



Efficiency Calculation, Effectiveness and Productivity of Sports Federations Using the Method (DEA)

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Efficiency Calculation, Effectiveness and Productivity of Sports Federations Using the Method (DEA)

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ABSTRACT

This study presents of Efficiency, effectiveness and Productivity sports federations using data envelopment analysis (DEA), respectively.

This research is applied and the type of research is descriptive. Research methodology and mathematical modeling, integration of inputs, outputs and to switch production between the performance and used data envelopment analysis techniques, combined with the theory of the decision maker. The population consisted of all sports federations worked at a sports field (39 federations), respectively. The sample was defined as the 39 Association. The instrument used was a questionnaire which its content and face validity. 0/92 reliability using Cronbach's alpha was calculated. Required calculations using the software GAMS is done.

Results based on mathematical formulas, among the thirty-nine Federation under review, twenty Federation of efficient and inefficient and the rest of them had only Golf Federation effectiveness and Productivity.

The results showed the Federation that their outputs to their inputs towards more efficient, more effective and has had productivity.

Keywords: Efficiency, Effectiveness, Performance, DEA.



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1. INTRODUCTION

In the current era, the dramatic changes in knowledge management have made the existence of an evaluation system inevitable, so that the lack of an evaluation system in utilizing the resources, facilities, goals and strategies of the organization and employees is considered as one of the symptoms of the disease organization. On the other hand, each organization needs an evaluation system to measure its desirability in order to be aware of the desirability of activity in its sub-collections (X Herbalian et al., 2009, p. 237). Sports federations are no exception to this rule as an organization. For the first time in 1957, Farrell designed his model with two inputs and an output for measuring efficiency and effectiveness, which was not successful due to the limited input and output of the model (Ayadi et al., 2014, p. 8; Batchellar, 2017, p. 207). Efficiency is the performance criterion of an organizational system that is based on the amount of resources (inputs) (Kian, 2009, p. 104). In other words, the efficiency of the use of resources to produce a certain amount of product effectiveness (Chamis et al., 2016, p. 323; Ahmad & Lev, 2015, p. 366). In this research, efficiency is defined as the ratio of produced outputs (outputs) to inputs (inputs) to produce these outputs. The concept of efficiency is usually confused with the two words of effectiveness and efficiency. The effectiveness of the degree to which the activities of an organization are consistent with the goals set for it, but productivity is a combination of effectiveness and efficiency (Berger et al., 2011, p. 323, 2015, p. 147). In this study, we use a ratio of total output or output to total consumption or input in a given time period to measure the productivity. Sports organizations are also interested in measuring their performance in pursuit of predetermined goals, but realistic and complete measurements of performance are performed when other indicators are used (Hamidi et al., 1394 , P. 166). Of course, due to the non-profit nature of sports federations, it is difficult to measure effectiveness and performance. In the present study, athletes, staff, budget, per capita sports, federation records, facilities as well as sports, general sports, championship sport, professional sport, sports education, sports training, sports research and sports competitions as outputs for measuring the rate The efficiency of federations was considered. To measure the effectiveness of sport, general sport, championship sport,



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professional sport, sport education, sports training, sports research and sporting events as input and development of community health, the motivation of competition in society, creating a suitable ethical model, strengthening the human attitude to life, Community technical knowledge and knowledge, publication of books, articles and publications, participation and hosting of important competitions are considered as output. There are many models for evaluating the performance of organizations in the world, each of which tries to advance organizations towards excellence and service improvement (Shilbyury & Moore, 2006, p. 38; Wang & Cullinam, 2006, p. 85 and Pacheco et al., 2017).

Organizations are choosing these models based on their needs, one of which is the data envelopment analysis model.

Considering the importance and importance of the sports federations in Iran and their very important duties, namely the development and promotion of sport at the general and elite level, the coordination of competitions at the local and national level, the selection, training and development of national teams for the presence on the field International and, on the other hand, their dependence on government funds to provide services and implement their programs must be responsive to their performance. Sport organizations such as sports federations are structurally and socially different in different situations and can not be easily compared to other sports organizations in the other countries. Of course, the sports organizations of the country can use these models and methods to examine their current and existing situation and possibly compare with the organizations of the country. We can not control everything that we can not measure, and managing anything that can not be controlled will not be possible. In this research, we compare and compare the performance of sport federations with each other through the development of DEA mathematical programming models (Data Envelopment Analysis). In this model, the outcomes of a sports federation are measured against specific inputs, and this compares the performance of the federation in different periods or the performance of several federations. The main advantage of the data development model in this research is the complete ranking of the units assessed and the design of the performance evaluation



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model of the sports federations based on the data envelopment analysis model as well as the presentation of the model for the federations.

2. RESEARCH METHODOLOGY

The type of research in terms of purpose is the development of applied knowledge in a particular context. The type of research is descriptive and non-experimental, and the method used in this research is survey. The method of this research is mathematical modeling (Mafi et al., 2012), the integration of inputs, outputs and intermediate products to transform into performance (efficiency, effectiveness, efficiency). The technique used is data integration analysis combined with decision-making theory. The statistical population of this study is all sports federations specializing in sports (39 federations). Given that this research is done using mathematical modeling, there is no need for sampling and the whole society (39 federations) is considered. In this research, we evaluate the efficiency, effectiveness and efficiency of sports federations in the following way: First, by distributing the questionnaire among the considered statistical society, we determine the importance of evaluation indices by qualified individuals using the Delphi method. We analyze the results by using DEA mathematical modeling and data envelopment analysis and GAMS software. Data Envelopment Analysis is a linear programming method and a useful tool in management for performance evaluation that uses multiple inputs for production and multiple outputs. In this research, the decision-maker is a separate organizational entity run by a person called the manager, the head, or the manager, with systemic benefits. In this research, each federation has a DMU. According to the type of research that modeling, we have no hypothesis.

The assumptions of this research are as follows:

1. All available information is quantitative or qualitative.
2. The type of return is assumed to be a constant or variable.
3. The members of the sample answer honestly and with knowledge of the questions and do not look frivolous.
4. Input and output indicators of sports federations according to their tasks, goals and missions and are suitable for determining the efficiency of federations.



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5. Applications and statistical analysis of the research have the integrity and adequacy of data analysis.

The following tools will be used to collect data :

1. Mathematical models (mathematical models are used to predict the behavior of a system and are simplified and approximate systems of a real system that contain solutions for describing the behavior of the system.)

The mathematical model presented for the system :

$$\begin{array}{l}
 1. \dots\dots\dots \text{Max} \\
 \frac{v^1v^1_{\alpha} + \dots + v^7v^7_{\alpha}}{vX} \\
 \\
 2. \dots\dots\dots \text{S.T.} \\
 \frac{W^1z^1_j + \dots + W^7z^7_j}{vX} \leq 1 \quad \forall j \\
 \\
 \frac{v^1y^1_j + \dots + v^7y^7_j}{W^1z^1_j + \dots + W^7z^7_j} \leq 1 \quad \forall j
 \end{array}$$

2. GAMS Optimization Software

The GAMS system is a high-performance modeling programming language.

3. Researcher made questionnaire

The most important step in identifying inputs and outputs is through interviewing with experts as well as observing the records and documentation in the units under investigation, and identifying inputs and outputs of the research through their impact on efficiency, Effectiveness and productivity have been taken. A researcher-made questionnaire has been used to collect the data in order to evaluate the efficiency. In order to evaluate the efficiency, the ratio of hits to the data was examined. In the present study, athletes, staff, budget, per capita sports, federation records, facilities and equipment as data; and sport exercise, championship sport, professional sport, sports education, sports training, sports research and sporting events as outputs to measure the rate The efficiency



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of federations was considered. To measure the effectiveness of sport, general sport, championship sport, professional sport, sport education, sports training, sports research and sporting events as input and development of community health, the motivation of competition in society, creating a suitable ethical model, strengthening the human attitude to life, Community technical knowledge and knowledge, publication of books, articles and publications, participation and hosting of important competitions are considered as output. In fact, in order to identify the indicators of effectiveness and effectiveness assessment, the following activities are carried out: reviewing the description of tasks set up for federations, examining the organizational structure and units that interact with the federations and how they interact, examine projects and activities Jointly with the General Offices and the Ministry of Sports and Youth, through an interview with the officials and experts of the federation, requesting a description, the importance and amount of time spent on the activities. Each of the inputs and outputs itself comes from a combination of multiple inputs or multiple outputs.

Table 1: Input and Output Indicators and Intermediate

Input Indicators	Intermediate Indicators	Output Indicators
1. Athletes 2. Staff 3. Budget 4. Federation record 5. Facilities	1. sport for all 2. Championship Sports 3. Professional sports 4. Breeding exercise 5. Educational sports 6. Sport research 7. Sports competitions	1. Develop community health level 2. The motivation to compete in society 3. Creating an appropriate ethical model in society 4. Strengthening the human attitude to life 5. Knowledge and technical knowledge of sport 6. Publishing books, articles and publications 7. Participation and hosting of competitions

Indicators of input on the level of employee education were identified. In the review section of the budget of the sports federations, the budget is considered to be the total amount of the current budget, the income of the coaching courses, the income of holding the refereeing courses, the income of the training classes, the income of the right to participate in the matches and income from other ways. In the survey of per capita sports,



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it was found that for each person training in each federation, there are several open-air and indoor sports spaces. Unfortunately, in this section, some of the relevant experts did not have enough information on the amount of per capita sports in the field of sports and the researcher received some information from the relevant expert from the Ministry of Sports. In the field of equipment and facilities, experts are asked to specify the number of halls and sports fields. In the Output Indicators (Championship Sports), the number of medals won (adults), international tournaments, Asian World Championships, Asian Games, the Olympic Games and the World League were reviewed. Each year, the number of gold, silver, and bronze medals was identified and assessed for each, meaning that if a federation won two gold medals, this number was multiplied by three, and the number of silver medals doubled and the number Bronze medals were multiplied by one. Then, in each part, the number obtained in each of the three colors of the medal together and multiplied in the value of that match. In the professional sport section, athletes from the national team and in the cultural activities section each number was identified. In the course of coaching and arbitration training courses were reviewed. The number of each course was determined in the field of specialized courses (sports management training courses, exercise science, exercise physiology, sports psychology, etc.). In the research section, the number of research activities in each federation was determined. In the host tournament (adult category), competitions are valued. This means that the number of hosts hosted in the international division is four times, Asian triple, double the international tournament, and a one-fold country. In the section on the questions of effectiveness, I have no idea of the four totally agreeable, agreeable, opposite, totally opposed. After receiving the answers, the researcher proceeded from the following method to remove numbers from the fuzzy state:

Completely agree	(0.8,1,1)
agree on	(0.6,0.75,0.9)
No idea	(0.3,0.5,0.7)
Against	(0.1,0.25,0.4)



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Completely opposed	(0,0,0.2)
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In addition to the questionnaire of articles, official sports federations' websites, interviews with experts in some federations, and related dissertations, in order to collect information and identify relevant data and outputs, Before referring to the federations, a letter was sent to the federation for cooperation from the Faculty of Physical Education and Sport Sciences, but due to the lack of cooperation of many of them and the waste of time and time, again sent a letter to the Center for Studies and Research The Strategic Plan was received by the Ministry of Sports from the Faculty, and then a letter was sent to the Ministry of Sports and Youth Protection Office, and a letter was sent to the sports federations to co-operate with the sports federations. Data collection from relevant federations lasted seven months. The time series of the data for the years 1391 to 1394 (four years) is collected by the country's sports federations. The spatial range includes all sports federations (which operate in a field of sports / 39 sports federations) in Tehran. In terms of subject matter, the indicators for assessing the effectiveness and effectiveness of sports federations with mathematical models and data envelopment analysis were determined. In this research, GAMS software is used.

3. RESULTS

The findings showed that the highest number of employees in the total of 4 years (91 to 94 years) was in the Squash Federation (103). The Volleyball Federation is ranked third in terms of the number of employees with 61 in the second rank and the Karate Federation with 59 in the four years (91-94). The highest level of equipment and equipment were related to skate federations with 290, badminton 120 cases and basketball 58 cases respectively. The largest record for the year 2012 is the Weightlifting Federation with 298 years, the Boxing Federation with 282 years, and the Basketball Federation with 274 years. The findings showed that the highest per capita sports expenses were related to skiing, cycling, climbing and sport racing, motorcycle racing and 4000 square meters racing federations, and polo, riding and boating associations with 2000 square meters. The



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maximum budget for a total of 4 years (91 to 94 years) is related to sailing federations with 24200000000 USD, a ship with 17.4 billion USD, and a motorcycle and a car with 15 billion USD. The highest number of athletes in training skating federations with 5 million people, 1 700 000 karate and 1690000 ships.

Based on the proposed mathematical model, the performance (S1) in sports federations is shown from 91 to 94.

The findings showed that based on the mathematical formulas, skiing, cycling, skating, basketball, badminton, bodybuilding and bodybuilding, taekwondo, polo, gymnastics, horseback riding, fencing, wrestling, golf, motorcycle and motoring, horseback riding and zurkhaneh O, martial arts, weightlifting, trilogy, wushu, handball are good. Based on findings Squash, Boxing, Bowling, Billiards & Bulls, Shooting, Archery, Tennis, Table Tennis, Judo & Kurash, Athletics, Chess, Diving & Water Polo, Sailing, Heart, Karate, Hiking And sports climbing, life-saving and diving, volleyball and hockey, kung fu and inferiority martial arts.

Table 2 shows the total effectiveness of sports federations from 91 to 94 years

DMU	Federations	S2 Effectiveness
DMU1	Squash	0.470
DMU2	Ski	0.145
DMU3	riding bike	0.191
DMU4	skate	0.237
DMU5	basketball	0.123
DMU6	badminton	0.135



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DMU7	Bodybuilding and Bodybuilding	0.292
DMU8	boxing	0.494
DMU9	Bowling and billiards and bowls	0.404
DMU10	Taekwondo	0.129
DMU11	Shooting	0.386
DMU12	Archery	0.278
DMU13	Tennis	0.613
DMU14	table tennis	0.371
DMU15	Judo and Kurash	0.221
DMU16	Polo	0.490
DMU17	Track and Field	0.227
DMU18	Gymnastics	0.260
DMU19	Horseback riding	0.251
DMU20	Chess	0.651
DMU21	Swordsmanship	0.617



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DMU22	Swimming, Diving and Water Polo	0.160
DMU23	Boating	0.391
DMU24	Liver	0.531
DMU25	Ship	0.153
DMU26	Karate	0.157
DMU27	Hiking and sports climbing	0.351
DMU28	Golf	1,000
DMU29	Motorsports and cars	0.299
DMU30	Lifeguard and diving	0.696
DMU31	Homeschooling and Zurkhaneh	0.233
DMU32	Martial Arts	0.337
DMU33	weightlifting	0.189
DMU34	Triple	0.796
DMU35	Volleyball	0.218
DMU36	Wushu	0.227
DMU37	Hockey	0.719
DMU38	Handball	0.136



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DMU39	Kung fu and martial arts	0.204

According to the results of the above table and the mathematical model presented from among the 39 sports federations under review, only the federation of golf has been effective among all federations, and the other federations have been non-fractional in the mathematical model of research. Table 2 shows the findings on the effectiveness of sports federations from 91 to 94. The results showed that the cycling federation in the sports section, the tennis federation in the research field of sports, the gymnastics federation in the championship sports, the chess federation in the sports section, the diving and water sports federation in the championship sports, the climbing and climbing federation In the sports section of the championship, the Golf Federation has played a role in three sports, championship and cultural divisions, life-saving federation and diving in the sports section, the martial arts federation in the sports research division, the tripartite federation in two areas of sport and sports championship and sporting events. The findings showed that only the Golf Federation had a total productivity of 91 to 94 years.

4. DISCUSSION AND CONCLUSION

The results showed that the highest number of employees in the total of 4 years (91 to 94 years) was from the Squash Federation (103). This may be due to the high profile of this federation. The Volleyball Federation is ranked third in terms of the number of employees with 61 in the second rank and the Karate Federation with 59 in the four years (91-94). The highest level of equipment and equipment were related to skate federations with 290, badminton 120 cases and basketball 58 cases respectively. Considering the per capita rate of sport in this study, which per each person under the training of every federation of several square meters of sports space, the amount of facilities and facilities of federations may also increase in the same proportion. The largest record for the year 2012 is the Weightlifting Federation with 298 years, the Boxing Federation with 282 years, and the Basketball Federation with 274 years. In fact, archaeological excavations show that



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weightlifting and weight lifting have been practiced in ancient Greece for athletics and gymnastics. Sports Boxing was also welcomed by the start of the Second World War in Iran. The first signs of basketball entry to Iran in 1310 and 1311 were also seen by foreign embassy personnel in Iran, and the first ever Iranian basketball at the international arena was at the London Olympics (1948). The maximum budget for a total of 4 years (91 to 94 years) is related to sailing federations with 24200000000 USD, a ship with 17.4 billion USD, and a motorcycle and a car with 15 billion USD. To calculate the budget of each federation, the total amount of current funding, the income of coaching courses, the income of holding arbitration courses, the income of the training classes, the income of the right to participate in competitions and income from other ways were examined. Therefore, the budget for these federations may be due to an increase in each of these cases. The number of athletes in training skating federations with a total of 5,000,000 people, 1,700,000 karate and 169,000 ships are the most. The increase in the number of athletes under training may mean that federations' history can affect the number of athletes due to the long-term activity of the federations. The findings showed that based on the mathematical formulas, skiing, cycling, skating, basketball, badminton, bodybuilding and bodybuilding, taekwondo, polo, gymnastics, horseback riding, fencing, wrestling, golf, motorcycle and car racing, horseback riding and zurkhaneh Yeah, martial arts, weightlifting, trilogy, wushu, handball, and others were ineffective. The findings showed that among the 39 sports federations under review, only the Golf Federation had been effective in all federations, and the rest of the federations were non-partisan in the mathematical model of research. Inputs entered for the Golf Federation were lower than the other federations and high yields were received. The low number of athletes under training and a relatively low budget and budget than other federations, and the holding and hosting of major competitions in Iran and the effectiveness in three areas of public sport, championship and culture have led to the high effectiveness of this federation and superiority to other federations. Became The results showed that the cycling federation in the sports section, the tennis federation in the research field of sports, the gymnastics federation in the championship sports, the chess federation in the sports section, the diving



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and water sports federation in the championship sports, the climbing and climbing federation In the sports section of the championship, the Golf Federation has played a role in three sports, championship and cultural divisions, life-saving federation and diving in the sports section, the martial arts federation in the sports research division, the tripartite federation in two areas of sport and sports championship and sporting events. . Jimaat et al. (2010). Comparison of the viewpoints of the heads of sports federations and managers of sponsoring companies about financial support goals, Hamidi et al. (2001). The study of factors related to the establishment of management information system in Islamic Republic of Iran sports federations. Ready et al. (2009) conducted a survey titled "Ranking of provinces in terms of technical efficiency of the industry sector using the data envelopment analysis method." Mohagher et al. (2010) and Najafi et al. (2008) have been investigating performance evaluation using combination of BSC, DEA and AHP methods. In this regard, by studying the indicators used to evaluate banks and with the help of experts in the field of currency, five indicators of the number of personnel, the total staff hours, operating profit, the number of foreign currency accounts and the average number of major currency services offered per day, in four perspectives, the Balanced Scorecard method was selected. The results of this research, as in most studies, were different from the results of this research because of the discrepancy of the statistical population. Statistical methods have been conducted and the target population has been different in the research conducted with this research, so the results and their findings cannot be compared. It is also worth noting that there are many models for evaluating the performance of organizations in the world, each of which tries to advance organizations towards excellence and service improvement (Shilbyury and Moore, 2006, p. 38). Organizations are choosing these models based on their needs. One of these models is the data envelopment analysis model. The DEA method used in this research is a management method that measures the performance of units, and provides management solutions. The present method deals with the comparison of units and is far from pure idealisation. The DEA method only determines the efficiency and disadvantages of other measurement systems that pursue an absolutism, and being efficient in a pattern is an achievable



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quantity (Foroughi and Esfahani, 2012). Also, the combined model of data envelopment analysis, like other models, has shortcomings and problems for implementation, including the high number of applications used by models in the absence of computer software and complex software algorithms. It will be difficult to use this model. The findings showed that only the Golf Federation had a total productivity of 91 to 94 years. The Golf Federation has entered Iran since about 1304, as foreign nationals have arrived to explore and extract oil in the oil-rich regions of the south. Following the nationalization of the oil industry, Iranian enthusiasts in this area, such as Masjed Soleiman, Aghajari, Gachsaran, Ahvaz, and Abadan, took on this sport with the same enthusiasm and passion as the current cities of Ahvaz, Abadan, Mahshahr, Masjed Soleiman and other cities of Khuzestan Province have attracted the most fans and athletes in this field. Generally, the oil company employees are doing this fun and joyful work (Zareinejad et al., 2014). Except for the southern parts of the country, anywhere in Iran, golf is not common and in Tehran, this field was specially set up in the revolutionary sport complex established in 1340. After the Islamic Revolution, all enthusiasts started playing golf without any limitations, and this interest made the organization of the golf sports of the country in May of 1370 as a committee and initiated by the development of its activities shortly officially as the Golf Federation The Islamic Republic of Iran was introduced and listed in the official federations of the country. The federation joined the Global Golf Council in 1996, and has been linked to the Confederation of Asian and Pacific Golf in recent years. At present, the provinces of East Azarbaijan, Ardebil, Isfahan, Alborz, Tehran, Chaharmahal Bakhtiari, Khorasan Razavi, South Khorasan, Khuzestan, Zanjan, Semnan, Sistan and Baluchestan, Fars, Qom, Kerman, Kermanshah, Golestan, Gilan, Lorestan, Mazandaran , Central and Hamedan provinces have active sports boards and various competitions are held at different levels each year. The efficiency, effectiveness and efficiency of the federation of golf from among other federations maybe due to its lower record among the other federation and the lower funding received and the number of athletes covered, all of which were considered as inputs and high outputs relative to inputs Justified. Proposals from the present study include using the obtained pattern in the research to evaluate the



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performance of the reviewed federations, review and review the functioning of inefficient federations, and use improvement strategies to bring them to the limits of the efficiency and use of information obtained and to analyze and Its analysis is relevant to program design and use in decision making. Suggestions for future research According to the researcher, the development of a two-stage, multi-stage structure, the integration of the DEA method and the BSC method as a grid, the implementation of a two-step method with fuzzy data and the relationship between efficiency and effectiveness and efficiency with environmental factors Is. It should be noted that given the data used in this study, through the information available on the official sites of sports federations and the accountability of sports experts in these federations, the responsibility for the accuracy of these data is for them.

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