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A first approach to an indicators theoretical proposal to assess the contribution to Mexico's competitiveness made by the Innovation and Knowledge Transfer Network through the strengthening of scientific-technological capabilities and applied research projects

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Executive Summary

The importance of science and technology parks (STPs) for developing countries relies in the fact that, given such nation's socioeconomic environments, the impact of such institutions could be greater and its contributions could significantly improve knowledge economy and innovation environments. Developed countries' STPs are leaders in many aspects related to performance and impact, also in the matter of assessing related data; but, so far, the lack of consensus on which is the best way to evaluate parks and the lack of information (quality and quantity) still being constants. Based on previous international indexes, in this article is expounded a proposal of indicators to measure the performance and impact of a Mexican STPs network, an important instrument so that the government and the private initiative can actually function as a triple helix with universities in our country, improving public policies and linkage methods to foster national STPs.

The variety of systems of innovation and measuring of the research and development (R&D) in developing countries can be appreciated within the systems themselves (institution, sector and region), as much as in the international level. Having said that, despite the increasing relevance of developing countries on R&D's world outlook, there is a lack of homogeneous indicators that allow to objectively compare the diverse science and technological parks (STPs) during their different functioning and maturity stages, as well as to accurately assess their results, performance and impact; this is an insufficiency originated by the feeble cooperation among research institutions, universities, enterprises and the three governmental levels to solve this and other STPs problems.[1]

Nevertheless the above, there are indexes that permit to have an outlook of the situation that science, technology and innovation (STI) present in Latin America and the world, methodological approaches that are the base to perfect new indicators able to give a more accurate, reliable, updated and complete reading of the current context. For example, the level of use information and communication technologies (ICTs) have can be measured, ICTs are a transverse axis that allows to increase gains in productivity and even in other relevant aspects for society, acting as a vectors of social development and transformation by improving access to basic services, enhancing connectivity, and creating employment opportunities.

In this sense, we can start an analysis on the 2015 Global ICT Report, which precisely studies the use and exploitation of ICTs. According to this study, some countries in Latin America and the Caribbean (LAC) have a high level of usage, even over more developed States. Chile and Barbados respectively occupy 38th and 39th positions, while Mexico is placed in 69th overall (and 6th regionally). It is worthy distinguishing that, despite having shown improvement in the last measurement, our country continues lagged behind other nations.[2]

Another indicator that provides valuable information in the regard is the amount of researchers residing in the developing countries, which increased the last decade (in 2002 was 30%, by 2007 it reached 38%). But such growth has an unequal distribution, as China is the generating economy of two thirds of that increase; this means that the rest of the developing countries should strengthen their efforts to generate an increase of this index. In Mexico, the researches dedicated to R&D (per million of people) in 2011 were barely 386, which placed our nation in the 13th position of the 247 countries, according to World Bank indicators (this study shows lacking information of a considerable number of countries, we could have a more objective comparison if in the future we can have that data).

In LAC, STPs are considered as instruments to generate a knowledge-based and sustainable economic development in long term, tools that help to solve the demand of technology and specialized human capital. And, on the understanding that providing infrastructure and services is not enough to achieve economic improvements, in this article a linkage and interaction methodology of national STPs is proposed, one that works through national universities of quality belonging to the public sector.[3] Although, in order to both leverage and prove the impact of such STPs in our country, first, it is necessary to evaluate these institutions' particular reality, their circumstances and environment; afterwards comes the assessment of their impact in local, regional, national and international knowledge economies and innovation ecosystems.

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[1] Information taken from *Medición de la investigación y el desarrollo (I+D): desafíos enfrentados por los países en desarrollo* [online PDF], consulted in the United Nations Organization for Education, Science and Culture page on spanish. Availabe at: <http://www.uis.unesco.org/Library/Documents/TechPaper5_RD_SP_finalwc%20(2).pdf>; date of consult: September 30th, 2015.

[2] Information taken from *Global Information Technology Report 2015,* by Soumitra Dutta, Thierry Geiger, Bruno Lanvin consulted in World Economic Forum portal. Available at: <http://reports.weforum.org/global-information-technology-report-2015/>, date of consult: October 28th, 2015.

[3] Liagouras (2010) quoted in *Los parques científicos y tecnológicos en América Latina. Un análisis de la situación actual* [online PDF], by Andrés Rodríguez-Pose, consulted in the Inter-American Development Bank portal access to network and applications on spanish. Available at: <http://idbdocs.iadb.org/wsdocs/getdocument.aspx?docnum=37017319>; date of consult: October 30th, 2015.

Therefore, with the aim of helping to reduce the existent gap in the matters of productivity, socioeconomic wellness and capacity for scientific-technological innovation between the developing and developed countries, the Autonomous University of Sinaloa (UAS, Universidad Autónoma de Sinaloa), through its Technological Innovation Park (PIT, Parque de Innovación Tecnológica), is part of the Innovation and Knowledge Transfer Network (RITC, Red de Innovación y Transferencia de Conocimientos), in collaboration with five of the best higher education institutions (HEI) in Mexico.

This synergy between universities will make possible that interdisciplinary and collaborative projects to be develop not only solve regional necessities, but also increase their impact and attend national needs. The general objectives of this network are based in the five objectives presented in the World Economic Forum's Competitiveness Index: *1)* to contribute so by 2018 the science, technology and innovation (STI) investment increases to 1%; *2)* to strengthen the scientific and technological infrastructure; *3)* to strengthen the regional devolvement; *4)* to strengthen the linkage with the productive sector; *5)* to train and strengthen the highly qualified human capital.

During the first stage, already ongoing, it is contemplated the impartation, in the member universities, of training and diffusion campaigns about the reach and impact of STPs, as well as relating to innovation and intellectual property. This, with the purpose of preparing human resources and generating a normative environment, so afterwards can be fostered the creation of STPs in each one of these universities, making the most of their capabilities on R&D and applying them on the solution of regional problems, but at the same time jointly working in order to make synergy and attend country's necessities.

It is foreseen to start a second stage, which will have as main objectives: getting the recognition by the National Council of Science and Technology (CONACYT, Consejo Nacional de Ciencia y Tecnología), continuing with the professionalization of the network's collaborators as linkage and technology transfer managers, as well as sharing knowledge and experiences with other HEIs. An element to highlight is the implementation of activities focused on the internationalization of the network, having as basis the results of specific studies on linkage, innovation and knowledge and technologies transfer.

With respect to the usage of STPs as instruments for the generation of a sustainable and knowledge-based economic growth in the long term, within emergent environments this has a predicament constituted by: technology demand, business spirit, limited tradition of investing on research and promoting innovation, besides the excessively regulated economic and institutional ambiance, which is more exposed to distortions and uncertainties.[4] The brief presentation of the methodology described in this article attends precisely such problems, even more so, considers the aspect of projects' financing in the framework of promoting private investment for the development of applied research projects. In addition, this pages include a proposal of indicators to assess the results, the performance and the impact of the STPs that conform the RITC.

In the particular case of Mexico, there are already public policies for this matter, in which is considered the participation of public and private HEIs, to implement the triple helix model. In such measures stands out funding for applied research projects, to deal with:

a) specific necessities of the private initiative, funded by both the enterprises and the CONACYT (federal Government);
b) needs of the scientific and technological development of municipal and state Governments, with the joint contribution of the CONACYT and the project's user government;
c) requirements of federal Government's sectors in order to promote the development of scientific and technological capabilities for their own benefit.

[4] Information taken from *Los parques científicos y tecnológicos en América Latina. Un análisis de la situación actual* [online PDF], by Andrés Rodríguez-Pose, consulted in the Inter-American Development Bank portal access to network and applications on spanish. Availabe at: <http://idbdocs.iadb.org/wsdocs/getdocument.aspx?docnum=37017319>; date of consult: September 28th, 2015.

Thus, within the context of all the aforementioned, it is relevant to emphasize that the RITC constitutes a tool that will allow to strengthen the obtained results of applied research activities, innovation and technology transfer, thanks to the creation and strengthening of Mexico's STPs culture, considering the obstacles they usually confront and under the premise that it is not enough to count with sufficient infrastructure and services provision, since it is required to establish trust networks with other universities, and mainly with the private initiative, so the annual amounts for applied research development can be significantly increased.[5]

1. The STI and STP indicators scene[6]

All over the world, ranks to measure the impact of STPs include indicators meant to investigate information related to STI, which is a subject with numerous updated studies based on even more than fifty years of data,[7] in contrast to what is available on STPs. Proposals of methodologies and indexes to assess STPs impact on economy growth have been made (and have increased in the last three lustrums), some are bound to evaluate countries or international regions, and others pretend to measure the impact on an international level. Despite such significant contributions, authors involved in this two types of indexes (STI and STPs) recognise that the «lack of good data on some of the most basic indicators… is truly alarming, as it can lead to misguided policies and misallocation of resources».[8]

In 2013, an article on empirical researches and proposed models of study in the matter of STPs, after analysing 81 papers, concluded that there are recurrent limitations: geographical-cultural context, the use of a same type of indicator to assess inputs and outputs, employment of approximated or substitutive variables and indicators, use of perceptions-based metrics, lack of historical data about PCTs, theoretical models that have not been yet empirically validated. The same paper classifies found research perspectives: quantitative, almost 31%; proposals of frameworks to evaluate or understand STPs' behaviour, 27%; case studies, around 22%; qualitative, almost 5%; scientific literature review, a little bit less than 3%; mixed, 18%.[9]

Having said that, according to the European Commission, there's no uniformity in STPs' success and potentials, because: «characteristics of the local economy, the local research base as well as the degree of local partnerships among public and private stakeholders are key components for their success».[10] If so, we believe that it is fundamental that any evaluation of STPs performance and impact considers such indicators.

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[5] Liagouras (2010) quoted in *Los parques científicos y tecnológicos en América Latina. Un análisis de la situación actual* [online PDF], by Andrés Rodríguez-Pose, consulted in the Inter-American Development Bank portal access to network and applications on spanish. Available at: <http://idbdocs.iadb.org/wsdocs/getdocument.aspx?docnum=37017319>; date of consult: October 30th, 2015.

[6] See **tables 01-04** in the **annexe 01**.

[7] There are publications from the Organisation for Economic Co-operation and Development like *Main Science and Technology Indicators* (1981 onwards) and *Measuring Innovation* (built on fifty years of indicator development).

[8] Soumitra Dutta, Thierry Geiger and Bruno Lanvin, «Executive Summary» of *The Global Innovation Index 2015, Effective Innovation Policies for Development* [online PDF], Soumitra Dutta, Bruno Lanvin and Sacha Wunsch-Vincent (editors), page XV, downloaded from The Global Innovation Index website. Available at <https://www.globalinnovationindex.org/userfiles/file/reportpdf/gii-full-report-2015-v6.pdf>; date of consult: April 7th, 2016.

[9] Gerardo Angulo Cuentas, Emilio Álvarez Suescun and Pablo Vera (2013), *Parques Científico- Tecnológicos (PCTs): Investigaciones empíricas y modelos propuestos para su estudio en la última Década* [online PDF], downloaded from the ALTEC 2013, Congreso Iberoamericano de Gestión Tecnológica website. Available at <http://www.altec2013.org/programme_pdf/867.pdf>; date of consult: April 6th, 2016.

[10] European Commission (2013), *Setting up, managing and evaluating EU science and technology parks. An advice and guidance report on good practice* [online PDF], downloaded from the European Commission official website. Available at

Huge differences exist among European and LAC STPs: for example, in LAC, there is no continental union to support STPs activities and neither for creation nor buildings investment nor anything else. These developing countries don't have a regional fund for development focused on innovation and research, but the bigger institution implementing policies at a continental level, the Inter-American Development Bank (IDB), which goal is helping to reduce poverty and inequality,[11] recognises the importance STPs have in achieving that goal.

In a 2012 study, the IDB found that «In less than 20 years it has gone from nothing to almost 150 parks in different development stages: functioning, implementation or project».[12] In spite of that growth: «Nevertheless the general great interest in STPs across Latin America, the implementation level enormously varies from one country to another».[13] Besides, LAC nations don't have national consolidated associations of STPs, neither strong quality nor accreditation mechanisms, and in scientific articles related to PCTs evaluation «stands out the absence of studies developed in Latin-American countries».[14]

In such LAC context, the field of STPs quality and accreditation standards definitely will be an area of opportunity once these parks reach the required maturity and career trajectory; meanwhile, LAC STPs should not be evaluated with the exact same criteria STPs placed in developed nations are being evaluated. Thus, regarding to performance and impact evaluation, there's a possible advantage in the current status of the LAC parks: since they're barely starting to emerge, they have the unprecedented opportunity of using existent case studies during the process of shaping their own indicators. But, clearly, these nations must never forget their particular reality.

The importance of having a proper methodology to evaluate LAC parks is that it could contribute to diminish the aforementioned possibility of having misguided policies and misallocation of resources, which is, of course, an essential measure in developing countries. In addition, these developing nations face the disadvantage of have started with the adoption of STPs during the last two decades of the twentieth century, about three decades after countries with developed economies and solid innovation ecosystems started. Thus, the elaboration of an *ad hoc* index could also imply having a better path to be followed by the LAC STPs, accurate, reliable and comprehensive, according to its reality, needs and potentials.

In the specific case of Mexico, within the governmental sector, the most recent available data about research and technological development corresponds to a survey made by the National Institute of Statistics and Geography (INEGI, Instituto Nacional de Estadística y Geografía) and the National Council of Science and CONACYT, based on 2010-2011 information and published in 2012.[15]

<http://ec.europa.eu/regional_policy/sources/docgener/studies/pdf/stp_report_en.pdf>; date of consult: April 6th, 2016.

[11] Inter-American Development Bank, «About us», information consulted on the official website. Available at <http://www.iadb.org/en/about-us/about-the-inter-american-development-bank,5995.html>; date of consult: April 10th, 2016.

[12] Andrés Rodríguez Pose (2012), *Los parques científicos y tecnológicos en América Latina: Un análisis de la situación actual* [online PDF], page 1, downloaded from the IDB official website. Available at <https://publications.iadb.org/bitstream/handle/11319/3132/Los%20parques%20cient%C3%ADficos%20y%20tecnol%C3%B3gicos%20en%20Am%C3%A9rica%20Latina%20%282%29.pdf?sequence=1>; date of consult: April 10th, 2016.

[13] Andrés Rodríguez Pose (2012), *Los parques científicos y tecnológicos en América Latina: Un análisis de la situación actual* [online PDF], page 17, downloaded from the IDB official website. Available at <https://publications.iadb.org/bitstream/handle/11319/3132/Los%20parques%20cient%C3%ADficos%20y%20tecnol%C3%B3gicos%20en%20Am%C3%A9rica%20Latina%20%282%29.pdf?sequence=1>; date of consult: April 10th, 2016.

[14] Gerardo Angulo Cuentas, Emilio Álvarez Suescun and Pablo Vera (2013), *Parques Científico- Tecnológicos (PCTs): Investigaciones empíricas y modelos propuestos para su estudio en la última década* [online PDF], page 3, downloaded from the ALTEC 2013, Congreso Iberoamericano de Gestión Tecnológica website. Available at <http://www.altec2013.org/programme_pdf/867.pdf>; date of consult: April 6th, 2016.

[15] INEGI, «Encuesta sobre investigación y desarrollo tecnológico y módulo sobre actividades de biotecnología y nanotecnología», 2012, consulted in the National Institute of Statistics and Geography portal. Available at:

The survey gives «information about human and financial resources destined, by enterprises and institutions, to research and technological development in productive, non-lucrative private, higher education and governmental sectors».[16]

Additionally, with the support of CONACYT and the Secretariat of Economy, a private enterprise dedicated to venture and private capital funding launched in 2013 the National Index of Innovation,[17] which makes an analysis of the top belonging to each of three categories. *Ciudad Juárez*, *Chihuahua* and *Culiacán*, *Sinaloa*.

The IDB's study states that many of the 35 Mexican parks identified in 2012 had their origin as «initiatives linked to universities, or even to faculties and departments of universities, frequently fruit of an initial dragging effect».[18] In 2014 was carried out the National Meeting «Present and Future of STPs in Mexico»,[19] an only event organized by the CONACYT and the CSO National Network of State Councils and Organisms of Science and Technology. By last, it is important to mention that, despite the existence of the National Network of Scientific and Technological Parks,[20] CONACYT's National Register of Scientific and Technological Institutions and Enterprises[21] and the National Survey of Linkages Higher Education Institutions-Productive Sector, and other organizations and instruments, so far, in our nation, there are no published studies on the matter of assessing Mexican STPs' results, performance and impact, not even an updated index or study with the precise amount of Mexican PCTs.

2. Innovation and Knowledge Transfer Network (RITC)

In highly developed nations like Sweden, USA or UK, the general advanced environment makes it hard for parks to make a difference;[22] meanwhile, in a lagging region with a mainly local competition, it would be advantageous for an enterprise to have a linkage with a STP.[23] These parks «contribute to innovation, taking as a starting point that a STP is not just a physical structure, but

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<http://www.inegi.org.mx/est/contenidos/proyectos/encuestas/establecimientos/otras/esidet_mbn/default.aspx>; date of consult: April 7th, 2016.

[16] INEGI, «Encuesta sobre Investigación y Desarrollo Tecnológico y Módulo sobre actividades de Biotecnología y Nanotecnología» [online PDF], 2012, downloaded from the National Institute of Statistics and Geography website. Available at: <http://www.inegi.org.mx/prod_serv/contenidos/espanol/bvinegi/productos/metodologias/ESIDET-MBN/ESIDETBN2012.pdf>; date of consult: April 15th, 2016. Author's translation of the quote.

[17] Venture Institute (2013), *Índice Nacional de Innovación* [online PDF], downloaded from the official website of the index. Available at <http://index.institute.vc/reporteINI.pdf>; date of consult: April 10th, 2016.

[18] Andrés Rodríguez Pose (2012), *Los parques científicos y tecnológicos en América Latina: Un análisis de la situación actual* [online PDF], page 29, downloaded from the IDB official website. Available at <https://publications.iadb.org/bitstream/handle/11319/3132/Los%20parques%20cient%C3%ADficos%20y%20tecnol%C3%B3gicos%20en%20Am%C3%A9rica%20Latina%20%282%29.pdf?sequence=1>; date of consult: April 10th, 2016.

[19] Red Nacional de Consejos y Organismos Estatales de Ciencia y Tecnología, A. C. (2014), «Se reúnen en Morelos especialistas nacionales e internacionales en materia de Parques Científicos y Tecnológicos», note available at <https://www.rednacecyt.org/se-reunen-en-morelos-especialistas-nacionales-e-internacionales-en-materia-de-parques-cientificos-y-tecnologicos/>, consulted on April 17th, 2016.

[20] Red Nacional de Parques Científicos y Tecnológicos' official website does not provide information further than 2013 and there is no updated information about activities nor members available online.

[21] The information provided in the official website of the Registro Nacional de Instituciones y Empresas Científicas y Tecnológicas does not especify how many of the 6,889 registered institutions are a STP. The statistical data is presented at <http://www.conacyt.mx/siicyt/index.php/estadisticas-del-reniecyt>; date of consult: April 15th, 2016.

[22] Ángela Rocío Vásquez Urriago *et alii* (2010), *The impact of science and technology parks on firms' radical product innovation. Empirical evidence from Spain* [online PDF], downloaded from the Industry and Innovation journal's DRUID Conference website. Available at <http://www2.druid.dk/conferences/viewpaper.php?id=501561&cf=43>; date of consult: April 7th, 2016.

[23] Alberto Albahari *et alii* (2013), *The influence of Science and Technology Parks' Characteristics on firms' innovation results* [online PDF], downloaded from Munich University Library's Munich Personal RePEc Archive website. Available at <https://mpra.ub.uni-muenchen.de/48829/1/MPRA_paper_48829.pdf>; date of consult: April 7th, 2016.

also constitutes an atmosphere that allows people to positively interact to generate a culture of innovation»;[24] but geographical proximity usually causes a disadvantageous competence for resources or contributions among STPs.

In a 2010 academic article that gathers information from Spanish STPs, it is pointed out that the establishment of local networks of innovators responds to the necessity of formatting strategic alliances more durable than the international ones; it is believed that «the element of uncertainty attached to the outcome of the innovation process is a factor that induces firms to search locally for competences».[25]

The Innovation and Knowledge Transfer Network (RITC, Red de Innovación y Transferencia de Conocimientos) supposes a favourable non-geographical proximity that likewise expects the exchange, the spillover and the dissemination that are inherent to geographical areas of innovation, thanks to the interaction among the professionals involved in the innovative projects to be jointly developed. This, with the objective of satisfying social, economic and business demands through the generation and transfer of knowledge made by means of activities belonging to the fields of basic and applied research, as well as technological development.

Through benefits like knowledge transfer, costs reductions, leverage experience and specialised formation of human resources in specific areas, strengthening of strategic economic sectors and creation of new ones, the RITC aims to help its STPs to become key components of the national innovation system. Additionally, the linkage and interaction methodology implemented by this network could be nationally and internationally adopted.

Given that the knowledge, part of the intangible assets, remains in the universities, clusters like the Mexican RITC could make the most of collective learning processes, which «involve the creation and development of common heuristics among territorial agents that allows them to tackle with arising technological and organizational challenges»;[26] as well as improving innovation system's efficiency rate, fostering the knowledge economy and increasing the country's productivity and competitiveness. One of the main objectives of this network is contributing to economic development, thanks to job creation and attraction of research activity and venture capital.

In 2015, with barely seven months of operations, the network designed and imparted the course Innovation Projects Elaboration (Tabasco), participated in the State Colloquium of Intellectual Property and Innovation (San Luis Potosí) and presented to the CONACYT 13 linked projects that will have impact in eight different Mexican states.

2.1. Member universities[27]

The RITC is constituted by six of the best HEIs in Mexico: Autonomous University of Sinaloa, Autonomous University of Hidalgo State, Autonomous University of San Luis Potosí, University of Quintana Roo, Juárez Autonomous University of Tabasco and Autonomous University of Ciudad Juárez (Chihuahua). The network is result of these universities' participation in the 2015 Intensive

[24] Daniel Ricardo Lemus Delgado, Miguel Ángel Montoya Bayardo and Mauricio Cervantes Zepeda (2015), «Los Parques Científicos Tecnológicos como espacios para la innovación: evidencias del Centro del Software en Guadalajara» [online PDF version], page 1, published in *Intersticios Sociales* magazine. Available at <http://www.redalyc.org/pdf/4217/421739502004.pdf>; date of consult: April 7th, 2016.

[25] Ángela Rocío Vásquez Urriago *et alii* (2010), *The impact of science and technology parks on firms' radical product innovation. Empirical evidence from Spain* [online PDF], page 3, downloaded from the Industry and Innovation journal's DRUID Conference website. Available at <http://www2.druid.dk/conferences/viewpaper.php?id=501561&cf=43>; date of consult: April 7th, 2016.

[26] Ángela Rocío Vásquez Urriago *et alii* (2010), *The impact of science and technology parks on firms' radical product innovation. Empirical evidence from Spain* [online PDF], page 5, downloaded from the Industry and Innovation journal's DRUID Conference website. Available at <http://www2.druid.dk/conferences/viewpaper.php?id=501561&cf=43>; date of consult: April 7th, 2016.

[27] The information about these six universities was provided by the same institutions, through a survey that was sent to them in order to have pertinent data for the writing of this paper.

Blended Learning University Leadership and Management Training Programme, supported by the German Academic Exchange Service (Deutscher Akademischer Austauschdienst).

4.1.1 Autonomous University of Sinaloa

Sinaloa is a north-western state, its population raises to almost three million of inhabitants, it has a privileged location where converge fertile prairies, mountain chains, abundant solar light, 1 sea and 11 rivers; also, a strategic situation with the markets of USA, Asia, Central and South America, thanks to its two deep seaports: Mazatlán and Topolobampo. The state houses a diversified touristic industry and world class agriculture, besides ICTs enterprises; such combination of sectors gives as a result an optimal ecosystem to foster business in state strategic economic sectors: logistics services, biotechnology, medical services, renewable energies and data science and engineering.

The Autonomous University of Sinaloa (UAS, Universidad Autónoma de Sinaloa) is a HEI that since its beginnings has been distinguished by the quality and suitability of its educational offer, same that allows this institution to help in the improvement of the state strategic economic sectors growth and also to make relevant contributions in biotechnology, agronomy, biology, chemistry, physical mathematics, ICT and electronics.

The UAS has 143,513 students in the whole state, served in 4 university campus (Culiacán, Guamúchil, Los Mochis and Mazatlán), 38 academic units, 56 high-school extensions and 106 libraries. This university counts on the support of 40 educational programmes inscribed in the National Programme of Quality Postgraduate Studies (PNPC, Programa Nacional de Posgrados de Calidad), a Bureau of Technology Transfer and 1,849 national and international conventions signed with diverse institutions, in addition to 217 academics belonging to the CONACYT's National System of Researchers (SNI, Sistema Nacional de Investigadores); 100 academic bodies (18 are consolidated, 39 are in this process and 43 are being formed).

This HEI has programmes oriented to foster and support the development of high-level scientific, technological and humanistic research. Example of this are the Research Projects Strengthening Programme, the Products Dissemination and Register Programme and the Promotion of Educative Research in High-School Programme. Product of these researches, up to 2015, the UAS has made 25 applications for patent registration before the Mexican Institute of Intellectual Property.

The diverse tasks this university accomplishes, in addition to the services it offers, as well as the solid linkages it has with different and numerous society organisms, both nationally and internationally, provide the university with the experience, the technical resources and the human capital that are necessary to operate a STP, the Technological Innovation Park (PIT, Parque de Innovación Tecnológica).

The PIT-UAS is a promoter of the triple helix model (government-university-industry) and is constituted by 19 professionals who belong to different fields of knowledge. At PIT-UAS' facilities can be found workshops, laboratories and areas such as Designing and Modelling, Mobile Computing, Automation and Control, Engineering and Data Science Laboratory, Bioinformatics and Geomatics, Prototypes Workshop, Motion Capture, Projects Development, Training Room, Educative Technologies Laboratory, Electronics Laboratory and Electronic Instrumentation, also Radiation Detectors Laboratory.

This STP offers services like: consultancy and specialized knowledge provided for the formulation of projects and the solution of specific necessities, innovation for enterprises, technology-based enterprises incubating, scientific and technological development, research and dissemination, technology transfer, intellectual property management, university technological modernization and training services.

Thus, during its brief period operating, the PIT-UAS has earned memberships to the National Network of Scientific and Technological Parks (June, 2014) and the International Association of Science Parks and Areas of Innovation (July, 2015); besides, the park belongs to the Innovation Network of the National Institute of the Entrepreneur (February, 2015), where is registered as high-specialization workshop.

4.1.2 Autonomous University of Hidalgo State

Hidalgo is a central eastern state and has a little more than two and a half million of inhabitants. Its strategic economic sectors are textile, agroindustry, construction materials and metalmechanics; in the future, it is expected to incorporate logistics services, tourism, automotive industry, energy sector and chemical products. The state counts on 81,570 economic units (2% of the national total), recruits 333,317 people (1.7% of the national total). The primary activities are agriculture, stockbreeding, forestry and fishing.

The Autonomous University of Hidalgo State (UAEH, Universidad Autónoma del Estado de Hidalgo) is a HEI with a student population that varies from about thirty thousand to forty thousand each academic cycle. The UAEH's core axis are constituted by 51 academic bodies, 91 lines of knowledge generation and application, as well as 236 SNI researchers and the 102 study programmes that form the institutional academic offer. In the UAEH is carried out 98% of state research, oriented to the state's strategic economic sectors. The university has 24 programmes of postgraduate studies that are part of the CONACYT's PNPC, 418 of the 997 papers published until 2013 were refereed, 61 books and 227 chapters have been published, 138 research projects were concluded and 201 are currently in development.

The UAEH's Scientific and Technological Park (PCYT, Parque Científico y Tecnológico) is held up by this HEI's strength and experience on R&D projects. Along the last years, the university has firmly supported high-level scientific formation and has linked scientific and technological research with postgraduate studies of excellence. Also, the STP has flexible and advanced management systems, part of an own management control platform and within international regulations of quality, safety and high efficiency.

In 2013, the first year of this STP, started the promotion of collaboration networks with Mexican Petroleums (Petróleos Mexicanos, PEMEX), through innovation and technological development; thus, was designed and implemented an experimental plant for the evaluation of petroleum ether's catalytic reformation catalysts, the first installed in America and the third in the world, after Holland's and Norway's.

The PCYT stimulates and manages knowledge and technology flux among enterprises and markets, propels innovative enterprises creation and growth via incubating and spin-off mechanisms, also provides other added-value services, as well as high-quality space and facilities. During the first stage, STP's resident enterprises and research institutions have access to: high-quality common areas, interactive and audio-visual classrooms, spaces for meetings and seminars, consultancy areas, legal advice and support, exhibition and linkage room.

4.1.3 Autonomous University of San Luis Potosí

San Luis Potosí is a central northern state, has about two and a half million of inhabitants, possesses a profitable location, given its proximity to the 3 most important Mexican cities, Mexico City, Monterrey and Guadalajara, as well as to 4 great deep seaports, Tampico, Altamira, Manzanillo and Mazatlán. The state's economic impact is due to several factors, such as tourism and industry; its location allows the fast shifting of products to almost any point of the Mexican Republic, which has boosted its strategic economic sectors, like agroindustry, automotive industry, metalmechanics, construction materials and electrical appliances; it is expect to also foster the medical services sector.

The Autonomous University of San Luis Potosí (UASP, Universidad Autónoma de San Luis Potosí) is one of the most important in the state, has 94 degree programmes and 83 postgraduate studies programmes, over twenty-eight thousand students and 830 full time professors, in 19 academic units, and has registered 98 academic bodies. This HEI has research areas, based on state characteristics, some of such spheres are sustainability, agriculture, engineering, biomedicine, nanotechnology and electronics.

The UASP publishes an average of 1.3 scientific articles per day on international specialised refereed magazines. During 2014, 92 research projects were developed (67 were national and 25

were international); product of such experiences, 99 articles were published, in 47 international refereed magazines.

As far as it concerns to signed conventions with governmental, social and business sectors, the university established 449 agreements for exchange, support or academic/financial collaboration and consultancies, processed through management and academic units.

4.1.4 University of Quintana Roo

Quintana Roo is a south-east state with about one and a half million of inhabitants, where business support services and tourism are the most important strategic economic sectors, nevertheless, its economy also includes agriculture, stockbreeding, fishing and forestry; it is expected to boost agroindustry and medical services sectors.

The University of Quintana Roo (UQROO, Universidad de Quintana Roo) has 4 academic units, located in Chetumal, Cozumel, Playa del Carmen and Cancún; has a register of over thirty-six thousand students, inscribed in 30 degree programmes and 11 postgraduate studies programmes. The QROO counts on 176 career professors and researchers (87 PhD and 54 SNI), a competitive and diverse group that is an essential strength of this HEI.

Nowadays, UQROO's 28 academic bodies develop 36 research projects with both external and internal resources; the main research themes are crime prevention, ecology, renewable energies, nanotechnology, market studies, communication systems, Mexican Caribbean conservation, urbanisation and tourism, teaching, literature, indigenous societies, among others. Overall, these interdisciplinary groups published, in 2015, 14 books, 7 co-editions, 30 chapters and 55 specialised articles.

Thanks to its university-enterprise linkage programmes, in 2015 6 general conventions of collaboration were signed, in addition to specific agreements with enterprises that will have impact in other Mexican states. This university also has an enterprises incubation programme, which offers consultancy for the elaboration of business models using Canvas methodology.

4.1.5 Juárez Autonomous University of Tabasco

Tabasco is a south-east state, has almost three million of inhabitants, its strategic economic sectors are agroindustry, petrochemical, business support services, counts on a promising future on renewable energies; leading on hydrocarbon reserves and considered as the main cacao producer, 64% of its territory is agricultural land, standing out the pasture sowing for cattle feeding, which favours the bovine cattle husbandry by free grazing or extensive farming, mainly used for beef production, although there also exists an important dairy farming that makes this state the main national supplier and one of the principal exporters. Among the most important state industries appear: milk and orange juice bottlers, citrus processors, coconut and palm oils factories, copra industrialising, dairy factories, chocolate factories, cacao industrialising, canners of cattle food, factories and packers of bread and fries, purified water and sodas bottlers, metalmechanics industries, fibre cement factories, cement companies, gravel pits and tarmac plants.

The Juárez Autonomous University of Tabasco (UJAT, Universidad Juárez Autónoma de Tabasco) has programmes and an academic offer according to this state scenario, stands out thanks to its activities in sectors like agronomy, biology, health, engineering and architecture. This HEI is seen as the state leading academic institution.

The UJAT has an enrolment of 55,733 students, who are attended in 12 academic divisions, 33 postgraduate studies registered in the CONACYT's PNPC (this is, 61% of its academic offer approved thanks to competitiveness and permanent evolutions characteristics), nowadays has 113 full time professors inscribed in the SNI, also counts on recognised academic bodies (13%, consolidated; 35%, under formation; 52%, in consolidation). The university offers diverse programmes to strengthen researchers and students development, like the Research Foment Programme, through which were realised 388 projects financed by university and external resources in 2015; likewise, the UJAT has signed state, national and international conventions with business and educational sectors, for R&D activities, professional practices, social service, further education, technical consultancy and linkage.

4.1.6 Autonomous University of Ciudad Juárez

Chihuahua is a north state and almost five millions of people live there. Industrially, with over three hundred employments in 406 plants, its development is based on sectors such as electronics and telecommunications, automotive and auto parts, textile, agro industry and food, forestry and furniture, construction materials and mining; also, where the workforce is more qualified within industrial technology development, there are 4 areas of opportunity: aerospace, electrical appliances, information technologies and biotechnology; Chihuahua manufacturing industry reports 9,917 economic units, like plants for the production of mechanical structures, tanks and boilers; manufacturing, repair and assembling of electrical machinery, equipment and accessories.

The Autonomous University of Ciudad Juárez (UACJ, Universidad Autónoma de Ciudad Juárez) has 28,544 students, 68 academic bodies to which are subscribed the 365 full time professors, 203 of these are part of the SNI and belong to 15 different knowledge spheres. This HEI makes projects in linkage with the productive sector, particularly those that are realised through CONACYT's calls, which implies the validation and interaction with the institutional Technology Transfer Bureau, organism that has managed 8 applications before the Mexican Institute of Industrial Property. The sectors in which the UACJ stands are biotechnology and agronomy, engineering, humanities and social sciences; in subjects such as science and engineering materials, pollution of natural resources, cellular and molecular biology, chemistry and food, agricultural production systems, microelectronics, tissue engineering and regenerative medicine.

2.2. STP linkage and interaction methodology implemented by the RITC

Since each park is born within a university, each of them counts on university resources and linkages, so these STPs can provide a strong knowledge base to their regions and country. The RITC does not have just a limited group of researchers specialised in areas according to the specific states the parks belong to, the network has access to the whole and diverse gamut of specialists belonging to these six HEI. Leveraging member HEIs' potentialities, the RITC carries out different activities, framed in our five core strategies: linkage, innovation, knowledge transfer, intellectual property and entrepreneurship.

The RITC supports linkage managers through trainings and facilitates the exchange of experiences, as well as cases of success and failure, with the aim of strengthening linkage programmes within HEIs and joint development of projects and researches focused on solving environmental, social and business problems, both regionally and nationally. Likewise, this network takes into account the professionalization of its members, guaranteeing with it that knowledge transfer permeate our institutions, at the same time standardization guidelines are given to policies and procedures, so that the RITC grow and consolidate its continuity.

RITC has seven specific objectives:

- To jointly develop research and linkage projects, encouraging interdisciplinary workgroups.
- To develop wide academic ways of collaboration, including training and distance learning, as well as the joint creation specific programmes for the impartation of courses, certification programmes and Masters.
- To disseminate the activities realised and the obtained results in the framework of this network.
- To spread and foster the usage of ICTs.
- To produce, commercialise, manage, administrate or utilise: a new process, product, commercial activity, business model, logistics model or customer service related to research, development, invention or technological innovation.
- To improve or adapt: a process, product, commercial activity, business model, logistics model or customer service related to research, development, invention or technological innovation.
- To realise technology transfer, knowledge management or intellectual protection of information, research product, development, invention or technological innovation.

And, as far as it concerns to 2016 expected results:

- Presenting before the CONACYT a proposal for the federal recognition of the RITC.
- Conference series at HEIs, about RITC's thematic axis.
- Imparting courses for the design of innovative projects, at Mexican HEIs.
- Realising studies on the matter of linkage, innovation, as well as knowledge and technologies transfer (and publishing the results).
- To continue with the professionalization of network's members as managers of linkage and technology transfer.
- Giving follow-up to 2015 joint projects.
- Developing more joint projects.

Such as resumed by Albahari *et alii*, according to some empirical studies, inputs of the innovation process, higher research productivity or higher likelihood to patent are externalities created by the on-park location,[28] benefits that also could be leveraged by the enterprises linked to STPs for specific projects, as proved in our own experience with firms. In addition, knowledge externalities or spillovers associated with R&D tend to flourish in delimited areas, which finds explanation in the fact that certain «knowledge can better flow locally than over big distances… as it is transmitted through personal contact and the development of personal relations based on trust».[29]

Nevertheless the undeniable location advantages of STPs established in technologically developed regions, in accordance with Albahari's theoretical summary, STPs also can be raised in regions with a lower index of development, «with the aim to compensate the lack of valuable inputs in these regions, to constitute enclaves of innovation… and to improve the overall image of the region… That is, they may create a technologically developed space in a lagging region».[30]

In fact, the authors of such study claim that there is a better performance of Spanish STPs in less technologically developed areas. Of course, these theorizations are based on data gathered in non-American countries; but the provided information in these pages about the aforementioned six Mexican states, let us expect that the RITC make an impact in regional and national knowledge economies and innovation ecosystems.

2.3. A proposal of indicators to measure RITC's impact

This article is a first approach to an indicators theoretical proposal, which aims to help in the assessing of the contribution to Mexico's competitiveness made by the RITC through the strengthening of scientific-technological capabilities and applied research projects. For the elaboration of our proposal, an interdisciplinary team belonging to the PIT-UAS reviewed diverse papers and indexes published or presented during the past 15 years, related to the assessing of the impact and/or performance of innovation and STP around the world; then, after synthesising and abstracting the core concepts and ideas, complementing such data with relevant information about the RITC's states, universities and STPs, the 264 indicators contained in the **tables 05** to **09** were created.

The classification we present in these five tables correspond to a combination of those we judge as the best taxonomies, after noticing their relevance to the Mexican context and the particular

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[28] Alberto Albahari *et alii* (2013), *The influence of Science and Technology Parks' Characteristics on firms' innovation results* [online PDF], downloaded from Munich University Library's Munich Personal RePEc Archive website. Available at <https://mpra.ub.uni-muenchen.de/48829/1/MPRA_paper_48829.pdf>; date of consult: April 7th, 2016.

[29] Ángela Rocío Vásquez Urriago *et alii* (2010), *The impact of science and technology parks on firms' radical product innovation. Empirical evidence from Spain* [online PDF], page 4, downloaded from the Industry and Innovation journal's DRUID Conference website. Available at <http://www2.druid.dk/conferences/viewpaper.php?id=501561&cf=43>; date of consult: April 7th, 2016.

[30] Alberto Albahari *et alii* (2013), *The influence of Science and Technology Parks' Characteristics on firms' innovation results* [online PDF], page 6, downloaded from Munich University Library's Munich Personal RePEc Archive website. Available at <https://mpra.ub.uni-muenchen.de/48829/1/MPRA_paper_48829.pdf>; date of consult: April 7th, 2016.

task we had ahead. Some national and state indicators were added, for example, those about the incorporation of researchers to the SNI, the quantity of university academic bodies, the amounts processed before the CONACYT, among others.

In the **annexe 02**, the blue colour corresponds to a classification based on the one presented in *The Global Innovation Index* (2015), a study centred on the identification and analysis of global innovation tendencies that includes STPs. This first level was chosen because we think categories *outputs* and *inputs* suit perfectly with the whole idea of our proposal, since location, performance and innovative activities can be classified with this criteria, no matter the form and stage of maturity the STP presents.

In grey colour, the second level, based on an analysis made by the European Commission, *Setting up, managing and evaluating EU science and technology parks. An advice and guidance report on good practice* (2013). The six categories are *market failure and rationale*, *baseline*, *activities*, *inputs*, *outputs and outcomes*, the first and the second belong to the STPs' external environments, the third and the forth are about the entrepreneurial ecosystem, fifth and sixth refer to the results generated by the STP (short and medium terms).

The third level is represented with green colour, belongs to a Spanish paper titled *Scientific and Technological Parks: empirical researches and proposed models for its study in the last decade* (2013), a study based on the review of 81 researches on STPs and private initiative functioning. This level creates a very specific classification (including even the external environment) of diverse indicators that can be easily suited with the above classifications.

The fourth and last level of the taxonomy we present, in blue colour, corresponds to that of the second level of *The Global Innovation Index* (2015), which has five input pillars: *institutions*, *human capital and research*, *infrastructure*, *market sophistication* and *business sophistication*; the outputs include two pillars: *knowledge and technology outputs* and *creative outputs*. These categories provide specificity and by including them along with the others we give to our proposal a framework of wholeness.

After applying this classification, the indicators were grouped in tables in **the annexe 03**, according to five environments: *national* (28 indicators) and *state* (36 indicators), with indicators about STPs' location, like economy, STI productivity, GDP, I+D+i investment; *RITC* (60 indicators), similar to *national* and *state*, delimited to the six states to which the network belongs to, also includes STI productivity and the dimensioning of STPs' roles in their regions; *STP* (92 indicators), indicators that specifically assess human resources, capital, investment, generated knowledge, scientific productivity, the creation of conditions for the enterprise-university innovation ecosystem; *enterprise* (48 indicators), which objective is to get information about private initiative, such as invested capital, I+D+i human resources, projects, gains by innovation product.

In relation to the proposed indicators in each of these tables, it is important to explain there are two types: *simples* and *composite* indicators. Mostly, simple indicators give absolute values, meanwhile the composite indicators are rates or quotients that might be used to compare STPs productivity and even assess a STP productivity in regard to its contribution to the RITC. An example is the composite indicator (calculated based on two simple indicators) *Annual quantity of I+D+i projects / quantity of researchers involved in I+D+i projects*, which assesses the involvement researches have, and also the dimension of the significance the projects have (no matter the size).

This proposal is outstanding because is conceived in a way that allows to measure and compare values from the five different environments it includes; in addition, distinctive characteristics of these are taken in account: this is an *ad hoc* proposal. And, given that this network is barely at its beginnings, the obtained results could trace the path to be followed, so the RITC can reach all its goals and the regions and the country can leverage it.

Besides, the perfections of this indicators and subsequent implementation would be a milestone that might lead to the creation of a culture of participation among all the involved institutions in Mexico, so the complete universe of data required to assess STPs development and impact could

be reachable, updated and reliable. By last, it is important to recall that good data about STPs is the key to have pertinent and fruitful public policies and investments.

3. Conclusions

This article is a first approach to an indicators theoretical proposal, which aims to help in the assessing of the contribution to Mexico's competitiveness made by the RITC through the strengthening of scientific-technological capabilities and applied research projects. The rationale of our index proposal are essentially: *1)* helping so, by showing them both the possibilities and the necessities of the parks, private and public investors be motivated to invigorate STPs ecosystems, thanks to pertinent public policies designed *ad hoc*; *2)* contributing to make possible the public availability of accurate, reliable, updated and global data about these STPs performance and impact; *3)* contribute for the formation of databases on this subject, reachable via visualization tools; *4)* encouraging the consolidation of a custom made index that allows to subsequently have diachronic studies about the performance and evolution of RITC's parks, with the aim of sketching the path to be followed in the years to come.

Since parks' evaluation is an STP edge yet to be perfected, the improvement and implementation of the 264 presented indicators to evaluate this Mexican network's performance and impact could become the beginning of a new period in national STPs' history. It is expected to progress in the obtaining of an assessing methodology able to provide significant data, our current theoretical proposal will be strengthened thanks to the feedback that is going to be provided by RITC's parks; each new interaction will aid for the consolidation of a methodology more and more pertinent, according to each environment's reality. It would be relevant that, by means of its members and thanks to its linkage with other entities, the IASP were the principal promoter and supporter of a first implementation of this proposal; additionally, this association could serve, in the first instance, as diffuser by electronic and physical means, with the intention of favorably impacting on decision makers. At the end, make significant contributions to knowledge economies and innovation ecosystems starts by knowing our starting point.

4. Annexe 01. Tables of the STI and STP indicators scene

International comparative											
The Global Technology Report 2015, ICTs for Inclusive Growth											
Rankings (out of 143)	U. S. A.	Japan	Germany	Spain	China	**Mexico**	S. Africa	India	Nigeria	Yemen	Chad
Networked Readiness Index 2015	*7*	*10*	*13*	*34*	*62*	***69***	*75*	*89*	*119*	*136*	*143*
1st pillar: Political and regulatory environment											
Intellectual property protection indicator	20	7	21	77	53	**82**	22	65	125	136	133
2nd pillar: Business and innovation environment											
Availability of latest technologies indicator	2	14	17	37	97	**66**	39	110	94	137	142
Venture capital availability indicator	3	24	28	100	13	**86**	37	20	131	138	136
Total tax rate, % profits	97	115	109	125	130	**117**	33	126	52	54	129
No. days to start a business	26	59	82	73	118	**35**	95	111	116	128	132
No. procedures to start a business	58	94	107	58	127	**58**	38	132	106	58	107
Intensity of local competition	10	1	12	35	44	**64**	36	91	50	124	136
Tertiary education gross enrollment rate, %	3	39	37	8	85	**81**	93	87	112	113	137
Quality of management schools	11	72	29	3	85	**70**	24	56	101	134	136
Gov't procurement of advanced tech	8	21	16	101	10	**76**	111	61	108	140	132
5th pillar: Skills											
Quality of educational system	27	33	12	88	52	**122**	139	45	121	142	134
Quality of math & science education	51	21	20	85	56	**128**	143	67	132	139	127
Secondary education gross enrollment rate,	57	25	29	2	70	**83**	24	104	125	121	140
Adult literacy rate, %	n/a	n/a	n/a	27	38	**48**	57	94	108	98	115
7th pillar: Business usage											
Firm-level technology absorption	3	2	13	52	68	**70**	29	102	91	134	139
Capacity for innovation	2	7	4	60	40	**72**	35	48	73	134	138
PCT patents, applications/million pop	11	1	6	26	31	**59**	46	61	113	120	120
Extent of staff training	14	2	13	96	46	**74**	18	77	48	131	138
8th pillar: Government usage											
Importance of ICTs to gov't vision	39	20	36	89	25	**84**	113	71	90	142	121
Gov't success in ICT promotion	26	27	31	99	38	**93**	103	81	71	137	119
9th pillar: Economic impacts											
Impact of ICTs on new services & products	18	14	19	26	49	**67**	58	87	71	141	142
ICT PCT patents, applications/million pop	8	3	11	26	30	**68**	45	58	95	99	99
Impact of ICTs on new organizational model	9	39	22	36	34	**63**	59	89	88	135	141
Knowledge-intensive jobs, % workforce	26	63	18	39	106	**81**	56	n/a	n/a	89	n/a

Table 01. Information included in Dutta, Geiger and Lanvin, 2015.

International comparative				
The Global Innovation Index				
Country	0-100 score (rank)	Income (rank)	Region (rank)	Efficiency ratio (rank)
U. S. A.	60.10 (5)	HI (5)	NAC (1)	0.79 (33)
Germany	57.05 (12)	HI (12)	EUR (9)	0.87 (13)
Japan	53.97 (19)	HI (19)	SEAO (6)	0.69 (78)
Spain	49.07 (27)	HI (27)	EUR (18)	0.72 (67)
China	47.47 (29)	UM (1)	SEAO (7)	0.96 (6)
Mexico	**38.03 (57)**	**UM (12)**	**LCN (4)**	**0.73 (61)**
S. Africa	37.45 (60)	UM (14)	SSF (2)	0.66 (94)
India	31.74 (81)	LM (8)	CSA (1)	0.79 (31)
Angola	26.20 (120)	UM (36)	SSF (21)	1.02 (1)
Nigeria	23.72 (128)	LM (30)	SSF (26)	0.80 (28)
Yemen	20.80 (137)	LM (33)	NAWA (19)	0.65 (97)

Table 02. Information included in Dutta, Lanvin and Wunsch-Vincent, 2015. Note: World Bank Income Group Classification (July 2013): LM = lower-middle income; UM = upper-middle income; and HI = high income. Regions are based on the United Nations Classification: EUR = Europe; NAC = Northern America; CSA = Central and Southern Asia; SEAO = South East Asia and Oceania; NAWA = Northern Africa and Western Asia; SSF = Sub-Saharan Africa.

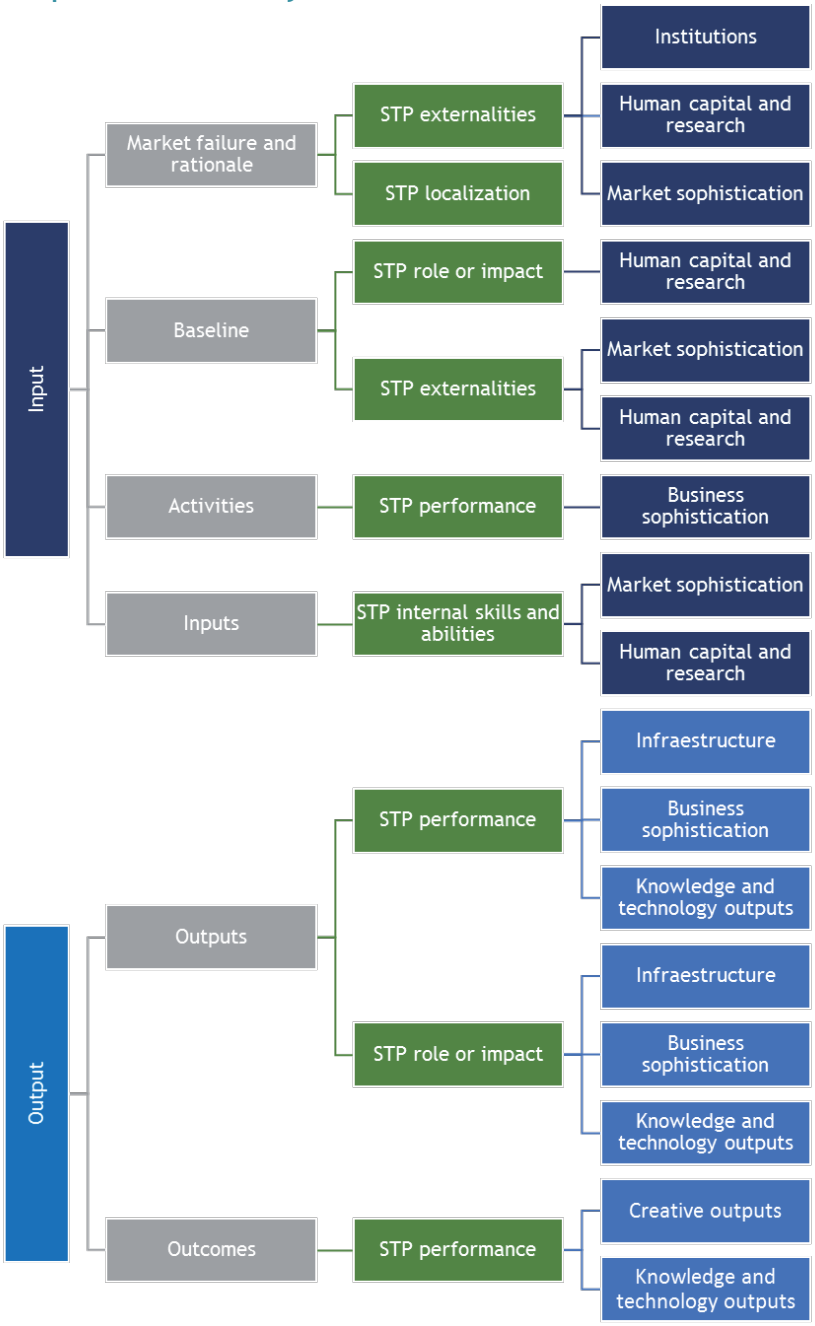
Latin-American countries comparative											
The Global Technology Report 2015, ICTs for Inclusive Growth											
Rankings (out of 143)	Chile	Uruguay	Costa Rica	Panama	Colombia	**Mexico**	Brazil	Peru	Argentina	Venezuela	Haiti
Networked Readiness Index 2015	*38*	*46*	*49*	*51*	*64*	**69**	*84*	*90*	*91*	*103*	*137*
1st pillar: Political and regulatory environment											
Intellectual property protection indicator	56	44	49	38	95	**82**	92	118	135	143	141
2nd pillar: Business and innovation environment											
Availability of latest technologies indicator	31	83	62	36	84	**66**	77	80	124	130	132
Venture capital availability indicator	32	77	111	16	82	**86**	80	54	137	122	124
Total tax rate, % profits	30	90	124	70	140	**117**	137	66	143	132	84
No. days to start a business	23	36	105	27	60	**35**	137	107	106	143	141
No. procedures to start a business	78	38	107	38	94	**58**	131	58	139	143	133
Intensity of local competition	27	103	59	67	56	**64**	52	70	131	142	139
Tertiary education gross enrollment rate, %	20	33	55	64	60	**81**	61	63	15	16	n/a
Quality of management schools	13	65	16	71	69	**70**	53	77	34	82	129
Gov't procurement of advanced tech	40	79	67	11	50	**76**	77	104	136	143	131
5th pillar: Skills											
Quality of educational system	71	116	21	83	90	**122**	125	133	112	130	137
Quality of math & science education	99	122	47	107	109	**128**	131	138	112	118	124
Secondary education gross enrollment rate,	69	67	21	88	60	**83**	n/a	68	63	85	105
Adult literacy rate, %	34	22	31	49	51	**48**	64	55	28	39	107
7th pillar: Business usage											
Firm-level technology absorption	39	93	45	35	89	**70**	59	78	115	122	135
Capacity for innovation	76	87	36	42	85	**72**	44	100	80	137	135
PCT patents, applications/million pop	45	54	63	57	64	**59**	51	87	66	89	120
Extent of staff training	52	80	21	47	83	**74**	44	93	95	123	129
8th pillar: Government usage											
Importance of ICTs to gov't vision	49	65	75	28	42	**84**	106	110	139	141	137
Gov't success in ICT promotion	56	50	65	35	57	**93**	106	111	136	142	133
9th pillar: Economic impacts											
Impact of ICTs on new services & products	29	48	43	35	51	**67**	75	76	110	132	138
ICT PCT patents, applications/million pop	54	56	65	42	75	**68**	59	83	66	92	99
Impact of ICTs on new organizational model	42	45	38	43	54	**63**	76	73	97	117	133
Knowledge-intensive jobs, % workforce	61	68	57	60	90	**81**	72	96	59	79	n/a

Table 03. Information included in Dutta, Geiger and Lanvin, 2015.

Latin-American countries comparative				
The Global Innovation Index				
Country	0-100 score (rank)	Income (rank)	Region (rank)	Efficiency ratio (rank)
Barbados	42.47 (37)	HI (34)	LCN (1)	0.81 (25)
Chile	41.20 (42)	HI (37)	LCN (2)	0.68 (82)
Costa Rica	38.59 (51)	UM (7)	LCN (3)	0.79 (32)
Mexico	**38.03 (57)**	**UM (12)**	**LCN (4)**	**0.73 (61)**
Panama	36.80 (62)	UM (15)	LCN (5)	0.78 (36)
Colombia	36.41 (67)	UM (18)	LCN (6)	0.60 (114)
Uruguay	35.76 (68)	HI (45)	LCN (7)	0.66 (91)
Brazil	34.95 (70)	UM (19)	LCN (8)	0.65 (99)
Peru	34.87 (71)	UM (20)	LCN (9)	0.60 (113)
Argentina	34.30 (72)	UM (21)	LCN (10)	0.75 (52)
Venezuela	22.77 (132)	UM (38)	LCN (22)	0.68 (84)

Table 04. Information included in Dutta, Lanvin and Wunsch-Vincent, 2015. Note: World Bank Income Group Classification (July 2013): UM = upper-middle income; and HI = high income. Regions are based on the United Nations Classification: LCN = Latin America and the Caribbean.

5. Annexe 02. Proposed taxonomy



Blue; extracted from *The Global Innovation Index 2015, Effective Innovation Policies for Development*.

Gray; extracted from *Setting up, managing and evaluating EU science and technology parks. An advice and guidance report on good practice*.

Green; extracted from *Parques Científico-Tecnológicos (PCTs): Investigaciones empíricas y modelos propuestos para su estudio en la última década*.

6. Annexe 03. Tables of indicators

ENTERPRISE INDICATORS

Level 1	Level 2	Level 3	Level 4	Type	Name	Periodicity
Input	Activities	STP performance	Business sophistication	Simple	Accumulated amount invested continuously in R&D by STP resident enterprise(*)	Only
Input	Activities	STP performance	Business sophistication	Simple	Annual amount invested continuously in R&D by STP resident enterprise	Decade
Input	Activities	STP performance	Business sophistication	Simple	Invested amount in tangibles (accumulated)	Decade
Input	Activities	STP performance	Business sophistication	Simple	Invested amount in intangibles (accumulated)	Decade
Input	Activities	STP performance	Business sophistication	Simple	Invested amount in software development and databases (IoT ,big data) (accumulated)	Decade
Input	Activities	STP performance	Business sophistication	Simple	Annually Invested amount in software development and data base (IoT, big data) (in the last decade)	Decade
Input	Activities	STP performance	Business sophistication	Simple	Invested amount in design (accumulated)	Decade
Input	Activities	STP performance	Business sophistication	Simple	Annually Invested amount in design (accumulated) (in the last decade)	Decade
Input	Activities	STP performance	Business sophistication	Simple	Invested amount in R&D (accumulated)	Decade
Input	Activities	STP performance	Business sophistication	Simple	Annually Invested amount in R&D (in the last decade)	Decade
Input	Activities	STP performance	Business sophistication	Simple	Invested amount in others (in the last decade)	Decade
Input	Activities	STP performance	Business sophistication	Simple	Annually Invested amount in others (in the last decade)	Decade
Input	Activities	STP performance	Business sophistication	Simple	Invested amount in Market Research and brand image (accumulated)	Decade
Input	Activities	STP performance	Business sophistication	Simple	Annually Invested amount in Market Research and brand image (in the last decade)	Decade
Input	Activities	STP performance	Business sophistication	Simple	Invested amount in continuous training and skills development (accumulated)	Decade
Input	Activities	STP performance	Business sophistication	Simple	Annually Invested amount in continuous training and skills development(in the last decade)	Decade
Input	Activities	STP performance	Business sophistication	Simple	Invested amount in in organizational Developments (accumulated)	Decade
Input	Activities	STP performance	Business sophistication	Simple	Annually Invested amount in in organizational Developments (in the last decade)	Decade
Input	Activities	STP performance	Business sophistication	Simple	Quantity of innovative enterprises (with 5 or more workers)	Decade
Output	Output	STP performance	Business sophistication	Simple	% of sales from new product innovation by resident of 5 or more employees	Decade
Input	Input	STP intern skills and abilities	Market sophistication	Composite	% of utility of intellectual property from the resident enterprise	Decade
Input	Input	STP intern skills and abilities	Market sophistication	Simple	% of utility in R&D from the resident enterprise	Decade
Input	Input	STP intern skills and abilities	Market sophistication	Simple	Annually Invested amount in R&D (table per year)	Decade
Input	Input	STP intern skills and abilities	Market sophistication	Simple	Annually average amount in R&D	Decade
Input	Input	STP intern skills and abilities	Market sophistication	Simple	Invested amount in basic research projects	Decade
Input	Input	STP intern skills and abilities	Market sophistication	Simple	Invested amount in applied research projects	Decade

ENTERPRISE INDICATORS

Level 1	Level 2	Level 3	Level 4	Type	Name	Periodicity
Input	Input	STP intern skills and abilities	Market sophistication	Simple	Annually Invested amount in intellectual property (table per year)	Decade
Input	Input	STP intern skills and abilities	Market sophistication	Simple	Annually average invested amount in intellectual property (table per year)	Decade
Input	Input	STP intern skills and abilities	Market sophistication	Simple	Annual amount of own fund invested in R&D (in the last decade)	Decade
Input	Input	STP intern skills and abilities	Market sophistication	Simple	% of venture capital of fund itself invested in R&D	Decade
Input	Input	STP intern skills and abilities	Market sophistication	Simple	Invested amount in in R&D with public administration funds	Decade
Input	Input	STP intern skills and abilities	Market sophistication	Simple	% of venture capital invested in R&D with public administration funds	Decade
Input	Input	STP intern skills and abilities	Market sophistication	Simple	Invested amount in R&D with funds from other companies	Decade
Input	Input	STP intern skills and abilities	Market sophistication	Simple	% Of venture invested capital in R&D with funds from other companies	Decade
Input	Input	STP intern skills and abilities	Market sophistication	Simple	Invested amount in R&D with capital of foreign origin	Decade
Input	Input	STP intern skills and abilities	Market sophistication	Simple	% of venture invested capital in R&D with capital of foreign origin	Decade
Input	Input	STP intern skills and abilities	Market sophistication	Simple	Amount of projects in CONACyT funds	Decade
Input	Input	STP intern skills and abilities	Market sophistication	Simple	Obtained amount for investment in R&D funds in response to CONACyT	Decade
Input	Input	STP intern skills and abilities	Market sophistication	Simple	Amount of projects in other federal funds	Decade
Input	Input	STP intern skills and abilities	Market sophistication	Composite	% of own invested fund in R&D with respect to the total invested in R&D	Decade
Input	Input	STP intern skills and abilities	Market sophistication	Composite	% of public administration funds invested in R&D with respect to the total invested in R&D	Decade
Input	Input	STP intern skills and abilities	Market sophistication	Composite	% of other funds invested in R&D with respect to the total companies invested in R&D	Decade
Input	Input	STP intern skills and abilities	Market sophistication	Composite	% invested amount in R&D of foreign origin with respect to the total invested in R&D	Decade
Input	Input	STP intern skills and abilities	Market sophistication	Composite	% obtained amount by CONACyT funds respect to total funds obtained by public administration	Decade
Output	Outcomes	STP performance	Knowledge and technology outputs	Simple	creation of new jobs in high technology companies impact	Decade
Output	Output	STP performance	Business sophistication	Simple	Graduates within private sector participating in technological innovation projects	Decade
Output	Market failure and rationale	STP externalities	Business sophistication	Simple	Masters within private sector participating in technological innovation projects	Decade
Output	Market failure and rationale	STP externalities	Business sophistication	Simple	PhDs within private sector participating in technological innovation projects	Decade

NATIONAL INDICATORS

Level 1	Level 2	Level 3	Level 4	Type	Name	Periodicity
Input	Market failure and rationale	STP externalities	Institutions	Composite	TPF	Decade
Input	Market failure and rationale	STP externalities	Institutions	Composite	National GDP/GDP of RITC's states	Decade
Input	Market failure and rationale	STP externalities	Institutions	Composite	% of national GDP invested in IP	Decade
Input	Market failure and rationale	STP externalities	Institutions	Simple	% of national GDP invested on I+D+i	Decade
Input	Market failure and rationale	STP externalities	Institutions	Simple	Annual amount invested on I+D+i	Decade
Input	Market failure and rationale	STP externalities	Institutions	Simple	Annual average amount invested on I+D+i	Decade
Input	Market failure and rationale	STP externalities	Institutions	Simple	Annual amount invested on IP	Decade
Input	Market failure and rationale	STP externalities	Institutions	Simple	Annual average amount invested on IP	Decade
Input	Market failure and rationale	STP externalities	Institutions	Simple	Amount invested by public administration on I+D+i	Decade
Input	Market failure and rationale	STP externalities	Institutions	Simple	Amount invested by enterprises on I+D+i	Decade
Input	Market failure and rationale	STP externalities	Institutions	Simple	Amount invested by foreign funds on I+D+i	Decade
Input	Market failure and rationale	STP externalities	Institutions	Simple	Quantity of I+D+i projects financed by CONACYT	Decade
Input	Market failure and rationale	STP externalities	Institutions	Simple	Amount provided to I+D+I projects by CONACYT	Decade
Input	Market failure and rationale	STP externalities	Institutions	Simple	Quantity invested on I+D+I projects by federal funds	Decade
Input	Market failure and rationale	STP externalities	Institutions	Simple	Amount provided to I+D+I projects by state funds	Decade
Input	Market failure and rationale	STP externalities	Institutions	Simple	Quantity of I+D+i projects financed by state funds	Decade
Input	Market failure and rationale	STP externalities	Institutions	Composite	% of private funds invested on I+D+i (regarding the total invest on I+D+i)	Decade
Input	Market failure and rationale	STP externalities	Institutions	Composite	% of public funds invested on I+D+i (regarding the total invest on I+D+i)	Decade
Input	Market failure and rationale	STP externalities	Institutions	Composite	% of foreign investment on I+D+i (regarding the total invest on I+D+i)	Decade
Input	Market failure and rationale	STP externalities	Institutions	Composite	% of CONACYT funds (regarding the total public funds obtained)	Decade
Input	Market failure and rationale	STP externalities	Human capital and research	Simple	Graduates within private sector participating in technological innovation projects	Decade
Input	Market failure and rationale	STP externalities	Human capital and research	Simple	Masters within private sector participating in technological innovation projects	Decade
Input	Market failure and rationale	STP externalities	Human capital and research	Simple	PhDs within private sector participating in technological innovation projects	Decade
Input	Baseline	STP role or impact	Human capital and research	Simple	Generation of new employments within high-tech impact enterprises	Decade
Input	Market failure and rationale	STP externalities	Human capital and research	Composite	% of active population that conforms the ST specialised HR base	Decade
Input	Baseline	STP externalities	Human capital and research	Composite	% of total employments that are high-tech employments	Decade
Input	Baseline	STP externalities	Market sophistication	Simple	Quantity of patent applications per each million of inhabitants	Decade
Input	Market failure and rationale	STP externalities	Market sophistication	Simple	Accumulated quantity of patent applications realised by the university	Decade

RITC INDICATORS

Level 1	Level 2	Level 3	Level 4	Type	Name	Periodicity
Input	Market failure and rationale	STP externalities	Institutions	Composite	TPF	Decade
Input	Market failure and rationale	STP externalities	Institutions	Composite	Country's GDP / states of the network (RITC) GDP	Decade
Input	Baseline	STP externalities	Human capital and research	Simple	Number of patent applications made by the university (accumulated)	Only
Input	Baseline	STP externalities	Human capital and research	Simple	Annual average patent applications made by the university	Decare
Input	Market failure and rationale	STP externalities	Market sophistication	Simple	Strategic economic sector for regional economy 1 (*)	Only
Input	Market failure and rationale	STP externalities	Market sophistication	Simple	Strategic economic sector for regional economy 2 (*)	Only
Input	Market failure and rationale	STP externalities	Market sophistication	Simple	Strategic economic sector for regional economy 3 (*)	Only
Input	Market failure and rationale	STP externalities	Market sophistication	Simple	Strategic economic sector for regional economy 4 (*)	Only
Input	Market failure and rationale	STP externalities	Market sophistication	Simple	Strategic economic sector for regional economy n (*)	Only
Input	Market failure and rationale	STP externalities	Institutions	Composite	TPF	Decade
Input	Market failure and rationale	STP externalities	Institutions	Composite	% of GDP on intellectual property	Decade
Input	Market failure and rationale	STP externalities	Institutions	Simple	% of GDP on R&D	Decade
Input	Market failure and rationale	STP externalities	Institutions	Simple	Annually Invested amount in R&D	Decade
Input	Market failure and rationale	STP externalities	Institutions	Simple	Annual average amount in R&D	Decade
Input	Market failure and rationale	STP externalities	Institutions	Simple	Annually Invested amount in intellectual property in the last decade (table per year)	Decade
Input	Market failure and rationale	STP externalities	Institutions	Simple	Annual average invested amount in intellectual property	Decade
Input	Market failure and rationale	STP externalities	Institutions	Simple	Invested amount in R&D of public administration funds	Decade
Input	Market failure and rationale	STP externalities	Institutions	Simple	Invested amount in R&D of companies funds	Decade
Input	Market failure and rationale	STP externalities	Institutions	Simple	Invested amount in R&D of foreign origin	Decade
Input	Market failure and rationale	STP externalities	Institutions	Simple	amount of R&D projects funded by CONACyT	Decade
Input	Market failure and rationale	STP externalities	Institutions	Simple	amount funds provided by CONACyT for R&D	Decade
Input	Market failure and rationale	STP externalities	Institutions	Simple	amount of R&D projects funded by federal funds	Decade
Input	Market failure and rationale	STP externalities	Institutions	Simple	amount provided by state funds in R&D projects	Decade
Input	Market failure and rationale	STP externalities	Institutions	Simple	Amount of R&D projects funded by state funds	Decade
Input	Market failure and rationale	STP externalities	Institutions	Composite	%Private enterprise fund invested in R&D with respect to the total invested in R&D	Decade
Input	Market failure and rationale	STP externalities	Institutions	Composite	% Public administration funds invested in R&D with respect to the total invested in R&D	Decade
Input	Market failure and rationale	STP externalities	Institutions	Composite	% Invested in R&D of foreign origin with respect to the total invested in R&D amount	Decade

RITC INDICATORS

Level 1	Level 2	Level 3	Level 4	Type	Name	Periodicity
Input	Market failure and rationale	STP externalities	Institutions	Composite	% obtained amount by CONACyT funds respect to total funds obtained by public administration	Decade
Input	Market failure and rationale	STP externalities	Human capital and research	Simple	Graduates within private sector participating in technological innovation projects	Decade
Input	Market failure and rationale	STP externalities	Human capital and research	Simple	Masters within private sector participating in technological innovation projects	Decade
Input	Market failure and rationale	STP externalities	Human capital and research	Simple	PhDs within private sector participating in technological innovation projects	Decade
Input	Baseline	STP role or impact	Human capital and research	Simple	Creation of new jobs in high technology companies Impact	Decade
Input	Market failure and rationale	STP externalities	Human capital and research	Composite	Human resources base in Science and Technology (% of labor force) .	Decade
Input	Baseline	STP externalities	Human capital and research	Composite	High-tech jobs as a percentage of total employment	Decade
Input	Baseline	STP externalities	Market sophistication	Simple	Number of patent applications per million habitants	Decade
Input	Market failure and rationale	STP externalities	Market sophistication	Simple	ICT number of applications for patents per million habitants	Decade
Input	Input	STP intern skills and abilities	Human capital and research	Simple	Quantity of researchers within knowledge sphere 01	Decade
Input	Input	STP intern skills and abilities	Human capital and research	Simple	Quantity of researchers within knowledge sphere 02	Decade
Input	Input	STP intern skills and abilities	Human capital and research	Simple	Quantity of researchers within knowledge sphere 03	Decade
Input	Input	STP intern skills and abilities	Human capital and research	Simple	Quantity of researchers within knowledge sphere 04	Decade
Input	Input	STP intern skills and abilities	Human capital and research	Simple	Quantity of researchers within knowledge sphere 05	Decade
Input	Input	STP intern skills and abilities	Human capital and research	Simple	Quantity of researchers within knowledge sphere *n*	Decade
Input	Input	STP intern skills and abilities	Human capital and research	Simple	Quantity of agriculture and livestock sphere's academic bodies in formation	Decade
Input	Input	STP intern skills and abilities	Human capital and research	Simple	Quantity of agriculture and livestock sphere's academic bodies in consolidation	Decade
Input	Input	STP intern skills and abilities	Human capital and research	Simple	Quantity of agriculture and livestock sphere's consolidated academic bodies	Decade
Input	Input	STP intern skills and abilities	Human capital and research	Simple	Quantity of health sphere's academic bodies in formation	Decade
Input	Input	STP intern skills and abilities	Human capital and research	Simple	Quantity of health sphere's academic bodies in consolidation	Decade
Input	Input	STP intern skills and abilities	Human capital and research	Simple	Quantity of health sphere's consolidated academic bodies	Decade
Input	Input	STP intern skills and abilities	Human capital and research	Simple	Quantity of natural and exact sciences sphere's academic bodies in formation	Decade
Input	Input	STP intern skills and abilities	Human capital and research	Simple	Quantity of natural and exact sciences sphere's academic bodies in consolidation	Decade
Input	Input	STP intern skills and abilities	Human capital and research	Simple	Quantity of natural and exact sciences sphere's consolidated academic bodies	Decade
Input	Input	STP intern skills and abilities	Human capital and research	Simple	Quantity of social and administrative sciences sphere's academic bodies in formation	Decade
Input	Input	STP intern skills and abilities	Human capital and research	Simple	Quantity of social and administrative sciences sphere's academic bodies in consolidation	Decade
Input	Input	STP intern skills and abilities	Human capital and research	Simple	Quantity of social and administrative sciences sphere's consolidated academic bodies	Decade
Input	Input	STP intern skills and abilities	Human capital and research	Simple	Quantity of engineering and technology sphere's academic bodies in formation	Decade
Input	Input	STP intern skills and abilities	Human capital and research	Simple	Quantity of engineering and technology sphere's academic bodies in consolidation	Decade

RITC INDICATORS

Level 1	Level 2	Level 3	Level 4	Type	Name	Periodicity
Input	Input	STP intern skills and abilities	Human capital and research	Simple	Quantity of engineering and technology sphere's consolidated academic bodies	Decade
Input	Input	STP intern skills and abilities	Human capital and research	Simple	Quantity of education, humanities and arts sphere's academic bodies in formation	Decade
Input	Input	STP intern skills and abilities	Human capital and research	Simple	Quantity of education, humanities and arts sphere's academic bodies in consolidation	Decade
Input	Input	STP intern skills and abilities	Human capital and research	Simple	Quantity of education, humanities and arts sphere's consolidated academic bodies	Decade

STATE INDICATORS

Level 1	Level 2	Level 3	Level 4	Type	Name	Periodicity
Input	Market failure and rationale	STP externalities	Institutions	Composite	TPF	Decade
Input	Market failure and rationale	STP externalities	institutions	Composite	National GDP/GDP of RITC's states	Decade
Input	Baseline	STP externalities	Human capital and research	Simple	Accumulated quantity of patent applications realised by the university	Only
Input	Baseline	STP externalities	Human capital and research	Simple	Annual average of patent applications made by the university	Decade
Input	Market failure and rationale	STP externalities	Market sophistication	Simple	Strategic economic sector for regional economy 1 (*)	Only
Input	Market failure and rationale	STP externalities	Market sophistication	Simple	Strategic economic sector for regional economy 2 (*)	Only
Input	Market failure and rationale	STP externalities	Market sophistication	Simple	Strategic economic sector for regional economy 3 (*)	Only
Input	Market failure and rationale	STP externalities	Market sophistication	Simple	Strategic economic sector for regional economy 4 (*)	Only
Input	Market failure and rationale	STP externalities	Market sophistication	Simple	Strategic economic sector for regional economy *n* (*)	Only
Input	Market failure and rationale	STP externalities	Institutions	Composite	TPF	Decade
Input	Market failure and rationale	STP externalities	Institutions	Composite	% of GDP invested on IP	Decade
Input	Market failure and rationale	STP externalities	Institutions	Simple	% of GDP invested on I+D+i	Decade
Input	Market failure and rationale	STP externalities	Institutions	Simple	Annual amount invested on I+D+i	Decade
Input	Market failure and rationale	STP externalities	Institutions	Simple	Annual average amount invested on I+D+i	Decade
Input	Market failure and rationale	STP externalities	Institutions	Simple	Annual amount invested on IP	Decade
Input	Market failure and rationale	STP externalities	Institutions	Simple	Annual average amount invested on IP	Decade
Input	Market failure and rationale	STP externalities	Institutions	Simple	Amount invested by public administration on I+D+i	Decade
Input	Market failure and rationale	STP externalities	Institutions	Simple	Amount invested by enterprises on I+D+i	Decade
Input	Market failure and rationale	STP externalities	Institutions	Simple	Amount invested by foreign funds on I+D+i	Decade
Input	Market failure and rationale	STP externalities	Institutions	Simple	Quantity of I+D+i projects financed by CONACYT	Decade
Input	Market failure and rationale	STP externalities	Institutions	Simple	Amount provided to I+D+I projects by CONACYT	Decade
Input	Market failure and rationale	STP externalities	Institutions	Simple	Quantity invested on I+D+I projects by federal funds	Decade
Input	Market failure and rationale	STP externalities	Institutions	Simple	Amount provided to I+D+I projects by state funds	Decade
Input	Market failure and rationale	STP externalities	Institutions	Simple	Quantity of I+D+i projects financed by state funds	Decade
Input	Market failure and rationale	STP externalities	Institutions	Composite	% of private funds invested on I+D+i (regarding the total invest on I+D+i)	Decade
Input	Market failure and rationale	STP externalities	Institutions	Composite	% of public funds invested on I+D+i (regarding the total invest on I+D+i)	Decade
Input	Market failure and rationale	STP externalities	Institutions	Composite	% of foreign investment on I+D+i (regarding the total invest on I+D+i)	Decade
Input	Market failure and rationale	STP externalities	Institutions	Composite	% of CONACYT funds (regarding the total public funds obtained)	Decade
Input	Market failure and rationale	STP externalities	Human capital and research	Simple	Graduates within private sector participating in technological innovation projects	Decade
Input	Market failure and rationale	STP externalities	Human capital and research	Simple	Masters within private sector participating in technological innovation projects	Decade

STATE INDICATORS

Level 1	Level 2	Level 3	Level 4	Type	Name	Periodicity
Input	Market failure and rationale	STP externalities	Human capital and research	Simple	PhDs within private sector participating in technological innovation projects	Decade
Input	Baseline	STP role or impact	Human capital and research	Composite	Generation of new employments within high-tech impact enterprises	Decade
Input	Market failure and rationale	STP externalities	Human capital and research	Composite	% of active population that conforms the ST specialised HR base	Decade
Input	Baseline	STP externalities	Human capital and research	Composite	% of total employments that are high-tech employments	Decade
Input	Baseline	STP externalities	Market sophistication	Simple	Quantity of patent applications per each million of inhabitants	Decade
Input	Market failure and rationale	STP externalities	Market sophistication	Simple	Quantity of ICT patents per each million of inhabitants	Decade

STP INDICATORS

Level 1	Level 2	Level 3	Level 4	Type	Name	Periodicity
Output	Output	STP performance	Business sophistication	Simple	Quantity of resident innovative enterprises (with 5 or more workers)	Decade
Input	Activities	STP role or impact	Business sophistication	Simple	The STP provides legal, commercial and financial services (1). It does not (0).	Decade
Input	Activities	STP role or impact	Business sophistication	Simple	Quantity of international enterprises the STP provides services to	Decade
Input	Activities	STP role or impact	Business sophistication	Simple	The STP provides legal, commercial and financial services (1). It does not (0).	Decade
Input	Activities	STP role or impact	Business sophistication	Simple	The STP provides services to international enterprises (1). It does not (0).	Decade
Input	Input	STP intern skills and abilities	Human capital and research	Simple	Quantity of full-time administrative employees (per each 100)	Decade
Input	Input	STP intern skills and abilities	Market sophistication	Simple	% of public funds invested in the STP's starting of operations	Decade
Input	Input	STP intern skills and abilities	Market sophistication	Simple	Fund type (public, private, mixed) of the investment made for the STP's starting of operations	Decade
Output	Output	STP role or impact	Business sophistication	Simple	Quantity of resident enterprises	Decade
Output	Output	STP role or impact	Business sophistication	Simple	Quantity of resident enterprises with international HQ	Decade
Output	Output	STP performance	Business sophistication	Simple	Quantity of start-up enterprises	Decade
Output	Output	STP performance	Business sophistication	Simple	Accumulated quantity of patent applications by enterprises linked to the STP	Only
Input	Input	STP intern skills and abilities	Human capital and research	Simple	Annual quantity of researchers involved in I+D+i projects	Decade
Input	Input	STP intern skills and abilities	Market sophistication	Simple	Years of STP's trajectory in operations	Only
Input	Input	STP intern skills and abilities	Market sophistication	Simple	Years of STP's trajectory in operations (quadratic value)	Only
Input	Input	STP intern skills and abilities	Human capital and research	Simple	Annual quantity of I+D+i projects / quantity of researchers involved in I+D+i projects	Decade
Output	Output	STP performance	Knowledge and technology outputs	Simple	Accumulated quantity of patent applications realised by the university (once the STP has begun to operate)	Decade
Output	Output	STP performance	Knowledge and technology outputs	Simple	Annual average of patent applications made by the university (once the STP has begun to operate)	Decade
Input	Input	STP intern skills and abilities	Market sophistication	Simple	Annual total amount for I+D+i projects (regarding the annual quantity of I+D+i projects)	Decade
Input	Input	STP intern skills and abilities	Market sophistication	Simple	Annual quantity of I+D+i projects	Decade
Input	Input	STP intern skills and abilities	Market sophistication	Simple	Annual total amount for I+D+i projects	Decade
Input	Input	STP intern skills and abilities	Human capital and research	Simple	% of university researchers specialised on ST (regarding the total of university researchers)	Decade
Input	Input	STP intern skills and abilities	Human capital and research	Simple	Annual quantity of SNI (candidate) researchers involved on I+D+i projects	Decade
Input	Input	STP intern skills and abilities	Human capital and research	Simple	Annual quantity of SNI (level 1) researchers involved in I+D+i projects	Decade

STP INDICATORS

Level 1	Level 2	Level 3	Level 4	Type	Name	Periodicity
Input	Input	STP intern skills and abilities	Human capital and research	Simple	Annual quantity of SNI (level 2) researchers involved in I+D+i projects	Decade
Input	Input	STP intern skills and abilities	Human capital and research	Simple	Annual quantity of SNI (level 3) researchers involved in I+D+i projects	Decade
Input	Input	STP intern skills and abilities	Human capital and research	Composite	Quantity of SNI researchers involved in I+D+i projects / quantity of researchers involved in I+D+i projects	Decade
Input	Input	STP intern skills and abilities	Human capital and research	Composite	Quantity of students involved in I+D+i projects / quantity of researchers involved in I+D+i projects	Decade
Input	Input	STP intern skills and abilities	Human capital and research	Composite	Quantity of researchers / total of employees	Decade
Input	Input	STP intern skills and abilities	Human capital and research	Simple	Quantity of researchers within knowledge sphere 01	Decade
Input	Input	STP intern skills and abilities	Human capital and research	Simple	Quantity of researchers within knowledge sphere 02	Decade
Input	Input	STP intern skills and abilities	Human capital and research	Simple	Quantity of researchers within knowledge sphere 03	Decade
Input	Input	STP intern skills and abilities	Human capital and research	Simple	Quantity of researchers within knowledge sphere 04	Decade
Input	Input	STP intern skills and abilities	Human capital and research	Simple	Quantity of researchers within knowledge sphere 05	Decade
Input	Input	STP intern skills and abilities	Human capital and research	Simple	Quantity of researchers within knowledge sphere *n*	Decade
Input	Input	STP intern skills and abilities	Human capital and research	Simple	Quantity of agriculture and livestock sphere's academic bodies in formation	Decade
Input	Input	STP intern skills and abilities	Human capital and research	Simple	Quantity of agriculture and livestock sphere's academic bodies in consolidation	Decade
Input	Input	STP intern skills and abilities	Human capital and research	Simple	Quantity of agriculture and livestock sphere's consolidated academic bodies	Decade
Input	Input	STP intern skills and abilities	Human capital and research	Simple	Quantity of health sphere's academic bodies in formation	Decade
Input	Input	STP intern skills and abilities	Human capital and research	Simple	Quantity of health sphere's academic bodies in consolidation	Decade
Input	Input	STP intern skills and abilities	Human capital and research	Simple	Quantity of health sphere's consolidated academic bodies	Decade
Input	Input	STP intern skills and abilities	Human capital and research	Simple	Quantity of natural and exact sciences sphere's academic bodies in formation	Decade
Input	Input	STP intern skills and abilities	Human capital and research	Simple	Quantity of natural and exact sciences sphere's academic bodies in consolidation	Decade
Input	Input	STP intern skills and abilities	Human capital and research	Simple	Quantity of natural and exact sciences sphere's consolidated academic bodies	Decade
Input	Input	STP intern skills and abilities	Human capital and research	Simple	Quantity of social and administrative sciences sphere's academic bodies in formation	Decade
Input	Input	STP intern skills and abilities	Human capital and research	Simple	Quantity of social and administrative sciences sphere's academic bodies in consolidation	Decade
Input	Input	STP intern skills and abilities	Human capital and research	Simple	Quantity of social and administrative sciences sphere's consolidated academic bodies	Decade
Input	Input	STP intern skills and abilities	Human capital and research	Simple	Quantity of engineering and technology sphere's academic bodies in formation	Decade
Input	Input	STP intern skills and abilities	Human capital and research	Simple	Quantity of engineering and technology sphere's academic bodies in consolidation	Decade
Input	Input	STP intern skills and abilities	Human capital and research	Simple	Quantity of engineering and technology sphere's consolidated academic bodies	Decade
Input	Input	STP intern skills and abilities	Human capital and research	Simple	Quantity of education, humanities and arts sphere's academic bodies in formation	Decade
Input	Input	STP intern skills and abilities	Human capital and research	Simple	Quantity of education, humanities and arts sphere's academic bodies in consolidation	Decade
Input	Input	STP intern skills and abilities	Human capital and research	Simple	Quantity of education, humanities and arts sphere's consolidated academic bodies	Decade

STP INDICATORS

Level 1	Level 2	Level 3	Level 4	Type	Name	Periodicity
Input	Input	STP intern skills and abilities	Human capital and research	Simple	Quantity of students involved in I+D+i projects (all academic levels)	Decade
Input	Input	STP intern skills and abilities	Human capital and research	Simple	Quantity of students involved in I+D+i projects (degree level)	Decade
Input	Input	STP intern skills and abilities	Human capital and research	Simple	Quantity of students involved in I+D+i projects (Master level)	Decade
Input	Input	STP intern skills and abilities	Human capital and research	Simple	Quantity of students involved in I+D+i projects (PhD level)	Decade
Input	Input	STP performance	Business sophistication	Simple	Quantity of areas within the STP	Decade
Input	Input	STP performance	Business sophistication	Simple	Name of area 01	Decade
Input	Input	STP performance	Business sophistication	Simple	Objective of area 01	Decade
Input	Input	STP performance	Business sophistication	Simple	Minimum duration of area 01's projects	Decade
Input	Input	STP performance	Business sophistication	Simple	Maximum duration of area 01's projects	Decade
Input	Input	STP performance	Business sophistication	Simple	Average duration of area 01's projects	Decade
Input	Input	STP performance	Business sophistication	Simple	Quantity of projects realised in area 01	Decade
Input	Input	STP intern skills and abilities	Market sophistication	Simple	Invested amount on tangible assets in area 01	Decade
Input	Input	STP intern skills and abilities	Market sophistication	Simple	Invested amount on intangible assets in area 01	Decade
Input	Input	STP performance	Business sophistication	Simple	Years realising I+D+i projects in area 01	Only
Input	Input	STP performance	Business sophistication	Simple	Name of area *n*	Decade
Input	Input	STP performance	Business sophistication	Simple	Objective of area *n*	Decade
Input	Input	STP performance	Business sophistication	Simple	Minimum duration of area *n*'s projects	Decade
Input	Input	STP performance	Business sophistication	Simple	Maximum duration of area *n*'s projects	Decade
Input	Input	STP performance	Business sophistication	Simple	Average duration of area *n*'s projects	Decade
Input	Input	STP performance	Business sophistication	Simple	Quantity of projects realised in area *n*	Decade
Input	Input	STP intern skills and abilities	Market sophistication	Simple	Invested amount on tangible assets in area *n*	Decade
Input	Input	STP intern skills and abilities	Market sophistication	Simple	Invested amount on intangible assets in area *n*	Decade
Input	Input	STP performance	Business sophistication	Simple	Years realising I+D+i projects in area *n*	Only
Output	Output	STP role or impact	Business sophistication	Simple	Accumulate quantity of collaboration agreements	Only
Output	Output	STP role or impact	Business sophistication	Simple	Annual quantity of collaboration agreements	Decade
Output	Output	STP role or impact	Business sophistication	Simple	Annual quantity of collaboration agreements with private initiative	Decade
Output	Output	STP role or impact	Business sophistication	Simple	Annual quantity of collaboration agreements with the government	Decade
Output	Output	STP role or impact	Business sophistication	Simple	Annual quantity of collaboration agreements with national institutions	Decade
Output	Output	STP role or impact	Business sophistication	Simple	Annual quantity of collaboration agreements with international institutions	Decade
Output	Output	STP role or impact	Business sophistication	Simple	Quantity of commercialization agreements	Decade
Output	Outcomes	STP role or impact	Knowledge and technology outputs	Simple	Received amount by achieved commercialization agreements	Decade
Output	Output	STP role or impact	Knowledge and technology outputs	Simple	Annual quantity of imparted courses or trainings	Decade
Output	Output	STP role or impact	Knowledge and technology outputs	Simple	Annual quantity of trained people	Decade

STP INDICATORS

Level 1	Level 2	Level 3	Level 4	Type	Name	Periodicity
Output	Output	STP role or impact	Knowledge and technology outputs	Simple	Annual quantity of benefited enterprises by the imparted courses or trainings	Decade
Output	Output	STP role or impact	Knowledge and technology outputs	Simple	Annual quantity of scientific publications realised	Decade
Output	Output	STP role or impact	Knowledge and technology outputs	Simple	Annual average of Q1 impact level publications	Decade
Input	Activities	STP performance	Business sophistication	Simple	Annual quantity of benefited entrepreneurs by a support programme	Decade
Input	Activities	STP performance	Business sophistication	Simple	Quantity of support programmes for entrepreneurs	Decade
Input	Input	STP intern skills and abilities	Market sophistication	Simple	Support amount (with own fund) given to entrepreneurs	Decade