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PIIT Monterrey: Collaborative Solutions for Expanding the Innovation Ecosystem

Parallel Session 4
"Innovation support services: thoughts in action"

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EXECUTIVE SUMMARY

The Research and Technology Innovation Park (PIIT) represents by itself a consolidated innovation ecosystem, and uses collaboration to boost the impact and the reach of support mechanisms to accelerate the process of innovation, technology transfer and the creation of new tech-based companies. However, given the increasing number of its residents and the changing environment of the R&D field, the PIIT, managed by the Institute of Innovation and Technology Transfer (I2T2), the organism responsible for the development of a collaborative environment in the PIIT's ecosystem, had to find new ways to effectively address the needs of its tenants. Some of these strategies are to partner with the current residents, benefiting from their location and proximity with other R&D centers to make the most out of its facilities, capacities and human talent, and the creation of new physical spaces for networking.

INTRODUCTION

The PIIT is considered worldwide as an effective node for open innovation. Within the PIIT, there are 29 public and private R&D centers full operational developing projects in the State's strategic areas, allowing the creation of new knowledge and its transfer to the productive sector. There are also 2 high-tech incubators doing collaborative work with other R&D centers at the PIIT to provide services and assist entrepreneurs to create new products and processes (Figure 1).

University centers	Public centers	Private centers	Incubators
UANL, Center for Research, Innovation and Development in Engineering and Technology, CIIDIT	Nuevo Leon's Water Institute, IANL	Arris (Motorola)	Nanotechnology
ITESM, Center for Innovation and Strategic Development of Products, CIDEP	CINVESTAV, IPN's Center for Research and Advanced Studies (2 units)	Pepsico – Gamesa	Biotechnology
Texas University, Global Center for Innovation and Entrepreneurship, CGIE	Center for Research in Advanced Materials, CIMAV	Sigma Alimentos	Information Technologies
UDEM, Research and Technological Development Center for Packaging and Identification Technologies, ABRE	Engineering and Industrial Development Center, CIDESI	Monterrey IT Cluster/ LANIA	Alternative Energies (Concept stage)
ITNL, Research and Technological Innovation Center	Center for Research and Assistance in Technology and Design, CIATEJ	PROLEC – GE	
UNAM, Chemistry School	Electric Research Institute, IIECM	VIAKABLE	
UNAM, Engineering School	Center for Research in Science and Higher Education, CICESE	Katcon	
UNAM, Engineering Institute	Research Center in Math, CIMAT	METALSA	In operation
UANL, Biotechnology and Nanotoxicology	Research Center in Applied Chemistry, CIQA	CAINTRA	Under construction
Data Center UANL		Schneider Electric	
		ANCE	
		COPAMEX	
		Automotive Cluster	
		SunPower	
		CEMEX	
10	10	15	4

Figure 1. Residents of the Research and Technology Innovation Park, PIIT.

The innovation ecosystem constituted by the PIIT and its residents is the source of employment for more than 2,800 people, including researchers and technicians. This ecosystem promotes synergy between universities, public and private R&D centers and companies, with the support of the State and Federal Government to create different kinds of infrastructure and support instruments and services for its tenants, focused on specific strategic areas (Figure 2).

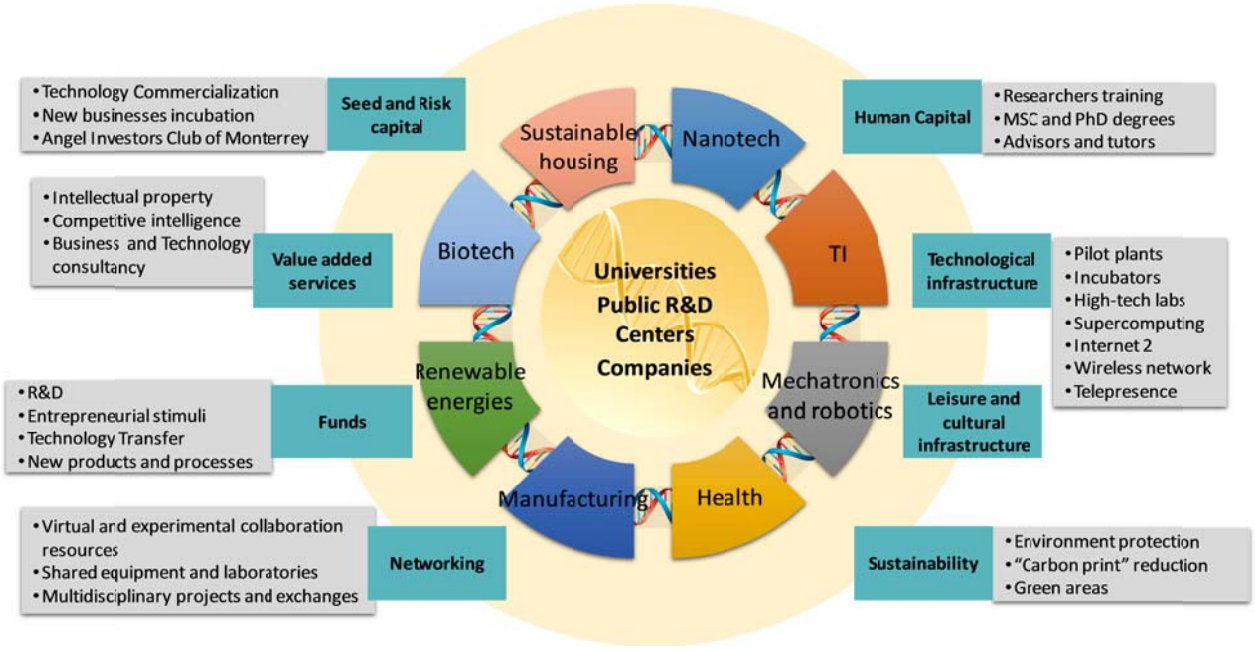

Figure 2. Model of the Research and Technology Innovation Park, PIIT.

The PIIT's model is well related and preserves the same focus of the State's Innovation Ecosystem, that contains legal, budgetary, strategic and institutional frameworks that ensure its long-term development and implementation, supporting 13 strategic clusters and focusing on building up and strengthen the 4 key capacities defined by the model (Figure 3):

1. Capacity to Develop Talent. It's the state's capacity of strengthen and reviewing its higher education institutions for MSc and PhD programs in several knowledge fields adjusted to educate the scientists and technicians for the strategic economic and social development of the region.
2. Science, technology and innovation infrastructure capacity. It includes the physical resources such as laboratories, equipment, pilot plants and experimentation facilities, which are critical for the R&D projects.
3. Capacity to generate R&D projects. This component is referred to the duty of creating knowledge through a portfolio of R&D projects which should be relevant, high quality, feasible and value generating for the economy and society of that region.
4. Capacity to develop tech-based companies. It's the ability to transform the scientific-technological knowledge in new businesses generating jobs, goods and high value services.

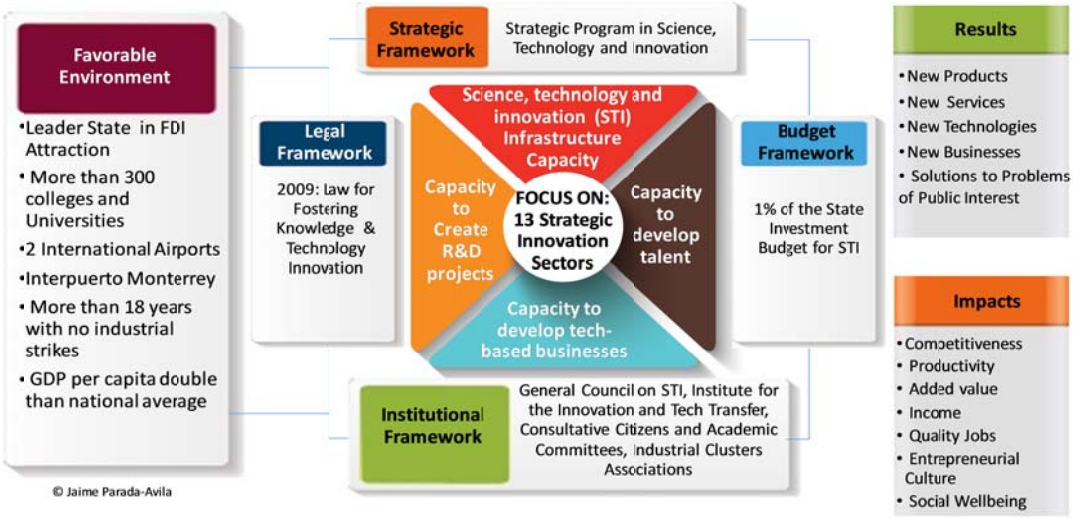

Figure 3. Nuevo Leon's Innovation Ecosystem.

Since the beginning of its operations in 2007, the PIIT's R&D centers have submitted over 550 applications and been granted close to 180 patents. The researchers at PIIT have also published more than 220 scientific papers and generated more than 300 projects linked with institutions both inside and outside the park.

Unlike the PIIT, the first science and technology parks created were usually owned by universities and were oriented to support big companies. Also, some of them had manufacturing activities[103]. The PIIT, on the other hand, is managed by the I2T2, the government agency in charge of science and technology policies in the state of Nuevo Leon, as a trust devoted solely for research and innovation activities. The only manufacturing allowed inside the R&D centers at PIIT is at pilot scale, and even though most of the private R&D centers belong to large companies, the I2T2 and the PIIT have mechanisms to support not only large companies, but also entrepreneurs, start-ups and SMEs in the incubator space.

These companies, the SMEs, are "the backbone of economies", but face some disadvantages in comparison with large, well established companies, becoming unattractive to financial services or advice providers and hence, they innovate less and are more likely to fail[104]. According to the National Registry of Institutions and Businesses in Science and Technology, RENIECYT, the State holds more than 7% of the SMEs and 14% of the large companies of Mexico registered as organizations with R&D activities[105]. At federal funding levels, there are several programs that SMEs can access to develop their innovation capabilities, partnering with public and private Universities, R&D centers and utilizing existing infrastructure installed in the park to improve their productivity and competitively enter the market with new products. There is empirical evidence that shows science parks providing organizational services encourage innovation among its residents more effectively than parks that only provide physical space[106], and that

[103] OECD (2011) "Policy instruments for regional innovation", in Regions and Innovation Policy, OECD Publishing, Paris. DOI: http://dx.doi.org/10.1787/9789264097803-10-en
[104] Idem
[105] National Registry of Institutions and Businesses in Science and Technology, RENIECYT (2016) http://148.207.1.115/siicyt/reniecyt/inicio.do
[106] Fukugawa, Nobuya, (2006). Assessing the Impact of Science Parks on Knowledge Interaction in the Regional Innovation System. Available at SSRN: https://ssrn.com/abstract=909464 or http://dx.doi.org/10.2139/ssrn.909464

the main role of the parks nowadays should be to develop the social capital necessary to boost entrepreneurship[107]. Therefore, as the value creation of the park PIIT has increased with the number of residents, and given the lean structure of the I2T2, we've had the need to search for more effective and smarter ways to create networks between the R&D centers at the PIIT with the industrial and technology-based companies in the region. One of these strategies is to partner with the current tenants, benefiting from their networks, location and proximity with other R&D centers. This strategy has been working in three areas mainly:

1) Networking and linking industry-R&D centers
2) Biotechnology and agri-businesses
3) Nanotechnology

Where I2T2 has been building partnerships that benefit the SMEs and large companies that use the incubation facilities at PIIT in the areas of nanotechnology and biotech mainly.

METHODOLOGY

1. Networking and linking industry-R&D centers

CAINTRA, the Manufacturing Industry Chamber of Nuevo Leon, has more than 4,000 members and the mission to represent, promote and serve the interests of the industrial community of the state in a wide variety of subjects, including competitiveness and innovation. CAINTRA's Technological Liaison Center, CVT by its name in Spanish, it is located at the PIIT and has been strategic in looking for ways to making inroads in connecting the research made at the centers with the needs of the industry and the SMEs in the region.

Through the CVT, it has been possible to sign more than 10 agreements between the productive sector and R&D centers and universities at PIIT to develop collaborative R&D projects. This has been possible through two main ways:

- As a business organization, CAINTRA's CVT is in a position that can contribute to the promotion of technological innovation connecting different industry sectors within themselves and the research centers, aiding in the assembly of teams composed of multidisciplinary experts that can effectively translate R&D results to innovation.
- CAINTRA's CVT can play a role as a broker or a commercialization agent for the new technologies, products and processes being developed in the R&D centers at PIIT, since they have the capacity to detect innovation among its members and many other companies, which can create value for their stakeholders, either licensing the new technologies or creating startups that can complete the local supply chain.

They are registered as a Technology Transfer Office at national level, working closely with the Center for Global Innovation and Entrepreneurship (CGIE) of the University of Texas, also at PIIT. CGIE is another partner of I2T2 which focuses on technology transfer and was an essential participant in the creation of an incubation model for the high-tech incubators within the PIIT. The center teaches one of the graduate programs of the PIIT, MS in Science and Innovation Commercialization, with 202 graduates and 7 generations to date.

[107] Hansson, Finn; Husted, Kenneth & Vestergaard, Jakob (2005). Second generation science parks: from structural holes jockeys to social capital catalysts of the knowledge society Technovation, Volume 25, Issue 9, September 2005, Pages 1039-1049

2. Biotechnology and Agri-business

Along with CAINTRA's CVT, the PIIT's ecosystem benefits from the collaboration of the I2T2 with other R&D centers and organizations to offer services and mentoring to the companies and entrepreneurs that want to develop new products using the facilities of the high technology incubators at PIIT. Such is the case of the collaboration with the Center for Research and Assistance in Technology and Design, CIATEJ, the Biotechnology Cluster of Nuevo Leon and the Biotech incubator managed by the I2T2.

CIATEJ's scope is to do R&D activities, provide technological services and to train high level human capital. The center is recognized by its collaborative work between its 5 units all over the country, and by the creation of networks that allow entrepreneurship, creativity and technological innovation through linked projects with the industry and other R&D centers. It has developed more than 50 linked projects in the areas of Industrial Biotechnology, Food Technologies and Environmental Technologies, among others, and has been granted 35 patents and has 111 in process. More than one third of these linked projects and patents belong to the Monterrey unit, inside the PIIT. This R&D center has a pilot plant to develop new products having more value added for the citric industry, partnering with FRUTECH, a SME that has a supply chain of small producers in the south of the State that benefit from the techniques and processes develop by CIATEJ. They have worked on the process of obtaining and purifying essential oils and other value added products from citric fruits waste, among other things.

The Biotechnology cluster of Nuevo Leon, has moved his offices at the biotechnology incubator at PIIT, in an effort to bring their associates and their projects to work more closely with the universities and R&D centers, using the infrastructure at the incubator to bring to life spin offs and startups that will create strong supply chains to develop this new sector of the economy for the State. The Biotech incubator has been certified as a high impact incubator by the Mexican Institute of the Entrepreneur, (INADEM), so it can access funds to support the development of business plans and technical assistance for the entrepreneurs and the member companies of the cluster. The cluster has the affiliation of more 20 companies and 4 universities public and private, and is promoting the entrepreneurship through awards and grants with the help of the federal and state government. There are already 6 startups resulting from this alliance incubating at PIIT. Not only the entrepreneurs benefit from the technical assistance of CIATEJ, but they have a link already through the cluster with the possible buyers of their products.

3. Nanotechnology

I2T2 has partnered with the Center for Research in Advanced Materials, CIMAV, Tec de Monterrey and the Nanotechnology Cluster of Nuevo Leon to develop this emerging industry sector in Nuevo Leon, using the installations of the Nanotechnology incubator to start up the new companies that can help to revitalize the manufacturing industry or create a new business niche through nanotechnology and nanomaterials.

CIMAV promotes technology commercialization and encourages institutional collaboration for the development of research projects and technological innovation. The center has developed more than 180 projects linked with the industry and addressed to specific needs of companies and R&D centers both inside and outside the PIIT. Aware that the development of human capital at higher level of education increases productivity, especially in high intensity environments[108], such as the PIIT's ecosystem, the I2T2 and CIMAV, among the other public R&D centers within the PIIT are committed

[108] Chang, Ching-Fu; Wang, Wang & Liu, Jin-Tan (2016). Knowledge spillovers, human capital and productivity, Journal of

with the development of more specialized human capital through its 9 MS and PhD programs. CIMAV, for example, teaches 2 MSc and 2 PhD programs in Material Science, Nanotechnology and Commercialization of Innovation, with more than 37 graduates to date.
The agreement with Tec de Monterrey is still being put in place, as both I2T2 and Tec de Monterrey have agreed to join resources to develop new businesses based on nanomaterials and nanotechnology. Tec de Monterrey, one of Latin America's largest universities, established in 2014 a formal relationship with the Massachusetts Institute of Technology (MIT) to bring students and faculty from Mexico to Cambridge for fellowships, internships, and research stays in MIT labs and centers, focusing on research at the frontier of nanoscience and nanotechnology. The Nanotechnology incubator will serve as the platform to bring some of those research results into innovation that reaches the market. To date, the incubator hosts 4 companies focused on advanced materials, health and cosmetic industry.

With the help of these R&D centers, the Nanotechnology incubator have also developed more than 50 projects linked with the industry and with other centers and entrepreneurs. Both the Nano and Bio incubators create new companies, but also support the SMEs and other existing companies to develop prototypes and optimize processes that help them to create new high added value products more efficiently and increase their competitiveness.

The Nanotechnology cluster has an agreement with the Nanotechnology incubator to lease its facilities in exchange of the promotion of the Incubator's services among the cluster members and its collaboration in the research projects and events the Incubator works on. There is a similar agreement between the Biotechnology Incubator and the Biotechnology cluster.

CONCLUSIONS

The I2T2 and the PIIT are not alone in making efforts to promote the science and engineering careers among the students of the local universities and innovation in the companies located in Nuevo Leon and the region. The resources dedicated to these tasks have been more than doubled with the collaboration of clusters, R&D centers and universities located at the park. This year two new projects are underway, that we hope they will be built into programs next year.

The project "Research summer at PIIT" offers to BSc students the possibility of making an internship at one of the R&D centers located at the PIIT during 4 to 6 weeks, working directly with the researchers and developing activities in a specific subject. The first stage and pilot of the project will take place during summer of 2017. There are already 15 research projects available for this first stage and the expected outcome is that we will more than double the project next year and to boost the research careers in Nuevo Leon with this type of programs.

Another effort to bring students, R&D centers and companies to work together solving the demands of the industry, will be experimented in an open innovation and patent writing project through the interaction of 40 BSc students, 10 researchers to help at least 2 companies interested in using nanotechnology and biotechnology in their processes and products. The students will be given an insight on the companies' processes and products, and they will be asked to work in groups with at least a researcher and a patent agent to look for new ways in which nanotech and biotech can help the companies be more competitive.

Macroeconomics, Volume 47, Part B, March 2016, Pages 214-232, ISSN 0164-0704,
https://doi.org/10.1016/j.jmacro.2015.11.003.

The I2T2 is also in the process of building a Center for the Promotion of Innovation and Dissemination of Science and Technology inside the PIIT. This Center will work as a hub for open innovation among the R&D centers at the park, and will have new spaces for meetings, conferences and scientific events available for the residents of the PIIT, enhancing the existing collaborations and allowing the creation of new joint projects. These kinds of physical spaces are becoming a new strategy to overcome the complex current innovation systems[109]; common areas create more accessibility, proximity and visibility, and thus boost the frequency of interactions between the users[110], in this case, the researchers and personnel working at the PIIT and all the actors of the innovation ecosystem, and provide new ways of networking.

The PIIT has attracted both global and local companies as well as public R&D centers and universities. The park facilities take advantage of world class technology infrastructure for research, telecommunications such as telepresence, virtual networks, and multiple meeting points for work or recreational, to encourage teamwork and the realization of multidisciplinary projects.

We are constantly looking for strategic alliances with universities, clusters and other international organizations to create new forms of collaboration that strength the innovation ecosystem of the state, in the form of joint projects, dual MSc and PhD programs and incubation of binational new companies, for example. These possible alliances are promoted through the more than 80 annual visits to PIIT from other countries' universities and companies, that have resulted in more than 90 signed agreements of the R&D centers inside the PIIT.

Nuevo Leon is recognized as a state driven by entrepreneurship and innovation. PIIT serves as a regional pole for open innovation, linking the centers at the park with the more than 70 public and private R&D centers in the state, and more than 300 colleges and universities to establish partnerships that result in the development of new products and services.

[109] Colobrans, Jordi (2010) Usuarios activos, living labs e innovación abierta. El caso del citilab de Cornellà. X Spanish Congress of Sociology. Pamplona, July 1 – 3rd of 2010

[110] Toker, Umut & O. Gray, Denis(2008) Innovation spaces: Workspace planning and innovation in U.S. university research centers, Research Policy, Volume 37, Issue 2, March 2008, Pages 309-329, ISSN 0048-7333, https://doi.org/10.1016/j.respol.2007.09.006