A Methodology for Selection Starting Line-Up of Football Players in Qatar World Cup 2022

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ABSTRACT

The process of player selection in multi-player sports is a complex multi-criteria problem. In Football, the role of a coach is selecting players as the starting line-up that is formed subjectively without regard to various criteria. The decision of the coach can impact team performance. This paper proposes a new model for selection starting line-up integrating criteria in FIFA World Cup 2022.The aim is to use MOORA method in football player selection process. We test the efficiency of the model using France National football team and we demonstrate how the methodology can facilitate decision making by selecting players.

Keywords: decision making, football game, MOORA, starting line-up.

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I. INTRODUCTION

Now, Football is one of the most popular multi-player sports in the world. Player selection for a team is a subjective issue, based on the coaches' preferences to form the best team.

The 2022 FIFA world Cup is the 22nd edition of the FIFA World Cup, a competition organized by FIFA and bringing together the best national teams. It takes place in Qatar from November 21 to December 18, 2022. Selectors of the national teams have selected a final list to participate in this world cup.

The process of player selection is a complex multi- criteria problem in sport. In general, the selection of soccer players and building of a team are judgments made by the coach. Selection of starting the best building of team players is always a difficult decision-making task with many criteria.

Nowadays, it is obvious that starting the best team is a very important task and one of the most critical issues that head coaches are often facing (Khatrouch *et al*., 2022). The best selection of players is very important in determining the team's collective performance (Al- Shboul *et al*., 2017; Jarvandi *et al*.,2013; Tavana *et al*., 2013).

The best selection starting line-up of football players is an MCDM problem where many criteria should be considered in decision- making. The paper begins with a detailed literature review in Section 2. In Section 3, a model for team solution is presented and the stages of the proposed approach are explained in detail. A real-world example for testing the proposed model and data analysis is discussed and is presented in Section 4. Conclusions of this study are given in Section 5.

II. LITERATURE REVIEW

The current literature on selection of a starting line-up of football team players is limited but some studies have attempted to create a framework for multi-player selection.

Mu *et al*. (2016) proposes an approach to evaluate the best players of the world in 2014 FIFA Ballond'or award. They used The Analytic Hierarch Process (AHP) method to identify the best player, Lionel Messi, did not appear as the best evaluated in any of the model sensitivity analyses, or James Rodrigues is named as the best player of the season. Ahmed *et al*. (2011) proposed a multi-objective optimization model for the selection of the players in the team. Raut *et al*. (2012) proposed procedure is based on a decision–making method to assist in the selection of a suitable player from among several available players for a game based on skills criteria. Ahmed *et al*. (2013) proposed a decision-making approach to team selection. They select the best team from a group of players with a certain budget. They analyze the result by selecting four teams with four different criteria. Tavana *et al*. (2013) develop a system to help the coach in selecting the game team by using the skills criteria to determine the best players. Miralles *et al*. (2013) explored individual player's strategies to assess the adequacy of shouting in a simulated laboratory task) in varying situations solutions and degrees of physical defensive pressure, rebound, defensive balance and shouting distance.

Qader *et al*. (2017) proposed an evaluation of the performance of players based on multi-criteria decision making (MCDM), but with the objective of assisting the selection for youth teams using the TOPSIS method.

Gökgöz *et al*. (2019) evaluate the national teams in 2018 World Cup. They compare two MCDM methods: additive ratio assessment (ARAS) and simple additive weighting (SAW) method. They integrate these methods with Shannon entropy approach.

Anwar *et al*. (2023) propose a Neutrosophic TOPSIS approach for performance assessment and choose of the best batsman and bowler of the Series. They calculate the ranks of the players using TOPSIS with two objective weight calculation methods. Then they evaluate and compare the obtained rank lists using Kendal Tau.

Naciri *et al*. (2018) propose an integrated approach that combines multiple-criteria decision-making analysis and mathematical programming to support the decision maker through a football team. First, the fuzzy analytic network process is applied to evaluate the significance of the different performance criteria for each position in the field. The score attained by the different players in each potential position is computed using PROMETHEE II.

MacMahon *et al*. (2019) identified a decision-making process of recruiters, there is still limited understanding of how recruiters make talent decisions, in particular what information they value when discriminating between athletes to recruit. Xing (2012) in his search defined how to select different players based on prior competition scores and games played. The technical data supplied is frequently used to judge several international players. Multicriteria decision-making (MCDM) is a common method in performance analysis.

The main objective of this paper is to propose a model that helps the football coach to choose the best starting lineup for a football player and a set of alternatives. Football player selection is an MCDM problem where many criteria should be considered in decision-making. Therefore, this model uses the MOORA approach to obtain the ranking of football players.

III. THE MODEL DESCRIPTION

The general positions in soccer are goalkeeper, defenders, midfielders, and forwards. In general, each team has 26 players and 11 are chosen by the coaches as the starting lineup to participate when the game begins. The process of football player selection can be a daunting process. For selecting starting line-up, the model in Figure 1 will help the football coach to find the most appropriate team.

We present a two-phase approach for selecting starting line-up. In the first phase, we evaluate players by a set of criteria (Metrics, physical, Mental, technical, offense and defense criteria). The Moora method is employed in phase two to rank players.
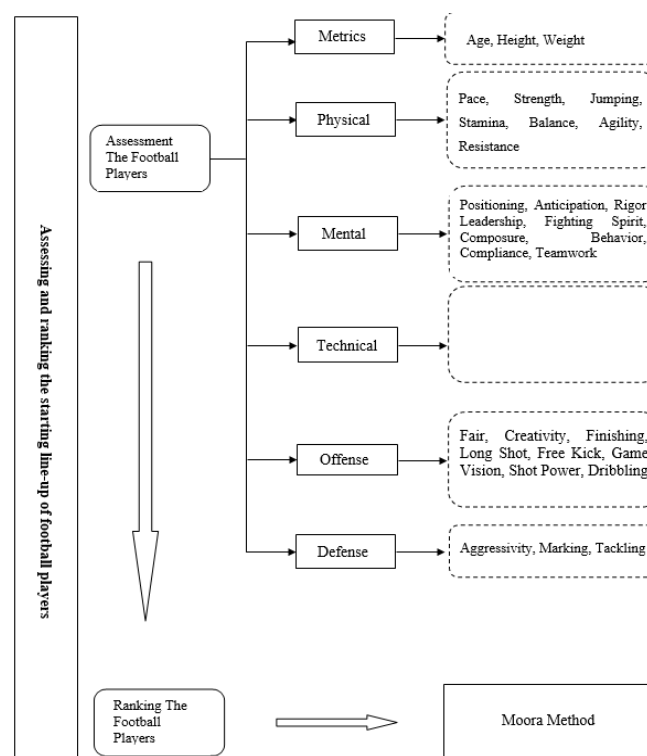

Fig. 1. A graphical representation of the proposed framework.

A. Criteria for Determining the Starting Lineup

Players chosen to play at the start of the game are called starting lineups and are divided into several positions: the goalkeeper, defenders, midfielders and forward. Each major position is subdivided into several more specific positions according to the task and role in the field. For the defender is divided into central defender, wingback, and sweeper. The midfielder's position is divided into defensive midfielders, winger midfielders, central midfielders and attacking midfielders.

The criteria used to determine the starting lineup of players in France National football team are presented in Table I.

The selection of the starting lineup of players is divided into parameters, physical, mental, technical, offensive and defense criteria, where each of these criteria has several sub criteria. (Table II, Table III, Table IV, Table V, Table VI, Table VII).

TABLE I: CRITERIA AND SUB CRITERIA FOR SELECTING STARTING LINEUPS

Criteria	Sub Criteria	
Metrics	Age HeightWeight	
Physical	Pace StrengthJumping Stamina	Balance Agility Resistance
Mental	Positioning Anticipation Leadership Fighting Spirit Composure	Rigor Behavior Compliance Teamwork
Technical	Crossing Passing Ball Control Technique	Off the ballHeading Right foot Left foot
Offense	Fair CreativityFinishing Long shot	Free kick Game visionShot Power Dribbling
Defense	Aggressivity Marking Tackling	

TABLE II: METRICS ASSESSMENT CRITERIA

N°	Assessment criteria	Description
C_{11}	Age	The lifespan of an individual.
C_{12}	Height	The measurement of someone from head to foot or from base to top
C_{13}	weight	The relative masses of a body.

TABLE III: PHYSICAL CRITERIA

N°	Assessment criteria	Description
C_{21}	Pace	A body's relative weight.
C_{22}	Strength	The ability of the player to use physical force to win the ball against an adversary.
C_{23}	Jumping	The ability of the player to jump higher than others, no matter how big or small.
C_{24}	Stamina	Player's ability to maintain fitness throughout the game.
C_{25}	Balance	The ability of the player to remain standing in any event.
C_{26}	Agility	The player's ability to move fast in a variety of ways.
C_{27}	Resistance	The player is able to resist shocks and physical problems.

TABLE IV: MENTAL CRITERIA

N°	Assessment criteria	Description
C_{31}	Positioning	The player's ability to position himself on the court in accordance with the circumstances.
C_{32}	Anticipation	Ability of the player to anticipate ball movements and analyse actions.
C_{33}	Leadership	The player's ability to motivate team members.
C_{34}	Fighting spirit	The player's ability to not let go when his team loses.
C_{35}	Composure	The player's ability to maintain control over their emotions and make the right move under exceptional circumstances.
C_{36}	Rigor	The player's ability to stay focused during a whole action and game.
C_{37}	Behavior	Player's ability to remain calm under any circumstances.
C_{38}	Compliance	The ability of the player to avoid abusing the rules.
C_{39}	Teamwork	The player's ability to determine if passing or keeping the ball is preferable.

TABLE V: TECHNICAL CRITERIA

N°	Assessment criteria	Description
C_{41}	Crossing	The ability of the player to make good crossing
C_{42}	Passing	The player's ability to pass the ball to a partner.
C_{43}	Ball control	Ability of the player to control the ball when he or she receives it.
C_{44}	Technique	The ability of the player to perform outstanding technical movements.
C_{45}	Off the ball	The player's ability to get out of an opponent's score.
C_{46}	Heading	Ability to place the ball where you want it with your head.
C_{47}	Right foot	The player can play with his right foot.
C_{48}	Left foot	The player can play with his left foot.

TABLE VI: OFFENSE CRITERIA

N°	Assessment criteria	Description
C 51	Fair	Ability of the player to find good opportunities and benefit from unexpected situations.
C 52	Creativity	The ability of the player to invent new gameplay sequences or technical movements.
C 53	Finishing	Player's ability to finish the actions with a goal inside the penalty area.
C 54	Long shot	Ability of the player to frame their shots out of the repair area.
C 55	Free kick	Ability to take a free kick or deliver corners to your target.
C 56	Game vision	Ability to see teammates in open spaces.
C 57	Shot Power	Player's ability to shoot hard until goal.
C 58	Dribbing	Capability of the player to win duels with his opponents with the ball.

TABLE VII: DEFENSE CRITERIA

N°	Assessment criteria	Description
C 61	Aggressivity	Aggression The player's capacity to challenge an opponent and engage physically.
C 62	Marking	Ability of the player to keep scoring their opponent.
C 63	Tackling	Ability of the player to successfully do tackles.

B. MOORA Method

The MOORA method, first introduced by Brauers (2004) is such a multi objective optimization technique that can be successfully applied to solve various types of complex decision-making problems in the manufacturing environment. The detailed steps of the MOORA method with equal weight of the criteria are listed below:

Step 1: The first is to represent all the information available for the attributes in the form of a decision matrix X.

where:

x_{ij} – the performance measure of i th alternative on j th attribute:

$$X = \begin{bmatrix} x_{11} & \cdots & x_{1n} \\ \vdots & \ddots & \vdots \\ x_{m1} & \cdots & x_{mn} \end{bmatrix} \qquad (1)$$

Step 2: The best choice is the square root of the sum of squares of each alternative per attribute. This ratio can be expressed as below:

$$x_{ij}^* = x_{ij} / \left[\sum_{i=1}^{m} x_{ij}^2 \right] \qquad (j=1,2,\ldots,n) \qquad (2)$$

Where $x_{i j}$ is representing the normalized performance of i th alternative on j th attribute whichbelongs to the interval [0, 1].

Step 3: These normalized performances are added in case of maximization (for beneficial attributes) and subtracted in case of minimization (for non-beneficial attributes). Then the optimization problem becomes:

$$y_i = \sum_{j=1}^{g} x_{ij}^* - \sum_{j=g+1}^{n} x_{ij}^* \qquad (3)$$

Where:

g – the number of attributes to be maximized

(n−g) – the number of attributes to be minimized,

y_i – the normalized assessment value of i th alternative.

Step 4: The y_i depending on the totals of its maxima (beneficial attributes) and minima (no beneficial attributes) in the decision matrix. An ordinal ranking of y_i shows the final preference and best alternative has the highest y_i value, while the worst alternative has the lowest y_i value.

IV. COMPUTATIONAL STUDY AND DISCUSSION RESULT

Player selection is a complex problem in all clubs, involving multiple criteria that should be evaluated simultaneously. The data for this study was obtained from the 2022 Data Base of France National team (2022).

Assessing the performance of football Player with different criteria, is a complex task. Hence, the criteria

selected by experts in organization of the France national team We report the results obtained. We have 27 football players with three disciplines (defenders, midfielders, forwards) and we have to select the starting line-up of football players in Qatar World Cup 2022. The framework proposed can help to choose the best team. The ranking of the candidate players according to the proposed model is shown in Table VIII.

TABLE VIII: THE RANKING OBTAINED BY MOORA METHOD

	Players	max	min	Y_i	Ranking
G	Alphonse Areola	5.066	0.445	4.620	16
	Hugo Lloris	6.150	0.446	5.703	13
	Mike Maignan	6.001	0.388	5.612	23
	Ibrahima Konaté	6.457	0.377	6.079	5
	Jules Koundé	6.453	0.354	6.098	26
	William Saliba	6.060	0.360	5.699	18
	Raphaël Varane	7.235	0.399	6.835	21
Defenders	PresnelKimpembe	5.770	0.387	5.382	9
	Jonathan Clauss	6.407	0.381	6.025	17
	Benjamin Pavard	6.168	0.378	5.790	14
	Lucas Digne	6.768	0.394	6.374	11
	Theo Hernandez	6.380	0.346	6.034	15
	Lucas Hernandez	6.460	0.375	6.084	2
	Boubacar Kamara	6.596	0.329	6.266	19
	Aurélien Tchouaméni	6.444	0.360	6.083	3
Midfielders	Paul Pogba	7.927	0.409	7.517	10
	Adrien Rabiot	6.320	0.382	5.937	12
	Mattéo Guendouzi	7.468	0.336	7.131	1
	N'Golo Kanté	6.698	0.393	6.305	7
	Kingsley Coman	6.477	0.365	6.111	4
	Antoine Griezmann	8.022	0.403	7.618	25
	Wissam Ben Yedder	7.060	0.400	6.660	6
	Kylian Mbappé	7.243	0.349	6.893	8
Forwards	Moussa Diaby	5.898	0.321	5.576	20
	Karim Benzema	7.123	0.429	6.693	6
	Olivier Giroud	6.982	0.472	6.510	8
	Christopher Nkunku	6.240	0.333	5.906	20

Our method is based on a multi-criteria decision model and uses the MOORA method. This technique seems to be more appropriate in our problem. Starting line-up of football player's selection problem can be assimilated to a decision-making problem. This is due to the fact that player selection problems usually associate several criteria. These criteria can be qualitative or quantitative. For this reason, the MOORA method provided a framework to cope with multiple criteria problems, then ranking players.

V. CONCLUSION

This document presents a decision support framework for complex multi-attribute decision issues and a new method for assessing and selecting the starting line-up of football players. The proposed approach was tested on the actual data gathered from the French national football team. The model developed is very reflective of reality. The next phase of our work will be to utilize our approach in other areas. We are also considering incorporating this model into a broader project management system under development. The model can be improved by adding other attributes (experience, leadership...) that can be looked at in the future.

CONFLICT OF INTEREST

Authors declare that they do not have any conflict of interest.

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