DECISION SUPPORT SYSTEM FOR IDEAL PLACEMENT OF PLAYERS POSITION STRATEGY IN FOOTBALL FORMATION

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ABSTRACT

To determine the ideal position of a football player to fit the character and the expected criteria, it takes instinct sharp enough coaches and a system that can help provide a means of supporting the choice of decision-making. Normally, in conducting the process of determining the player is still done manually is to implement in the form of a paper file of the form and character assessment criteria alone players. So far, there is a coach who is less precise in determining the ideal position players because only the ego instincts and rely on the players so that there is still a coach who has not been able to objectively assess the players.

By using Analytical Hierarchy Process (AHP) as a method of Decision Support System (DSS) in the process of determining the ideal position for a player who uses several criteria (Multicriteria) for selecting an appropriate player. DSS was helping coach in making the right decision and AHP is used as a model for Multi weighting in the selection process. In the method of data collection techniques, study of literature, observation and interviews are used to the problems related. In addition, techniques and data analysis models using a structured method in which the flow of tools used are Data Flows Diagrams (DFD) and Entity Relationship Diagram (ERD). This application was built with the tools Borland Delphi (7.0) as the display interface design and MySQL as database processing media.

Based on these research can be concluded that this application is expected to help coach in the decision-making process and can change the way the assessment of the subjective become more objective.

Keywords: Football, Decision Support System, Analytical Hierarchy Process (AHP), Database

1. INTRODUCTION

1.1 Identification of Problems

How to build applications for the placement decision support system of ideal players position in football formation strategy.

1.2 Review of literature

The research object being studied is called School Soccer Shoot Patriot residing in Bekasi, West Java.

1.3 Objectives

The purpose of this final project is to build a decision support system application for ideal placement of the players in a football formation strategy. While the objectives of this research are:

1. *Provide information such as an option for the coaches as a supporting person in making a decision.*
2. *Help a manager / coach to change the assessment in selecting players, in order to assess the subjective to be more objective.*
3. *Facilitate a manager / coach in determining the ideal position for a player.*
4. *Improve the effectiveness and efficiency of working hours for the coach in determining the ideal position of players.*

1.4 Benefits

The benefits in making this application include:

1. *Present information that is able to provide options for the coaches as a supporting person in making a decision.*
2. *A coach helps to change the assessment in selecting players.*
3. *A coach is easier in determining the ideal position for a player.*
4. *Improve the effectiveness and efficiency of working hours for the coach in determining the ideal position of players.*

2. MODELS, ANALYSIS, DESIGN AND IMPLEMENTATION

2.1 Model

1. Stage of data collection
- *a. Literature Review*
- *b. Observation*
- *c. Interview*

2. Stage of software development
- *a. System / Information Engineering*
- *b. Analysis*
- *c. Design*
- *d. Coding*
- *e. Testing*
- *f. Maintenance*

2.2 The position and role players

One team consists of 11 football players whose position and duties vary. Generally there are 10 positions in soccer players, such as:

1. Goalkeeper
2. Central defender
3. Left-back
4. Right defender
5. Half-back
6. Left midfield
7. Right Midfielder
8. Central Striker
9. Left Striker
10. Right Striker

2.3 SPK

Definition of decision supporting system is a system that provides a means for managers to develop information in accordance with the decisions to be made.

It is also meant as a computer system that processes data into information to make decisions from a semi-structured specific problem. The following are the stages of the PRSP:

a. *Defining the problem*
b. *The collection of data or relevant information elements*
c. *Processing data into information in the form of graphs and written reports*
d. *Determine alternative solutions (possibly in percentage)*

The objective of the DSS:

1. Help to resolve the semi-structured problems
2. Support managers in making decisions
3. Improve the effectiveness rather than efficiency in making decision

2.4 Benefits of DSS

The benefits of DSS include the following:

1. *Rational decision-making based on the required type of decisions.*
2. *Make a prediction (forecasting).*
3. *Compare the alternative actions.*
4. *Create an impact analysis.*

5.Create models

2.5 AHP Method

In essence, AHP is a comprehensive model of decision-makers by counting things qualitatively and quantitatively. In the model of decision making with the AHP is basically trying to cover all the shortcomings of previous models. AHP is also possible to structure a system into components and environment interacting each other and then unite them by measuring and managing the impact of the error component system (Saaty, 2001). The main equipment of this model is a functional hierarchy with human perception as the main input .

2.6 AHP Procedures

Basically the procedures or steps in the AHP method includes:

1. *the hierarchy structuring of the problems faced*
2. *criteria and alternatives assessment*
3. *priorities determination*
4. *consistency management*
5. *Calculate the consistency index / consistency Index (CI) by using this formula:*

$$CI = ((\lambda maks - n) / n-1$$

Where n = number of elements

6. *Calculate the consistency ratio / consistency ratio (CR) with the formula:*

   $$CR = CI / IR$$

   Note: CR= consistency ratio
   CI = consistency index
   IR = Index Random

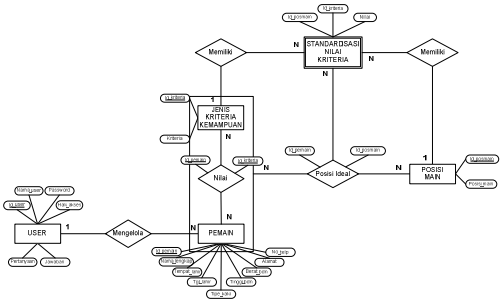
7. *Checking the hierarchy consistency. If the value of consistency ratio is less than 0.1, it can be accepted.*
   Consistency Index (CI); random matrix with 9 rating scale (1 to 9) and its opposite as the Random Index (IR). Based on calculations using 500 samples Saaty, if "judgments" taken randomly from a numerical scale of 1 / 9, 1 / 8, ..., 1, 2, ..., 9 will gain an average consistency for the different matrix sizes.

8. *The calculations to determine the destination.*
   After the calculation of CR has been accepted / successful then the calculation continues to determine the final destination, that is:

   *Result 1 = (Value Priorities Kriteria1 Kriteria1 *) + (Value * Priority Kriteria2 Kriteria2) + ... until criterion-n-n + Priority Criteria*
   *Result 2 = (Value Priorities Kriteria1 Kriteria2 *) + (Value * Priority Kriteria2 Kriteria2) +-n ... up to the criteria*
   *Results-n = (n * Value-Priority Criteria Kriteria1) + (Value Criterion-n * Priority Kriteria2) +-n ... up to the criteria*
   The final result is the comparison of the results have been calculated, by comparing all the results, then gained the highest result and this result is a decision of the final result is selected.

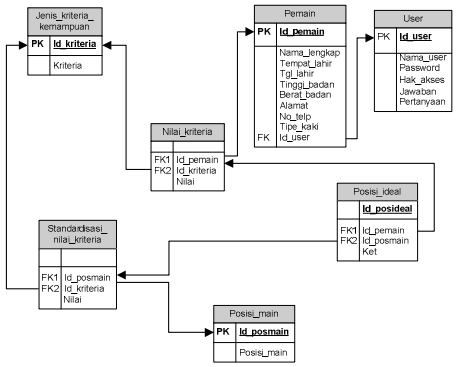
2.7 Design

1. ERD (Entity Relationship Diagram)



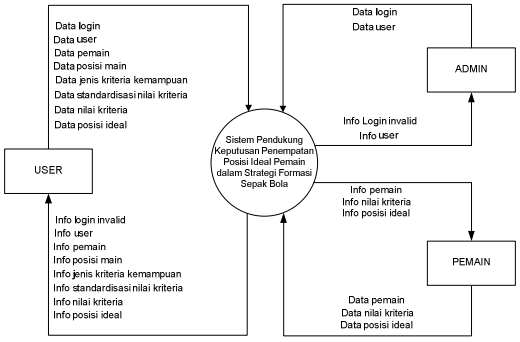
Picture 1. ERD (Entity Relationship Diagram)

2. Relasi tabel



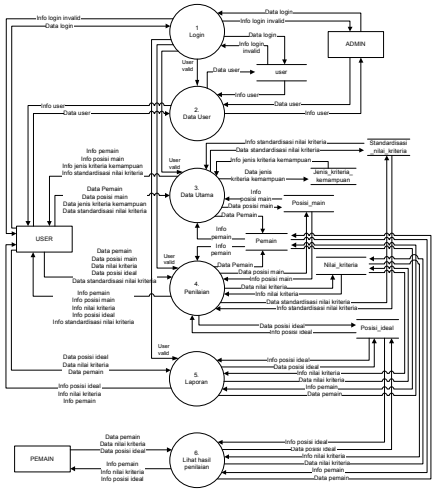
Picture 2. Relasi tabel

3. Diagram konteks



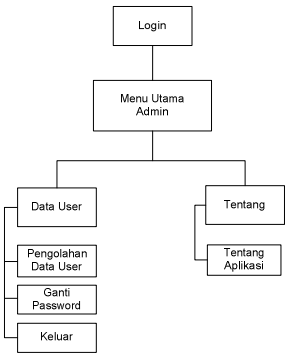
Picture 3. Diagram konteks

4. DFD (Data Flow Diagram)



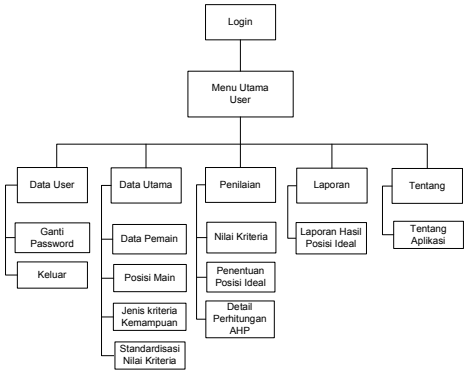
Picture 4. DFD level 1

5. Administrative Menu



Picture5. Arsitektur menu admin.

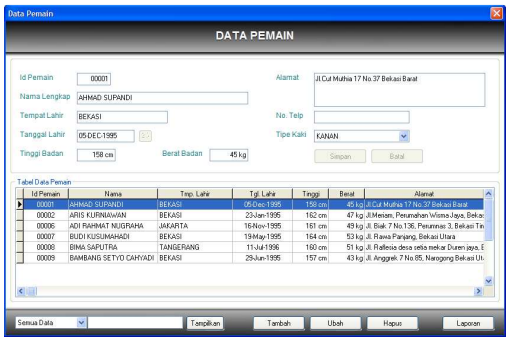
6. User Menu



Picture6. Arsitektur menu user.

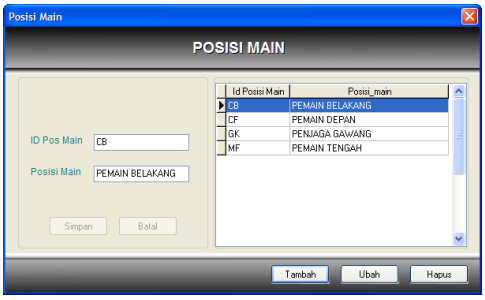
2.8 Implementation

1. Players Data Menu



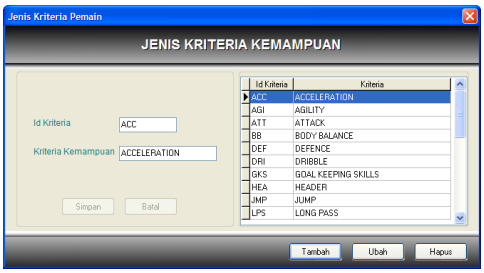
Picture 7. Players data menu

2. Players Position Menu



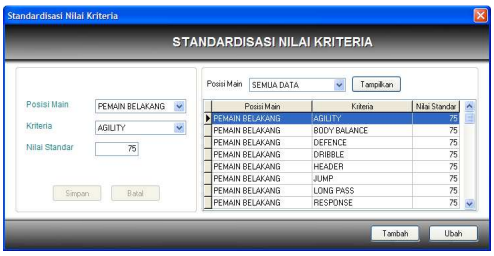
Picture 8. Menu posisi main

3. Skill Criteria Menu



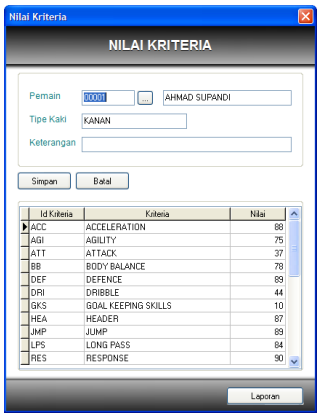
Picture 9. Skill Criteria Menu

4. Criteria Standard Menu



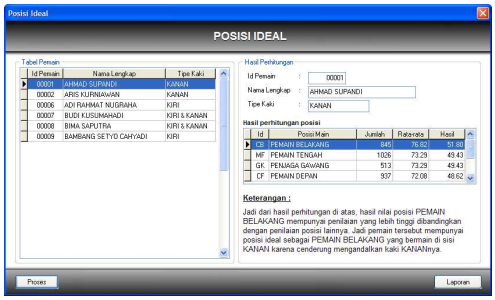
Picture 10. Criteria Standard Menu

5. Criteria Score Menu



Picture 11. Criteria Score Menu

6. Ideal Position Menu

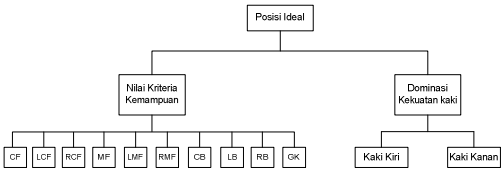


Picture 12. Ideal Position Menu

3. RESULTS AND DISCUSSION

3.1 Solving Problems with AHP

In determining the ideal position players by using AHP (Analytical Process Hierarchy), first create a hierarchical structure associated with the ideal position, the hierarchical structure can be seen from the picture below:



Picture 13. Hirarki Proses Pada Penentuan Posisi Ideal

3.2 Case Example

Data will be taken as an example of the value of one player to the application of AHP method. The data is taken from the average value of the players' ability and leg strength dominance .

1. Sub criteria "Ability Criterion Value (NKK)" Below is a table on average players:

Table 1. The average value of the player

Appraisal	***Value***
Criteria striker	*76,31*
Criteria Players midfielder	*73,36*
Criteria Players Bek	*71,09*
Goalkeeper Criterion	*62,43*

2. Sub-criteria "Foot Strength Dominance (DKK)"

The observation result by the coach for this player is more likely to rely on the left leg and the right arm.

3.3 Calculation of Ideal Position Criteria

In determining the value of criteria scale, based on the intensity level of importance as the following table:

Table 2. Paired comparison rating scale

The intensity of Interest	*Description*
1	*two elements of equal importance*
3	*elements that a little more important than other elements*
5	*elements which one is more important than other elements*
7	*one element is absolutely clearly more important than other elements*
9	*one obvious element is absolutely important than other elements*
2,4,6,8	*Values between two adjacent values*

Table 3. Table IR

Matrix size	***IR Value***
1	*0.2*
2	*0.2*
3	*0.58*
4	*0.9*
5	*1.12*
6	*1.24*
7	*1.32*
8	*1.41*
9	*1.45*
10	*1.49*
11	*1.51*
12	*1.48*
13	*1.56*
14	*1.57*
15	*1.59*

Determining the Priority Criteria
a. Create a matrix of pair wise

	NKK	*DKK*
NKK(1)	*1*	*2*
DKK (2)	*1/2=0.5*	*1*
Total	***1.5***	***3***

b. Create a matrix of criteria values

	NKK(1)	*DKK(2)*	*Total (3) = (1)+(2)*	***Priority (Total /2)***
NKK	*0.67*	*0.67*	*1.34*	***0.67***
DKK	*0.33*	*0.33*	*0.66*	***0.33***

c. Make each row sum matrix

	NKK(1)	*DKK(2)*	***Total (3)=(1)+(2)***
NKK	*0.67*	*1.34*	***2.01***
DKK	*0.17*	*0.33*	***0.5***

d. Consistency Calculation

	each row of matrix (1)	*Priority= row of number / 2 (2)*	*RESULTS (1)+(2)*
NKK	***2.01***	*1.01*	*3.02*
DKK	***0.5***	*0.25*	*0.75*
		Total	***3.77***

Total = 3.77
n (number of criteria) = 2
λ max (sum / n) = 3.77 / 2 = 1.89
CI ((λ max-n) / n-1) = ((1.89 - 2) / 2-1)
= -0.11
CR (CI / IR (see table IR))
= -0.11/0.2 = -0.55 (0.2 is obtained from table 2)

Because the value of consistency ratio is less than 0.1, then the ratio of the consistency of these calculations can be accepted.

The same calculations can be continued for the next sub-criteria, in order to obtain the main vector and Eigen value of CR on every level.

The calculations to determine the Ideal Position Players:

Striker
*= (Average rating criteria striker * Priority NKK)*
KK Priority +
*= (76.31 * 0.67) + 0:33*
= 51.13 +0.33
= 51.46

Half-back
*= (Average rating criteria Players Midfielders * NKK Priority) Priority + DKK*
*= (73.36 * 0.67) + 0:33*
= 49.15 +0.33
= 49.48

Back
*= (Average rating criteria Players Bek * Priority NKK) + Priority DKK*
*= (71.09 * 0.67) + 0:33*
= 47.63 +0.33
= 47.96

Goalkeeper
*= (Average rating criteria Goalkeeper * Priority NKK) + Priority DKK*
*= (62.43 * 0.67) + 0:33*
= 41.83 +0.33
= 42.16

Description:
So from the calculation above, the player has an ideal position as a striker who plays in the middle because it tends to rely on his left leg and right arm.

4. CONCLUSIONS AND RECOMMENDATIONS

4.1 Conclusion

1. *The system can provide information that provides an option for the coaches as a supporting means in making a decision*
2. *The system can help a coach to change the way of assessment in selecting players, in order to assess the subjective become more objective.*
3. *The system can facilitate a coach in determining the ideal position for a player.*
4. *The system can improve the effectiveness and efficiency of working hours for the coach in determining the ideal position players.*

4.2 Suggestion

Based on the conclusions, the expected suggestions are developing the decision support system applications of ideal placement for the players in a football formation strategy, so that its presence could be more "user friendly" and more beneficial to the advancement of soccer.

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