

Conceptual Framework of Decision Support System for Team Sports

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Abstract: Many approaches have been described ranging from simple checklists to complex programming models for the benefit of sports improvisation. However, there are very few algorithms or decision engine have been made available that could be used by decision makers to aid in the process of forming a strong team, especially for team sports. This study outlines the conceptual framework for football decision support system to determine the suitable playing position for players and the best team formation to be used when facing certain opponents in a game, through the creation of new combined decision model which incorporates Analytical Network Process (ANP) and Case Based Reasoning (CBR).

Key words: Football, analytical network process, case based reasoning, team formation, team sports

INTRODUCTION

Team sports such as football and hockey Aman (2006) has becoming the symbolic sports in the world that attracts a lot of attentions. These sports become more competitive, stressed and sensitive in term of motivations and responsibilities by the players and their coaches to achieve a good result of competition which shows the reputation of every team involved.

Team sports usually require the coach to set the team formation and players who can fill in the formation. The selected formation certainly is the formation that can guarantee the winning of the team and this is based on the historical success of the formation used in the match played before with the opponent teams. If the team has a history of losing with certain formation when against any opponent, surely the coach will try other alternative of formations with different players. Even so, the choice of formation depends on the availability of players to be fitted into the decided position. For example, if the team decided to use an offensive formation, the coach has to consider the number of striker available on his team. Furthermore, the team strategy should also be considered when determining the formation of the team. For example, more defenders need to be put in the team if the team just aims to get a draw or more attackers will be used if the team seeks a win.

Such research seem to require a lot of creativity by the coach to form a strong team. The usage of an appropriate methodology is necessary when forming a team, where the analytical calculations and logical reasoning can assist the coach in making the right

decision. This study seeks the possibility to integrate the Analytical Network Process (ANP) and Case Based Reasoning (CBR) as the decision model that can carried out the task. ANP can capture both quantitative and qualitative criteria and reflect more realistic results among decision attributes and alternatives due to the existence of interdependent relationships in the real selection and evaluation environment (Agarwal and Vijayvargy, 2012). While, CBR enable the selection of an appropriate solution based on similar problems which identical to current situation, that were solved in the past (Lopez *et al.*, 2006). By integrating these two to act as a decision engine of a system can produce a potentially good team sports Decision Support System (DSS) that can be used by a coach.

Problem statement: It was well known that a team sports of eleven players requires a great adaptability and complicated technique and tactics due to its features that are high antagonistic, tense, fast and flexible (Yu *et al.* (2010), not only focuses on every player but for the whole team. Therefore, the key to obtain better team performance does not depend only on the ability of the single member but also rely on the congeniality between teammates in the competition (Baker *et al.*, 2003). So, the position assignation of a member is very crucial and having a solid member performance evaluation process in place can make the assignation process easier.

But, the current scenarios that can be seen is the selection of teammates and position assignation are usually decided subjectively based on experiences from the decision-makers, can be from the management levels

but usually the coaches (Wei *et al.*, 2009) and by the members themselves. Moreover, until now still there is a coach who has not been able to objectively assess the players and relying only on instincts and hope on the players which lead to a less precise in determining the ideal position of players (Febianto, 2010). Since people's opinions are in many cases 'biased', so almost certainly, these principles are not acceptable. For example, a coach might be impressed with the movement skill of a certain player which would affect his decision. Furthermore, a coach may be wrong in selecting a good player due to difficulty of giving a full attention to all of the players' performance. Therefore, this kind of subjective approach can produce less functional team set up.

Based on the discussion above, obviously people could not check whether a certain selection of players is fair. People can argue that the main purpose of team setup is based on the coach alone or sometimes based on the management satisfaction. Hence, one of the crucial issues that must be considered when assigning the position for each member is taking into account his or her strength, seniority, attitudes and other attributes that worth to address too.

Usually, coaches nevertheless use certain game statistics data such as: total number of shots and number of goals scored, number of passed and shot efficiency, turnovers, steals and others. However, there is a lack of criteria by means of which experts would be able to evaluate the actual quality of player (Hraste *et al.*, 2008). Therefore, it is necessary to define precisely those criteria and to determine the degree of importance of each and every criterion in relation to any playing positions.

Other than the lack of suitable criteria that can be used to judge a player, another issue that can be addressed is that how the current analyses and researches on systematic analysis of the team and player adjustment through system science and modern information technology are still very insufficient. According to Silva *et al.* (2009), coaches are in great need for a modern technological solution to boost the performance of an athlete. So, the focus of this study is to use DSS, based on the development of intelligent analysis system for playing position assignation and team setup, where a new decision engine will be studied and developed.

Most of the sports system at present mainly focused on administrative work but less likely to coaches and athletes (Qing and Mengzhong, 2010). Moreover, there are no reports found regarding the implementation of DSS to deal with assigning the best formation and position for players in team sports. ANP will be used as the foundation of the DSS to be built but not only using the

ANP alone. This research will propose an algorithm through the integration between ANP and CBR that leads to a new decision engine which can be used to solve selection of players, position assignation and plus, the selection of formation strategy in the team.

MATERIALS AND METHODS

DSS variables: This study attempts to construct a systematic players lining and position decision method programming architecture for team sports which comprises of integration of ANP and CBR methodologies to be inserted as a DSS engine that can act as a strategist advisor beside the expertise and experience of the coach.

The end result expected from this research is an intelligent system that can guide the coach to decide the best team formation and position for players in the team. Figure 1 explains the input (independent variables) and the output (dependent variables) values of the research:

RESULTS AND DISCUSSION

Conceptual framework: The user of the system is the trainer who is analyzing the performance and condition of the players and that would be the team manager or coach. This system will be implemented as a desktop application. User can use it to input player's personal information and manage information about the indicators or attributes taken into consideration for performance evaluation based on personal judgment observed during training or performance showed by the players in the past game.

The decision support system of formations selection and positioning of players provides a decision support for team coaches. The decision engine of the system will dynamically analyze the players' information and provide them with recommended position to be played on the field as well as the best formation to be used. Though, the formation will be generated as a list of option to be chosen as well as the players who will fit the formation and it is up to the coach to choose which type of team alternative to be applied during the actual game.

The way the system will arrange the suggested formation is based on the current player's ability and fitness as well as the success rate considered for each formation based on past record. However, if the coach decides to apply new formation then the system will arrange the list of players best to be used and saved it as a new case in the database and will be one of the alternatives of formations in the future game play.

By adapting the Intelligent Decision Support Systems (IDSS) framework proposed by Tariq and Rafi (2012). Figure 2 is created which explains the conceptual

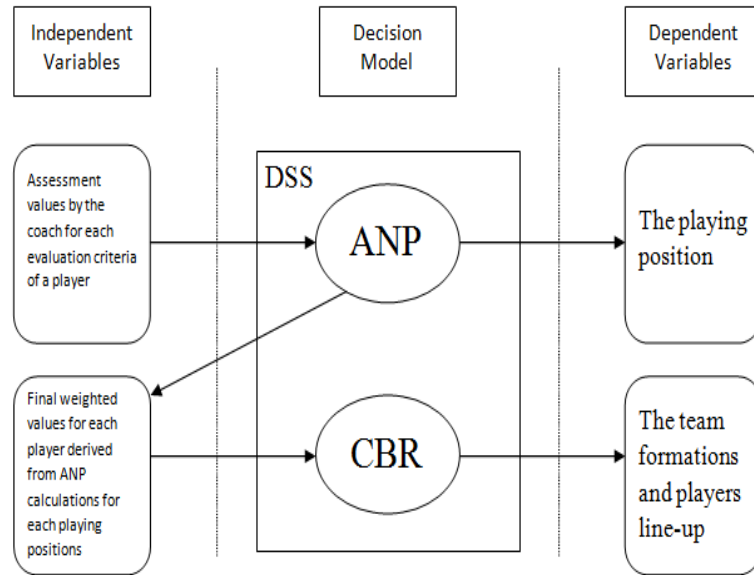


Fig. 1: Independent variables and dependent variables

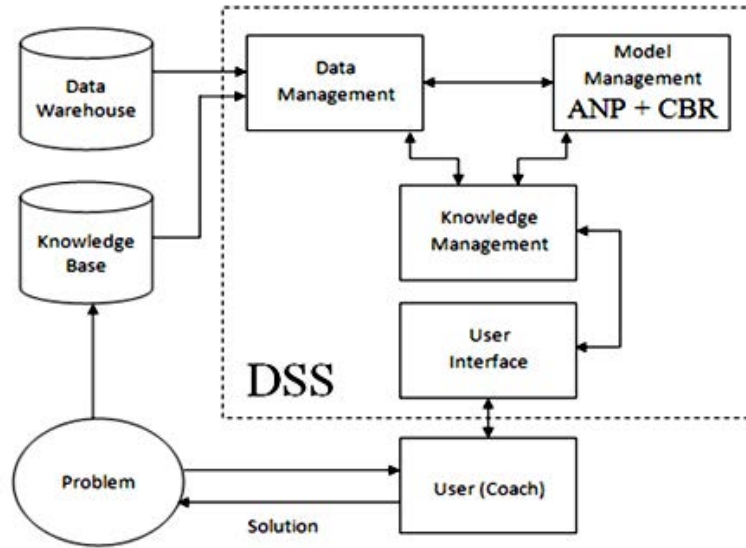


Fig. 2: Conceptual framework of team sport DSS

framework of how the DSS suggested in this study work. The DSS components are all software. Data are entered from sources on the left side which is the database that stores all the information about the players (data warehouse) and the team tactics (knowledge base). The coach which referred to as the user of the system will interact with the DSS through the user interface. As more problems are solved, more knowledge is accumulated in the knowledge base Fig. 1 and 2.

CONCLUSION

Now a days, interactive computer-based system has become a crucial need by people in their daily management work. The previous conventional study based methods, suddenly has transformed towards electronic data management. With the emergence of DSS study, the usage of the computer has extended one step further, where it is not only used to manage the data but

also to help in decision making. This is based on the nature of the DSS itself which allows the decision makers to make decisions by the use of communication technologies, data, documents, knowledge and or models to identify and solve problems and complete the decision process tasks (Schuff *et al.*, 2011). With the enormous competition in the current sports world, the use of information technology in a DSS for professional sports specifically for team sports is seen as an advantage to a team to outperform other competitors (Schuff *et al.*, 2011) where DSS can act as a technological aid to assist coaches' decision to set up a strong team line-up and formation.

NOMENCLATURE

ANP = Analytical Network Process
CBR = Case Base Reasoning
DSS = Decision Support System
IDSS = Intelligent Decision Support System

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