

THE APPLICATION OF BASKETBALL COACH'S ASSISTANT DECISION SUPPORT SYSTEM

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ABSTRACT

In the current basketball game, when the basketball coach makes decisions, they rely on the original professional skills and experience. Sometimes the wrong judgment of the situation of the court will be caused, and the wrong decisions result in losing the basketball game. How to judge the basketball game quickly, accurately, scientifically and effectively is a problem that requires urgent solution. Based on the previous results, the study establish the data warehouse and data mining and make a real-time basketball coach's assistant decision support system. The assists data of the basketball game in the university are used to establish dimension and carried on the data analysis. The frequent items are looked out in the data results, which can provide the scientific basis for basketball coach to make the accurate decision and choose the formations.

Keywords: *Basketball, Coach, Assistant Decision Support System, Application*

1. INTRODUCTION

Basketball is one of the most popular sports in the world [1-3], which brings a lot of joy to people in their daily life. The win or loss of the basketball not only depends on the individual ability of each player (a star player is not enough), but also depends on a good basketball coach, who plays an important role in the basketball game. It is mainly reflected in two aspects: on one hand, how to formulate and arrange the training plan of the basketball player; on the other hand, how to organize the training of the basketball player to show their specialty in the basketball games [4-6]. The physical quality as well as individual ability of the basketball players can be improved obviously and the basketball skills and abilities can be possessed by effective scientific guidance; The basketball team can be helped to win the final basketball games not only by the reasonable formations aiming at different teams in the actual competition, but also by the rotation play of the good players. Basketball coach who is the core of the whole team makes the final decision and plays an important role in the basketball games [7-9].

Based on the problems and current situations of the basketball competitions at present, the cycle training intensity are strengthened, the corresponding training program is designed and the team formations are chosen. However, some deviation exists, it is easy to make the wrong

decisions and analyze the situation wrongly by subjective consciousness. Many researchers have a deep discussion on the problem from different angels, which provides the scientific basis for the further research and decision making.

Therefore, how to make use of the modern management mode to formulate and use the data decision analysis not only improve the accuracy of the analysis obviously, but also embody the importance of the basketball coach's assistant decision support system. So, the coach who relies on the previous experience and special skills and knowledge is not as good as the coach who can use the assistant decision support system. The data is carried on the arrangement analysis by the system in many ways and each player is analyzed accurately by establishing the data processing model and data analysis technology, which provide the coach with scientific basis and help him make the specific decisions to win the final competition [10-11].

2. THE PRINCIPLE OF THE BASKETBALL COACH'S ASSISTANT DECISION SUPPORT SYSTEM

2.1. The Design Goal of the Basketball Coach's Assistant Decision Support System

The design goal of the basketball coach's assistant decision support system is to help the

basketball coach to make the right decision in the routine training and basketball games. According to the establishment of effective data analysis system, the real data support is provided for the coach to make plans [12-13] and solve the problems:

(1) Training arrangement of the team. In training cycle, how to divide and formulate training intensity should be arranged in detail. It does not mean that high training intensity and more training will obtain the good results. The high intensive training will increase the player's resistance and overwork can also affect the full play of the individual ability. Thus, the training arrangement of the team is the first strategic decision which the basketball coach needs to make.

(2) Training arrangement of the player. Due to the individual personality and the physical quality of each player are different, the specific training program should be made in view of the concrete conditions. The effective data information is acquired by data analysis and the customized training program is made for each player.

(3) Defense and scoring problems in the basketball games. As for the different teams, the appropriate defense tactics are chosen. Based on the data information, the characteristics of each team are analyzed, joint defense or man-to-man defense are chosen and the best defensive effects of the player are chosen. At the same time, the habitual scoring position of each player is analyzed to take effective measures, occupy in advance or block.

(4) Chemical reaction of the basketball team. The basketball team is a team game. Teamwork skills and cooperative engagement capability of the player should be matched best to produce the effective chemical reaction.

2.2 The function design of the basketball coach's assistant decision support system

The typical function of the basketball coach's assistant decision support system is to give basketball coach decision aiding in the process of training and in the basketball games. Thus, it is divided into training decision support subsystem and the action decision support subsystem. The training decision support subsystem produces the best results in view of the player's intensity, frequency as well as records during the process of training and makes preventive measures based on the player's exposed problems. The action decision support subsystem refers to the team rotation and the effective formation are taken into consideration to achieve the best partner, implement the specific defense tactics, arrange the player's offense and defense in the specific area based on the calculation and analysis of the dimension, and the important player's field goal at the key point after gaining possession should be considered.

2.2 The structure design of the basketball coach's assistant decision support system

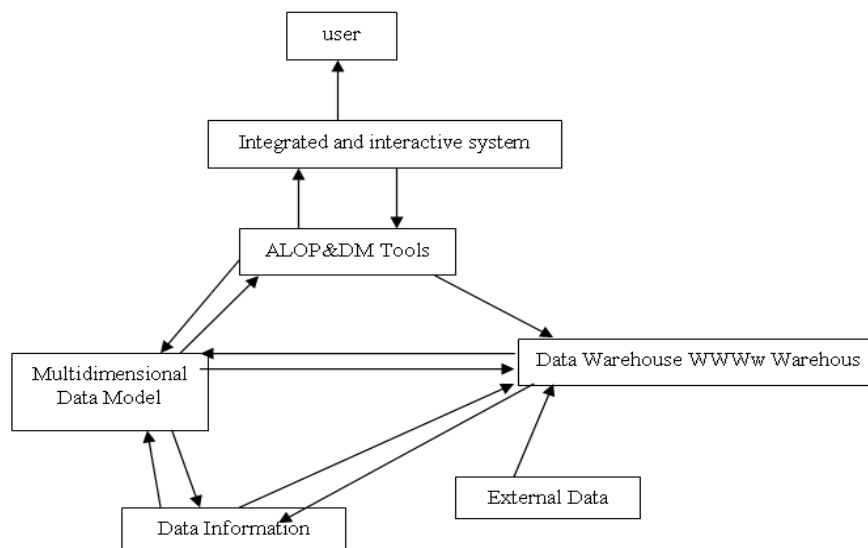


Figure1: the structure system of basketball coach's assistant decision support system

As shown in the figure1, the data warehouse is the decision foundation of the basketball coach's assistant decision support system and the data set in the families of systems. Based on the data warehouse, data analysis and processing system tools and data mining tools manipulate the data by

model analysis, summarize and sum up the data and the result is fed back intuitively to the basketball coach through the man-machine switch module. To establish the matrix of the original data, the nth evaluation object and the math evaluation index set up the n×m matrix, as is shown in Table 1:

Table 1: the original data matrix

Evaluation Index	Index 1	Index 2	...	Index m
Object 1	x_{11}	x_{12}	...	x_{1m}
Object 2	x_{21}	x_{22}	...	x_{2m}
...
Object n	x_{n1}	x_{n2}	...	x_{nm}

The data is collected and analyzed; the low optimal index

standardized processing, then the standardized matrix Z:

$x_{ij} (i = 1, 2, \dots, n ; j = 1, 2, \dots, m)$ is transformed into the high optimal index

$$Z = \begin{bmatrix} z_{11} & z_{12} & \dots & z_{1m} \\ z_{21} & z_{22} & \dots & z_{2m} \\ \vdots & \vdots & \vdots & \vdots \\ z_{n1} & z_{n2} & \dots & z_{nm} \end{bmatrix}$$

is established.

through the formula $x'_{ij} = \frac{1}{x_{ij}}$ by using the weighting method so as to keep the consistency of the evaluation index. If the original data belongs to the high optimal index, the formula

The established data warehouse is a kind of management technology, and induction and classification depends on different data, which provide the effective evaluation index for the basketball coach, as shown in the Figure 2:

$$Z_{ij} = \frac{x'_{ij}}{\sqrt{\sum_{i=1}^n (x'_{ij})^2}}$$

is adopted to carry on the

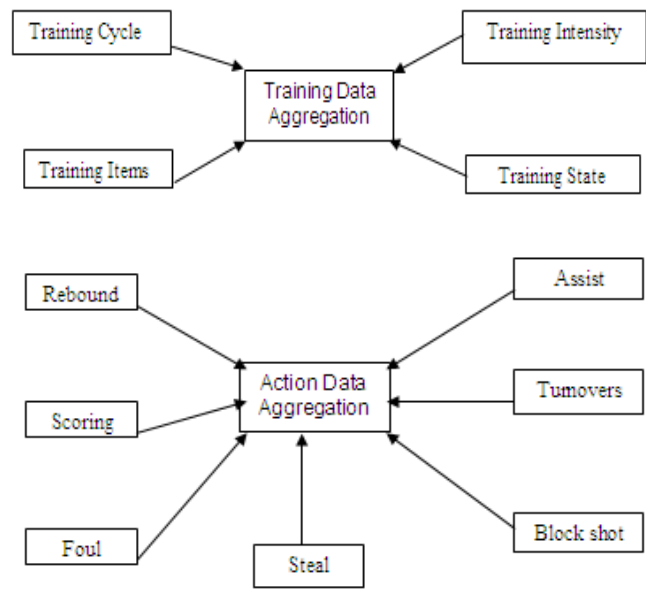


Figure 2: Comprehensive descriptions of system data in the basketball coach's assistant decision support system

The system indexes in the basketball coach's assistant decision support system divided into two aspects: one is the training data (training intensity, training items, training cycle, training state and so on. The other is action data (scoring, steal, block shot, assist, turnover, and foul, rebound and so on). The different dimensions are established based on the different indexes; the bridge between the subjective and the objective is established through the model in the computer; the dimensions are expressed by using the conceptual model, and the data in the evaluation system is regarded as the metric of late evaluation. From the different point of view, it is divided into the following dimensions: Training circle dimension is to record the arrangements of team and players in the training cycle in detail. Training item dimension is to record the items during the process of the training in detail. Training intensity dimension is to record the player's training intensity in detail. Training attitude dimension is to record the player's attitude in detail. Score dimension is to record the player's score in the game. Assist dimension is to record the player's assists in the game. Steal dimension is to record the player's steals in the game. Block shot dimension is to record the player's blocks in the game. Foul dimension is to record the player's foul in the game. Turnovers dimension is to record the player's turnovers in the game; Rebound dimension is to record the player's rebounds in the game.

The relevant tables of logic model design should be established. The player table includes player's ID, weight, height, position; the training items table includes ID of items, training time and interval training time; the training cycle table includes training ID, interval training time, training intensity grade; the player's training state table includes player's ID, training items ID and state evaluation; the score table includes player's score ID, player's ID, score, scoring method, scoring position, scoring time; the rebound table includes rebound ID, player's ID, offensive rebounds, defensive rebounds, rebounds and rebound time; the steal table include the steal ID, player' ID, steal number, steal position and steal time; the block shot list includes block shot ID, player's ID, block shot number, block shot position and block shot time; the assist table includes assist ID, player's ID, assist number, assists, assist players and assist time; the foul table includes foul ID, player's ID, foul number, foul time and foul position; the turnover table includes turnover ID, player's ID, turnover number, turnover time, turnover position and turnover type; the rival table includes the rival player's ID, scoring, rebounds, foul, assist, turnover, steal, block and so on. The training decision support subsystem diagram and the action decision support subsystem diagram are established, as shown in the Figure 3 and Figure 4:

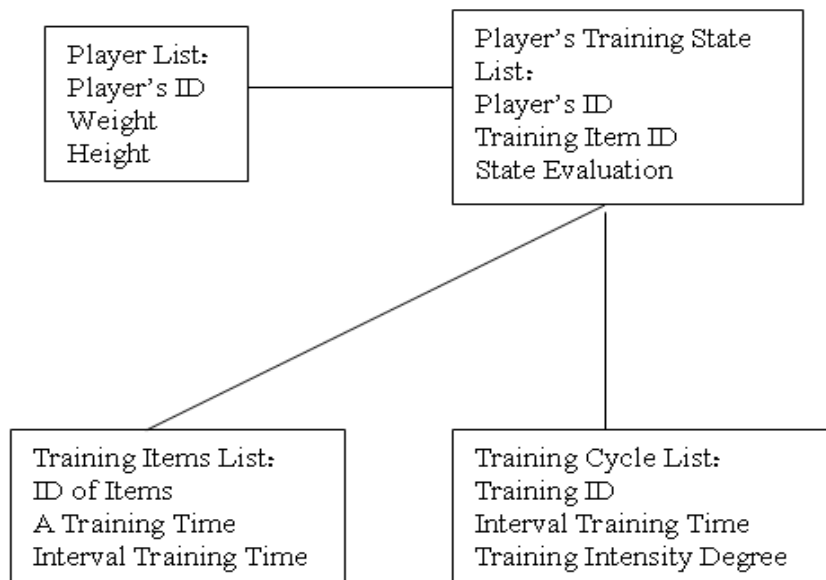


Figure 3: the training decision support subsystem diagram

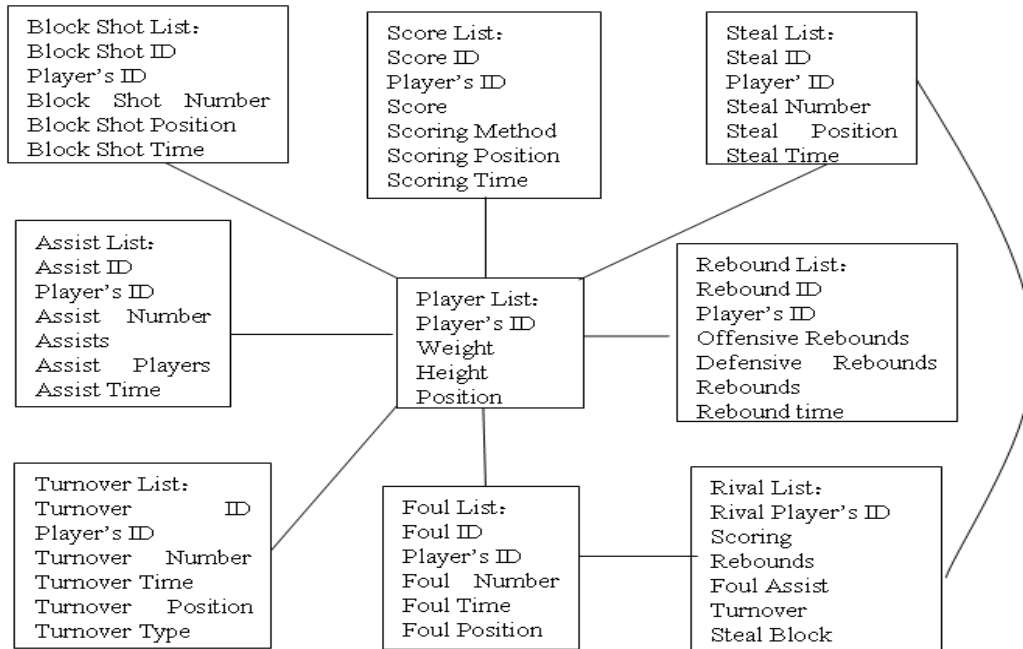


Figure 4 the action decision support subsystem diagram

The training decision support subsystem and the action decision support subsystem should be designed respectively. The training decision support subsystem designs the fact table, including player's ID, training ID and the corresponding training intensity, training items, training cycle, training state should be designed according to specific circumstances. The fact table of the action decision support subsystem includes score ID, rebound ID, foul ID, assist ID, turnover ID, steal ID, block ID and score dimension, rebound dimension, foul dimension, assist dimension, turnover dimension, steal dimension and block dimension are designed. The system which has better data mining function uses SQL2005 as the

information exploitation platform and analyze rapidly by establishing the database and multi-dimensional data set, then the retrieval speed is improved by using index.

3. THE APPLICATION OF BASKETBALL COACH'S ASSISTANT DECISION SUPPORT SYSTEM

Take the assist data of the basketball team of a university in the game as an example, the dimensions are established and the data analysis is carried on, and the assist data is used to carry on the data analysis in a game due to large data quantity, as is shown in Table 2:

Table2: Basketball team's assists record table in a game

Assist ID	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Assists ID	2	11	1	2	7	3	1	2	3	11	4	4	1	7
Assisted ID	4	3	4	4	11	2	4	7	4	3	2	7	7	2
ASSIST ID	15	16	17	18	19	20	21	22	23	24	25	26	27	28
Assists ID	11	4	2	1	7	2	1	11	4	2	3	7	2	3
Assisted ID	3	3	7	7	4	3	7	3	11	1	11	1	4	4

According to the data analysis model and the data mining of the basketball coach's assistant decision support system, the following data can be obtained: the player ID2 and the player ID4 have 22 assists, which is the result of computer data analysis and is the maximum assist number. It can be

recorded as (2,4) frequency, followed by (2, 3) frequency, (2, 7) frequency, (3, 7) frequency is 20, that is, the assists are produced twenty times. Less than twenty times will not be considered and frequent item set can be made according to the above data.

If (2,4) is taken as the frequent item sets, basketball coach should have two player play in the game at the same time; If (2,3) is taken as the frequent item sets, basketball coach should have two player play in the game at the same time. In the same way, the players of the highest frequent item sets are made to play in the game at the same time so as to achieve the best performance.

4. CONCLUSIONS

The design purpose of the basketball coach's assistant decision support system is to help the coach to play the best advantage, make the accurate, scientific, reasonable and effective decision, help the team to reverse the result at the critical moment and win the final achievement. The basketball coach's assistant decision support system uses SQL2005 as the information exploitation platform to not only improve the overall strength of the basketball team rapidly by making use of advantages of data warehouse and data mining technology as well as the coach's previous experience and professional knowledge, but also help the basketball team to develop better by adopting the advanced science and technology.

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