


# Decision Support System for Determining the Position of Players in a Football Team Using the Simple Multi At Tribute Rating Technique

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ARTICLEINFO	ABSTRACT
<p><b>Article history:</b> Received Jun 29, 2021 Revised Jul 12, 2021 Accepted Jul 27, 2021</p> <hr/> <p><b>Keywords:</b> Football; pharmacy; SMART; Decision Making System.</p>	<p>One of the keys to a team's victory in a soccer match is about the composition of players or the placement of a player's position in accordance with the abilities he has in the team. In general, the determination process is carried out manually based on the trainer's estimates. In this way, it is impossible to know the value of a formation/team with a certain composition of players. In this study, the authors create a decision support system that can assist the coach in determining the most appropriate players to occupy a position in the team formation. Various assessment factors that become decision variables in this system will be taken into consideration in choosing their position. The assessment factors used are weight (kg), height (m), assessment of tactical assessment techniques, psychological assessment, physical assessment, knowledge of a player who is judged when a player makes attacks, defenses, transitions, scoring per position: goalkeeper, back, center, front. The author uses the Simple Multi Attribute Rating Technique (SMART) method because it is considered the most suitable in this case. By considering various attributes, the value of each player, the value of the player in a formation, and the value of a team formation can be obtained with good results.</p> <p><i>This is an open access article under the <a href="#">CC BY-NC</a> license.</i></p> 

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## **1. INTRODUCTION**

Football is a game that shows the individual's ability to process the ball. Many people around the world love to play and watch football. This activity of watching or playing soccer becomes an activity to unwind from various tasks at the office, campus, and so on. In addition, this activity can also be an activity to strengthen kinship relations. Football fans often have favorite players, clubs and national teams.

A club certainly wants to win and win various tournaments. There are various keys to a team's victory, for example the composition of players, the foresight of the coach, the selection of formations, the individual abilities of the players, and so on. All these keys are fulfilled by the club through routine training activities that are neatly arranged starting from basic exercises such as dribbling, passing, shooting and so on, including teamwork. In general, a player is considered good if the player can play in several positions or in other words more than one position. This condition allows a player to rotate in any situation according to the scheme provided by the coach. In the

Sanata Dharma University (USD FC) soccer UKM, there were several obstacles experienced by the team, coaches, and management,

USD FC, the name for the Sanata dharma Student Activity Unit team in the Yogyakarta city PSSI branch competition is registered with the Yogyakarta City Civil Service PSSI so that they often participate in competitions held by the Yogyakarta City PSSI branch. The Yogyakarta City PSSI branch consists of two divisions, namely Division 1 and the Main Division. In 2015 USD FC was still in Division 1. To be able to move up to the First Division, USD FC needed players who had good individual abilities. However, USD FC has many obstacles such as players often not being on time, training schedules clash with class schedules so that players do not attend training regularly. This obstacle causes players not to develop quickly and coaches find it difficult to review the development of each player's abilities and then save them into a file that will become the coach's archive.

Another problem also often occurs between players who practice often and players who rarely practice. Some players who practice often are rarely called upon to defend the USD FC team in participating in competitions, which can lead to jealousy between players. The absence of players in training due to conflicts with the class schedule so that they can still be tolerated to be included in the team.

The various obstacles above cause the player's assessment file to become very large or the record may be incomplete, so the coach will be confused in determining the most suitable player positions and alternative player positions according to the abilities of the players. Another major obstacle is choosing substitute players if the main players cannot be played with various obstacles, for example colliding with the exam schedule, assignments from campus, unfit health and so on.

From some of the problems above, the writer took the initiative to make a final project with the title "Support System for Decision Making in Determining the Position of Players in a Football Team Using the Modified Simple Multi Attribute Rating Technique (SMART) Method. Case Study: USD Soccer UKM (Universitas Sanata Dharma Yogyakarta)" to be able to assist coaches in solving these problems. Through this system, the coach can clearly see which players are suitable to occupy certain positions as well as alternative positions of these players according to the abilities possessed by a player.

## 2. METHOD

The methods used in order to answer these problems in this study are as follows:

- a. Problem analysis  
At this stage, analyze the problem by conducting interviews, archive studies and literature studies. Interviews were used to collect information about data on soccer players. Archival studies were carried out to study documents related to player data ranging from player abilities, player development during the training provided by the coach. The analysis of the problem is also supported by a literature study that is used to find patterns for decision making.
- b. System Development  
The model that will be used is the waterfall model. Where the waterfall model is a sequential software development process, through phases such as planning, modeling, implementation (construction), testing and maintenance.
- c. System Effectiveness Testing  
This stage serves to test the effectiveness of the decision-making support system for positioning the soccer team in making decisions. The testing process itself will be tested directly to the user, after that the user will fill out a questionnaire about the effectiveness of the system being built.
- d. Data analysis  
The data obtained will be calculated using a Likert scale. Calculations will be calculated for each item of the questionnaire.
- e. Withdrawal of Conclusion  
Based on the results of data analysis that has been carried out in the previous stage, conclusions can be drawn from this research. The use of a decision support system for

determining the position of players in a soccer team can be said to be effective if many of the statements contained in the questionnaire can be received well or very well.

**3. RESULTS AND DISCUSSIONS**

**1. System Test**

System testing can be done in two ways, first by testing or comparing manual calculations (Ms Excel) with calculations from the application and the second is analyzing the results of questionnaires from users. The following is a test of the system.

**2. Excel**

The following is a comparison of the results between manual calculations (Ms Excel) and the application. This is a manual test.

**a. Player Data**

Idp_jurnal	Nama	tinggi	berat	Teknik	Takik	Fisik	Psikologi	Serang	Tahan	Transisi	Gawang	Belakang	Tengah	Depan
PEM_01	Bergito (G)	185	80	2	1	3	4	1	1	1	4	2	1	1
PEM_02	Purandito (G)	180	85	3	3	3	4	3	3	4	3	2	1	1
PEM_03	Edy Hecap (B)	183	85	3	3	3	3	2	2	2	1	4	2	2
PEM_04	Antonius D. Subianto (B)	176	90	3	4	3	4	3	4	4	1	3	2	1
PEM_05	Megawan T. Nabaja (B)	182	80	3	3	3	4	4	4	4	1	4	3	2
PEM_06	Yohanes Pribadi (B)	180	82	3	3	3	4	3	4	4	1	4	3	1
PEM_07	Shafiqul Eshq (C)	180	70	3	4	4	4	3	4	4	1	4	4	1
PEM_08	Iqbal Moez (B)	185	83	4	4	4	4	4	4	4	1	4	3	2
PEM_09	Nahidius Singam (T)	187	75	3	3	4	4	3	3	3	1	2	4	3
PEM_10	Puflifanedi (T)	185	82	4	4	4	4	4	4	4	1	3	4	2
PEM_11	Ahmad H. Lukman (T)	187	88	3	3	3	4	2	3	2	1	2	3	1
PEM_12	Yohanes Eshq (T)	182	81	4	4	4	4	4	3	4	1	2	3	1
PEM_13	Alif Prang Pama (T)	183	80	3	3	3	4	4	4	4	1	2	3	2
PEM_14	Ahmad Kiper (T)	180	84	4	4	4	5	5	4	4	2	4	5	4
PEM_15	Dimpas T. Taluku (D)	183	80	4	4	4	4	4	4	4	1	3	3	4
PEM_16	Simons Sengulaja (D)	185	84	3	2	3	3	2	2	2	1	2	3	3
PEM_17	Oleh Cahle (D)	188	86	3	3	3	4	3	4	4	1	2	4	4
PEM_18	Eduardo Hendri (D)	187	85	3	3	3	3	4	3	4	1	2	4	4
Minimal		180	75	2	1	3	3	1	1	1	1	2	1	1
Maksimal		188	75	4	4	4	5	5	4	4	4	4	5	4
Skala		5												

Figure 3 Player Data

**b. Goal Factor Weight and Objective Factor Weight Normalization**

Tipe dan Karakter - Soccer Star Players										
No	Kriteria	Faktor Tujuan	BFT-Gawang	Normalisasi BFT-Gawang	BFT-Belakang	Normalisasi BFT-Belakang	BFT-Tengah	Normalisasi BFT-Tengah	BFT-Depan	Normalisasi BFT-Depan
1	tinggi	Max Tinggi	8	0.145454545	9	0.163636364	4	0.072727273	3	0.054545455
2	berat	Max Berat	3	0.054545455	3	0.054545455	1	0.018181818	2	0.036363636
3	Teknik	Max teknik	5	0.090909091	5	0.090909091	8	0.145454545	8	0.145454545
4	Takik	Max takik	4	0.072727273	4	0.072727273	7	0.127272727	7	0.127272727
5	Fisik	Max psikologi	6	0.036363636	8	0.145454545	6	0.036363636	6	0.036363636
6	Psikologi	Max fisik	7	0.127272727	7	0.127272727	5	0.090909091	5	0.090909091
7	Serang	Max menyerang	1	0.018181818	1	0.018181818	3	0.054545455	3	0.036363636
8	Tahan	Max bertahan	3	0.163636364	6	0.090909091	2	0.036363636	1	0.018181818
9	Transisi	Max transisi	2	0.036363636	2	0.036363636	3	0.163636364	4	0.072727273
10	Posisi	Max posisi	10	0.181818182	10	0.181818182	10	0.181818182	10	0.181818182
Total BFT			56		56		56		56	

Figure 4 Goal Factor Weights and Normalization per position

**c. Criteria Interval Value**

Tipe dan Karakter - Soccer Star Players							
No	Kriteria	Interval	Interval				
			1	2	3	4	5
1	tinggi	4	>=160 && <164	>=164 && <168	>=168 && <172	>=172 && <176	>=176 && <=180
2	berat	5	>=50 && <55	>=55 && <60	>=60 && <65	>=65 && <70	>=70 && <=75
3	Teknik	0.4	>=2 && <2.4	>=2.4 && <2.8	>=2.8 && <3.2	>=3.2 && <3.6	>=3.6 && <=4
4	Takik	0.6	>=1 && <1.6	>=1.6 && <2.2	>=2.2 && <2.8	>=2.8 && <3.4	>=3.4 && <=4
5	Fisik	0.2	>=3 && <3.2	>=3.2 && <3.4	>=3.4 && <3.6	>=3.6 && <3.8	>=3.8 && <=4
6	Psikologi	0.4	>=3 && <3.4	>=3.4 && <3.8	>=3.8 && <4.2	>=4.2 && <4.6	>=4.6 && <=5
7	Serang	0.8	>=1 && <1.8	>=1.8 && <2.6	>=2.6 && <3.4	>=3.4 && <4.2	>=4.2 && <=5
8	Tahan	0.6	>=1 && <1.6	>=1.6 && <2.2	>=2.2 && <2.8	>=2.8 && <3.4	>=3.4 && <=4
9	Transisi	0.6	>=1 && <1.6	>=1.6 && <2.2	>=2.2 && <2.8	>=2.8 && <3.4	>=3.4 && <=4
10	Gawang	0.6	>=1 && <1.6	>=1.6 && <2.2	>=2.2 && <2.8	>=2.8 && <3.4	>=3.4 && <=4
11	Belakang	0.4	>=2 && <2.4	>=2.4 && <2.8	>=2.8 && <3.2	>=3.2 && <3.6	>=3.6 && <=4
12	Tengah	0.8	>=1 && <1.8	>=1.8 && <2.6	>=2.6 && <3.4	>=3.4 && <4.2	>=4.2 && <=5
13	Depan	0.6	>=1 && <1.6	>=1.6 && <2.2	>=2.2 && <2.8	>=2.8 && <3.4	>=3.4 && <=4

Figure 3 Criteria Interval Value

**d. Normalization of Criteria Value**

Kode alternatif	Nama	topp	berat	Tarik	Tarik	Fisk	Pakolop	Serang	Tahan	Transisi	Gawang	Belakang	Tengah	Depan
PEM_1	Sergio (G)	2	2	1	1	1	3	1	1	1	5	1	1	1
PEM_2	Purnomo (G)	1	1	3	4	1	3	3	4	5	4	1	1	1
PEM_3	Eddy Hosyo (B)	3	3	3	4	1	1	2	2	2	1	5	2	2
PEM_4	Antonius D.Sulistiyanto (B)	4	1	3	5	1	3	3	5	5	1	3	2	1
PEM_5	Magasie T.Nabyal (B)	1	2	3	4	1	3	4	5	5	1	5	3	2
PEM_6	Yohanes Robinson (B)	2	1	3	4	1	3	3	5	5	1	5	3	1
PEM_7	Stefanus Edo.C (B)	5	4	3	5	5	3	3	5	4	1	5	4	1
PEM_8	Igantius Moez (B)	2	1	5	5	5	3	4	5	5	1	5	3	2
PEM_9	Nofeminus Singpanki (T)	2	5	3	4	5	3	3	4	4	1	1	4	4
PEM_10	Paul Francis R (T)	2	1	5	5	5	3	4	5	5	1	3	4	2
PEM_11	Johanis V.Lakesubun (T)	2	4	3	4	1	3	2	4	2	1	1	3	1
PEM_12	Yohanes Erick (T)	1	1	5	5	5	3	4	4	5	1	1	3	1
PEM_13	Aji Prasetyo Putra (T)	1	1	3	4	1	3	4	5	5	1	1	3	2
PEM_14	Ajher Wage (T)	2	3	5	5	5	5	5	5	5	2	5	5	5
PEM_15	Zampari T.Trakna (D)	1	1	5	5	5	3	4	5	5	1	3	3	5
PEM_16	Simeon Sergius Iyai (D)	2	3	3	2	1	1	2	2	2	1	1	3	4
PEM_17	Obeth Cealtie (D)	2	4	3	4	1	3	3	5	5	1	1	4	5
PEM_18	Balbo Hendra (D)	2	3	3	4	1	1	4	4	5	1	1	4	5

Figure 4 Normalization of Criteria Value

e. Utility Score

nilai bobot	1	2	3	4	5
Normalisasi	0	0.25	0.5	0.75	1

Figure 5 Utility Score

f. Convert Normalized Value to utility Score

Kode alternatif	Nama	topp	berat	Tarik	Tarik	Fisk	Pakolop	Serang	Tahan	Transisi	Gawang	Belakang	Tengah	Depan
PEM_1	Sergio (G)	0.25	0.25	0	0	0	0.5	0	0	0	1	0	0	0
PEM_2	Purnomo (G)	0	0	0.5	0.75	0	0.5	0.5	0.75	1	0.75	0	0	0
PEM_3	Eddy Hosyo (B)	0.5	0.5	0.5	0.75	0	0	0.25	0.25	0.25	0	1	0.5	0.5
PEM_4	Antonius D.Sulistiyanto (B)	0.75	0	0.5	1	0	0.5	0.5	1	1	0	0.5	0.25	0
PEM_5	Magasie T.Nabyal (B)	0	0.25	0.5	0.75	0	0.5	0.75	1	1	0	1	0.5	0.25
PEM_6	Yohanes Robinson (B)	0.25	0	0.5	0.75	0	0.5	0.5	1	1	0	1	0.5	0
PEM_7	Stefanus Edo.C (B)	1	0.75	0.5	1	1	0.5	0.5	1	1	0	1	0.75	0
PEM_8	Igantius Moez (B)	0.25	0	1	1	1	0.5	0.75	1	1	0	1	0.5	0.25
PEM_9	Nofeminus Singpanki (T)	0.25	1	0.5	0.75	1	0.5	0.5	0.75	0.75	0	0	0.75	0.75
PEM_10	Paul Francis R (T)	0.25	0	1	1	1	0.5	0.75	1	1	0	0.5	0.75	0.25
PEM_11	Johanis V.Lakesubun (T)	0.25	0.75	0.5	0.75	0	0.5	0.25	0.75	0.25	0	0	0.5	0
PEM_12	Yohanes Erick (T)	0	0	1	1	1	0.5	0.75	0.75	1	0	0	0.5	0
PEM_13	Aji Prasetyo Putra (T)	0	0	0.5	0.75	0	0.5	0.75	1	1	0	0	0.5	0.25
PEM_14	Ajher Wage (T)	0.25	0.5	1	1	1	1	1	1	1	0.25	1	1	1
PEM_15	Zampari T.Trakna (D)	0	0	1	1	1	0.5	0.75	1	1	0	0.5	0.5	1
PEM_16	Simeon Sergius Iyai (D)	0.25	0.5	0.5	0.25	0	0	0.25	0.25	0.25	0	0	0.5	0.75
PEM_17	Obeth Cealtie (D)	0.25	0.75	0.5	0.75	0	0.5	0.5	1	1	0	0	0.75	1
PEM_18	Balbo Hendra (D)	0.25	0.5	0.5	0.75	0	0	0.75	0.75	1	0	0	0.75	1

Figure 6 Convert Normalized Value to Utility Score

g. Final score

Kode alternatif	Nama	Gawang	Belakang	Tengah	Depan
PEM_11	Sergio (G)	0.2955	0.1182	0.0682	0.0682
PEM_12	Purnomo (G)	0.4682	0.2909	0.4318	0.3618
PEM_13	Eddy Hosyo (B)	0.2545	0.4318	0.3227	0.3227
PEM_14	Antonius D.Sulistiyanto (B)	0.5000	0.5500	0.5727	0.4591
PEM_15	Magasie T.Nabyal (B)	0.3909	0.5182	0.5500	0.4818
PEM_16	Yohanes Robinson (B)	0.4091	0.5409	0.5500	0.4000
PEM_17	Stefanus Edo.C (B)	0.6864	0.8682	0.8045	0.6091
PEM_18	Igantius Moez (B)	0.5864	0.7545	0.7773	0.7000
PEM_19	Nofeminus Singpanki (T)	0.5227	0.5227	0.6727	0.6591
PEM_20	Paul Francis R (T)	0.5864	0.6636	0.8227	0.7000
PEM_21	Johanis V.Lakesubun (T)	0.3773	0.3409	0.4182	0.3273
PEM_22	Yohanes Erick (T)	0.5091	0.5045	0.7500	0.6364
PEM_23	Aji Prasetyo Putra (T)	0.3773	0.3227	0.5455	0.4727
PEM_24	Ajher Wage (T)	0.7273	0.8500	0.9364	0.9409
PEM_25	Zampari T.Trakna (D)	0.5500	0.6227	0.7591	0.8227
PEM_26	Simeon Sergius Iyai (D)	0.1818	0.1727	0.2864	0.3364
PEM_27	Obeth Cealtie (D)	0.4500	0.4000	0.6031	0.6091
PEM_28	Balbo Hendra (D)	0.3364	0.3000	0.5636	0.5909

Figure 7 Final score

3. System

This is a test with the system:

a. Goal Factor Weight

Tetapan Bobot Faktor Tujuan Untuk Tiap Posisi

Fungsi Tujuan	Gawang	Belakang	Tengah	Depan
Posisi	Maksimalkan 10	10	10	10
Teknik	Maksimalkan 5	5	8	8
Taktik	Maksimalkan 4	4	7	7
Fisik	Maksimalkan 6	8	6	6
Psikologi	Maksimalkan 7	7	5	5
Tahan	Maksimalkan 9	6	2	1
Serang	Maksimalkan 1	1	3	9
Transisi	Maksimalkan 2	2	9	4
Tinggi	Maksimalkan 8	9	4	3
Berat	Maksimalkan 3	3	1	2

Figure 8 Goal Factor Weight per Position

b. Normalization of Goal Factor Weight

Faktor Tujuan, Bobot, dan Normalisasinya

	DEPAN	TENGAH	BELAKANG	GAWANG
Posisi	10 0.1818182	10 0.1818182	10 0.1818182	10 0.1818182
Teknik	8 0.1454545	8 0.1454545	5 0.09090909	5 0.09090909
Taktik	7 0.1272727	7 0.1272727	4 0.07272727	4 0.07272727
Fisik	6 0.1090909	6 0.1090909	8 0.1454545	6 0.1090909
Psikologi	5 0.09090909	5 0.09090909	7 0.1272727	7 0.1272727
Tahan	1 0.01818182	2 0.03636364	6 0.1090909	9 0.1636364
Serang	9 0.1636364	3 0.05454545	1 0.01818182	1 0.01818182
Transisi	4 0.07272727	9 0.1636364	2 0.03636364	2 0.03636364
Tinggi	3 0.05454545	4 0.07272727	9 0.1636364	8 0.1454545
Berat	2 0.03636364	1 0.01818182	3 0.05454545	3 0.05454545
Total	55	55	55	55

Figure 9 Normalization of Goal Factor Weights per Position

c. Final score

Faktor Tujuan, Bobot, dan Normalisasinya

	DEPAN	TENGAH	BELAKANG	GAWANG
Posisi	10 0.1818182	10 0.1818182	10 0.1818182	10 0.1818182
Teknik	8 0.1454545	8 0.1454545	5 0.09090909	5 0.09090909
Taktik	7 0.1272727	7 0.1272727	4 0.07272727	4 0.07272727
Fisik	6 0.1090909	6 0.1090909	8 0.1454545	6 0.1090909
Psikologi	5 0.09090909	5 0.09090909	7 0.1272727	7 0.1272727
Tahan	1 0.01818182	2 0.03636364	6 0.1090909	9 0.1636364
Serang	9 0.1636364	3 0.05454545	1 0.01818182	1 0.01818182
Transisi	4 0.07272727	9 0.1636364	2 0.03636364	2 0.03636364
Tinggi	3 0.05454545	4 0.07272727	9 0.1636364	8 0.1454545
Berat	2 0.03636364	1 0.01818182	3 0.05454545	3 0.05454545
Total	55	55	55	55

Proses Perhitungan Normalisasi Bobot Faktor Tujuan

[PEM\_11] Sergio  
 Gawang : 0.236454545  
 Belakang : 0.118181818  
 Tengah : 0.081818175  
 Depan : 0.081818175

Tinggi: 0.0136363625 - Norm=0.05454545 - Skor=0.25 - Nilai=165 - Interval=4 - Min=160 - Max=180  
 Berat=0.00909091 - Norm=0.03636364 - Skor=0.25 - Nilai=60 - Interval=5 - Min=50 - Max=75  
 Teknik=0 - Norm=0.1454545 - Skor=0 - Nilai=5 - Interval=0.4 - Min=2 - Max=4  
 Taktik=0 - Norm=0.1272727 - Skor=0 - Nilai=1 - Interval=0.6 - Min=1 - Max=4  
 Psikologi=0.045454545 - Norm=0.09090909 - Skor=0.5 - Nilai=4 - Interval=0.4 - Min=3 - Max=5

Figure 10 Final Score Hasil

In this section is a description of the answers to the system evaluation questionnaire given to users. The questionnaire is divided into three biggest aspects, namely the Aspects of Purpose and Benefits, Functional Aspects and Non-Functional Aspects with several questions. Following are the results of the system evaluation questionnaire:

Aspects of Purpose and Benefits

- a. Statement : The system is able to support decision making in determining the position of soccer players according to the ability of the players  
User Response : Strongly Agree
- b. Statement : With this system the positioning process becomes more effective

#### 4. CONCLUSION

The conclusions obtained from the research on making a decision support system for determining the position of soccer players are as follows: The Decision Support System for Positioning Players in a Football Team has been successfully built using the SMART (Simple Multy Attribute Rating Technology) method and the C# programming language. (C Sharp). This system can determine the best position of a player as well as alternative positions. The Decision Support System for Determining the Position of Football Players using the SMART (Simple Multy Attribute Rating Technology) method can assist the coach in determining the position of a player effectively according to the ability of the player. The calculation results of the SMART method for determining the position of this player in the application are the same as the results of the manual calculation.

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