

Research Article

Investigated Capability Science and Technology Towns on Regional Economic Development Case Study: Isfahan Science and Technology Towns

¹Mahsa Asadi Azizabadi and ²Sepideh Amiri Sarokolaei

¹Regional Planning, Islamic Azad University, Qazvin Branch, Qazvin, Iran

²Entrepreneurship-New Business, Islamic Azad University, Central Branch, Tehran, Iran

Abstract: Regions can become developed through support policies, appropriate legislation and effective institutional frameworks. Science and technology parks have potential in regional development. Regional differences and different social and economic backgrounds require different strategies for achieving the development, therefore different features and capabilities are necessary in science and technology parks. The aim of this study was to investigate the capability of scientific and technological town on local economic development. The paradigm of this research is quantitative and objective is practical which is implemented by correlation method. Statistical population of survey contains 196 companies in Isfahan STP and 75 companies were estimated as the sample size by using Cochran formula and the samples were selected by using the random sampling. The main tool of research was a questionnaire which its validity was confirmed by a panel of experts and reliability of research confirmed by Cronbach's alpha coefficient (0.75). The results showed that the most important capability in STP is strong Participation in knowledge and learning procedures in the region. The exploratory factor analysis was utilized in the classification of capabilities and the results showed that five factors are accounted for 55.08% of features and capabilities of STP. These capabilities include the facilities and infrastructures (26.22%), human capital (8.22%), market (7.68%), communication factor (6.59%) and support factor (6.36%).

Keywords: Factor analysis, regional development, science and technology park

INTRODUCTION

Given over a half of century of science and technology parks as a global movement in the world, numerous discussions can be provided about their nature and role in the regional development. Science and technology parks are as the tools for achieving the specific objectives especially the scientific and economic development (Jafarnejad and Ghasemi, 2008). In most of the developed countries, the science and technology parks are the powerful elements for regional development and the governments are seeking to improve its capacity and capability for playing the role at the regional level (Taati and Bahrami, 2009).

Isfahan science and technology town was founded inspired by the idea governing the parks and Technology development centers in 1993 in order to coordinate and integrate the scientific and technical abilities of research, academic and industrial centers of Isfahan province. On this basis, Isfahan science and technology town seeks to create the dynamic and creative infrastructure for resolving the available problems in the industries of region and achieve the necessary technologies of country by the outcome of effective forces available in mentioned sectors. After over two decades of town activities, the investigation of its capability in regional development is essential in

order to create the infrastructure for improving the functions and processes of town by assessing its potential. In this regard, this study seeks to investigate the potential and capabilities of town in the regional development (Website of Isfahan Science and Technology Town, 2002).

According to provided definition by the International Association of Scientific Parks, the science and technology park is an organization which is managed by the professional experts of management - and the main objective of establishing the science and technology parks is to increase the wealth in the society through encouraging and promoting the culture of innovation and increase the constructive competition among the firms and institutions which do activities based on the knowledge and science in the park (Bamdad *et al.*, 2008). For achieving this goal, a park is made with the aim to create the motivation and management of procedure, knowledge and technology among the universities, research and development centers, private companies and market and the growth of companies dependent on the innovation is facilitated through creating the growth centers and reproductive processes (Haeri Izadi, 2006).

Science and technology parks are as the tools to generate the wealth and have a social purpose

(Kharaghani and Selseleh, 2009). Not only the science and technology parks are active in relation to new technologies, but also their activities have been associated with the provision of advanced services, research and development processes, creation of new companies, transferring the technology and marketing. However, the priority of this center above all is the activity associated with the entrepreneurial processes, methods and behavior which aim to create the added value for all different elements in the companies. This value added includes production, manufacturing activities and management and marketing in companies (Delangizan, 2005). Companies in today economy, which has the global dimensions, will be able to be ensured of their own advance and position in the global market and become strong enough to survive only through the innovation (Tavallaei *et al.*, 2006).

Infrastructural role of parks is the provision of facilities and active support of local companies based on innovation and enhancing the competitiveness of local enterprises in the region, so that the science and technology parks should support the new companies as well as paying equal attention to increased competitiveness in current companies in the province and related sectors with the activity of park. Efforts to attract the current companies will be only reasonable if transferring the companies to the park environment increases the reputation of these companies from the viewpoint of regional development and in fact these are the services which the company cannot obtain alone and it can be provided only through the synergy created by the parks and their management (Samadi and Taherzadeh, 2007).

Nowadays, the knowledge is a sustainable and necessary source of competitive advantage and in the era of development and environmental uncertainties, the manifestation of science and technology parks is in line with the identification and use of this knowledge in products and services. Science and technology park is an organization which is managed by the management professionals and aims to implement and manage the knowledge and technology among the universities, research and development institutions, private companies and companies and market through the growth of companies based on the innovation. A science and technology park causes the knowledge-based commercial forming the development (Mahdavi, 2009).

Science parks provide the high value-added services and qualitative and appropriate work places and facilities for the enterprises located in the park. This definition is now widely accepted and used. It includes all different types of parks around the world such as technology parks, research parks, technology poles and technology areas. Despite the fact that each of the above cases may have the differences, these differences is not so much that needs to provide

different definitions, but each of these cases are the subsets of a concept. Therefore, the science and technology parks are the tools to create the wealth and have the social objectives (Jafari, 2006).

Science and technology can enhance the productivity and stimulate the economic growth in each country through the development and application of support policies, appropriate laws and efficient institutional frameworks (Dodgson, 2000). Governments and entities, which are not able to innovate and use the scientific and technological achievements, are doomed to failure and are soon eliminated from the competition (Smith, 2002). Therefore, the sustainable economic development is achieved through the dynamic technological changes which are supported by efficient and effective innovation systems. Technology innovations pave the ways for achieving the unique values such as inventing new ways of doing things, providing the services and so on (Willoughby, 2000).

In fact, the science and technology parks increase the competitiveness of universities and help considerably to enhance their role in fulfilling the community needs through support of companies' business along with the universities. In other words, the universities will be able to operate by this way as an active factor in economic development and increase their revenue through the research contracts. In summary, the science and technology parks should create the infrastructures and services necessary for increasing the competitiveness of companies and reducing the cost and also creating the synergy among the companies in the park. In other words, each science and technology park should increase the credibility for companies in the set, otherwise it is not considered as the science and technology park. In this case, they are only the traditional and ordinary industrial complexes which will not be so important in terms of regional development (Delangizan, 2005).

As the sets, which provide the possibility of rapid expansion of research units and completion of research cycle from industry to, the research parks are all similar in three major objectives of completing the cycle of research from the university to industry, accelerating the technology transfer process, supporting the new research companies and units, and helping their grow and success and commercializing the results of research despite different topics such as the Technology Park, Techno Police, and Research Park (Frenz and Ietto-Gillies, 2009).

Cassiman and Veugelers (2006) believe that the Science and Technology Park affect the technology development through creating the research structures at the universities and accelerating the transfer of personal research to organized research, commercializing the research results and helping to provide the research funding, facilitating the presence of industries and the research companies along with the universities, developing the cooperation among them and developing

the spin-off companies and creating the knowledge-based technologies.

Investigating the factors affecting the development of technology indicates that demand pull and supply push and interaction among the motivation, abilities and relevant organizations contribute to technology development (Chakrabarti and Richard, 2002). Since the positive potential of parks in economic development can become actual in the case of appropriate market for a park, the parks should pay attention to the local benefits and environment. The existence of appropriate science and technology infrastructure in the hosting area of park plays the most important role in attracting the customers of park. Primary institutions, located in the park, play the important roles in creating the park identity. In fact, since utilizing the synergy capacity is one of the main attractions of parks, the customers provide the bases for attracting other technology companies in the park (Tariq, 2002). So in this study investigated capability Science and Technology towns on regional economic development (Case study on Isfahan Science and Technology towns) are investigated.

MATERIALS AND METHODS

This research is quantitative based on the paradigm and has used the survey strategy according to the wide range of research. This research is among the applied studies in terms of direction and objective and is among the single-sectional studies based on the time since it has been conducted in a specific and certain period of time that it was from 2006 till 2011 in Isfahan Science and Technology towns. Statistical population of survey contained all member companies in Isfahan Science and Technology Town; these were 88 companies located in the park and 108 companies located in the centers of development and totally 196 companies were considered as the study statistical population and the sample size was estimated by using Cochran Formula of 75 companies and the samples were selected by using the random sampling method. The questionnaire was the research main tool which its validity was established by a panel of experts in the visual validity dimension. Reliability of research tool was also calculated and obtained by Cronbach's alpha coefficient which represented the appropriate reliability of research tool (0.75). In this study, a five-point Likert scale with 48 items in the fields related to the development capabilities was used to evaluate the abilities and capabilities of park in the regional development. The factor analysis was used for classifying the obtained results and identifying the development potential.

RESULTS ANALYSIS

Experts' personal and professional characteristics: Investigating the results obtained from the experts'

Table 1: Extracted factors along with the Eigenvalue, percentage of variance and percentage of cumulative variance

No.	Factors	Eigenvalue	Percentage of variance	Cumulative frequency
1	First factor	12.58	26.22	26.22
2	Second factor	3.94	8.22	34.44
3	Third factor	3.68	7.68	42.12
4	Fourth factor	3.16	6.59	48.71
5	Fifth factor	3.05	6.36	55.08

personal and professional characteristics suggest that the experts' average age is 34.78 years, of which the minimum age is 24 years and the maximum is 56 years. The highest frequency of experts is in the class with less than 30 years (61.7%) indicating that the young experts in the Science and Technology Park. Evaluating the experts' educational level indicates that 48.3% are masters, and this shows the experts' noticeable levels of knowledge. Obtained results indicate that the experts' fields of study have been more diverse and different and the industry field with 7 individuals has had the highest frequency. Investigating the respondents' organizational position indicate that 71.7% of them have had the expert position and the rest of them had activities as the Managing Director position. Study of experience in that position also indicates that the experts have has approximately 4.06 years of experience in the previous position on average and the highest frequency belonged to the class below 2 years (60.7%) and this indicates the experts' low experience in obtained position. (58.3%) of experts have stated that they have had the managerial position and 47.3% believe that the proportion of field of study with the type of assigned duties has been to a large extent.

Capabilities and features of Isfahan Sheikh Bahaei science and technology town: The obtained results indicate that the most important feature of park is the strong participation of park in the procedures of knowledge and learning and localization of technology, compatibility of developed ideas with the market needs, close relationship and increased participation in the areas of industry and university, existence of experts and university graduates, and existence of appropriate scientific and technical structure, universities and several research centers are placed in the next priorities. The exploratory factor analysis was used in order to classify and identify the capabilities and features of Isfahan Science and Technology Town. The amount of coefficient KMO is equal to 0.87 and Bartlett's test becomes significant ($\chi^2 = 2941.94$, $df = 2811$, $sig. = 0.00$) and this indicates the suitability of data for factor analysis.

The obtained results indicate that five factors express the capabilities and features of Isfahan Science and Technology Town that they are shown in Table 1 and they explain about 55.08% of the variance related to the features. The first factor, with Eigenvalue equal to 12.58, explains about 26.22% of variance related to the capabilities and features of Isfahan science and

technology town. This factor has been named as the factor of facilities and infrastructures and emphasized that utilizing the appropriate facilities and infrastructures is the most important feature of park. In this factor, there are the variables such as the specific features for establishing the technology units in the technology entrepreneurship structures, convenient life and welfare facilities, providing the facilities for entrepreneurs, technology builders and early-return firms in the form of advanced technology project, appropriate and high-quality infrastructure, value-added services, available necessary resources for implementation, existence of appropriate industrial and economic infrastructures, factories, industrial towns, and existence of proper scientific and technical infrastructure, universities and several research centers in the region.

The second factor, which has been named as the human capital, indicates that one of the major capabilities of this town is the existence of town skilled and efficient manpower that has the ability to collaborate with entrepreneurs and companies. This factor explains about 8.22% of science and technology Town capacities. This factor includes the variables such as park and research town managers' education and expertise, entrepreneurship centers managers' education

and expertise, technology centers employees' education and expertise, existence of skilled workforce, university graduates, existence of high-experienced professors at the university in various fields and implementation ability and technical success in terms of working team professional capability.

The third factor is named as the market factor and refers to the existence of appropriate markets for commercial products in the town. This factor explains about 7.68% of variance related to the capabilities of Science and Technology Town and emphasizes that the success of a developed project in the town is subject to the existence of proper markets. This factor includes the variables such as the potential market for developed technologies in the park, existence and being close to the regional, national and international markets, the ability to estimate the amount and portion of market by the park, and the ability to estimate the lifetime of product.

The fourth factor, named as the communicational factor, emphasizes that the development of inter-organizational and intra-organizational communication in order to make the infrastructure for development and commercialization of technology is among the features of Science and Technology Town. This factor explains about 6.59% of variance related to the features. This

Table 2: Variables related to each of the factors and the value of factor coefficients

Factor name	Variable	Factor coefficients
Facilities and infrastructure	Special features for establishing the technology units in technology entrepreneurship structures	0.614
	Appropriate life and welfare facilities	0.540
	Providing the facilities for the entrepreneurs, technology builders and early-return firms in the form of advanced technology plan	0.706
	Appropriate and high quality infrastructures (including the spaces, landscaping, communications, transportation access, appropriate location, good facilities and buildings, etc.)	0.797
	Good public services (office equipment, meeting rooms, parking, dining room and restaurant, hotel, security, etc.)	0.652
	Value-added services (communicational infrastructure, internet access with good quality, video conference facilities, consulting services, commercial support, etc.)	0.734
	Access to the necessary resources for implementation	0.595
	Existence of appropriate economic and industrial infrastructure, factories, industrial parks	0.765
Human capital	Existence of appropriate scientific and technical structure, universities and several research centers in the region	0.521
	Lands of parks and commercialization technology complexes	0.880
	Park and research towns managers' education and expertise	0.685
	Entrepreneurial centers managers' education and expertise	0.827
	Technology centers employees' education and expertise	0.619
	Existence of experts and university graduates	0.550
	Existence of high experienced professors at university in different fields	0.608
Market	Implementation ability and technical success execute in terms of working team professional capabilities	543/0
	Existence of appropriate markets for commercial products in the town	0.742
	Existence and being close to the regional, national and international markets	0.599
	The ability to estimate the amount and portion of market by the park	0.514
Communicational	The ability to estimate the lifetime of product	0.808
	The park which is located geographically close to Isfahan University of Technology	0.788
	Effective communication with research institutes, universities and researchers and access to their laboratory equipment	0.689
	Close communication and frequent participation in industry and at university	0.824
	Existence of several universities including the state, non-profit and Azad (free) universities in Isfahan Province.	0.861
Supportive	Acceptance and financial and spiritual support of technology companies	0.537
	Acceptance and support of Ph.D. theses	0.625
	Support of seminars, exhibitions, conferences and workshops	0.657

factor includes the variables such as the location of park geographically close to Isfahan University of Technology, effective communication with research institutes, universities and researchers and access to their laboratory equipment, close communication and frequent participation in industry and at university, existence of several universities including the state, non-profit and Azad (free) universities in Isfahan Province; and finally, the fifth factor, named as a supportive factor, emphasizes on the park potential to support the academic elites, plans and entrepreneurs. This factor explains 6.36% of variance related to the features. This factor includes the variables such as acceptance and financial and spiritual support of technology companies, acceptance and support of Ph.D. Theses, and support of seminars, exhibitions, conferences and Workshops. Other obtained are presented in Table 2.

CONCLUSION AND RECOMMENDATIONS

Science and Technology Park increases the production and income of increased employment and will create a new market for the labor market by classifying the employees. In other words, the level of employment will be increased and the employment context will be changed in an overlapping chain. Creating and developing the Science and Technology Park will lead to two kinds of overflow: The first type is related to the technology overflow which supports the development of high-tech industries and the results of this study emphasize on this case; the second overflow will create the appropriate and adequate support for providing the new national and regional needs for the technology in response to new needs market by creating the upper strong block.

The communication with higher education institutions, the reduced different risks and hazards, and emphasis on the development of new technology-based firms are among the features of science and technology parks which have tasks in encouraging the development of companies and providing better facilities and services. The results of this research also indicate that the service-providing capability is the most important feature of Science and Technology Park. Facilities and services, provided by each of the science and technology parks, are crucial and important in development and survival of company.

The Science and Technology Parks have activity, more than anything else in terms of innovation. He expresses that through creating an appropriate environment for innovation at the national and regional level, the countries allow the companies and industries to become much stronger and thus make higher profit and create high level of employment. Therefore, Sanz's emphasis on the innovation policies in the country has been considered as a pioneer in improving the performance of parks, but based on Luger and Goldstein's point of view (2000), the scientific parks

with innovative entrepreneurship create the economic and social benefits and more emphases are made on the objectives of science and technology parks.

Development of communicational services is among the features of Science and Technology Park. Based on Marciniak (2007) the most important information services which should be provided for Science and Technology Parks include the access to the local the Internet network, access to the libraries and library resources of other centers which have the memorandum of understanding and the computer software. Furthermore, the obtained results are in consistent with Poursoleymanian (2006) which emphasizes on different support and the strengthening the infrastructures and paying attention to the social, cultural, and political capital. Given the obtained results, the following suggestions can be provided in order to enhance the positive effects of park development on the region:

- Isfahan Science and Technology Town should hold the training courses for knowledge-based companies in the far regions.
- The town should establish the agencies or branches in counties for familiarity and knowledge of knowledge-based organizations in order to create the infrastructure for the companies' membership in development centers.
- Given the agricultural major portion of Isfahan province, the agricultural development centers should be established with support of town.
- The appropriate mechanisms should be established for participation of park with planners and decision makers in order to transfer the status quo of technologies for investment in target sections.
- Local Science and Technology Parks should be networked in order to exchange the information and support and also establish the communication with parks of other countries.
- Science and technology park communication with remote and border areas should be developed in order to transfer the development impacts of town on these regions.
- The agricultural technologies should be developed in the park in order to affect the rural areas and transfer the development effects to these regions.
- Discount should be provided for companies which develop the technologies and affect the local markets.

REFERENCES

- Bamdad, N., A.F. Gholam and R. Parisa, 2008. A model for marketing management of science and technology parks. *Quart. J. Res. Plann. Higher Educ.*, 14(3): 69-95.

- Cassiman, B. and R. Veugelers, 2006. In search of complementarity in innovation strategy: Internal R&D and external knowledge acquisition. *Manag. Sci.*, 52: 68-82.
- Chakrabarti, A.K. and K.L. Richard, 2002. Regional economic development: Comparative case studies in the us and Finland. *Proceeding of IEEE Conference on Engineering Management Cambridge, UK*.
- Delangizan, S., 2005. Clusters of science and technology: Towards a general theory. *Quart. J. Technol. Dev.*, (Roshd-e-Fanavari).
- Dodgson, M., 2000. *The Management of Technological Innovation: An International and Strategic Approach*. Oxford University Press, Oxford.
- Frenz, M. and G. Ietto-Gillies, 2009. The impact on innovation performance of different sources of knowledge: Evidence from the UK community innovation survey. *Res. Pol.*, 38: 1125-1135.
- Haeri Izadi, M., 2006. Science parks, expectations, models and achievements. *Quart. J. Technol. Dev.* (Roshd-e-Fanavari), 8: 26.
- Jafari, M., 2006. Procedures governing the field of service technologies. *Monthly J. Tadbir*, 17(178).
- Jafarnejad, A. and A. Ghasemi, 2008. Providing the model of technology acquisition according to the strategy of intellectual capital (case study: Companies located in science and technology park of University of Tehran. *Quart. J. IT Manag.*, 1: 19-36.
- Kharaghani, S. and M. Selseleh, 2009. Typology of science and technology parks with the knowledge management approach. *Quart. J. Technol. Dev.*, (Roshd -e- Fanavari), 2: 2.
- Mahdavi, H., 2009. Important factors in the acceptance process of incubator companies. *Technol. Dev.*, (Roshd-e-Fanavari), 15: 23.
- Marciniec, B.M., 2007. The role of science and technology parks in increasing the competitiveness of small and medium sized companies. *Adam Mickiewicz Univ., Foundation-Poznan Sci. Technol. Park*, 11(1).
- Poursoleymanian, F., 2006. Role of science and technology parks in developing the technology development in local industry. *Quart. J. Technol. Dev.* (Roshd-e-Fanavari), 9: 49.
- Samadi, S. and M. Taherzadeh, 2007. Investigating and explaining the criteria, indicators and terms in designing and architecture of science and technology parks with emphasis on international experiences. *Quart. J. Technol. Dev.* (Roshd-e-Fanavari), 12(3): 4-12.
- Smith, K., 2002. What is the "Knowledge Economy"? Knowledge Intensity and Distributed Knowledge Bases. Retrieved from: <http://econpapers.se/>.
- Taati, M. and M. Bahrami, 2009. A comparative study of factors affecting the future of science and technology management in Iran until the horizon of 2025 based on the experts and policy makers' viewpoint. *Quart. J. Sci. Technol. Policy*, 2(2): 47-61.
- Tariq, Kh., 2002. *Management, Technology, Competition and Success in Wealth Creation*. McGraw-Hill, Boston, pp: 483.
- Tavallaei, M. *et al.*, 2006. Strengths, weaknesses, opportunities and threats of Science Parks in Iran: The effects of new technologies. *Quart. J. Technol. Dev.* (Roshd -e- Fanavari), 8: 26.
- Website of Isfahan Science and Technology Town, 2002. Retrieved from: www.istt.ir.
- Willoughby, K.W., 2000. Building internationally competitive technology regions: The industrial-location-factors approach and the local-technology-milieux approach. *J. Int. Area Stud.*, 7(2): 1-36.