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Performance Evaluation of sport association board of Isfahan Province through DEA and a championship approach

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Abstract

Performance evaluation in regular periods is one of the ways in which organizations can evaluate their performance as well as weak and strong points unifiedly and precisely. These days, mathematical models are also used to evaluate the efficiency and productivity of various units. These units are a collection of education, research and service activities as input and output factors and according to effectiveness and importance degree of each factor in total performance, the ratio of total weighed output to total weighed input are calculated as efficiency degree of decision making units. In this study, data envelopment analysis is employed to evaluate the efficiency of 48 sport association board of Isfahan province based on championship perspective. In present study, factors such as sending to matches, holding matches, the number of players in national teams and etc. are used. Moreover, calculation is done based on constant return on scale. Finding of efficiency calculation reveal that out of 50 present boards in Isfahan province, 24 boards in men's group and 22 boards in women's group have been efficient in year 90. After ranking blind and weak-sighted board, deaf board and martial art board in women's group have been recognized in the first place. Also, blind and weak-sighted board has the highest rank among 50 active association board in men's group. Finally sensitivity analysis of input data shows that sending to matches has the most significant effect on efficiency of association boards.

*Keywords :*Performance evaluation efficiency, sport association board, data envelopment analysis

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1. Introduction

Sports activities are regarded as crucial and effective elements in individual and social lives of each person. When taking about the impact of sport on individual life, we remember the role of sport in physical and mental health, energy, alacrity and vivacity since both physical education along with conducted research in this field and visible proof confirm it. Nowadays, these multiple effects are the reason to attract people to physical and sports activities [4]. According to important and societies use of positive social, educational and hygienic dimensions of sport and also the significance of this fact that efficiency concept is not just limited to industrial and cultural productions and can be applied in each traning, service, manufacturing or even information organization, performance evaluation needs to be an inseparable part of each organization[14]. Therefore, sport boards as a service organization will require this principle.

Sport board is an establishment which is founded in order to provide a suitable path to develop related sport field based on predicted principle and rules based on objectives of federation and physical education organization. Making motivation and attracting all groups of people to sports finding talents and improving sport skills are among the goals of each board. Each board is the agents of related sport federation in provinces that performs related activities in the city in accordance with the regulations of related international federation as well as coordination with physical education of the province and observing all the performed rules. The following items are among the goals of boards [20]:

- holding provincial matches in different age groups
- making relationship and coordination with governmental and non-governmental institutes which are active in that specific field.
- financial and technical help as well as equipment support for province financial board and other independent sections with accordance with the head office of sport and youth.
- making relationship between city board and the ones in independent sections of suburbs with related federation.

Sport variation process in life get started with playing which the essential factors in child's development and growth; then, it join the sport with the concept of competition first starts informally and ends in a unified competitive sport which is championship. A correct planning is really vital for athletes in championship. It means that an athlete might be in highest desirable level in technique and tactics, but cannot take part in matches or achieve the ideal result because of lack of mental preparation. Therefore, in an ideal planning, all aspects need to be considered [3].

Due to the importance of presence of practical social, cultural, political and economic benefits of these associations, their importance and efficiency level become really important [8]. Efficiency in its common concept means efficiency measurement with the aim of efficiency improvement in sport association board through using reliable techniques such as data envelopment analysis. Data envelopment analysis is a frontier non-parametric method to evaluate the efficiency which is used for evaluating relative efficiency and performance of a system including comparable items. These comparable items are called decision making units which are used to convert input to outputs [1]. Based on this fact that performance evaluation of each organization and suggesting an appropriate strategy to improve the performance lead to recognizing and improve the weak and strong points and also finding

can play educational, economical and consultative roles for each organization including sport; this paper tries to shed light upon performance evaluation of sport association board including both group or individual sports to make the possibility of using all equipment to make the appropriate infrastructure and prepare expropriate experts and essential credit to improve the provincial sport. Hence, after specifying performance evaluation factors of sport association board in a championship approach, previous literature is reviewed and experts opinion are taken into account to collect data from the main organization of sport and youth. These factors contain match hosting, being sent to matches, held training courses, the number of the sport insured, the number of the invited to national team and etc. Next, each input and output factor will be described. The experts of this section include the head of association boards, deputies and staff of sport and youth organization then, DEA is employed to evaluate the performance of sport association boards and determined the efficient ones in 1390. Accordingly, BCC model is used. Next, DEA ranking models such as makui's are used to rank association board and finally sensitivity analysis is used to specify the importance of each input.

2. Review of literature

A lot of research has been done highlighting non-parametric DEA that sine of them are mentioned as follow:

Using DEA and malmquist indicator as well as a multi-level model, Fernando and Cabanda (2006) estimated the practical performance of relative efficiency of 13 faculties of a university. Experimental result show that efficiency change factors play a crucial role in productivity increase. Additionally, it has been shown that by using input-output total, studied colleges have recorded a higher level of technical efficiency than innovation [9].

Hilmola (2007) has analyzed partial productivity as well as efficiency of European railway transportation in 1980-2003. He used DEA along with partial productivity to analyze all geographical lands of various European countries. Findings indicate that countries with the highest efficiency level in 80s have unexceptionally experienced an efficiency drop in 90s [11].

Desheng Wu and Hienta Bruce (2009) have evaluated the performance of electronic banks through DEA and analysis of main parts. In this research, operation cost and labor force are regarded as input and web parameter as well as profit is taken into account as outputs. first, researcher has used DEA to analyze bank efficiency based on internet operations and then categorized similar groups through PCA and according to bank internet operations as well as cost efficiency [6].

Jardin (2010) has evaluated the efficiency of participating teams in first division league of franc in 2004-2007 through DEA; then, examined their dynamic performance. In spite of other research about other competition superior units based on efficiency are not the superior ones in mentioned sample Score. Average show that first division league of franc is efficient. The first problem deals with inefficiency in that league due to the amount and value of investment. Despite stability in average performance of clubs in studied period. Results indicate that deterioration of conditions affect clubs performance [12].

Moreover, Mirfakhrodini and khatibi aghda (2011) have evaluated the performance of 15 sports associations in attracting people in Yazd province and rank them through Anderson-Peterson. They have regarded activity period of associations in Yazd. Their dedicated budget and the number of coaches as input and the number of athletes as outputs. Results show wrestling association and Bowling and Billiard association have the highest and lowest efficiencies, respectively [17].

Soleimani et al (2011) have evaluated the efficiency of Iranian soccer teams through DEA. These teams are the ones playing in first division league of the country. In this research, AHP is employed to specify input and output with a more intensified effect. Then, DEA and Specifically BCC is used to determine the efficiency of each specified team. Finally, it has been revealed that Esteghlal, Abu Moslem, Teraktorsazi, Moghavemat and Steel Azin have the efficiency number of 1 and Ahwaz Esteghlal has the lowest efficiency number [19].

Francisco Gonzalez- Gomez (2012) have investigated management change effects on performance of sport teams in half-season. Due to the importance of manager's role in decision making, some teams change their managers in middle of the season and hire the new one with the new strategic while some teams work with their current manager. After analyzing through DEA, this research shows that although changing manager in middle of the season has a positive effect on team performance, teams that work with the same manager up to end of the season are more satisfied [10].

Kutlar et al (2012) have specified the efficiency of global railway companies through DEA, and then, compared their efficiencies through Tobit analysis. Data of this research is related to 31 railway companies in 2000-2009 and technical efficiency was found by using DEA. Result of CCR analysis show 17 efficient companies for the first years and 18 one for the 10th year signaling just 1 more unit [15].

Zbranek (2013) has used DEA as a tool to evaluate staff's performance. Here, researcher tries to offer a framework with less pitfalls than traditional patterns of performance evaluation, introducing more comprehensive factors to assess individual staff. Inputs of this model contain stimulator factors such as payment, working conditions, bonus and profits. The model has been performed in a bank unit; 12 employees have been recognized as efficient and 48 ones need to improve output factors to reach the maximum efficiency [22].

Pour Akbar et al (2013) measure and efficiency of physical education units of Isfahan Province using DEA and specify efficient and inefficient cities. They have used 4 approaches of championship, public, training and construction and specified efficiency and inefficiency of units after data collection. In this research, enthropy has been employed to merge, ranking results of physical education offices through 4 mentioned approaches. Also, ranking was done without considering zones [18].

Azizi et al (2013) have used modified DEA models to evaluate the performance of DMUs, with the feature of disrupted efficiency (distance) one as DMUs. Accordingly, two limiting techniques of DEA are used. In this research, a numerical example has been used showing DEA model, if DMU output is zero, cannot determine distant efficiency for each DMU. However, limiting model overcome this defect. Another numerical example is related to performance evaluation of participating countries in the summer Olympic Games of Athen 2004, showing that suggested patterns are efficient and influential methods to evaluate efficiency in our real world [2].

Reviewing literature indicates that all private and state organizations need a performance evaluation system to develop and survive in competitive world allowing them to assess and measure efficiency and effectiveness of organization's planes, process and human resources. Efficient organization do not stop collecting and analyzing data, but they use this data to improve and fulfill their strategies and goals. Now, according to independent place of sport board as public beneficial institutes and also this fact that developing and improving sport field require constant planning and activity along with coordination with sport boards, federations and sport and youth head organization. This paper evaluates performance of each board through a championship approach.

3. Data envelopment Analysis

Data Envelopment analysis is one of the reliable non-parametric techniques to evaluate the efficiency of decision making units [21]. It is possible to compare observed units with some inputs and outputs. In this technique, v evaluation indicators of each decision making units are model input and output parameters that are different because of aims and philosophy of that specific unit, its expected tasks, and factors influencing the unit [7]. In other words, in data envelopment analysis, a frontier function studies input and output factors without specifying an assumption of manufacture function shape and with solving optimizing models through using related data to the number of real input and output of decision making units. This frontier includes linear parts that provide not only the current efficient units, but also an analysis about inefficient ones. The upside of DEA is that its "efficiency frontier" can be expanded and used as a pattern for similar organizations [13].

Data Envelopment Analysis evaluates the productivity of decision making units (DMU) in comparison with productivity of other DMUs. This group of DMUs includes some similar inputs and outputs and calculates productivity as a proportion of output eight on input. Mathematical form of original DEA model will be as follow:

$$\text{Max} \quad \frac{\sum_{r=1}^{s} u_r y_{rk}}{\sum_{i=1}^{m} v_i x_{ik}} \qquad (1)$$

$$\text{St.} \quad \frac{\sum_{r=1}^{s} u_r y_{rj}}{\sum_{i=1}^{m} v_i x_{ij}} \leq 1; \quad j = 1, \dots, n$$

$$u_r, v_i \geq 0; \quad r = 1, \dots, s; \quad i = 1, \dots, m$$

Here x_{ij} and y_{rj} are i_{th} input and r_{th} output values, respectively. Also v_i and u_r are the give weights to i_{th} input and r_{th} output respectively. K is the DMU whose efficiency has been measured. Mathematical form of basic DEA is a fractional model and finding its solution is quite completed; therefore, the revised version of DEA, called CCR which was introduced by Charnes, Cooper and Rhodes. This model is regarded as a basic pattern to formulate other patterns in DEA. In fact, this pattern include constant return on scale. According to this point that in many cases return to scale is variable, Banker

et al, developed CCR and considered a different return to scale and therefore, introduced BCC. BCC is shown as follow as a multiple input oriented form [5]:

$$MinZ = \sum_{r=1}^{s} u_r y_{rp} + w \qquad (2)$$

$St.$

$$\sum_{i=1}^{m} v_i x_{ij} = 1$$

$$\sum_{r=1}^{s} u_r y_{rj} - \sum_{i=0}^{m} v_i x_{ij} + w \geq 0 \quad j = 1, \dots, n$$

$$U_r \geq \varepsilon \qquad r = 1, \dots, s$$

$$V_i \geq \varepsilon \qquad i = 1, \dots, m$$

Makui's technique is one of available methods to rank DMUs. In a research, Makui et al (2008) introduced a model in which performance was evaluated through using an ideal planning model and DMUs were ranked. The difference between this DEA model and common ones is that the weight of inputs and output for all DMUs will be the same. In this techniques, CCR is used to find the value of Θ for each DMUs [16].

$$MaxZ = \sum_{r=1}^{s} u_r y_{rp} \qquad (3)$$

$St.$

$$\sum_{i=1}^{m} v_i x_{ip} = 1$$

$$\sum_{r=1}^{s} u_r y_{rj} - \sum_{i=0}^{m} v_i x_{ij} \leq 0 \quad j = 1, \dots, n$$

$$U_r \geq \varepsilon \quad r = 1, \dots, s$$

$$V_i \geq \varepsilon \quad i = 1, \dots, m$$

Then, Θ_{CCR} help relation (4) to calculate the common values of u and v for each input and output.

$$Min \sum_{j=1}^{n} \left(d_j^- + d_j^+\right) \qquad (4)$$

$St.$

$$\sum_{r=1}^{s} u_r y_{rj} - \sum_{i=1}^{m} v_i \Theta_j^* x_{ij} \leq 0 \qquad \text{j= 1,2,..,n}$$

$$\sum_{r=1}^{s} u_r y_{rj} - \sum_{i=1}^{m} v_i \Theta_j^* x_{ij} + d_j^- - d_j^+ = 0 \qquad \text{j= 1,2,…,n}$$

$$\sum_{r=1}^{s} u_r + \sum_{i=1}^{m} v_i = 1$$

$$d_j^-, d_j^+ \geq 0 \qquad j = 1,2, \dots, n$$

$$u_r \geq 0 \qquad r = 1,2, \dots, s$$

$$v_i \geq 0 \qquad i = 1,2, \dots, m$$

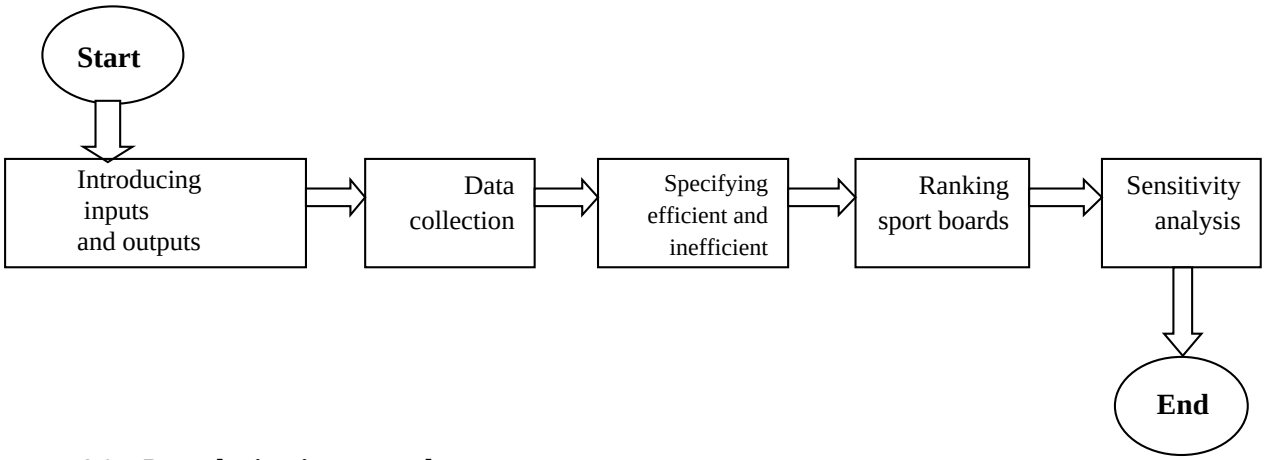
Solving the equation presents the common value of u and v for all DMUs. The following relation results in finding the efficiency of DMU_j (j=1,2,…,n).

$$\theta = \frac{\sum_{r=1}^{s} u_r^* y_{rj}}{\sum_{i=1}^{m} v_i^* x_{ij}} \qquad (5)$$

If efficiency=1 by using (u^*,v^*) , we consider DMU_P efficient. It is worth mentioning that If DMU_P is efficient in relation 3, it will be efficient in input-oriented CCR, as well [16].

4. Research Methodology

As a descriptive analytical, this paper is performed as a library study. This research has been conducted in 1390-91 in sport boards of Isfahan province including 50 ones in both individual and team sports and in 2 groups of men and women. In first level, research variable have been specified in two groups of inputs and outputs. Data was collected by using available statistics related to each sport board in 1390 information and statistics unit of sport and youth organization of Isfahan province. Then, in second phase, appropriate DEA was selected and DEA frontier software was used to evaluate the efficiency of boards. In the third phase, DEA ranked sport boards and finally sensitivity of input data was analyzed. The steps are as follow:



4.1. Introducing inputs and outputs

Inputs and outputs were defined after reviewing literature and asking expert's opinions. Due to this fact that some inputs and outputs include sub-factors and also each sub-factor has a different significant, a questionnaire has been designed for specifying weights and given to experts to make the sub-factors the same inputs and outputs are shown in the table (1).

Table 1:

Inputs and outputs factors

Outputs	inputs
1 -invited to national team 2 -selected for national team 3 -medals and acquired positions in country's championship 4 -medals and acquired positions in country 5 -medals and acquired positions in region 6 -medals and acquired positions in Asia 7 -medals and acquired positions in world 8 -international medals and positions	1 -match hosting 2 -sending to matches 3 -held training courses 4 -the number of the sports insured

A. Inputs:

1. Match hosting : is related to the times each sport board host in various levels of province, country and world. Beside cultural, economical and social effects, match hosting has a magnificent effect on technical improvement of players, coaches and referees of each field and consequently, result in performance improvement in sport events inside and outside the country. It is worth mentioning that importance weight of each one is different which is shown in table (2) according to expert's opinions.

Table 2:

Weights of match hosting

Weight assigned	Type of hosting
1.574	provincial
2.208	national
2.961	international

2. Sending to matches : deals with the times when each sport board sends players or teams in all age groups to national, international, Asian and global matches. It makes a good condition for players to get experienced and provides future success for each player or team by each board. Importance weight of each game is displayed in the table (3):

Table 3:

Weights of sending to matches

Weight assigned	Type of matches
3.221	national
3.825	international
4.502	Asian
4.648	Global

3. Held training courses : These courses include courses for learning to be a coache, referee and also reviewing courses which are held annually, based on applicant's requests and needs in each board and in various degrees. These courses can directly affect each field encouragement and increase the efficiency of that specific board. The importance of each course is displayed in table (4) :

Table 4:

Weights of held training courses

Weight assigned	Held training courses
3.276	Learning to be coach
2.874	Learning to be referee
2.415	Reviewing courses

4. The number of the sports insured: includes the number of people who are active in various sport places in different sport fields each year. The higher insured in a board, the more improvement of fans of that field that can lead to selecting players with more skills to be present in various national or international events that can bring about greater honors for the board.

B. Outputs:

1. The invited to national team: is related to the number of those who are invited to natinal team in various age from Isfahan and related board.

2. The selected for national team: is related to the number of those who are selected as a player for national team after selective and provision camp.

3. Medals and acquired position in country's championship: is related to the number of gold, silver and bronze medals as well as acquired first, second and third places by board of each province in

national championship matches which are held by different sport federations in different age group as both individual and groups. Related weights are presented in table (5):

Table 5:

Weight of Medals and position in country's championship

Weight assigned	Medals and position in country's championship
4.361	gold
3.556	silver
2.917	bronze
4.115	First place
3.445	Second place
2.712	Third place

4. Medals and positions in country: is related to the number of gold, silver and bronze medals as well as acquired first, second and third places by each sport team in each province in different national matches, each year, both as individual and groups. Weight of Medals and position in country are presented in table (6).

Table 6:

Weight of Medals and position in country

Weight assigned	Medals and position in country
3.671	gold
2.415	silver
2.559	bronze
3.671	First place
3.068	Second place
2.712	Third place

5. Medals and positions in region: is related to the number of gold, silver and bronze medals as well as acquired first, second and third places by teams of province in matched held in regions and with presence of some provinces in various levels. Weight of Medals and position in rejion are presented in table (7).

Table 7:

Weight of Medals and position in region

Weight assigned	Medals and position in region
3.734	gold
2.944	silver
2.015	bronze
3.734	First place
2.944	Second place
2.015	Third place

6. Medals and positions in Asia: is related to the number of gold, silver and bronze medals as well as acquired first, second and third places by sent teams of each province in Asian games. Table (8) shows weight of medals and position in Asia.

Table 8:

Weight of Medals and position in Asia

Weight assigned	Medals and position in Asia
4.361	gold
4.942	silver
3.768	bronze
4.502	First place
4.401	Second place
3.768	Third place

7. Medals and positions in world: is related to the number of gold, silver and bronze medals as well as acquired first, second and third places by sent teams of each province in Global games. weight of medals and position in world are presented in table (9).

Table 9:

Weight of Medals and position in world

Weight assigned	Medals and position in world
4.502	gold
4.401	silver
3.768	bronze
4.502	First place
4.263	Second place
3.191	Third place

8. International medals and positions: is related to the number of gold, silver and bronze medals as well as acquired first, second and third places by sent teams of each province in international games. Weight of medals and position in international games are shown in table (10).

Table 10:

Weight of Medals and position in international games

Weight assigned	Medals and position in international games
4.502	gold
3.825	silver
3.671	bronze
3.671	First place
3.825	Second place
3.325	Third place

4.2. Data collection

After specifying input and output factors, researchers have used the available database in sport and youth organization to find the value of each input and output factor for each association board in 1390 and 2 groups of men and women.

4.3. Specifying efficient and inefficient units

In this phase, performance of sport boards is evaluated based on the number of inputs and outputs. Therefore, data collected by DEA Frontier was evaluated. Using this software showed that return to scale of most boards is variable, hence their performance evaluation was done in condition of variable return to scale and in BCC model whose results in 2 groups of men and women are presented in Tables (11) and (12)

Table 11:

Efficiency in BCC condition- men

Efficiency No in BCC	**Sport board**	**Efficiency No in BCC**	**Sports board**	**Efficiency No in BCC**	**Sport board**
0.293	Kabaddi	0.448	Archery	0.039	Physical preparation
0.307	wrestling	1.000	Disable's sport	0.000	Squash
1.000	Kung fu	1.000	Judo	0.000	Ski
0.143	Mountain climbing	0.000	Polo	0.885	Skate
1.000	Golf	1.000	Biking	0.510	Sport association
0.597	Driving and motor riding	1.000	Running	0.395	Badminton
1.000	Blind and weak sight	1.000	Campaignship	1.000	Body building
1.000	Deafs	0.067	Rural and nomadic	1.000	Basketball
0.738	Lifesaving	0.000	Gymnastics	1.000	Boxing
0.377	Volleyball	0.043	Horse-back riding	0.169	Bowling
1.000	Martial arts	1.000	triple	1.000	Special diseases
0.057	Public sports	0.387	chess	0.000	Medical sport
1.000	Weight lifting	0.752	Fencing	1.000	Heroic and athletic
1.000	Wushu	0.584	Swimming	1.000	Tekwando
1.000	Hockey	0.434	Football	0.166	Tennis
1.000	Handball	1.000	Boating	0.206	Ping pong
		1.000	Karate	1.000	Shooting

Based on Table (11) , 24 boards in men 's group have the efficiency of 1 in BCC and are efficient.

Table 12:

Efficiency in BCC condition- women

Efficiency No in BCC	Sport board	Efficiency No in BCC	Sports board	Efficiency No in BCC	Sport board
0.416	Kabaddi	1.000	Archery	0.328	Physical preparation
0.000	wrestling	1.000	Disable's sport	0.000	Squash
1.000	Kung fu	0.802	Judo	0.365	Ski
0.175	Mountain climbing	0.175	Polo	0.871	Skate
1.000	Golf	1.000	Biking	0.889	Sport association
0.000	Driving and motor riding	0.254	Running	1.000	Badminton
1.000	Blind and weak sight	1.000	Campaignship	0.000	Body building
1.000	Deafs	0.942	Rural and nomadic	1.000	Basketball
0.138	Lifesaving	0.155	Gymnastics	0.000	Boxing
1.000	Volleyball	0.105	Horse-back riding	1.000	Bowling
1.000	Martial arts	0.000	triple	1.000	Special diseases
0.153	Public sports	0.000	chess	0.000	Medical sport
0.000	Weight lifting	1.000	Fencing	0.000	Heroic and athletic
1.000	Wushu	0.231	Swimming	1.000	Tekwando
0.000	Hockey	1.000	Football	0.455	Tennis
1.000	Handball	1.000	Boating	0.244	Ping pong
		1.000	Karate	1.000	Shooting

Table (12) shows that 22 boards in women's group are also efficient with efficiency number of 1.

4.4. Ranking sport boards

Sport boards are ranked in the end; therefore, Makui et al's technique is used. Ideal planning is used for ranking, first efficiency value is calculated for each unit through CCR and then the common value of u and v is determined through relation (3) for each input and output. Finally, relation (4) is used to

specify θ for each unit according to which ranking is done. θ value and final ranking of each board will be found. Women's board ranking and men's are presented in Table (13) and (14).

As it is observed, boards of Blinds and weak-sighted, Deaf and Martial arts are recognized as number 1 in women's group. Medical sport board is not ranked due to having no activity in case of championship; Also boards of Bodybuilding, Boxing, Heroic and athletic, Wrestling and Weight lifting have not been ranked because they have had no activity in women's group.

Table 13:

Ranking boards based on Makui's technique- women

θ_{makui}	**RS**	**Sport board**	θ_{makui}	**RS**	**Sport board**
0.013346553	34	Horse-back riding	0.002964626	38	Physical preparation
0	40	triple	0	40	Squash
0	40	chess	0.119867297	22	Ski
0.307205806	13	Fencing	0.037578717	29	Skate
0.013038963	35	Swimming	0.349517242	12	Sport association
0.027368971	30	Football	0.08661527	25	Badminton
0.779647213	5	Boating	0.052031299	26	Basketball
0.702544191	7	Karate	0.463157749	10	Bowling
0.087410551	24	Kabaddi	0.630815116	9	Special diseases
0.238728224	16	Kung fu	0.051576496	27	Tekwando
0.008091033	36	Mountain climbing	0.213669388	18	Tennis
0.776986846	6	Golf	0.116021154	23	Ping pong
0	40	Driving and motor riding	0.177398066	20	Shooting
1	1	Blind and weak sight	0.293738507	14	Archery
1	1	Deafs	0.665887895	8	Disable's sport
0.042920749	28	Lifesaving	0.226818622	17	Judo
0.024845745	31	Volleyball	0.134454387	21	Polo
1	1	Martial arts	0.460142278	11	Biking
0.003083901	37	Public sports	0.024516858	32	Running
0.264027934	15	Wushu	1	4	Campaignship
0	40	Hockey	0.014288994	33	Rural and nomadic
0.196165715	19	Handball	0.000495404	39	Gymnastics

Table 14:

Ranking boards based on Makui's technique - men

θ_{makui}	**RS**	**Sport board**	θ_{makui}	**RS**	**Sport board**
0.02420	40	Horse-back riding	0.02274	41	Physical preparation
0.17834	23	triple	0	46	Squash
0.05495	35	chess	0	46	Ski
0.27006	14	Fencing	0.09774	30	Skate
0.16822	25	Swimming	0.4111	10	Sport association
0.01039	43	Football	0.2407	16	Badminton
0.22573	18	Boating	0.18781	21	Body building
0.23578	17	Karate	0.12486	28	Basketball
0.03386	38	Kabaddi	0.13045	27	Boxing
0.09329	31	wrestling	0.07049	33	Bowling
0.17004	24	Kung fu	0.64020	5	Special diseases
0.00878	44	Mountain climbing	0.47637	8	Heroic and athletic
0.18448	22	Golf	0.08614	32	Tekwando
0.14313	26	Driving and motor riding	0.09993	29	Tennis
1	1	Blind and weak sight	0.05245	36	Ping pong
0.60734	6	Deafs	0.349581	12	Shooting
0.02427	39	Lifesaving	0.188562	20	Archery
0.02145	42	Volleyball	0.484292	7	Disable's sport
0.99999	2	Martial arts	0.070046	34	Judo
0.04408	37	Public sports	0	46	Polo
0.79074	4	Weight lifting	0.263139	15	Biking
0.19396	19	Wushu	0.399771	11	Running
0.44522	9	Hockey	0.99999	2	Campaignship
0.33038	13	Handball	0.004327	45	Rural and nomadic
			0	46	Gymnastics

4.5. Sensitivity Analysis

At the end, sensitivity of model inputs is analyzed. Therefore, in each phase one input is omitted and problem is solved again. Finally the variation between efficiency in each phase by omitting as input is calculated with efficiency in the whole condition. Each input whose omission makes the highest variance in efficiency has the greater importance. The results of sensitivity analysis are presented in Table (15)

Table 15:

Sensitivity Analysis

Distance amount in men's group in BCC model	**Distance amount in women's group in BCC model**	**Distance Specification**	
2.351	1.123	$\theta - \theta_1$	Match hosting
5.436	4.338	$\theta - \theta_2$	Sending to matches
2.684	4.089	$\theta - \theta_3$	Training courses
2.233	2.977	$\theta - \theta_4$	The number of the sport insured

According to Table(13) and variance of efficient number with efficiency number resulted by omitting each input in 2 groups, it is observed that omitting the second input, sending to matches has the greatest effect on board's efficiency.

Tables (11) and (12) can be compared to recognize efficient and inefficient boards. Among 50 ones, 24 boards in men's group and 22 in women's group were efficient in BCC.

5. Conclusion

Productivity is a comprehensive concept including efficiency whose increase result in boosting the level of life, welfare and human's comfort and has been highlighted by those involved in economics, industry and management. In current circumstances, a higher productivity and efficient use of available equipment is not a mere selection but a necessity, including sport association boards as a system. Productivity increase and efficient use of financial and human resources in sports whether in a national level or in case of improving sport and health culture matter; therefore, the significance of performance evaluation of sport boards and ranking them has made researcher use data envelopment analysis to evaluate performance of boards and rank them and finally, relevant organization can intensify the efficiency reasons through examining reasons of efficiency and inefficiency of boards and weaken or even remove the reasons of inefficiency.

Accordingly, present study tries to evaluate the performance of 50 association boards in Isfahan province through championship approach. Thus, match hosting, sending to matches, held training courses and the number of the sport insured are selected as inputs and numbers of the invited to the national team, the number of the selected for national team, medals and acquired positions in country, region, Asia and world are regarded as outputs. Next, the data was collected from sport and youth organization of Isfahan province. Then, BCC model was employed to evaluate the efficiency of each

one of 50 boards. Sport association boards were ranked in both categories and lastly, sensitivity analysis of all model inputs was done.

Findings reveal that 24 boards in men's group and 22 ones in women's were efficient. Among them, boards of Blind and weak-sighted, Deaf and Martial arts were put in the first place in women's group and board of Blind and weak-sighted was selected as the first in men's group. Moreover, it was found that, sending to matches has the most significant effect on board's efficiencies. Finding of current study are important in management, as well. Managers can get aware of performance condition of each board in comparison with others to improve the current states and make a healthy competitive atmosphere. Furthermore, analysis reasons and how to get them help inefficient units convert to efficient ones based on effective inputs and outputs in efficiency and evaluation information. On the other hand, this criterion can be used for budget dedication to dedicate more budget and facilities to boards that have had a better performance by using specific level of facilities. Also, some planes are offered to improve the condition of boards that got inefficient. Since making them efficient can lead to saving input resources such as costs of match holding, training courses and sending to matches and increase the outputs like the member of medals in all communities resulting in cost reduction championship increase.

Among advantages of this research we can state the following points:

- Comprehensiveness of information and statistical population.
- Considering the evaluations done in various methods and the similarity of findings with mentioned methods, we can put that validity of findings is acceptable and can be applied to remove the pitfalls and further analysis.
- Selecting practical factors based on experts opinion, confirmed sport boards.

Despite the comprehensiveness and accuracy of finding, analysis of information has not been done on different age groups due to the complexity. Also, sensitivity analysis and significance level of each input and output along with performance evaluation during different years can affect development of this study.

According to available limitations for the researcher as well as other analysis approaches in DEA, we can shed light on items including MPI factor analysis, analysis approach change by names such as cultural, economical and managerial as information analysis based on age groups.

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