Innovation parks and their impact on competitiveness in northwestern México

DOI: 10.46932/sfjdv3n3-052

Received in: March 22nd, 2022
Accepted in: April 21st, 2022

José Ramón López Arellano
PhD in organizational management
Institution: Autonomous University of Sinaloa
Address: Blvd Miguel Tamayo Espinoza de los Monteros 2358 Desarrollo Urbano 3 Ríos CP 80020
E-mail: ramonlo@uas.edu.mx

Kenia Inzunza Duarte
Master in Management
Institution: Autonomous University of Sinaloa
Address: Blvd Miguel Tamayo Espinoza de los Monteros 2358 Desarrollo Urbano 3 Ríos CP 80020
E-mail: keniainzunza@uas.edu.mx

Ricardo Rocha Ruiz
Master in Management
Institution: Autonomous University of Sinaloa
Address: Blvd Miguel Tamayo Espinoza de los Monteros 2358 Desarrollo Urbano 3 Ríos CP 80020
E-mail: ricardorocha@uas.edu.mx

ABSTRACT
Globalization forces nations to get involved in a constant struggle for their companies to survive, they must be in an exhaustive search for strategies that allow them to be more competitive to remain in the market, one of which contemplates the implementation of the model triple helix (involvement of universities, government and business) which gives way to the creation of science/technology parks. Due to the above, this paper analyzes innovation and competitiveness through the Technological Innovation Park of the Autonomous University of Sinaloa (PIT-UAS); supporting this with different articles which talk about the importance of collaborative work to boost competitiveness between regions and that, according to the results found, these parks can generate high profits in such a short time.

Keywords: economic development, science parks, regional development, innovation.

1 INTRODUCTION

The constant changes in the world make innovation necessary and for this to take place it is necessary to establish or form areas that generate an environment for it to develop, in that sense Porter (2000) in the article: Location, Competition, and Economic Development: Local Clusters in a Global Economy. that the core of knowledge should consist of three things:

1) Economic factors, 2) demand conditions and 3) supply chain management. In other words, collaboration in a knowledge center directs technological innovation through the education program, accelerating the learning process and improving it, focusing on supply and demand

directed at companies to stimulate their operation, creating an environment that supports media of decent life for local communities to improve their economic development (Porter, 2000, p.15-34).

Addressing the above issues and knowing the needs of a region, innovation can be focused on them, thus proposing Science and Technology Parks as centers of innovation development,

In this sense, the present work analyzes innovation and competitiveness through the Technological Innovation Park of the Autonomous University of Sinaloa (PIT-UAS) during the last years of operation (2015 and 2016). Supporting this in different articles which talk about the importance of collaborative work to boost competitiveness between regions, such as Yun & Lee (2013), who mention that companies are no longer the only ones to create or contribute to innovation, research centers and universities have become major participants in it.

2 THEORETICAL AXIS AND WORKING METHOD

Countries like Malaysia are increasingly using science parks as a strategy to promote innovation, especially among small and medium-sized enterprises (SMEs), as they provide an environment that helps companies develop their creative capacities, which that detonates in innovation. A very particular characteristic of these parks is that they provide a network of sources that allows companies located in them to collaborate with universities and research institutions (Zawdie, 2008).

Other examples where the concentration of skills, specialized materials, and technological inputs and knowledge have generated cost reductions for individual companies and increased returns for the entire region are Taiwan's Hsinchu Science Park and California's Silicon Valley. On the other hand, Korea has obtained a good reputation worldwide in the production of semiconductors, a product that emerged in the technological park, with this it is possible to extend them to developing countries such as Mexico, since the results of these parks showed that "innovation performance" shows dominance of six main factors and in the area of Regional Development, the main factor data shows that "localized competition" was the most important subfactor for the creation of a knowledge center of the Science Park (K.C., S.S., & Batchuluun, 2016)

This is how this document investigates the importance of collaborative work between university-industry-government to promote competitiveness between regions with reference to the experience of the Technological Innovation Park of the Autonomous University of Sinaloa (UAS) in the city of Culiacan, Sinaloa, Mexico.

The success of many academics as entrepreneurs in various fields of technology has also contributed to this trend. Direct involvement of universities with industry can be seen in activities such as research funding, training partnerships and technical service contracts. Apart from this, the industry also sponsors research centers and researchers and offers executive positions for them (Keld Laursen, 2004).

On the other hand, it is argued that for innovation to be successful, it is necessary to have an ecosystem in which good relations are maintained, since competitiveness is present by regions at a global level (Gibson & Naquin, 2011), and therefore is that the concept of Science and Technology Parks (PCT) arises (Vásquez Urriago, Barge Gil, Modrego Rico, & Paraskevopoulou, 2014), so that in a single space specialized labor, knowledge and infrastructure can be obtained, supporting innovation activities.

Therefore, PCTs are seen as the mechanism that help reduce uncertainty indicators; because through them certain socioeconomic goals can be met such as job creation, diversification of economies and promotion of greater efficiency (Vasquez-Urriago et al 2014).

In Latin America, PCTs are considered as instruments for the generation of long-term sustainable economic growth based on knowledge, in the understanding that it is not enough to provide infrastructure and services to achieve economic improvements, this article proposes a methodology for linking and interacting with PCT through quality national public universities (Liagouras, 2010).

Recent studies mention that the low levels of competitiveness in Mexico are associated with the use of factors demanded by organizations, since these do not encourage innovation, which leads to continuing to maintain only comparative advantages, without progress in competitiveness (Leal, 2016).

The foregoing is reflected in the results of the Global Innovation Index 2016 (GII), which shows that Mexico is currently in the 61st position, going through 60th and 62nd in the Input Innovation Sub-index and the Innovation Product Sub-index, so the GII suggests that investment in research and development, as well as innovation, become crucial for economic growth, which raises levels of competitiveness.

The above results are a sample of what Porter mentions in his book on the competitive advantage of nations: “the basis of productivity in a country is found in its companies; that is, their capacity to use labor, natural resources and capital efficiently and creatively” (Porter, 1991).

In the same vein, reference is made to what Buesa, Martínez, Heijs and Baumert (2002) mention in their article Regional Innovation Systems in Spain:

Due to the importance acquired by the regional specification of innovative activities, there is an interest in differentiating the systems within a nation and, therefore, in defining typologies of regional innovation systems taking into account the resources available to them, their institutional configuration and their results (Mike Buesa, 2002).

As a result of its characteristics and according to the methodology of the National Ranking of Science, Technology and Innovation (CTI), Sinaloa is located in the 15th position of all entities in the country, forming part of the second cluster, along with the states of Baja Southern California, Colima, Durango, State of Mexico, Guanajuato, Hidalgo, Michoacán, Puebla, Quintana Roo, San Luis Potosí, Tamaulipas, Veracruz, Yucatán and Zacatecas.

It is highlighted that the entity reaches significant positions in the dimensions of Academic and Research Infrastructure (2nd place); Information and Communication Technologies (7) and Institutional Component (10). In contrast, it presents areas of opportunity to strengthen in the dimensions of Investment in STI, Scientific and Innovative Productivity, Economic and Social Environment, Business Infrastructure and Gender (Scientific and Technological Consultative Forum, 2014).

2.1 SINALOA/UAS/PIT-UAS WORKING METHOD

In order to reduce the gap that separates underdeveloped countries from developed countries in terms of productivity, socioeconomic well-being and scientific-technological innovation capacity, this paper analyzes the innovation and competitiveness that it has in the state of Sinaloa derived from the results obtained in two years of life of the Technological Innovation Park of the Autonomous University of Sinaloa (UAS).

2.2 AUTONOMOUS UNIVERSITY OF SINALOA

Sinaloa is located in the Northwest region of Mexico; its geographical location allows it a strategic advantage with the markets of the United States, Asia, Central and South America (INEGI, 2016). It is home to a diversified tourism industry, world-class manufacturers, adding those information technology and software companies; the combination of these sectors results in an optimal ecosystem to boost business in strategic sectors of the state (INADEM, 2016).

Based on the above and according to the third report of the dean Dr. Juan Eulogio Guerra Liera of the Autonomous University of Sinaloa (Universidad Autónoma de Sinaloa, 2016), has the support of its 40 educational programs enrolled in the Quality Postgraduate National Program (PNPC), its Technology Transfer Office and the 1,849 national and international agreements signed with various institutions, in addition to the 217 academics registered in the National System of Researchers.

The subject of scientific research is becoming more and more interesting every day and that is why the UAS has programs that aim to encourage, promote and support the development of high-level scientific, technological and humanistic research in all areas of knowledge, in the various schools, faculties, centers and institutes.

2.3 TECHNOLOGICAL INNOVATION PARK OF THE AUTONOMOUS UNIVERSITY OF SINALOA

The various tasks that this HEI performs, in addition to the services it offers, as well as the solid links it has with different and numerous organizations of society, at a national and international level,

allow it to have the experience, technical resources and trained human capital necessary to operate a science and technology park (PCT), the Technological Innovation Park (PIT).

The PIT is a promoter of the triple helix model (Government-university-industry), made up of 19 professionals who belong to different areas of knowledge, located in ad oc laboratories such as design and modeling, mobile computing, automation and control, data engineering, bioinformatics and geomatics laboratory, prototype workshop, motion capture, training classroom, educational technology laboratory, electronics and a large space for the development of projects, in which services are offered such as: advice provided by specialized researchers, innovation for companies, incubation of technology-based companies, scientific and technological development, research and dissemination, technology transfer, intellectual property management, university technological modernization and training.

3 ANALYSIS AND INTERPRETATION OF RESULTS

Since its inauguration, the PIT-UAS has made an effort to develop innovative projects that generate a positive impact, the evolution of the amount of project development can be seen in table 1, where the projects that have been worked on are specified, during 2015, 8 projects were developed, of which five were continued during 2016, in addition to this, in 2016, 14 more were developed.

Table 1 PIT-UAS projects per year

2015 (8)	**2016 (14)**
• Connected Mexico Project • Training in Applied Computing for the Companies of the Sinaloa IT Cluster Organization. • Generation of Pulses for the Transmission of Ultra Wide Band Signals by Optical Fiber • Automation System for the Plastic Material Recycling Process for 3D Modeling and Printing (continues in 2016) • IMOC, Development of an Operations Center for Infrastructure Management in Critical Rooms • Decision Support System (satd) for the Control of Viruses Affecting Chile Crops (Capsicum Annuum L.) in Sinaloa (continues in 2016) • Development and Creation of 3D Printers at Low Cost (continues in 2016) • Comprehensive Ecological Model for the Implementation of Sustainability and the Internet of Things in Urban Complexes: Smart Eco-Park PIT-UAS (continues in 2016)	• 3Comprehensive Ecological Model for the Implementation of Sustainability and the Internet of Things in Urban Complexes: Smart Eco-Park PIT-UAS (continuation, project started in 2015) • Internet of Things: Design of Data Protocols • Solar Motorhome • Control of Multisensory Luminaires for Smart Cities • Smart Parking • Automation System for the Plastic Material Recycling Process for 3D Modeling and Printing (continued, project started in 2015) • Drone Detector and Treater of Pests and Diseases in Crops • Interdisciplinary Bioinformatics Research Group • Development and Creation of Low Cost 3D Printers (continuation, project started in 2015) • Wind Tree • Information System for the Early Detection of Pests and Diseases in Agricultural Crops, through the Processing of Images Captured by Drones and Associated with a Traceability Platform • Innovation and Development of Devices and Systems for Energy Saving and Efficiency in Drinking Water Operators. • Platform for the Detection of Diseases of the Musculoskeletal System and Quantification of Physical Activity in Patients in the Rehabilitation Process

	• Development of a Portable Device for Evaluation and Phototreatment of Skin Conditions Produced by P. Acnes. • Design and Implementation of an Intelligent System for the Control of Viruses that Affect Chile Crops (Capsicum annuum L.) in Sinaloa (continuation, project started in 2015) • Comprehensive System to Increase Security in ATMs and Reduce Attacks and Robberies on These Devices • Comprehensive Technological Platform to Increase the Competitiveness of the Agricultural Industry Through the Use of Drones • LEED certification of the Technological Innovation Park building • Science, Technology and Innovation Camp (TecnoCamp)

For 2017, project proposals have been prepared with funding from the National Science and Technology Council (CONACyT), since its calendar includes open calls and/or calls in the evaluation process during the first months of the year.

Throughout the year, work continues to attend calls financed by other institutions with which it has previously participated, such as INADEM, PEMEX, SAGARPA, among others.

Table 2 shows a concentrate of the number of proposals, the call attended and the institution that finances, so far this year.

Table 2 Work proposals for the first half of 2017

Call	**Financing institution**	**Number of proyects**
Incentive Program for Research, Technological Development and Innovation 2017 (PEI 2017)	CONACyT	21
1Complementary Support f1or the Establishment and C2onsolidation of National La5boratories CONACyT 2017.	CONACyT	1
Program to promote scientific and technological vocations in Mexican children and youth.	CONACyT	1
Support for the strengthening and development of scientific and technological infrastructure 2017. (Infrastructure 2017)	CONACyT	2
Program for the Promotion and Support of Research Projects (PROFAPI-2015)	UAS	5

The PIT-UAS clearly shows a joint work between the entities that compose it, because although it is true the theory says that collaborative work is necessary to develop innovation, this is an example that it is fulfilled.

The findings also manage to concatenate with what Porter points out in the article: Location, Competition, and Economic Development: Local Clusters in a Global Economy, due to in the State of Sinaloa, one of the economic sectors that contributes the most to its GDP is the countryside, and if we analyze the projects that are developed in the PIT-UAS, these are mostly concentrated on improving the competitiveness of the products of the primary sector.

The foregoing allows us to demonstrate what Porter himself recommends in his book on comparative advantage: nations must find a way to increase the value of their goods and services so as not to be left alone in the comparative advantage they possess, that is, they need the intervention of the man so that this can be achieved, therefore, it would derive in the so-called competitiveness that is what is intended to be achieved.

4 CONCLUSIONS

The joint work that has been carried out so far in the PIT-UAS is evidence that regional development and economic growth can be achieved efficiently with the creation of collaboration centers that allow the ideas that many people have in mind and that these are a reality that can trigger innovations that ultimately result in the generation of quality jobs with competitive salaries that would allow a better quality of life for the citizens of the region.

Although it is true that Mexico is not so favored in the global competitiveness table, the actions that it is taking to reverse this are being carried out and one of the strategies for this is the creation of technology parks.

REFERENCES

Emprendedor, I. N. (agosto de 2016). INADEM. Obtenido de https://www.inadem.gob.mx/sectores-estrategicos-por-estado/sinaloa/

Foro Consultivo Cientifico y tecnologico, A. (2014). Diagnostigos Estatales de Ciencia, Tecnología e Innovación 2014. Ciudad de México.

Geografía, I. N. (agosto de 2016). INEGI. Obtenido de http://www.beta.inegi.org.mx/app/areasgeograficas/?ag=25

Gibson, D. V., & Naquin, H. (2011). Investing in innovation to enable global competitiveness: The case of Portugal. Technological Forecasting & Social Change, 1299-1309.

K.C., J., S.S., C. B., & Batchuluun, S. A. (2016). Exploring the influence factors for creation one knowledge hube of science park: comparison between silicon valley and hsinchu science park. technology management for social innovation, 1156-1171.

Keld Laursen, A. S. (2004). Searching low and high: what types of firms use universities as a source of innovation? DRUID Working Paper, 3-16.

Leal, A. O. (2016). Factores explicativos de la competitividad en la empresa de manufactura: caso Navojoa, Sonora. Estudios de desarrollo regional en México.

Mike Buesa, M. M. (2002). Los sistemas regionales de innovacion en España. Innovación regional, 347-364.

Porter, M. (1991). La ventaja competitiva de las naciones. Buenos Aires: Javier Vergar.

Porter, M. (2000). Location, Competition, and Economic Development: Local Clusters in a Global Economy. Economic Development Quarterly, 15-34.

Universidad Autónoma de Sinaloa (abril de 2016). Obtenido de http://sau.uas.edu.mx/pdf/3er_Informe_UAS_2015-2016.pdf

Vásquez Urriago, Á. R., Barge Gil, A., Modrego Rico, A., & Paraskevopoulou, E. (2014). The impact of science and technology parks on firms'.

Yun, S., & Lee, J. (2013). An innovation network analysis of science clusters in South Korea and Taiwan. Asian Journal of Technology Innovation, 277-289.

Zawdie, C. M. (2008). Science parks and University Industry collaboration in Malaysia. Technology & Strategic Management, 727-739.