

Factors Influencing the Acceptance and Application of Solar Technology in Sport Places in Line with Technology Promulgation (Case Study: Sport Places in Ardabil)

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Abstract

Technology promulgation is one of the most important objectives of the innovation system, particularly in the developing countries and it is also viewed as a difficult issue in the face of the policy-makers. Renewable energy is one of the sectors seriously faced with the issue of technology promulgation. During the recent years, supporting the expansion of renewable energies has drawn a lot of attention in Iran; however, the people are still not so willing in using such energies. Thus, the present study aims at the role of factors influencing the acceptance and application of solar energy in the sport places in line with technology promulgation for the case study of the sport places in the city of Ardabil. The data have been collected based on a field method and the instrument used for doing so is a researcher-constructed questionnaire the validity of which was confirmed by the experts and professors and its reliability was equal to 0.89 based on Cronbach's alpha test hence optimum for social studies. The study sampling method was purposive. Specialists and informed sport agents were asked to complete the questionnaire. Kolmogorov-Smirnov test was the method of choice for data analysis parallel to the identification of data normality and one-sample t-test was employed for the investigation of the significance of the variables related to the factors influencing the acceptance and application of solar energy in sport places in line with technology promulgation; moreover, to determine and rate the most important factors influencing the acceptance and application of the solar energy in sport places in line with technology promulgation, use was made of Friedman test in SPSS software environment. Based on the results of the one-sample t-test, all of the studied variables were found statistically significant hence having effects on the factors influencing the acceptance and application of solar technology in sport places in line with technology promulgation. Furthermore, the results obtained from the current research signified that managerial, economic, policy-making, attitudinal, educational, social, legal and finally technical factors are respectively the most important factors influencing the acceptance and application of solar technology in sport places in line with technology promulgation in the city of Ardabil.

Key words: Technology Promulgation, Solar Energy, Solar Energy in Sport Places, Ardabil.

Introduction

Renewable energy sources feature a very high potential for meeting the energy demands, especially in developing countries (Pfeiffer and Mulder, 2013). In Iran, as well, various branches, including the energy and oil ministries, are obliged to support the expansion of such renewable energy sources as wind, solar, geothermal, hydraulic, marine and biomass energies (Islamic Consultative Assembly, 2010). The evidence is reflective of the idea that although Iran has a very high potential to use the renewable resources, they have not been appropriately exploited (Atabi, 2004; Fada'ei et al, 2011, Ardehali, 2006; Ghorashi and Rahimi, 2011; Mostafaeipour and Mostafaeipour, 2009). The issue is that the transition from the traditional energy system to renewable energy system and effective use of the renewable energy is largely dependent on the promulgation of renewable energy technologies (Tsoutsos and Stamboulis, 2005) and the evidence is suggestive of the idea that although efforts have been made since long ago for the promulgation of the renewable energy technologies, the promulgation process of renewable energy' technologies is very slow and difficult (Negro et al, 2012) and the codification of proper policies for the promulgation of the technologies of renewable energy is firstly dependent on the correct recognition of the factors influencing the promulgation of these technologies.

Iran is generally a very sunny country and it is enumerated amongst the best countries in terms of the amount of the solar energy received.

The abundant and eternal solar energy has been expanded all around the country without any need for huge and costly transmission and distribution networks (Haj Saqati, 2001). In addition, Iran is situated between 25 to 40 degrees of the northern latitude in a region that is

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in the highest ranks in regard of the solar energy reception in comparison to the various spots around the globe. The amount of solar energy irradiation in Iran has been estimated to be in a range between 1800 to 2200 kWh/m² per year and it is of course higher than the world's average. More than 280 sunny days have been reported for Iran on a yearly average and it is a very notable figure. Figure (1) illustrates the map of the solar irradiation and the various regions' enjoyment of this gift in Iran. Since one of the most important factors polluting the environment in the world and, particularly, in our country is the fossil fuels' consumption in residential, commercial, industrial and sport places for preparing hot water and heat in the living spaces, the implementation of the principles of the environmental stability can help us fight this problem and renewable solar energy can be one choice.



Figure 1: the amount of solar irradiation in Iran (source: New Energies Organization in Iran)

Although Ardabil is located in a cold and mountainous region, the number of sunny days in the city goes well beyond that of many of the European cities using solar energy; however, solar energy use in Ardabil is very low. Additionally, considering 1) elevation from the sea level (the beams are blocked by the humidity in lower elevations) for values above 1200 provide the best conditions for the installation of panel and Ardabil is quite favorable in this regard; 2) 25°C is the temperature in which the highest power and output can be gained so the colder regions have the highest output as compared to the warmer places and Ardabil is better for panel installation for its being humid; 3) closeness to the equator: the higher the distance to the equator the more the panel's output is reduced and Ardabil Province possesses the potential for using the solar energy in sport places, especially for the supply of power to the sport buildings and heating the water in sport pools but the use of this energy is far away from becoming common in sport places. Thus, the present study's main objective is the identification of factors influencing the acceptance and application of solar technology in sport places in line with technology promulgation with a case study of the sport places in Ardabil. That is because it is necessary for the promulgation of the use of solar energy in the sport places and reduction of the pollution resulting from the fossil fuels to perform studies regarding the identification of the factors influencing the acceptance and application of solar technology in the sport places so that the barriers can be removed and the incentives of using solar energy can be corroborated to finally encourage the officials to make use of renewable resources in sport places.

Theoretical Foundations and Study Background:

In the present era, the highest amount of the energy used by Iran is supplied by the renewable energy resources and fossil fuels like coal, oil and natural gas (Ntona et al, 2015) but the use of these fuels causes the dispersion of the pollutant gases and intensively leads to environmental pollution (Ding and Somani, 2010). Based on the predictions, in case of keeping on the current process and mismanagement and not reducing the energy consumption rate, all of the fossil fuel resources of the world for the production of which a time between 500 and 700 million years has elapsed in the nature would reach their end at most till the end of the present century (Kaviani, 2002). Due to the same reason, the authorities of sustainable development have resorted to the promulgation of the use of renewable energies.

Renewable energy is a term referring to the energies that can return to nature unlike the non-renewable ones. Wind, solar, geothermal, biomass, biofuel and hydropower energies are enumerated amongst these energies. Renewable energy resources have a high potential for satisfying energy demands worldwide. Besides having cleaner effects in contrast to fossil fuels, these energies are fascinating options for economic growth, meeting the energy needs, job creation and establishment of manufacturing and service industries that are very much interesting in developing countries (Pfeiffer and Mulder, 2013). Effective utilization of renewable energies is largely dependent on renewable energy technologies (Tsoutsos and Stamboulis, 2005).

Technology promulgation that is defined by Rogers (2010) as a process in the course of which technology is percolated through certain paths within a period of time in a social system (Rogers, 2010) is occasionally envisioned alongside with the creation and exploitation as the primary goal of the innovation system (Edquist and Hommen, 2009; Lundvall, 2010) and sometimes as a function of the innovation system (Hekkert et al, 2007) and once in a while as the third phase of the technological change following the lead of the invention and innovation (Suriâach, et al, 2009). In the literature on science and technology policy-making, the importance of the technology promulgation amongst the innovation systems' goals is to the extent that even some individuals like Viotti (2002) consider attraction and promulgation as being more important to the less developed countries than the other objectives or functions. Hence, either as an objective, a function or a phase of the technological change, technological promulgation is inevitably important for the development of the renewable energy sector.

Moreover, the most important factors influencing consumption can be divided into three sets: a) economic and legal factors like energy price, rules and regulations, energy intensity and workforce productivity; b) technical factors like the growth of the electricity industry, load management and energy preservation, production equipment, transmission and distribution equipment technology, consumption equipment technology, simultaneous production of power and heat, energy recycling and energy substitution; and c) sociocultural factors like population growth, consumption culture, encouragements and punishments (Fasihi, 2008).

SANA experts (2011) have identified hindrances for the development of the use of renewable energies amongst which the followings can be pointed out: the existence of cheap fuel, absence of a comprehensive and codified national program with certain quantitative scales that have been stabilized in the form of a law, the existence of structural problems till the end of the third development plan regarding the involvement of several governmental institutions in energy sector that causes scattering and parallel working, the problems of the private sector for entering the arena of renewable energy's development, shortage in the budget required for performing plans and projects and falling short of thorough and on-time allocation of the budget, the limited number of the qualified consultants and contractors and supervisors in this area and costliness and time consuming nature of creating the technical, scientific and industrial potentials needed for the implementation of this set of projects in the country, newness and, in the meantime, sophistication of some of the related technologies and absence of native knowledge in these grounds. Furthermore, the barriers to the endorsement of new contracts due to the special international relations and nonexistence of the state-of-the-art knowledge and technology, various global embargos and increase in the costs of supplying raw materials, parts and equipment from European countries as a result of the increase in Euro-Rial exchange rate and some other sanctions (Driver, 2000) all of which are reasons making the use of solar energy encountering problems.

Background:

It was in 1615 (about 400 years ago) that solar energy was practically used for facilitating the daily human works for the first time. In that year, a French engineer used heat produced by solar energy to operationalize a water pump and transferred water from a point to another meaning that he used the device to practically turn solar energy to mechanical energy. After that, during the years from 1854 to 1873, an Australian person named Gantenner, used several mirrors to concentrate sun light on a long pipe wherein water was flowing and produced vapor thereof. The vapor could produce mechanical energy by rotating a vane (Shadlou, 2005).

Amongst the renewable energies, solar energy has reserved itself the most important position for Iran's climatic conditions. According to the fact that Iran is located between 25° and 40° of the northern latitude, it is in the highest ranks amongst the various regions around the globe in terms of solar energy reception (Zabihi, 1998). All of these characteristics are expressive of Iran's properties in terms of solar irradiation hence it has more suitable conditions in contrast to many of the countries for making use of this energy. In an academic dissertation, Shams Moqaddam has studied the facilities for taking advantage of solar energy in Iran. In this dissertation, he has dealt with numerous applications of solar energy in the country and power supply to Kish Island using photovoltaic cells has been found cost-effective. Technical and economic investigation of using solar water-heaters in tropical cities has shown that the use of solar water-heaters can meet the consumers' needs and, at the same time, enable a considerable foreign currency saving as a result of reducing the consumption of the oil by-products (Shams Moqaddam, 1998). Eywazi (2004) explored the application of solar energy for making optimum use of solar energy in district 24 of Tehran. He also paid attention to the amount of pollutant dispersion, percentage saving plus pollutant dispersion and the costs resulting thereof and announced 10.4 years as the initial capital return period for the application of solar energy (Eywazi, 2004).

Terct et al performed four researches on the productivity and use of renewable energies with the objective of specifying the implementation and use of solar systems in urban parks in Scharney Haiser Neighborhood with a 7000 population rate in Germany. In this study, productivity and static values and the necessary strategies in this regard were evaluated. Two applications were assessed for it: the first section was installation of photovoltaic panels for receiving the thermal energy of the sun and their applications in the residential areas were evaluated in residential regions; in the second part, the value and potential and the cost return period were taken into account. Novel energies of the sun's heat such as the combination of heat and cold were evaluated. Based on this research, 30% of the demand for the initial energy in Scharney Haiser Park can be covered by means of the strategies of storing solar energies. In a study called "the barriers, capacities and costs of renewable energy, Verbruggen et al consider conceptual topics like not paying attention to the technical

factors and marketing as the barriers to the development of the renewable energies. In a study titled “development of renewable energies in Queensland in Australia: studying the barriers, goals and regulations”, Martin and Rice believe that factors like investment hindrances, commercial barriers, impediments related to the rules and regulations, technological as well as informational and educational barriers adversely influence the development of the renewable energy.

Larijani et al investigated the factors influencing the amount of solar energy systems’ social acceptance in Tabriz. The results indicated that five variables, namely education, income, job, marital status and individuals’ awareness, have the most important factors influencing the acceptance of solar energy systems. Shabiri and Bayati Malayeri concluded in an investigation of the amount of solar energy systems’ social acceptance from the perspective of the people from Arak that there is a positive and significant relationship between the amount of the individuals’ use of information sources and their awareness with the amount of the solar energy systems’ acceptance. Zaidin et al found out in their study under the title of knowledge, perception and attitudes of the high school teachers regarding the use of renewable energy in Jordan that there is a positive and significant relationship between such variables as knowledge level and amount of the using information sources with the amount of using renewable energy and individuals’ attitudes towards such energies while no significant effect was evidenced for social and demographic factors on the amount of using energy.

Khorasanizadeh et al showed in a study named the investigation of the factors influencing the acceptance of clean energy technologies in developing countries (with an emphasis on Malaysia) that the usefulness, ease of use, social influence and offering of relevant information to the addressees are amongst the main factors influencing the acceptance of the light-based diodes.

As it is seen, there is a scarcity of domestic research regarding the factors influencing the role and acceptance of solar energy use. So, the current research paper studies the factors influencing the acceptance and application of solar technology in sport places in line with the promulgation of technology for a case study of the sport places in the city of Ardabil so that the researchers and planners can obtain a more subtle perception of the officials’ behaviors and motivations for the use of solar energy and such information can be useful for the officials’ planning in regard to improving the status of using solar energy.

Solar Energy Application in Sport Places:

Solar energy can be used by installing solar panels in sports complexes of the stadiums and pools and photovoltaic systems can be applied for lighting the buildings and generating power. Photovoltaic is the effect of the system wherein solar energy is transformed into electrical energy without employing moving and chemical mechanisms. Nowadays, photovoltaic systems are utilized in the majority of the world’s coliseum for the supply of power in such a way that the edges of the stadium’s ceiling with square cross-section are stretched towards inside like a waterfall and the ceiling is also supported on the outside with a large number of thin and white pillars. At the same time, the vehicle parking lots are near the stadium and are covered by roofs made of solar panels playing the role of shade. These panels store the received solar energy and transmit it to a power plant constructed nearby so that the entire required electricity can be supplied. According to the fact that the application of electricity for lighting and other uses in the sports gyms imposes millions of rials of costs, it is better to use solar photovoltaic systems for supplying the electricity in the sport complexes for they are more cost-effective and create no pollution.

Another use of solar energy in sport places pertains to the solar water heaters that can be utilized for producing hot sanitary water in sport places, particularly in places that have fuel delivery problems. If the capacity of these systems is increased, they can be used in solar baths existent in sport stadiums. Solar heating of the swimming pools is also a very effective method that is very much cost-effective. Solar heating can be added to the existing circuit of swimming pools’ heating facilities and it is less costly in terms of maintenance. The sample solar heating system is composed of collectors made of plates each of which containing pipes called header connected to each other through smaller tubes that are heated by sun’s irradiation and water is heated and starts flowing. The size of the collector required for a swimming pool depends on numerous factors including the pool’s size, climate status, the required temperature of the water, wind blowing conditions, the pool’s being in a shady or sunny place and the frequency by which it is used. Furthermore, solar water heater is a solution for creating heat inside the building spaces and sports gyms.

Study Method and Study Region Introduced:

The present study has been conducted based on a descriptive-analytical research method and the required information has been collected based on the library research and field study in such a way that the initial data and information were seminally gathered using library research and questionnaire was prepared based thereon. The questionnaire was researcher-constructed and its validity has been confirmed by professors and experts. The questionnaire’s reliability, as well, was found equal to 0.89 based on Cronbach’s alpha method after distributing 30 questionnaires amongst the sport specialists and experts. The study sample volume has consisted of 70 experts to whom the questionnaire was administered purposively based on the snowball method. The study analysis was carried out statistically using SPSS software. In the present study, Kolmogorov-Smirnov test was utilized to determine the data normality. To investigate the significance of the variables of the factors influencing the acceptance and application of solar technology in sports places in line with

technology promulgation, use was made of one-sample t-test; also, Friedman's method was employed for identifying and rating the most important factors influencing the acceptance and application of solar technology in the sport places.

Introducing the Study Region:

Ardabil is the capital of province and Ardabil County is located on a plain with the same name. The city is located in $48^{\circ} 15'$ to $48^{\circ} 19'$ of the eastern longitude and $38^{\circ} 11'$ to $38^{\circ} 17'$ of the northern latitude (figure 3). The city is 1200m above sea level. The average annual precipitation rate ranges between 280mm and 340mm. the mean relative humidity in Ardabil's synoptic station is 71% and the number of sunny days is 230 and the average annual temperature is 10.6°C (Meteorology Organization's website, 2017). Based on the enactments of the comprehensive plan (2007), Ardabil has been divided into four municipality districts and 44 urban districts. The city reaches in area to over 6100 ha and based on a general population and housing census in 2016, the city accommodates a population of 529 thousand and 374 individuals.

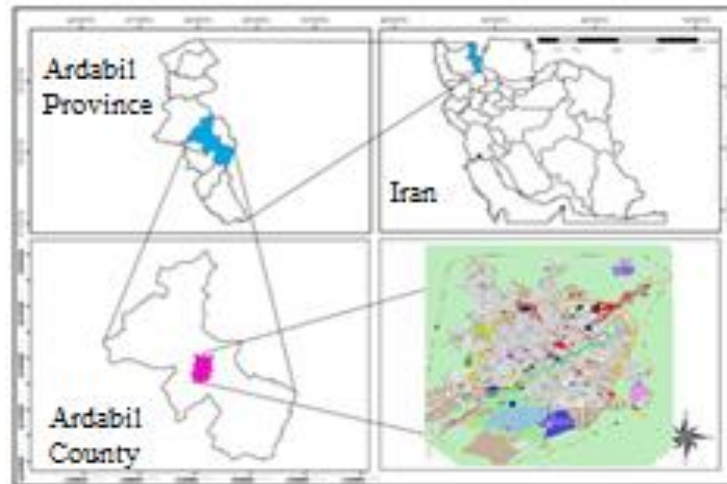


Figure 2: the map of the study region's geographical position

Study Findings:

To investigate the status of the scales related to the factors influencing the acceptance and application of solar technology in sport places in Ardabil, use was made of one-sample t-test. In this test, according to the fact that Likert's five-point scale has been used for assessing the reasons of not being willing to use solar energy, score 1 indicates the lowest willingness to the acceptance and application of solar energy and score 5 indicates the highest tendency to the acceptance and application of solar energy. This way, score 3 has been considered as the hypothetical mean of the responses and the obtained mean (empirical mean) will be compared with the aforesaid value.

One-sample t-test is amongst the parametric tests. Before conducting the test, it is necessary to investigate the normality of the related data's distribution. Kolmogorov-Smirnov was the test of choice for exploring the data distribution normality. The results of Kolmogorov-Smirnov test indicate that the variables significance level is equal to 0.69 so parametric tests (t and F) can be undertaken. That is because the insignificant results obtained in data distribution normality test (Kolmogorov-Smirnov) for the scales of solar energy acceptance and application means that the data related to corresponding variables have a normal distribution. In line with this, the eight criteria of solar energy technology's acceptance and application were assessed from the perspective of the sports experts with 39 items. The outputs of the test have been analyzed below:

The scales related to the acceptance and application of solar energy technology in sport places of Ardabil have been assessed with several items based on one-sample t-test. Table (1) gives the results of the test.

Table 1: the studied technical indicator and the output resulting from one-sample t-test

Variable	Mean	Standard deviation	t-value	Significance level
Technical barriers				
Access to sun irradiation under cloudy and rainy conditions	3.088	1.032	0.704	0.484
Need for energy storage systems	3.887	1.115	6.703	0.000
Elite experts in the area of solar tools' installation and repair	3.760	1.176	5.446	0.000

Access to the technical knowledge and solar instruments' technology	3.957	1.101	7.329	0.000
Existence of an executive solar energy standard	3.914	0.912	8.381	0.000
Installation and maintenance of solar technology	3.414	1.122	3.087	0.003
Instructional indicator				
Promotive and informative activities	3.873	1.218	6.041	0.000
Sufficient knowledge of the supportive regulations	3.814	0.921	7.394	0.000
Specialized human workforce	3.771	1.009	6.392	0.000
Statistics and information	3.690	1.090	5.335	0.770
Written sources	3.042	1.212	0.294	0.001
Long-term instructional programs	3.394	0.948	3.504	0.000
Researchers' participation	3.514	1.085	3.909	0.000
Governmental staff's motivation in solar energy affairs for promoting services and use in sport places	3.563	0.996	4.765	0.000
Instructional contents in the area of novel energy use	3.500	0.880	4.751	0.000
Specialists' planning	3.842	0.987	7.142	0.000
Policy-making indicator				
Government's commitment to the support of solar energy	3.887	1.153	3.483	0.000
Supervising the solar energy projects and plans	3.742	0.911	6.816	0.000
Governmental and private organizations' collaboration	3.800	1.043	6.411	0.000
National and local policies in the area of potential assessment and source identification	3.760	1.048	6.113	0.000
People's participation for social acceptance of the technologies related to renewable energy	3.633	1.058	5.044	0.000
Social indicator				
Solar energy acceptance culture	3.619	1.211	4.310	0.000
Awareness of the advantages of the renewable energy	3.542	1.072	4.235	0.000
Sustainability in renewable energy resources	3.500	1.073	3.897	0.000
Managerial indicator				
Country's executives' cooperation for completion of the projects	3.718	1.266	4.777	0.000
Managers' capability in the application of solar energy	3.816	0.960	7.164	0.000
Managers' awareness of the advantages of using solar energy	3.929	1.004	7.797	0.000
Economic indicator				
Government's attention and granting of loan to the solar energy users	3.957	0.984	8.134	0.000
Supplying of sufficient credits for the research plans and projects	3.897	0.964	7.637	0.000
Private sector's investment	3.691	0.996	5.720	0.000
Country's richness in terms of fossil fuels	4.057	1.047	8.440	0.000
Large costs of purchasing solar technology	3.985	1.007	8.004	0.000
Legal indicator				
Transparency in the regulations related to the use of solar energy	3.400	1.147	2.917	0.005
Collaboration between the executive branches	3.565	0.865	5.424	0.000
Transparency in the rules supporting the investors	3.757	0.954	6.636	0.000
Attitudinal indicator				
Ease of using natural gas in contrast to solar technology	3.571	1.246	3.837	0.000
Pollution in using gas for supplying heat to the sport places	3.385	1.053	3.063	0.003
Ready access to the electricity through countrywide power grid	3.842	1.085	6.498	0.000
Existence of many fossil resources in Iran	3.885	1.123	6.596	0.000

(Source: Study Findings)

The output resulting from one-sample t-test presented in table (1) shows that all of the six variables in technical indicator have higher means than the hypothetical value, 3, and the most important variables of the technical indicator respectively are access to the technical knowledge and solar tools' technology, existence of an executive solar energy standard, need for energy storage systems, elite experts in the area of installing and repairing solar tools, installation and maintenance of solar technology, access to the solar irradiations under cloudy and rainy conditions. Now, according to one-sample t-test and the amount of its value and significance, it can be stated that all of the other variables except access to the sun's irradiations under cloudy and rainy conditions are significant in a 95% level for their t-statistic has been obtained larger than 1.96 and their significance values fall below 5%. Finally, it can be stated that all the six variables are totally significant because the mean t-statistic obtained for them is 6.992 which is larger than 1.96 and the significance level is 0.000, on average, which is below 5% meaning that the significant percentage of the indicator is 95 in total.

It can be expressed in an investigation of the outputs of Table (1) that all of the ten studied variables have mean values above the hypothetical mean, 3. The most important variables of the instructional indicator are: promotive and informative activities, specialists'

planning, sufficient knowledge regarding the supportive regulations, specialized human workforce, statistics and information, governmental employees' motivation in regard of the solar energy affairs for promoting services and use in housing sector, instructional content in the area of new energy, researchers' participation, long-term instructional programs and written sources. Now, according to one-sample t-test and its statistical value and significance level, it can be stated that all of the variables except written sources feature acceptable and close significance levels (for their t-statistics are larger than 1.96 and significance level is below 5%) and all of the variables are acceptable considering their t-statistics being computed larger than 1.96 and their significance level being found below 5%; in other words, there is a significant difference in a 95% level between the obtained means and the hypothetical mean. It can be stated that all of the intended ten variables are generally significant because their mean t-statistic is equal to 7.500 which is larger than 1.96 and their significance level is 0.000, on average, which is below 5% meaning that the indicator is generally significant in a 95% level.

The information presented in Table (1) regarding the policy-making indicator shows that all of its corresponding variables have mean values above the hypothetical mean, 3. The most important variables of policy-making indicator are: government's commitment to the support of solar energy, governmental and private organizations' collaboration, local and national policies in the area of potential assessment and resource identification, supervising the solar energy projects and plans and people's participation for the social acceptance of the technologies related to the renewable energy. Now, according to one-sample t-test and its statistical value and significance level, it can be stated that all of the variables have acceptable significance levels (for their t-statistics are larger than 1.96 and their significance level is below 5%) hence all of them are acceptable considering their t-statistics being found larger than 1.96 and their significance level being below 5%); in other words, there is a significant difference between the mean values obtained for the variables and the hypothetical mean in 95% significance level. So, all of the five variables are significant in general because their mean t-statistic being found equal to 8.241 which is larger than 1.96 and their significance level being 0.000 which is smaller than 5% meaning that the indicator is generally significant in 95% level.

Considering the results given in Table (1) for social indicator, it can be stated that all of the three variables related thereto have mean values larger than the hypothetical mean, 3. The most important variables of social indicator are: solar energy acceptance culture, awareness of the renewable energy advantages and sustainability in renewable energy resources. Now, according to one-sample t-test and its statistics and significance level, it can be stated that all of the variables possess acceptable significance level (because their t-statistics are larger than 1.96 and their significance levels are below 5%) hence all of them are acceptable for their t-value is larger than 1.96 and their significance level is below 5%; in other words, there is a significant difference between the hypothetical mean and their calculated means in a 95% level. So, all of the three variables related to this indicator are significant in general for their mean t-statistic is equal to 5.329 which is larger than 1.96 and their significance level is 0.000 which is below 5% meaning that the indicator is significant in general in 95% level.

The investigation of Table (1) for managerial indicator shows that all of the variables have mean values larger than the hypothetical mean, 3, of the study. The most important variables of the managerial indicator are managers' awareness of the advantages of applying social energy, cooperation between the country's executive managers for completing the plans and managers' capability in applying solar energy. Now, according to one-sample t-test and its statistic and significance levels, it can be stated that all of the variables have acceptable significant levels (because their t-statistics are larger than 1.96 and their significance levels are below 5%) hence all of them are acceptable considering their t-statistics being computed larger than 1.96 and their significance level being found below 5%; in other words, there is a significant difference between the obtained means and the hypothetical mean in 95% level. So, all of the three intended variables are significant in general for their mean t-statistic is equal to 5.329 which is larger than 1.96 and their significance level is 0.000 which is below 5% meaning that the indicator is generally significant in a 95% level.

It can be stated in an interpretation of the results summarized in Table (1) regarding the economic indicator that all of its related five variables have mean values larger than the hypothetical mean, 3, of the study. The most important variables of the economic indicator are the country's richness in terms of fossil fuels, large costs of purchasing solar technology, government's attention and granting of loans to the solar energy users and supplying of sufficient credits to the research plans and projects, private sector's investment. Now, according to one-sample t-test and its statistic and significance level, it can be stated that all of the variables are in an acceptable significant level (because their t-statistics are larger than 1.96 and their significance levels are below 5%) hence all of them are acceptable considering their t-statistics being calculated larger than 1.96 and their significance level being found below 5%). So, all of the variables are acceptable considering their t-values being larger than 1.96 and their significance level being smaller than 5%; in other words, there is a significant difference between their obtained mean values and the study's hypothetical mean in 95% significance level. Therefore, all of the intended five variables are generally significant for their mean t-statistic is 9.767 which is larger than 1.96 and their significance level being 0.000 which is below 5%. This means that the indicator is generally significant at 95% level.

The results of Table (1) regarding the legal indicator shows that all of its related three variables have mean values larger than the study's hypothetical mean, 3. The most important variables of the legal indicator are the transparency in the regulations supporting the investors, cooperation between the executive branches and transparency in the regulations related to the use of solar energy.

Now, according to one-sample t-test and its statistic and significance level, it can be stated that all of the aforementioned variables are in an acceptable significance level (for their t-statistic being computed larger than 1.96 and their significance level being found below 5%) hence all of them are acceptable for their t-statistics being larger than 1.96 and their significance levels being below 5%; in other words, there is a significant difference between the study's hypothetical mean and the variables' statistical mean in a 95% level. So, all of the three intended variables are significant in general because their obtained mean t-statistic is equal to 5.536 which is larger than 1.96 and their mean significance value is 0.000 which is smaller than 5% meaning that the indicator is generally significant at 95% level.

It can be stated in a study of Table (1) regarding the attitudinal indicator that all of the four variables have mean values above the hypothetical mean, 3. The most important variables related to the aforesaid indicator are the existence of abundant fossil resources in Iran, easy access to the countrywide power grid, ease of using natural gas in comparison to solar technology and pollution creation when using gas for supplying heat to the sport places from the perspective of the people. Now, according to one-sample t-test and its statistic and significance level, it can be stated that all of the aforesaid variables are in an acceptable significance level (for their t-statistics being found larger than 1.96 and their significance level being smaller than 5%) hence all of them are acceptable for their t-statistics being larger than 1.96 and their significance levels being below 5%; in other words, there is a significant difference between the study's hypothetical mean and the variables' statistical mean in a 95% level. So, all of the intended four variables are significant in general because their mean t-statistic is equal to 6.926 which is larger than 1.96 and their significance level is equal to 0.000 which is smaller than 5% meaning that the indicator is generally significant at 95% level.

Friedman's test was utilized in line with the determination of the most important indicator related to the acceptance and application of solar technology in sports places. The test offers the factors in a rated form (table 2).

Table 2: the results of Friedman test for rating the criteria of solar technology acceptance and application

Barriers		Rank mean	
Managerial		5.21	
Economic		5.15	
Policy-making		4.94	
Attitudinal		4.26	
Instructional		4.24	
Social		4.13	
Legal		4.09	
Technical		3.98	
Indices of Friedman Ranking Test			
Number	Number	Degree of freedom	Significance level
70	70	7	0.000.

(Source: Study Findings)

The test's output indicated that the most important indicators in an order of the rank mean respectively are the managerial barriers with a mean rank of 5.21, economic indicator with a rank mean of 5.15, policy-making indicator with a rank mean of 4.94, attitudinal indicator with a rank mean of 4.26, instructional indicator with a rank mean of 4.24, social indicator with a rank mean of 4.13, legal indicator with a rank mean of 4.09 and, finally, technical indicator with a rank mean of 3.98. These rankings are significant in 95% level based on Friedman's test considering their significance levels (errors below 0.05%).

Discussion and Conclusion:

Ardabil has no shortage in terms of climatic factors for the use of solar energy in sport places and the responsible institutions can support the use of solar energy to some extent. However, the problem is that the officials of sport affairs are not willing to use solar energy in their sport places. Thus, the present study endeavored to investigate the factors influencing the acceptance and application of solar technology in sport places based on the theory of technology promulgation. The findings obtained from the tests indicated that the managerial, economic, policy-making, attitudinal, instructional, social, legal and technical indicators are respectively the most important factors influencing the acceptance and application of solar technology in sport places from the perspective of the sports experts and agents.

Also, the study results indicated that environmental capacities can be optimally exploited under Iran's conditions by making innovations even if limited ones. Use of solar energy is one of such facilities that besides economic saving, helps the improvement of efficiency and works parallel to the prevention of environmental pollution which is amongst the acute problems of Iran.

Although Ardabil is amongst the cold cities of the country, it is more optimal for the use of solar energy than many of the European countries and cities in terms of its natural status. In regard to the solar energy, there is an urgent need for investigating the issues related to the acceptance and application of solar technology in Iran and, especially, in Ardabil. The result achieved based on one-sample t-test is that all of the studied variables are significant and influential on the acceptance and application of solar technology in sports places. Managerial indicator is the most important factor contributing to the acceptance and application of solar technology in Ardabil. In addition, the most important component of the managerial indicator is the managers' awareness of the advantages of solar energy applications. Country's richness of fossil fuels, easy access to power, promotive and informative activities, the culture of acceptance and transparency in the supportive regulations and access to technical knowledge and technology of the solar tools have also been found as the other most important factors taking the next ranks. It can also be stated that no proper policy has been adopted regarding the support of solar energy. Additionally, the absence of national and local programs and policy-making weaknesses are amongst the other matters hindering the use of solar energy in the sport places.

The following suggestions have been made in line with the results of the present study regarding the application of solar technology in sports places:

- Instructing and informing the managers and officials responsible for solar energy affairs and use of solar energy in the sport places
- Reducing the subsidy to the fossil fuels and energy carriers and spending the revenue obtained thereof for promoting and developing the use of solar energy
- Implementation of binding policies for utilizing solar energy in sport places
- Informing the citizens and making expanded advertisement in public media for changing the attitudes and infirming a culture for the use of solar energy.

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