Evaluation Index System on Performance Management of University High-Level Wushu Team Based on the AHP

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Abstract   This paper aims to select the evaluation indexes of high-level Wushu team based on the literature, questionnaires, AHP and mathematical statistics so as to build a Performance Management Evaluation Index System. The research findings are as follows: high-level Wushu team Performance Management Evaluation Index System consists of four first-class indexes including the sports team training management, team logistics management, and management of competition and team players, and 17 specified second-class indexes. The construction of evaluation indexes can provide theoretical and methodological basis for fostering more talented competitive martial arts athletes.
Key words   High-level Wushu team; Analytic hierarchical process; Performance evaluation system; Innovation system

1 Introduction

Colleges and universities incorporate the competitive sports into the higher education system, which corresponds to the current world trend of development of competitive sports. Since 1987 when the State Education Commission issued "Notification on the pilot project of the recruitment of high-level athletes in some colleges and universities", more than 100 university which can enroll high-level athletes have been established as pilot universities. Establishment of University high-level sports teams has become an important strategic measure in the development of physical education in schools. The pilot project of recruiting high-level players in colleges and universities create a new way of combining the sports and teaching and is a strategy to establish the sports talent echelon in multi-level and multi-channel way. The University high-level wushu team as an important part of high-level sports teams, its establishment and development open up a new way of fostering high-level Martial Arts players. In the past decades, some achievements in construction of university high level martial arts teams which plays an positive role in cultivating talent martial arts players has been accomplished. This article tries to integrate the performance management into the management of the martial arts sports teams and provide theoretical and methodological basis for fostering more talented high-level of martial arts athletes in universities,   optimizing the High-level wushu team management and for the rational reform of the university high-level wushu teams.

2 Literature Review

Performance management refers to a sustainable and cyclic process in which managers at all levels participate in performance planning , performance coaching communication, performance appraisal evaluation, application of evaluation results, and the elevation of performance goals in order to achieve the organizational goals , with enhancing personal, departmental and organizational performance as its objectives. Rogers (1990) claims that the major characteristics of performance management is that it is a system with integrated annual cycle, development of group policies, resources goals and guidelines. Spangenger (1992) points out that traditional performance evaluation is a relatively independent from other background factors of the organization, such as such as organizational goals and strategies, organizational culture, and managers' commitment and support. Bates (1995) pointed out that the performance is a multi-dimensional construction which will have different results when measured and observed in different angles. The limited role that the traditional performance evaluation plays in improving employee satisfaction and performance is in accomplishing organizational goals contributes to the development of the performance management system. Brocken, J (1996) contends that incentive fairness features the amount of material interests obtained from incentive results which are determined by the performance evaluation, so the individuals will judge if it's fair by comparing their own material interests with their efforts or with their colleagues' material interest in horizontal direction. Taylor (1999) pointed out that increasing employees' job satisfaction is beneficial for organizational commitment, while they did not propose specific solutions.

The research on the application of performance management in the sports industry is in its infancy in China. Zhang HongZhen (1995) pointed out the major problems existing in the current performance evaluation of professional sports clubs : singleness of Performance Evaluation index of sports clubs, lack of content ; little value of evaluation results ; lack of participation and communication when developing evaluation system; singleness of dynamic mechanism of evaluation ; emphasis on results rather than process . Based on analysis of strengths and weaknesses of management of university high-level sports teams in Jiangsu Province, Zhan Xingyong (2007) proposes that during the construction and management of University high-level sports teams, it is an urgent need to establish a comprehensive management evaluation system to monitor and control the managing process effectively. Wei Wei, Chou Liqin (2008) made use of survey and Delphi and constructed the Performance Management evaluation index of Higher PE institution teaching management based on the balanced score card, and established the weight of the performance evaluation index of the teaching management PE institutions through AHP analytic method. Sun Xiaoming (2009) adopted several methods such as literature, questionnaire, consultancy and mathematical statistics to do research on the current situation of university high-level sports teams in the light of core competitiveness, and set up the core competitiveness index evaluation system of university high-level sports teams in Jiangsu Province. Research on performance management in the sports industry in China is relatively limited in terms of quantity and quality. The author searched for two keyword "sports" and "performance management" in "Chinese Journal Full-text database" from 1999 to 2010, and only got 26 relevant articles, among which there are fewer articles about performance management of high level martial arts teams. The research on this field is in urgent need to be explored.

3 Analytic Hierarchical Processes and Its Application
3.1 The selection of performance management indexes of university high-level Wushu teams
Through searching for the Chinese periodical full text database, the author read the research literature about the performance management evaluation indexes of the high-level Wushu Team. Thus, the author chose as many indexes as possible, especially those frequently occurring indexes and then left out those repeated or similar indexes. In combination with the definition and characteristics of the high-level Wushu team, as well as the framework of the high-level Wushu Team evaluation indexes system, several indexes have been selected. 21 evaluation indexes are initially designated including 4 first-class indexes and 17 sub-class indexes, as follows: Wushu Team training management subsystem (including the training content B1, training sessions B2, training methods B3, training resumed B4), Wushu Team stuff management subsystem (athletes enrollment management B5, athletes roll management B6, athletes employment management B7, coaches proficiency B8, coaches academic qualifications B9), Wushu Teams' competition Management subsystem (competition frequency management B10, competition achievement management B11, competition system management B12, competition performance management B13), Wushu team logistics management subsystem (the input of funds B14, scientific research B15, input of playground B16, medical input B17).
3.2 The principle of constructing the innovative evaluation system
3.2.1 Scientific principle
When constructing innovative evaluation index system of high-level Wushu Team performance management, the researcher should be objective and respect the actual situation of high-level Wushu Team to ensure that the evaluation indexes are scientific and reasonable. It includes three aspects: firstly, the overall evaluation index system of performance management should be complete and reflect the evaluation goal comprehensively, clearly and scientifically. Secondly, the indexes within the performance management index system are independent; the indexes in the same hierarchy do not contain each other or overlap with each other; Thirdly, Calculate the combination weight vector of the lowest level over the objective, and do the consistency test according to the formula. If the test is passed, the results shown by the combination weight vector can be implemented
3.2.2 Hierarchical principle
The Evaluation Index System of High-Level Wushu Team Performance Management is not only systemic and holistic, but also hierarchical and synthetics in a certain degree. To accurately and comprehensively reflect various aspects and characteristics of the evaluation index system, a comprehensive evaluation must be carried out in different levels, consisting of the overall goal, sub-goals, evaluation criteria and the specific alternative plans. Therefore, the performance management index system does not merely concern the one aspect or one factor; it should be comprehensive as a

system with distinct hierarchies and structure.

3.2.3 Dynamic principle

Dynamic principle is that all the elements constituting the system are dynamic and developing, and are interrelated and constrained with each other. The performance management indexes of High-level Wushu Team are subject to the limitations and constraints of the system itself, and affected and restrained by other systems as well. The indexed will change according to time, location, and how much effort people make. it is the dynamic relevance of various parts within the performance management evaluation index system of High-level Wushu team that contribute to the continuous development of the system. Therefore, we must master of the dynamic features of each management factor and make full use of the relevant factors.

3.3 Constructing the judgment matrix and calculating the weight value

The analytic hierarchy process (AHP) takes a very complex multi-goal strategic problem as a whole and divides the integral goal into some sub goals or sub-principles. The sub goals and sub-principles are further discomposed into a number of multi-index hierarchies. By the method of solving characteristic vectors of the judgment matrix, the preferential weights that the elements of each hierarchy accord with higher hierarchy are calculated, and then the final weights of the alternative plans to the overall objective are added hierarchically by weighted sum.

3.3.1 Scale value of indexes' relative importance

This article uses the analytic hierarchy process to construct the performance management evolution indexes system of high-level Wush Team and to clarify the relationships among the evaluation indexes hierarchies, and builds a hierarchical model. The Delphi method and the ratio scale technology are adopted to judge the relative importance of each indexes and to construct a judgment matrix. The implication of one index on another one is shown in table 1.

Table 1   Scale Value of Indexes' Relative Importance

Compare Index A with index B	The evaluation value of index A	Memo
By comparison, A is extremely more important than B	9	2，4，6，8 is the mid-value of these adjacent evolution value
By comparison, A is much more important than B	7	
By comparison, A is more important than B	5	
By comparison, A is slightly more important than B	3	
By comparison, A is as important as B	1	1/2，1/4，1/6，1/8 is the mid-value of these adjacent evolution value
By comparison, A is slightly less important than B	1/3	
By comparison, A is less important than B	1/5	
By comparison, A is much less important than B	1/7	
By comparison, A is extremely less important than B	1/9	

3.3.2 Constructing the pair wise comparison matrix

Constructing the pair wise comparison matrix refers to the process that starting from the second layer, each factor of the same hierarchy that influences the factors on the higher hierarchy are compared by pair to construct the comparison matrix by using the 1-9 comparison scale till the lowest level. In this paper, the Delphi method and AHP and the importance in Table 1 are combined to assign the value of judgment matrix (see table 2).

Table 2   Judgment Matrix of the Relative Importance of Indexes

A	A1	A2	A3	A4		A3	B10	B11	B12	B13		A4	B14	B15	B16	B17
A1	1	3	2	3		B10	1	2	1/5	1		B14	1	3	2	2
A2	1/3	1	1/2	1/3		B11	1/2	1	1/5	2		B15	1/3	1	1/2	1/2
A3	1/2	2	1	2		B12	5	5	1	3		B16	1/2	2	1	2
A4	1/3	3	1/2	1		B13	1	1/2	1/3	1		B17	1/2	2	1/2	1
A2	B5	B6	B7	B8	B9				A1	B1	B2	B3	B4			
B5	1	1/2	4	3	3				B1	1	2	1/3	1			
B6	2	1	5	7	7				B2	1/2	1	1/5	1			
B7	1/4	1/5	1	5	3				B3	3	5	1	5			
B8	1/3	1/7	1/5	1	1				B4	1	1	1/5	1			
B9	1/3	1/7	1/3	1	1											

3.3.3 Defining the weight of each index

In the analytic hierarchical model, it is normal to apply the method of summation to define the weight of each index. The underlying theory is that for a consistent judgment matrix, the normalization of the value of each row is its corresponding weight. A single row of weight is obtained from normalization of the judgment matrix (Table 5). The combination weight of sub-class indexes, or the final weight of each index is calculated by the data from Table 5 and combination weight formula: $w(k)=(w1(k), w2(k),..., wn(k), T=p(k)w(k-1)$. Based on this index system this article chose the AHP method to define the weight of each weight. As shown in table 3, through calculation. WA_{1j}=(A1,A2, A3,A4)=(0.4502, 0.1061, 0.2599,0.1838)$; WB_{1j}$=(B1,B2, B3,B4)= (0.17 80,0.1108,0.05796,0.1317)$; WB_{2J}$=(B5,B6,B7,B8,B9)=(0.2543,0.4924,0.1346,0.0563,0.0622)$;WB_{3J}$=(B11,B12,B13,B14) =(0.1576,0.13 25,0.5832,0.1266)$; WB_{4J}$=（B15，B16，B17，B18）=（0.4202,0.1213,0.2685,0.1898）.

Table 3　Construction of High-level Wushu Team Performance Management Evaluation

Index	weight	Sub-index	weight
Team training management A1	0.4502	Training contentB1	0.1780
		Training sessions B2	0.1108
		Training method B3	0.5796
		training resumedB4	0.1317
Team stuff management A2	0.1061	athletes enrollment management B5	0.2543
		Athletes roll management　B6	0.4924
		athletes employment management B7	0.1346
		coaches proficiency B8	0.0563
		coaches academic qualifications B9	0.0622
Team competition management A3	0.2599	competition frequency management B10	0.1576
		competition achievement management B11	0.1325
		competition system management B12	0.5832
		competition performance management B13	0.1266
Team logistics management　A4	0.1838	input of funds B14	0.4202
		scientific research B15	0.1213
		input of playground B16	0.2685
		medical input B17	0.1898

3.3.4 Consistency test of the judgment matrix

Calculate the combination weight vector of the lowest level over the objective, and do the consistencies test according to the formula. If the test is passed, the results shown by the combination weight vector can be implemented and determine the performance management index system of university high-level Wushu team. The value of 1-9 level in the judgment matrix can be seen in Table 4. Specific formula is as follows: $CR = CI / RI$, $CI = (λmax-n) / n-1$, in which n is the order of the matrix, and RI the average random consistency index of the matrix. When $CR <= 0.1$, it is considered that the judgment consistency is acceptable, otherwise it needs some rearrangement. When $n \leq 2$, there is no need for having the consistency test. By calculating, $CR (A) = 0.0607<0.1$, $CR (A1) = 0.0162< 0.1$, $CR (A2) = 0.0762 <0.1$, $CR (A3) = 0.0975 <0.1$, $CR (A4) = 0.0126 <0.1$. This judgment matrix of evaluation index system passes the consistency test.

Table 4　The Value of Average Random Consistency Indexes

n	1	2	3	4	5	6	7	8	9
R1	0	0	0.58	0.6	1.12	1.24	1.32	1.41	1.46

4 Guarantee Strategies of University High-level Martial Arts Sports Teams Performance Management

4.1 Establishing scientific and reasonable performance management evaluation system

University high-level martial arts Sports Team performance management mechanism belongs to one type of non-participation evaluation systems, in which the martial arts Sports Team is passive to

accept the tasks with ambiguous goals and equivocal responsibilities. After tasks are completed, the manager of the martial arts team carries on the appraisal and the inspection to the subordinate with limited index and subjective impression. Obviously, this kind d evaluation will result in some deviation. The scientific and reasonable construction of index system requires explicit design principle which guides the design of the framework and content of high-level martial arts sports teams' index system. In turn, the framework and index content determine the index calculation and data retrieval.

4.2 Feasibility of enhancing performance management evaluation system

Performance management system as a foreign advanced theory is applied in the high-level martial arts Sports Team operation. Due to the differences in the operation, management and evaluation of high level martial arts Sports Teams this theory can't be transplanted without some adjustments. Feasibility of the high level martial arts Sports Team performance management can be quantified in three parts. First, a scientific and reasonable performance management index system can be constructed on the basis of expert evaluation and Delphi and high-level martial arts Sports Team's behavior need to be guided to achieve the set working standard. Second, establishment of fair competitive system can guarantee the "publicity, fairness and equality" in the evaluation process. Third, according to the problems emerging from the evaluation process, the indexes can be adjusted. And the targets can be assigned to the leader of each section, according to the operation of the high-level martial arts sports teams.

4.3 Improve the feedback mechanism of performance management evaluation system

Good performance feedback is helpful for elimination obstacles quickly and maximizing the efficiency of high-level martial arts Sports Team performance management. The main purpose of performance feedback is to improve and enhance the relationship between the valuator and the martial arts Sports Team, and to help them make good use of the strength and overcome the weakness, to clarify the need for development and training of martial arts Sports Team, and to understand feedback and evaluation of martial arts Sports Team. The effective feedback can not only make the team managers master the actual operation process of target realization, but plays a intriguing role in affirming the achievements through conversation and communication so as to stimulate the team to train harder and make better performance in competition. All the problems emerging from the performance evaluation should be taken seriously, analyzed and solved to improve the performance management of university high-level martial arts sports teams.

5 Conclusions

University High-Level martial arts sports team Evaluation index innovation system is comprised of four first-class indexes including team training management, team logistics management, team competition management, team personnel management and 17 sub-class indexes. The construction of Performance Management Evaluation Index System of the High-Level martial arts sports team provides a new theoretical basis for university high-level martial arts sports teams achieving advantages in competitions. This research builds a simple Performance Management Evaluation Model of high-level martial arts sports teams. As this is the first time to research on high-level martial arts sports teams from this perspective, some concrete studies still need to be further explored and improved.

References

[1] Ranasinghem, L.Economic Risk Analysis of Large Engineering Projects[J]. Canadian Journal of Civil Engineering, 1991, 18(3):416-427

[2] Kaplan, R.S., Norton.D. Using the Balanced Scorecard as a Strategic Management System[J]. Harvard Business Review, 1996(1-2)

[3] Kaplan.R.S., Norton.D. How Strategy Maps Frame an Organizations Objectives[J]. Financial Executive, 2004

[4] Zhu Hongwei, Liu Jin. The Study of the Salary Management in Commercial Banks in China[J].The Economy and Trade in China: Academic Edition, 2007, (11): 1-3 (In Chinese)

[5] Kaplan, R.S., and Norton, D. The Balanced Scorecard-Measures That Drive Performance[J], Harvard Business Review, 1992(1-2)

[6] Kaplan R.S., Norton.D. Linking the Balanced Scorecard to Strategy[J]. California Management Review, 1996, (4)

[7] Zhu Hongwei, Liu Jin, Zhang Zhi-qiang. Some Issues about Job Evaluation in Commercial Banks in China[J]. Journal of Chengdu Institute of Public Administration, 2008, (4): 78-81 (In Chinese)