hasa pemro graman PHP. Pen elitian ini telah me nerapkan me tode analy tical hiera rchy proc ess (AHP) untuk me nentukan se rta me nguji kon sistensi bo bot krit eria yang me liputi 4 kriteria yaitu fisik, teknik, psikis, dan strategis. Penelitian ini dengan Penerapan Metode metode AHP dan (TOPSIS) dengan hasil pengujian, didapat kesimpulan bawaha sistem yang di bangun lebih efektif dalam menyeleksi atlet pencak silat dibanding tim penguji tanpa menggunakan sistem.

Kata kunci: *Sistem Penunjang Keputusan, AHP, TOPSIS, Pencak Silat, PSHT*

ABSTRACT

The name Setia Hati Terate Brotherhood means prioritizing relationships between others that grow from a sincere, sincere, and clean heart. In addition, it was also explained that all members of the Setia Hati Terate Brotherhood are one brother who does not distinguish between rank, degree, and dignity as well as ethnicity, religion, race, and inter-group (SARA). One of the constraining factors for the development of Pencak silat which is in the spotlight is the lack of trainers who are qualified in selecting athletes. Considering all the reasons for the problems at the research site, it is necessary to create a decision support system that can be used by coaches and organizers of an open selection that can assist in selecting athletes to get the most potential athletes to achieve maximum performance. The selection system for Pencak silat athletes will use the AHP method which can decompose problems into a hierarchy so that it is easy to solve, while TOPSIS is a ranking method that has the advantage that it considers the best solution not only the solution closest to the ideal

solution but also the most far from a negative solution. The method used is the Analytical Hierarchy Process (AHP) and Technique For Order Preference By Similarity To Ideal Solution (TOPSIS) with the PHP programming language. This study has applied the analytical hierarchy process (AHP) method to determine and test the consistency of the weight of the criteria which includes 4 criteria, namely physical, technical, psychological, and strategic. This research uses the application of the AHP and (TOPSIS) methods with the test results, it is concluded that the system built is more effective in selecting Pencak silat athletes than the test team without using the system.

Keywords: Decision Support System, AHP, TOPSIS, Pencak Silat, PSHT

1.   Introduction

The development of increasingly advanced information technology, one of which is in providing the best solution for every problem that exists, requires computer skills. A computer-based decision support system (Computer-Based Decision Support System) is designed to facilitate decision-making in solving problems faced. Each problem requires the right way and can solve the problem with the most effective, effective, and efficient steps to fulfill its needs. Every region in Indonesia always has strong athletes in each class. Someone who wants to become a regional athlete must take part in the election held in that area. Selection in the competing categories brings together 2 (two) fighters and fights according to the existing provisions. Many of them got injured after taking part in the selection. The mentality of the athletes is also affected by every decision made by the referees and judges. Errors in decision making at the Pencak silat college of 'Persaudaraan Setia Hati Pekanbaru Branch can have a huge impact on the achievements of athletes and the achievements of the region itself. This is detrimental to the athletes who will take part in the next match.

One of the hindering factors in the development of Pencak silat athletes that are in the spotlight is the lack of trainers who are qualified in selecting athletes, one of them happened in the Pencak silat Setia Hati Terate Pekanbaru branch, where the coaches only tended to follow the culture or previous experience.

1.   Pencak Silat

Pencak Si lat is a traditional art form. Various aspects and components of this art have taken root and developed in the cultural life of the Indonesian nation. Pencak Silat is one of the cultural products of the Malay nation in the form of self-defense or self-defense.

2.   Selection

Selection is a method and procedure in selecting people for a purpose. In Pencak silat, In a tournament, participants are required to go as a team, this team is called a contingent. The contingent contains several Pencak silat athletes which are divided into certain categories. Each contingent will make a selection to form a team that will be completed in a championship. In addition, the selection is held as a form of preparation to take part in the championship.

3.   Athlete

Athletes according to the Big Indonesian Dictionary are athletes, especially those who take part in competitions or competitions in agility, speed, skill, and strength.

4.   Decision Support System

The concept of a decision support system is an interactive computer-based system, which helps decision-makers utilize data and models to solve unstructured and semi-structured problems. Decision support systems are not intended to automate decision-making, but provide interactive tools that allow decision-makers to perform various analyzes using available models (Akarte et al., 2001; Cheng & Mon, 1994; Erol & Kilkiş, 2012).

5.   AHP (Analytical Hierarchy Process)

Analytical Hierarchy Process (AHP) merupakan suatu model pendukung keputusan yang di kembangkan olwh Thomas L. Saaty (1993). Model pendukung keputusan ini akan menguraikan masalah multi faktor atau m ulti kriteria yang kompleks menjadi suatu hirarki, hirarki didefenisikan sebagai suatu representasi dari sebuah permasalahan yang kompleks dalam suatu struktur multi level dim ana level pertama adalah tujuan, yang diikuti level faktor, kriteria, sub kri teria, dan seterusnya ke bawah hingga level terakhir dari alternatif.(Dweiri & Al-Oqla, 2006; Handayani & yuni darmianti, 2017; Nasibu, 2009)

6.   TOP SIS (Technique for Order Preference by Similarity to Ideal Solution)

TOPSIS is a multi-criteria method used to identify solutions from a set of alternatives based on simultaneous minimization of the ideal point distance and maximizing the distance from the lowest point(Sari et al., 2018).

2. RESEARCH METHODOLOGY

This research methodology is closely related to the methods, techniques, patterns, and methods of research design used by researchers in sequencing the work carried out in a study so that it can help researchers to control the stages and also make it easier to know the research process involved. done. Furthermore, this research process aims to understand the accuracy level of the Analytical Hierarchy Process (AHP) method in providing consistent criteria weights and the accuracy level of the Technique For Order Preference By Similarity To Ideal Solution (TOPSIS) method in the use of decision support systems. Pencak Silat athlete selection.

3. RESULT AND DISCUSSION
3.1 Data analysis

Data analysis is defined as an effort to process data into information so that the properties of the data can be easily understood and useful for answering problems related to research activities(Isyarah et al., 2020)(Simorangkir & Arief, 2020). Thus, data analysis techniques can be interpreted as a way of carrying out analysis of data, processing the data into information, so that the properties of the data can be easily understood and useful for answering problems related to research activities, both related to data descriptions. as well as to make inductions, or draw conclusions about population characteristics (parameters) based on data obtained from samples (statistics).

3.2 Application of AHP (Analytical Hierarchy Process) Method

AHP is an analysis that is used in decision-making with a systems approach, where decision-makers try to understand a system condition and help make predictions in making decisions.

1. Determine the Types of Criteria

Based on the method used in determining the eligibility of the selection, which is the criteria mentioned in the following hierarchy.
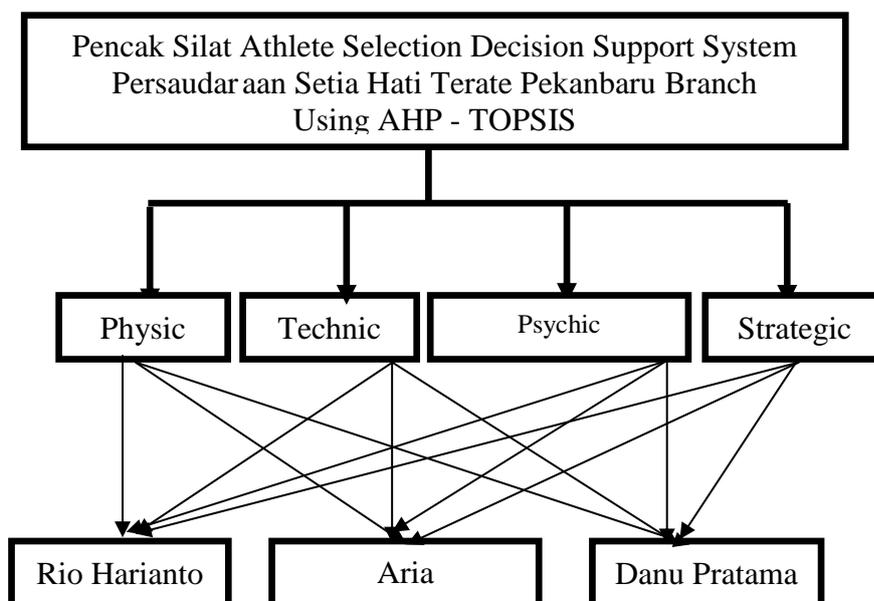

Figure 1. Hierarchy Pencak Silat Setia Hati

2 Develop Criteria

Based on the hierarchy above, we can arrange what criteria we use in the selection of the Pekanbaru branch of PSHT Pencak silat into a paired matrix as follows :

Tabel 1 Criteria Data

No	Criteria Name	Criteria Code
1	Fisik	C01-FI
2	Teknik	C02-TE
3	Psikis	C03-PS
4	Strategis	C04-ST

Tabel 2 Alternative Data

No	Code	Name
1	A01	RIO HARIANTO
2	A02	ARIA KAMANDANU
3	A03	DANU PRATAMA

Table 3 Comparison Value

No	Value
1	as important as
2	Approaching a little is more important than
3	Slightly more important than
4	Approaching is more important than
5	More important
6	Approaching the very importance of
7	Very Important of
8	Close to absolute of
9	Absolute very important of

First of all, construct a hierarchy that starts with objectives, criteria, and location alternatives at the lowest level. Next, determine the pairwise comparison between the criteria in the form of a matrix the diagonal matrix value for the comparison of an element with the element itself is filled with numbers (1) while the contents of the comparison value between (1) to (9) are the opposite, then add up each column. The data matrix is shown in the following table.

Table 4 Comparison Matrix Between Criteria

Code	C01-FI	C02-TE	C03-PS	C04-ST
C01-FI	1	2	3	3
C02-TE	0.5	1	2	3
C03-PS	0.333	0.5	1	2
C04-ST	0.333	0.333	0.5	1
Total	2.167	3.833	6.5	9

Information :
- For detailed search criteria data can be seen in the example below Calculate the value of C2 and C2 = 1/2 = 0.5
- To search for the total, it can be obtained from the vertical sum of each column.

3. Creating a Criteria and Priority Value Matrix

In the column, the calculated amount is obtained from the sum of each row, while in the priority column above the value is obtained from the value in the column number divided by the number of criteria, in this case, the number of criteria is 4.

Table 5 Comparison Matrix Between Criteria

Kode	C01-FI	C02-TE	C03-PS	C04-ST	Bobot Prioritas
C01-FI	0.462	0.522	0.462	0.333	0.445
C02-TE	0.231	0.261	0.308	0.333	0.283
C03-PS	0.154	0.13	0.154	0.222	0.165
C04-ST	0.154	0.087	0.077	0.111	0.107

4. Creating a Criteria Consistency Matrix

To find out the consistency of the comparison matrix, multiplication of the entire contents of the column A comparison matrix with the priority weight of criterion A, the contents of column B of the comparison matrix with the priority weight of criterion B, and so on. Then add up each row and divide the row sum with the appropriate priority weight as shown in the following table.

Table 5.6 Comparison Matrix Between Criteria

Kode	C01-FI	C02-TE	C03-PS	C04-ST	Bobot
C01-FI	0.462	0.522	0.462	0.333	4.112
C02-TE	0.231	0.261	0.308	0.333	4.087
C03-PS	0.154	0.13	0.154	0.222	4.054
C04-ST	0.154	0.087	0.077	0.111	4.032

5. Determine the Ratio Index based on the Order of the

The next step is to calculate or determine the ratio index based on the order of the matrix, so that the consistency index, Ratio Index, and Consistency Ratio are obtained. For more details, it can be described as in the table below:

Table 7 Ratio Index based on the Order of the Matrix

Ordo Matriks	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Ratio Index	0	0	0.58	0.9	1.12	1.24	1.32	1.41	1.46	1.49	1.51	1.48	1.56	1.57	1.59

So we have obtained consistency index = 0.024, Ratio Index = 0.9 and Consistency Ratio = 0.026 **(Consistent).**

3.3 Application of TOPSIS Method (*Technique For Order Preference By Similarity To Ideal Solution*)

Based on the results of the ratio index based on the order of the matrix obtained by the AHP method. The results of the process of weighting the athlete's value with sub-criteria weights were carried out using the TOPSIS method (Technique For Order Preference By Similarity To Ideal Solution). In the process of determining the value of the athlete's test results, the system receives input for the value of each sub-criteria from each athlete. This value that will be used in the calculation process is as follows.

1. Constructing a Decision Matrix

After getting input from the user, the system will compose a decision matrix, which can be seen in the table below.

Table 8 Decision Matrix

Atribute	Fisik	Teknik	Psikis	Strategis
Rio Harianto	5	4	6	8
Aria Kamandanu	5	4	5	6
Danu Pratama	5	6	7	7

2. Constructing a Normalized Decision Matrix

After compiling the decision matrix, the next step is to carry out the normalization process, which can be seen in the table below.

Table 9 Normalized Decision Matrix

Attribute	C01-FI	C02-TE	C03-PS	C04-ST
A01	0.57735	0.48507	0.57208	0.65539
A02	0.57735	0.48507	0.47673	0.49154
A03	0.57735	0.72761	0.66742	0.57346

3. Constructing a Weighted Normalized Decision Matrix

In addition, the system will call the sub-criteria weights that can be processed by AHP. After calling the sub-criteria values from the previous process, the next step is to transfer the normalized decision matrices with the weights of each sub-criteria as follows

Table 10 Weighted Normalized Decision Matrix

Attribute	C01-FI	C02-TE	C03-PS	C04-ST
A01	0.25665	0.13736	0.09444	0.07026
A02	0.25665	0.13736	0.0787	0.0527
A03	0.25665	0.20603	0.11018	0.06148

4. Compiling a Positive Ideal Solution and a Negative Ideal Solution

After determining the weighted normalized decision matrix, the next step is to find the positive and negative ideal solutions for each sub-criteria. The positive solution is the highest value and the negative solution is the lowest value of the sub-criteria.

Table 11 Composing Positive Ideal Solutions and Negative Ideal Solutions

Solution	C01-FI	C02-TE	C03-PS	C04-ST
Positive	0.25665	0.20603	0.11018	0.07026
Negative	0.25665	0.13736	0.0787	0.0527

5. Calculate the alternative distance of each solution and the Preference value

After determining the Positive Ideal Solution and the Negative Ideal Solution, the next step is to calculate the alternative distance of each solution and look for the preference value of each alternative, more details can be presented in the following table.

Table 12 Calculate the alternative distance of each solution and the Preference value

Attribute	Positive	Negative	Preference
A01	0.07046	0.02359	0.2508
A02	0.07756	0	0
A03	0.00878	0.07606	0.89648

6. Ranking

After determining calculating the alternative distance of each solution and the Preference value, and already getting the positive ideal solution value and the negative ideal solution, the next step is the ranking process from the results of the assessment selection using the AHP-TOPSIS method, which is as follows.

Table 13 Ranking with TOPSIS Method

Attribute	Total	Rank
A01 - RIO HARIANTO	0.251	**2**
A02 – ARIA KAMANDANU	0	**3**
A03 – DANU PRATAMA	0.896	**1**

3.4 Implementation View

Implementation of a Decision Support System for the Selection of Pencak Silat Athletes from the Setia Hati Terate Brotherhood of Pekanbaru Branch Using AHP – TOPSIS as follows.
1. Result of Admin Page/Selection Team Implementation
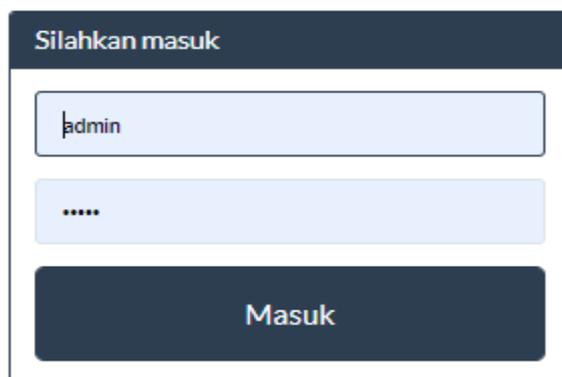
Picture 3 Admin/Selection Team Login Page

Figure 3 describes the login page that limits the system to the user interface. Login restricts user access to the menus provided by this decision support system application. The admin controls the entire contents of the page, while the selection team is in charge of inputting the scores of the prospective athletes.
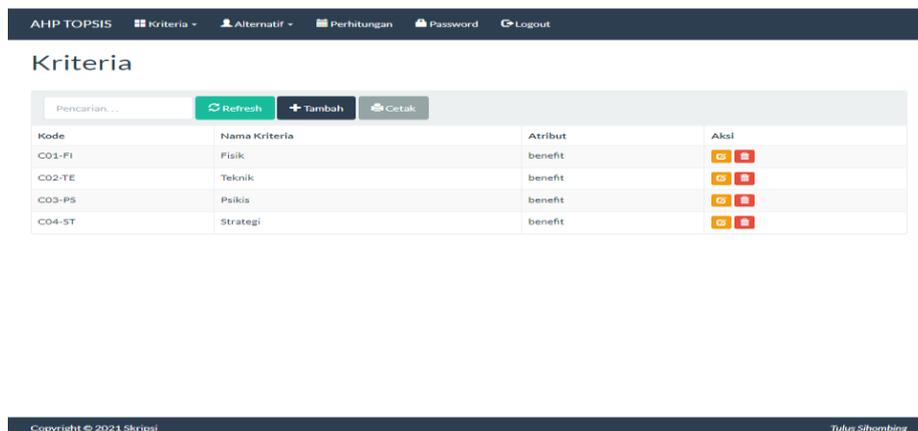
2. Main Page Implementation Results

Picture 4 Implementation Page Main Page

Figure 4 describes the main page that can be accessed by this decision support system. There are several main menus including Criteria, Alternatives, Calculations, Passwords, and Logout.

3. Criteria Page Implementation Results

Picture 5 Implementation Page Criteria Page

Figure 5 describes the menu for input criteria. In the menu, there is a Code, Criteria Name, Attributes, and action buttons. We can change and add criteria to this menu.

4. Results of Implementation of the Criteria Weighted Value Pages

Picture 6 Implementation Pages Criteria Weighted Values Pages

Figure 5 describes the menu for input criteria weights. After we input the criteria menu, we continue by inputting the weights of each criterion.
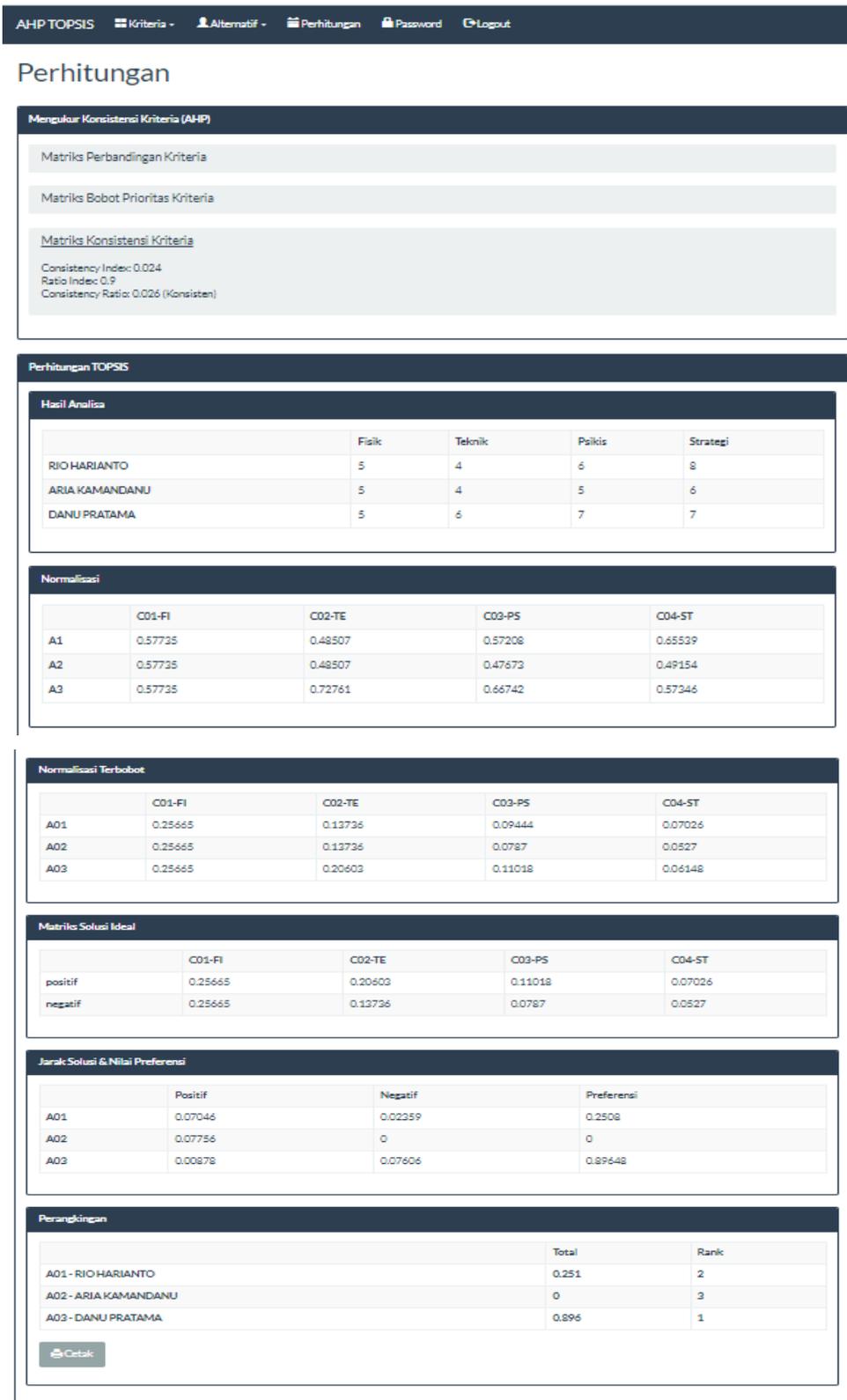
5. Alternative Page Implementation Results

Picture 7 Alternative Page Implementation Page

In the menu shown in Figure 7, it is explained about alternative data input. We can add, and replace alternative data that we will display.

6. The results of the implementation of the calculation results of the AHP-TOPSIS method

Picture 8 AHP-TOPSIS Calculation Results Implementation Page

Figure 8 describes the page that displays the results of calculations using the AHP and TOPSIS methods. On this page, the final results of the AHP and TOPSIS calculations are explained as well as the calculation details.

4. Conclusions and suggestions

4.1 Conclusions

Based on the description of the analysis of the discussion that has been carried out, it can be concluded that the decision support system for the selection of brotherly martial arts athletes can be drawn Setia Hati Terate Pekanbaru branch using AHP–TOPSIS:

1. This study has applied the analytical hierarchy process (AHP) method to determine and test the consistency of the weight of the criteria which includes 4 criteria, namely physical, technical, psychological, and strategic.
2. This research uses the analytical hierarchy process (AHP) and Technique For Order Preference By Similarity to Ideal Solution (TO-PSIS) methods in the decision support system for the selection of Pencak silat athletes. From the test results, it was concluded that the system that was built was more effective in selecting Pencak silat athletes than the testing team without using the system.

4.2 Suggestions

The suggestions that can be given by researchers to parties in need of the results of this study are as follows:

1. For the selectors of Pencak silat, they can use this SPK application to select silat athletes at the silat college, loyal to the heart, terate.
2. Hopefully, this DSS system can be improved or further developed in the future according to a similar research title.

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