ORIGINAL PAPER

APPLICATION OF THE ANALYTIC HIERARCHY PROCESS FOR THE PERFORMANCE EVALUATION CRITERIA OF SPORT OFFICES IN UNIVERSITIES

Seyedeh Azra Mirkazemi[1], Mehr Ali Hemmatinesgad[2], Mohammad Hasan Gholizadeh[3], Mohammad Rahim Ramazanian[3]

[1] Physical Education & Sport Science Faculty , Birjand University, Birjand , Iran.
[2] Physical Education & Sport Science Faculty, Giullan University , Rasht , Iran.
[3] Department of Management , , Giullan University , Rasht , Iran.

Corresponding author:
Seyedeh Azra Mirkazemi
p. o. Box : 1438
Physical Education & Sport Science Faculty
Birjand university
Birjand , IRAN
00985612502203 (Tel)
00985612502412 (Fax)
somirkazemi@yahoo.com

Submitted for publication: Sep 2009
Accepted for publication: Nov 2009

ABSTRACT
MIRKAZEMI, S. A.; HEMMATINESGAD, M. A.; GHOLIZADEH, M. H.; RAMAZANIAN, M. R. Application of the analytic hierarchy process for the performance evaluation criteria of sport offices in universities. Brazilian Journal of Biomotricity, v. 3, n. 4, p. 390-398, 2009.In this paper we identify and prioritize the performance evaluation criteria of physical education and sport offices at universities by employing the Analytical Hierarchical Process (AHP). Priority has been based on mathematical principles resulting from this method through the identified criteria. This study has identified seven criteria, namely: budget, the human resources, facilities, income, equipment, operational activities and education and research activities, with 33 alternatives, and the weight and importance of each by expert`s judgment, with the goal of identifying and determining the superior criteria for assessing physical education departments at universities. The results showed that alternatives such as, the ratio of students participating in extracurricular activities to the total number of students at university, in time and complete access to sport spaces and the university sport current budget, having the highest degrees of importance 0.395, 0.174 and 0.167, respectively, and the number of unskilled labor (man and woman) with the lowest degree of importance of 0.01.

Key words: analytic hierarchy process, ranking, criteria, sports offices

INTRODUCTION

Sports activities at university provide good opportunity for students to become interested in physical activities. They need good health and energy to carry out their academic work. Such opportunities are available to them through the organization of sports activities at university. Physical education offices at universities present sports programs to the students. For achieving these goals and to evaluate their performance, the administrators of physical education offices at universities should manage their organizations based on scientific standards. Evidently, in the process of assessing their performance, identification and use of key indices is very crucial. Using these indices, it will be possible to provide important information to measure the progress in their respective organizations.

Analytic Hierarchy Process (AHP), since its invention, has been a tool at the hands of decision makers and researchers; and it is one of the most widely used multiple criteria decision-making tools (GHODSIPOUR, 2005).The advantage of the AHP is that it breaks down a complex unstructured problem into its components and then constructs a hierarchy of the system components in order to evaluate them. It is also easy to implement, it can handle tangible and intangible criteria, and it imposes a discipline on the thought process. AHP falls within the framework of Multiple Criteria Decision Analysis (MCDA). Numerous methods have been developed for rank scaling, which can be found in the literature on MCDA (KORHONEN ,1986). Nevertheless, AHP has become more popular due to the following reasons:

1) It provides an opportunity for a richer involvement of the decision makers in the evaluation procedure.

2) The existence of several commercial computer codes makes its implementation much simpler than most MCDA techniques.

AHP is now much more widely taught in management workshops and textbooks (see for example, RENDER and STAIR, 1994). In the 1970s, several pairwise-comparison approaches for ranking teams in sport were applied for post evaluations after all the games had already taken place (LADANY et al.,1977; COOK et al.,1996). Dyer (1990) views AHP as an arbitrary procedure for ranking alternatives. Lugassi et al. (1985) find AHP more applicable than the utility approach. Sinuany-Stern (1988) applied the AHP to rank 16 soccer teams from the Israeli National League. Six criteria (attributes) were used for evaluating each team: the teams' facilities, the teams' coach, the players' level, the teams' fans, the previous season's performance, and the current performance. Golden and Wasil (1987) evaluated sports records using AHP. They examined individual single event records, individual season records, and individual career records. Partovi (2002) presented a model for soccer to be more lovable. Wu et al. (2002) used AHP and comprehensive Fuzzy for evaluating body physical exercise risk.

The importance of these applications is that they all examine human characteristics in some way. In this paper the performance of organization evaluated and answered to these questions. What are Criteria for performance evaluation of physical education and sports offices in university? And their priority how can be?

MATERIAL AND METHODS

The main purpose of the application of AHP is to present the consistency and applicability (feasibility) of AHP in the decision process. A more fundamental issue in respect to evaluation is the nature of the expert used. Professional expertise has been intensively investigated, both generally in management and specifically in sports management. For

instance, it has been established that in sports, experts differ from novices in respect to underlying cognitive processing mechanisms (ABERNETHY, 1994), which enable these experts to be better decision makers (TENENBAUM et al., 1993). In sport, however, universal criteria for determining an 'expert' have not as yet been defined (ABERNETHY,1994). One solution to this problem would be to use persons whose expertise on a particular subject matter is unequivocal. Such an approach was used in several investigations in elite ball-games such as basketball, soccer, team-handball and water polo (BAR-ELI, 1997). According to the forecasting literature, combining several forecasters' (experts') opinions provides better predictions than a single forecaster (SLOVIC et al., 1971), and therefore, in our paper we have combined the predictions of several experts. Twenty administrators and faculty members in sport management served as experts in this study (table 1).

Table 1 - Distribution and collection of AHP questionnaire

Row	Experts	Has been distributed	Collected	percent
1	Only the administrator of sport office in University	7	3	42/85
2	Both The administrator of sport office in University and Faculty member	10	8	80%
3	Managers and labors of The office of the Physical Education and sport in the Science and research ministry	3	3	100%
4	Faculty member	10	6	60%
total		30	20	

After reviewing the literature and interviewing the experts, the team determined 7 criteria with 33 sub-criteria. The AHP's flexibility is achieved by the manner in which a problem may be decomposed into hierarchical levels (SAATY et al., 1991). So, first, the decision hierarchy was structured (Figure 1).

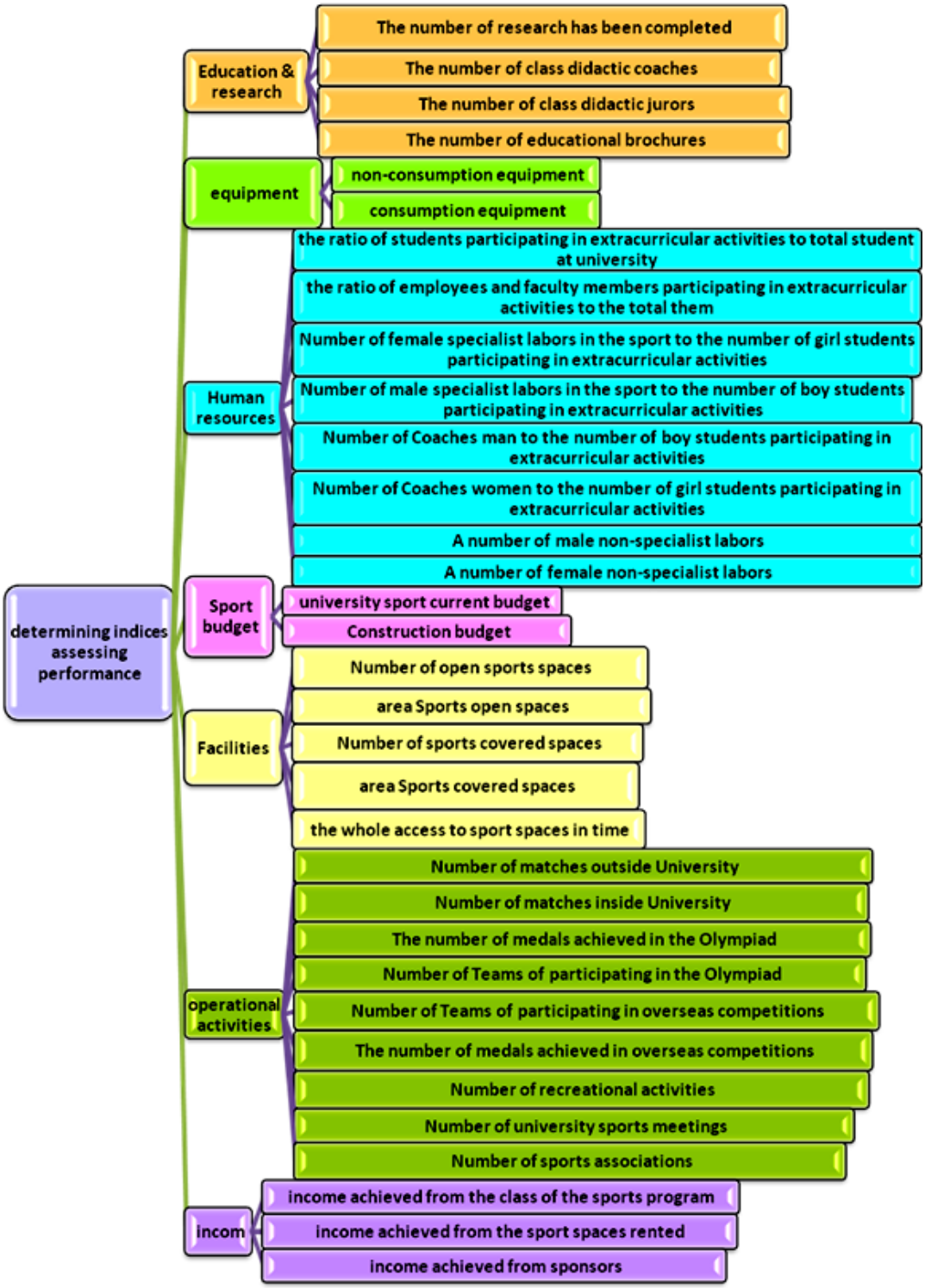

Figure 1 - Hierarchy tree view of performance evaluation criteria for sport offices in university

After building the three-tier hierarchy, we collected input data that would establish the relative importance weights (priorities) for each set of elements at each level of the hierarchy. Each expert evaluated the importance of each criterion by comparing it with the other pairs. Each faculty member and administrator was asked to take into account their own opinions and experiences when comparing criteria, and to compare the decision criteria with each other. For this purpose, standard tables were used for pairwise comparisons of the criteria and sub criteria (see Table 2).

Table 2 - Scale of relative importance Intensity of Relative Importance Definition

Intensity of Relative Importance	Importance Definition	Explanation
1	Equal Importance	Two activities contribute equally to the objective
3	Moderate Importance	Experience and judgment another slightly favor one activity over
5	Essential or Strong	Experience or judgment strongly favors one activity over another
7	Importance Demonstrated	An activity is strongly favored and its dominance is demonstrated in practice
9	Extreme (Absolute)	The evidence favoring one activity over another is of the highest possible order of affirmation
2,4,6,8	Intermediate values	When compromise is needed

RESULTS

This study is based on group decision making. So the matrixes are synthesized by employing the Geometric Mean Method (GMM). Following this procedure, one vector of the coefficient of importance for each criterion was obtained from every one judge, and the coefficients of importance matrix were formed for each criterion.

In addition to final preference weights, the AHP permits calculation of a value called the consistency index (SINUANY-STERN, 1988). This index measures transitivity of preference for the person doing the pairwise comparisons. To illustrate the meaning of transitivity of preference, if a person prefers choice A over B, and B over C, then do they in consistent fashion prefer A over C? This index provides a useful check, because the AHP method does not inherently prevent the expression of intransitivity of preferences when ratings are being performed. The AHP consistency index compares a person's informed preferences ratings to those generated by a random preference expression process. An arbitrary but generally accepted as tolerable level of inconsistent preference scoring with the AHP is less than or equal to 0.1 (SINUANY-STERN, 1988). A consistency ratio CR is computed for each comparison matrix. In an interactive application of AHP a matrix classified as being inconsistent (CR > 0.1) was given back to the decision making for modification until it fulfills the consistency condition. All of them were less of 0.1.

For determining weight of every alternative, arithmetic means (formula 1) was used:

$$r_{ij} = \frac{a_{ij}}{\sum_{i=1}^{n} a_{ij}} \qquad j = 1,2,3,\ldots,m \qquad \text{Formula 1}$$

Vectors of the arithmetic means of the coefficients of importance were then rescaled in the manner that their sum equaled one. Then the symphonic means were calculated based on formula 2:

$$W_i = \frac{\sum_{i=1}^{n} r_{ij}}{n} \qquad j = 1,2,\ldots,m \qquad \text{Formula 2}$$

The results are shown in table 3.

Table 3 - The weights of performance evaluation criteria for sport offices in university by AHP

Score	criteria	rank	scores	criteria	rank
0/035	Number of matches outside University	18	0/395	the ratio of students participating in extracurricular activities to total student at university	1
0/034	consumption equipment	19	0/174	the whole access to sport spaces in time	2
0/033	Number of Teams of participating in the Olympiad	20	0/167	university sport current budget	3
0/033	The number of class didactic coaches	21	0/571	Number of sports covered spaces	4
0/033	The number of educational brochures	22	0/103	the ratio of employees and faculty members participating in extracurricular activities to the total them	5
0/031	The number of class didactic jurors	23	0/083	Construction budget	6
0/028	income achieved from sponsors	24	0/067	Number of female specialist labors in the sport to the number of girl students participating in extracurricular activities	7
0/026	income achieved from the class of the sports program	25	0/059	Number of male specialist labors in the sport to the number of boy students participating in extracurricular activities	8
0/025	area Sports open spaces	26	0/054	area Sports covered spaces	9
0/025	income achieved from the sport spaces rented	27	0/051	Number of sports associations	10
0/022	The number of medals achieved in the Olympiad	28	0/050	Number of matches inside University	11
0/018	The number of research has been completed	29	0/045	Number of recreational activities	12
0/017	Number of Teams of participating in overseas competitions	30	0/041	Number of open sports spaces	13
0/015	The number of medals achieved in overseas competitions	31	0/041	Number of Coaches man to the number of boy students participating in extracurricular activities	14
0/01	A number of male non-specialist labors	32	0/04	Number of Coaches women to the number of girl students participating in extracurricular activities	15
0/01	A number of female non-specialist labors	33	0/039	Number of university sports meetings	16
			0/039	non-consumption equipment	17

DISCUSSION

Although more than half a century has passed since the beginning of sport activities at universities, till date there has not been a qualitative evaluation of the student sport process. The prevalent evaluations of various organizations such as physical education organizations have largely focused on qualitative factors, and performance evaluation of these organizations are carried out mostly by completing questionnaires and forms by evaluators. In this process, the main aim of evaluation has been lost, and as the result a lot of resources have been wasted. In view of the developments in the student sport in the last decades, and their effects on different classes of society, this study, through the presentation of a new outlook and thinking atmosphere, using a new and useful method, has helped in the determination of main criteria for evaluation of performance of physical education organizations.

This investigation provides further evidence that multi-criteria models such as AHP could be beneficial to decision makers in the applied setting of sports. Decision-aid systems (such as the one proposed by SAATY, 2000) can relieve them of cognitive flaws and biases incurred during judgment and decision-making processes, especially those being made under stressful conditions (VAIDYA, 2006). It seems that the strategy of fractionating a total complex problem into a series of structurally related parts – asking experts to assess these fractions and aggregating them by a model – may indeed contribute substantially to the judgment and decision processes often required in the area of sport management.

Karimiyan (2004) and Talebpour (2006) have observed that the maximum budget at universities spent on sport is related to inter-university games conducted outside the university, and to a lesser extent to entertainment activities. This is indicative of the focus the universities put on championship, while the experts consider sport for all such as entertainment activities to have priority over inter university games. The championship or sport for all look at the university sport should be based on its importance and special position in the planning of university sport, giving better direction to university sport. Moreover, according to Tondnevis (1997), the physical education managers consider the effect of lack of facilities and infrastructure, as a factor preventing extra curriculum sport activities, to be 83.8%, which is also confirmed by other experts. Karimiyan (2004) has observed that the maximum share as far as the increase in extra curriculum activities is concerned is related to the human resources, the second most important factor being the spent budget, which are confirmed by the results of present study. Moreover, Dastjerdi (2002) presented students' priorities regarding the university sport programs, and classified, in order of importance, factors such as entertainment and sport for all activities, sport training courses and sport games as the most important factors. He concluded that as far as this classification is concerned, opinions expressed by experts matched those of students. The validity of this conclusion should be further investigated with other groups of experts, such as students and labors who can provide valuable input to determine the performance of sport offices.

PRACTICAL APPLICATIONS

This investigation has identified the main and important factors of performance evaluation the sport offices. The criteria of the evaluation has been compiled, and based on surveys of experts, priority has been given to them. Using these criteria, physical education executive managers of universities and the programming committees of can prioritize these activities and efforts to implement them step by step.

REFERENCES

ABERNETHY, B. The nature of expertise in sport", , International Perspectives on Sport and Exercise Psychology. Fitness Information Technology Inc., Morgantown, WV, p.57–68, 1994.

ARMSTRONG, J. S.; DENNISTON, W. B.; GORDON, M. M. The use of the decomposition principle in making judgments. Organizational Behavior and Human Performance, v. 14, p. 257-263, 1975.

BAR-ELI , M. Psychological performance crisis in competition, 1984-1996 a review, European Yearbook of Sport Psychology, v. 1, p.73-112 ,1997.

GOLDEN BRUCE, L.; WASIL, E. A. Ranking Outstanding Sports Records. INTERFACES, v. 17, n. 5, p. 32-42, 1987.
COOK, W. D.; DOYLE, J.; GREEN, R.; KRESS, M. Ranking players in multiple tournaments. Computers and Operational Research, v. 23, p.869-880, 1996.

DASTJERDI, H. Standpoint of student on physical education and sport activities at universities in Iran. Sport Science Research center, 2002.

DYER J. S. Remarks on the analytic hierarchy process. Management Science, v. 36, n. 3, p.249-258, 1990.

GHODSIPOUR, S. H. Analytic hierarchy process. Amir Kabir Publ., Tehran, 2005.
KARIMIAN, G.; TONDNEVIS, F. Effects of human resources, budget and sport spaces area on increasing sport activities at universities. Journal of sport and movement science, v. 1, n. 3, p. 65-79, 2004.

KORHONEN P. A hierarchical interactive method for making alternatives with multiple qualitative criteria. European Journal of Operation Research, v. 24, p.265-276, 1986.

LADANY, S. P.; MACHOL, R. E. Optimal Strategies in Sports: Studies in Management Science and Systems. North Holland Publ. Co, Amsterdam, 1977.

LUGASSI, Y.; MEHREZ, A. ; SINUANY-STERN, Z. Nuclear power plant site selection: a case study. Nuclear Tech., v. 69, p. 7-13, 1985.

PARTOVI, F.; RAFAEL, Y.; CORREDOIRA, A. Quality function deployment for the good of soccer. European Journal of Operational Research, v. 137, n. 3, p. 642-656, 2002.

RENDER, B.; STAIR, T.M. Quantitative Analysis for Management, Allyn and Bacon, Boston, 1994.

SAATY, T.L.; VARGAS, L.G. Prediction, Projection and Forecasting. Kluwer Academic Publishers, Boston, 1991.

SAATY, T.L. Fundamentals of decision making and priority theory whith the analytic hierarchy process. v. 6, RWS publications, Pittsburgh, 2000.

SINUANY-STERN, Z. Ranking of sports teams via the AHP. Journal of the Operational Research Society, v. 39, p.661–667, 1988.

SLOVIC, P.; LICHTENSTEIN, S. Comparison of Bayesian and regression approaches to the study of information processing in judgment. Organizational Behavior and Human Performance, v. 6, p.649–744, 1971.

TALEBPOUR, M.; KASHTIDAR, M. Collection of Evaluative and supervision system for the sport & physical education activity and programs of universities. Sport Sciences Research center, Tehran, 2006.

TENENBAUM, G.; BAR-ELI, M. Decision making in sport: a cognitive perspective. In R.N. Singer, M. Murphey and L.K. Tennant (Eds.), Handbook of research on sport psychology, Macmillan, New York, p.171-192, 1993.

TONDNEVIS, F. The organizational structure of extracurricular sport at universities in Iran. harakat, v. 3, p. 5, 2000.

VAIDYA OMKARPRASAD, S. Analytic hierarchy process: An overview of applications. European Journal of Operational Research ,v. 169, n. 1, Pages 1-29, 2006.

WU YIZHI; YONGSHENG D.; HONGAN, XU. Comprehensive Fuzzy Evaluation Model For body physical exercise risk. LSMS, LNBI 4686, p.227-235, 2007.

AUTHOR BIOGRAPHY

Name: S. A. Mirkazemi

Employment: Faculty of physical education (Sport Management) University of Birjand

Research interests: Measurement and Evaluation, Supervision and control, Management of Human resources in sport organization. Sport women. Sport tourism. Research method

Name: M.H. Gholizadeh , PhD

Employment: Assistant professor, University of Guilan; Management Faculty, Rasht , IRAN

E-mail: gholizadeh@guilan.ac.ir, gholizadehmh@yahoo.com

Name: M.A. Hemmatinezhad

Employment: Assistant professor (Sport Management)

Degree: (PhD) ,University of Guilan

Research interests: Supervision and control, Management of Human resources in sport organization, Sport tourism, Research method

E-mail: ma_hemati@yahoo.com

Name: M.R. Ramazaniyan, PhD

Employment: Assistant professor University of Guilan; Management Faculty Rasht , IRAN

E-mail: m_ramazanian391@yahoo.com