INNOVATION AND TERRITORIAL DEVELOPMENT IN LATIN AMERICA

PROJECT:

INNOVATION CENTRE AND VENTURE CAPITAL FUND FOR HIGH TECNOLOGY INSTRUMENTS TO INCREASE THE COMPETITIVENESS OF LOCAL LATIN AMERICAN PRODUCTION SYSTEMS

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INTRODUCTION

During the last decade Latin America has witnessed an intense -but not seldom disordered- search for new development '*models*'. First, the crisis of the *development paradigm* and the neoliberal model after have opened a wider process of experimentation and reflection on the way Latin American countries must continue to make a quality leap towards sustainable development with equity.

In this way, there is a greater attention to public policy, in particular the role played by local administrations; a design not only economic but multidimensional in terms of development; greater participation of economic and social agents in the formulation and implementation policies, an enlargement of the pursued objectives, among which emphasizes environmental sustainability and the fight to social exclusion.

Three fundamental processes as basis of this route for building new paradigms of Latin American development are recorded. On the one hand, especially at economic level, there is evidence of the importance acquired by the territorial contexts in the development processes. It has consolidated the idea that not only companies compete but also territories. The processes of Latin American development in recent years show an evolution called "*leopard spots*" that has led to a new economic geography of Latin America. Territories that in the previous cycle occupied marginal spaces have become areas of great potential importance, both because of the strength of resources (energy, minerals and agricultural products), as well as the strategic position they have acquired in context of globalization (linking points of the new economic corridors) or by its innovative position capable of proposing such territories as new poles of development. Likewise, territories that previously played an important role have suffered the impact of the global market because has put in difficulty their budgets (suffice to think the decline of many industrial parks constituted in the years 60s-70s), and have undergone profound processes of production redirection with the aim of setting these territories as strong components of the international value chain.

On the other hand, in social terms, it can be seen the emergence of large segments of the civil society, especially the popular sectors previously excluded from public policies. The processes of economic inclusion of the " *base of the pyramid*" is one of the most interesting dimensions of the Latin American territorial development.

Finally, at the political level, it has witnessed a "*quiet revolution*" of local and regional powers, that have acquired political significance, both for the consolidation and extension of the direct election of their representatives, and for the transfer of powers from central to peripheral levels. As Adriana Clement argues "the municipal decentralization was a strategy which, together with the privatization and targeting of social policies, accompanied the neoliberal economic reform [...] The receptiveness to the proposed decentralization cannot be contextualised in a separate way from the historical moment that preceded the military dictatorships and authoritarianism, which determined the State-society relationship, a proposition that promised transparency and social participation resulted incontestable for most citizens and governments ". Since then, the decentralization process has been an important source of debate in Latin America. National and multilateral agencies of international cooperation have been strong drivers of decentralization, although Latin America has not missed critical voices. Specifically, the critical elements of such process have focused on the externalities that decentralization produces in terms of new inequalities and

"*municipalisation*" of poverty[1]. There is, however, a terrain of broad consensus on the potential of decentralization: the role assigned to local governments in promoting regional development. "The recovery of the territory as a key actor in economic analysis" provides to local administrations ample room for action[2]. The mobilization of economic actors, the institutional coordination multilevel (local-national-international), the public-private partnerships (PPP), the promotion of local networks and social capital are some of the roles to be played by local institutions in Latin America.

The actual process of drawing up the new paradigms of Latin American development, based on the territorial approach, offer an extremely heterogeneous arrangement in the various countries of the area: the differences in institutional contexts, through the diversity of public policies, the provision of resources, the strategic placement of the territories, the asymmetrical quality of local administrations, and other many factors. The map of territorial development in Latin America begins to be delineated with defined profiles.

The three processes outlined –new placement of the local economic areas, greater attention to the "*popular economy",* the broader powers to local governments in public policies- are the main constraints of territorial development. To make this relationship a virtuous circle requires a strong complementary and synergistic interaction among the three processes mentioned: the opportunities opened up by new forms of economic integration in Latin American territories can be better exploited if the local government institutions are prepared to perform their functions adequately. Likewise, the processes of territorial decline caused by globalization can be reversed or neutralized by those local actors capable of guiding new development processes.

The importance acquired by the territorial development has given strategic importance to a key factor. In particular, the best Latin American experiences show that "local economic development depends crucially on the ability to introduce innovations within the base of enterprises base and business tissues of a territory"[3]. This conclusion was the result of a process over a decade of learning and experimentation that in no way can be considered gained and widespread in the territory.

On the basis of this process, there is the depletion of a production model based on *temporary comparative advantages*, as the favourable exchange rate, the protectionist measures of the domestic market, energy and cheap labour, which in the past have allowed the extensive use of a production of "*low quality at low prices*." The rapid deterioration of the temporary advantages has led to, at an early stage, an intra-Latin American competition by relocation of traditional industries to regions and countries with lower costs of production factors and the closure or underutilization of existing productive capacity.

This process has drastically changed the labour market, seriously affecting the conditions of workers and encouraging the phenomenon of emigration. Thus, it appears one of the most contradictory situations that are experiencing a series of territorial development processes in Latin America. The rapid loss of temporary comparative advantage due changes in the context of many Latin American countries has caused or accelerated the flow of emigration, which in turn has meant privation of basic human resources fundamental for development.

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[1] Adriana Clemente (2004), "Descentralización y desarrollo en América Latina. Las contradicciones de una ecuación incompleta", en J.L. Rhi-Sausi (Ed.), *El desarrollo local en América Latina. Logros y desafíos para la cooperación europea*, Nueva Sociedad, Caracas.

[2] Francisco Alburquerque (2004), "Desarrollo local e integración productiva", Ponencia presentada en el Segundo Encuentro BID/FOMIN y GTZ, Cartagena, Colombia, 6-7 septiembre.

[3] Francisco Alburquerque (2004), "El enfoque del Desarrollo Económico Local", *Cuadernos DEL*, n. 1, Buenos Aires.

FROM THE TERRITORIAL PRODUCTION SYSTEMS TO THE REGIONAL INNOVATION SYSTEMS (RSI)

This situation has led to the formulation of exit strategies based on innovation, technological upgrading and integration of productive chains, with the aim of promoting competitiveness and exports, generate jobs within their community and improve the quality of life its inhabitants.

Initially the innovation has made reference almost exclusively to the need to *innovate products and processes* as essential mechanisms to increase the competitiveness of small and medium enterprises (SMEs) of the territory. In terms of paradigms, the experiences of *Italian industrial districts* and the *Spanish local systems business* have offered a significant conceptual framework[4]. It can be confirmed that the local economic development in Europe has arrived (in theory) in Latin America well before that its concrete way. Even more, we can say that the presence of European conceptual local productive systems have prepared the reception capacity of Latin American proposals for bi-regional cooperation among territorial economies.

This "community" of operators and local development experts introduced a number of approaches, methodologies and tools for promoting local economic development. In this regard, it is important to recall two important changes in the route of Latin American politics for promoting local economic development: On the one hand, the affirmation of the *cluster approach to development*, namely the importance of clusters of SMEs and their interactions as a condition for the competitiveness of small enterprises, and the substitution of the traditional approaches to economic sectors by an approach that gives priority to the production value chains.

On the other hand, it has been given particular importance to the *institutional dimension of local economic development*: the active role of administration in the sub-territorial realignment, the introduction of knowledge in production processes as well as the governance with international, national and local actors.

The introduction of innovation as a key variable of Latin American local economic development has given way to the decline of the concept in three main areas of action: technological innovations, social innovations and institutional innovations[5]. There are many examples showing positive indicators in Latin America in one or more of these dimensions.

In potential terms, these experiences point out to the construction of *territorial systems of innovation*[6], understanding "a system in which relevant factors [actors and institutions] interact in a innovation process"[7], whereby a set of policies, standards and tools allow the creation of environments favourable to regional economic development, incorporating knowledge institutions in economic processes (university-enterprise relationships) and business practices able to innovate processes / products and create alternative models of management which include the improvement of working conditions.

In short, as shown in the diagram below, territorial innovation systems are proposed as articulators of the three fundamental dimensions of territorial development: institutions, financial incentives, physical infrastructure and technology.

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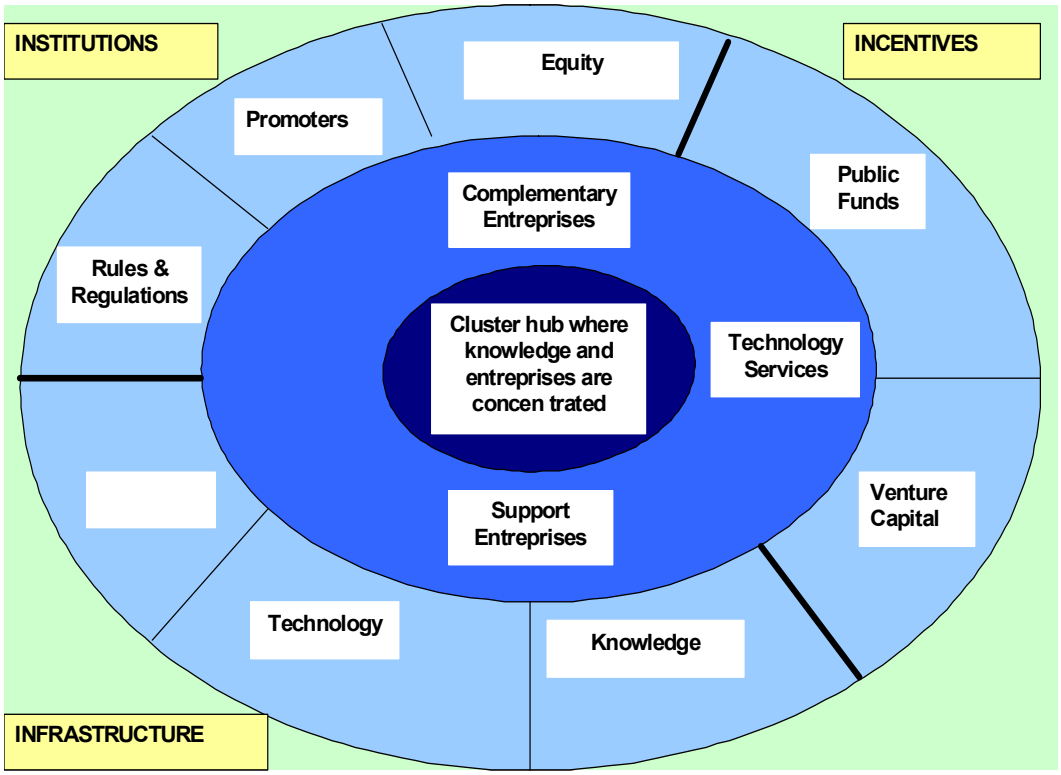
[4] Cfr. Patrizio Bianchi, Lee M. Miller (Coordinadores) (1999), Innovación y Territorio. Políticas para las pequeñas y medianas empresas, Ed. Jus, México.

[5] . Cfr. F. Alburquerque*, op.cit.*

[6] UNIDO, "Innovation Systems in Practice. Charting a new path for UNIDO", Position Paper, 2008.

[7] Andersson and Karlsson (2004), "Regional Innovation Systems in Small & Medium – Sized Regions. A Critical Review & Assessment", CESIS Working paper.



This strategic design requires promoting an evolution of existing local production systems towards a type of *clusters structure* that are inserted in the international value chains, by introducing innovation in their production processes and marketing[8]. This means, adopting the cluster approach as an articulating tool of small and medium-scale enterprises in production processes and assumes the innovation system as a key component of competitiveness and space for interaction between actors and institutions.

The relevant factors of RSI are: *public authorities* bringing to the system the capabilities of local government, the *networks of economic associations* (industrialists, traders and workers), *knowledge institutions* (universities, research institutes and centres of technological development) and *civil society* organizations that enrich the territory with their capital of social relationship[9].

Certainly there is no territory in Latin America containing the comprehensive characteristics of a RSI, but their heuristic validity stems from the fact that this is a paradigm that is proposed as "*ideal type*", whose more immediate horizon is to generate a productive structure that is mostly based in the knowledge economy.

A fundamental premise for the construction of a RSI is the existence of intense and profitable interaction of the enterprises with the institutions of governance and with knowledge institutions.

[8] Alberto Brugnoli y Alessia Spairani (2006), "La realtà dei distretti industriali in Italia e in America Latina: alcune considerazioni di sintesi", on Fabio Antoldi (Coord.), *Op. cit*

[9] F. Sabatini, "Social Capital and the Quality of Economic Development", Conferencia CeSPI, 04.06.2008, www.cespi.it.

The Latin American experience matured over the years provides a number of positive cases. With respect to the relations companies-institutions, it can be established favourable conditions in the following dimensions:

(a) *Potential for structuring local public policies* in favour of development, thanks to the level of priority that national policies have provided to the territories. In many cases significant margins of autonomy of regional authorities in formulating such policies are recorded. All this, beyond the institutional structure of the State is a federal or unitary type.

(b) *Growing international insertion* of the territories. The international activity of regional governments in Latin America has increased sharply. This has been favoured by both the autonomous action of local institutions (new powers of local administrations), and the activities of international agencies for international cooperation. Suffice to recall in this regard, the European Union programmes such as URBAL and AL-INVEST.

(c) *New financial resources* for local development. All this has resulted in public, national and international resource transfers directly into the territories.

(d) *Innovations in government administration*. In this area many Latin American territories have been scenes of significant reforms (administrative simplification, changing mechanisms and creation of the political class, organization by objectives of the government action), although very different levels in scope and efficiency. A basic idea that accumulates the innovative experiences in Latin America in governance is the idea having a guiding principle and objective of promoting local economic development. This is explicitly designed as a *structuring hub* of the action of government.

(e) *Alliances or public-private partnerships* (PPPs). The local institutional innovation in Latin America has promoted widely public-private partnerships. These alliances are becoming stronger as the governance is devoted primarily to: (i) strengthen, restructure and innovate the local productive system, based on micro, small and medium enterprises, (ii) to consider territorial development as a mechanism for socio-economic inclusion, which took the fight to social exclusion, generating decent work and sustainable development, (iii) promoting participatory development, particularly considering the world economic organizations (companies, cooperatives, trade unions, banks, corporations of microfinance, NGOs for development) and knowledge institutions as privileged partners of the government action.

(f) *Design strategic plans and territorial programming*. In this process, many Latin American sub-national institutions are beginning to seriously tackle the territorial programming. The government plans designed as a "dream books" are starting to become strategic plans, in which market opportunities (demand) are the basis for restructuring the supply and territorial vocations. The most advanced sub-national governments do not intend to act merely as "*managers*" of the present economic world to govern "*the same thing over again*" but as "leaders" of *transformation processes of the territorial economic environment*. The same economic world is diversified among those sectors that are open to innovation and dynamism to those seeking to resist temporary advantages. In this sense mature not generic PPP, but specific alliances with specific objectives.

Company-university relations. As regards the relations between enterprises and institutions of knowledge, Latin America found a strong delay, even if, in recent years some significant steps have been taken in this direction. On the one hand, the national technology policies have been endowed with more resources and greater operational capability. On the other hand, the efforts of universities and technological institutes, both public and private, have been widespread at the territorial level. However, as a whole the company-university relations are still limited. Certainly, some spontaneous processes are recorded but the impression one gets is that this connection requires public-private policy instruments with active and specific incentives.

Agencies and agents. In this new context of Latin American territorial development, interactions between institutions and actors have created new operating agents. The creation of numerous agencies for local economic development was of particular significance. This is a process whose performance has been highly heterogeneous. Positive results were also contrasted with many negative results. The own experiences in a more mature contexts of territorial development, such as Europe, do not provide an unequivocal answer.

A first conclusion, agents about the operating agents in Latin American development can be obtained by analysing the main indicators on the *capabilities* that are recorded in the good practices in local economic development. First, the ability of the *process governance*, including the construction of effective public-private partnerships, at regional level, capable of generating virtuous relations between the various institutional levels (multi-level governance). Second, the *ability to introduce innovation* in the local economic environment, through positive relationships with external economic framework as well as institutions of knowledge. Third, the *ability to define and integrate the territory of reference.* Last but not least, the ability to *include and put together the society* in the process of local development.

The most successful Latin American experiences in introducing innovation in the economic environment have been focused on relationships and transfers of knowledge and technology from the most dynamic companies, mostly of foreign origin, with large and medium size, to micro and small companies in the territory. The range of instruments adopted for the development of productive chains and other forms of association of companies comprised the following lines:
(a) Creating public-private agencies of coordinating activities. Its aim has been to develop networks of relationships that are aimed at creating value chains.
(b) Promotion of export consortia, through the incorporation of innovation in processes / products and marketing.
(c) Boosting the chains of supplier (SMEs) - customer (big companies)
(d) Establishment of centres for technology transfer, so as to enable micro, small and medium enterprises to build on the progress of scientific research that SMEs can not sustained due their small size.
(e) Promotion of business incubators that incorporate technological innovation and content.
(f) Testing of some innovative financial instruments (factoring, consortia of guarantee funds, etc)

VENTURE CAPITAL FUNDS AS TERRITORIAL DEVELOPMENT FACTOR

The European experience shows that programmes and policies that foster successful territorial development were established to develop and implement new technologies and make them available to markets, thanks to the integration of academia, science, industry, finance, and management as well as public and private institutions.

Europe is experiencing a new technologic growth pushed by the growing and planned integration into the territory of science, industry, finance and management. This has meant that in some areas of Ireland, new businesses of American origin have been installed at the rate of one and a half per day, either in Catalonia 8 billion euro of investment have been drawn up. From this phenomenon are benefiting even some regions of Austria (around the area of Salzburg, Carinthia) or declining industrial areas (Lancashire and Yorkshire in England) or characterized by strong reconverting industrial processes (North Rhine Westphalia particularly Dortmund) that applied with determination a shared vision for the medium and long term.

The governments "equip" areas of interest in an integrated manner: Development Agencies linked to local Venture Capital Funds and Science and Technology parks located in specialized industrial areas constitute an integrated system in which technological firms can be created and developed Table below shows some cases of success: in Copenhagen, which has a population of some 1,300,000 inhabitants, over 100 new enterprises, in the past five years, have been installed with the support of a promotion policy targeting the bio-industry traditionally present in the country (beer industry, production of yeast, etc.), but this time backed by 14 venture capital funds dedicated to biotechnology initiatives. Obviously, if a researcher or a manager wants to develop a new enterprise in the biotechnology sector can count quickly with support, consulting and responses by local institutional investors. In Avignon, a city of 200,000 inhabitants, 18 scientific institutions and 46 companies are located in a new Science and Technology Park (agro-food oriented). In Salzburg, a city with a population of 150,000 inhabitants was established a Fund for Local Development with a budget of € 90 million euro provided by a group of Savings Banks. Even as a small town of Lund in Sweden with 90,000 inhabitants has a fund of 15 million euro for high-tech initiatives through spin-offs from the university.

European Territories properly equipped

Locality	Country	Notes	Instrumentos fundamentales				Results (end of 2006)
			Development Agency	Scientific and Technology Park	Local Ventuture Capital Funds	Specialised Industrial Areas	
Copenhagen	DK	√	"Copenhagen Capacity Biotech"	√	14 Venture Capital Fund for biotechnology	2 oriented areas to bioindustrial activities	More than 100 new firms installed en the last 5 years.
Avignon	FR	City in the routh of France with 200,000 inhabitants, localised at 75 km from Marseille	"Engager à Avignon"	"Agroparc - Technopôle Régional d'Avignon"	4 Venture Capital Fund for general; *high tech*	n.d.	18 scientific institutions and 46 firms located with agro industry business
Salzburg	AU	Capital of the region with 150,000 inhabitants	"Salzburg Agentur"	√	"Fund for Salzburg", 90 Million €, given by the local saving firms (Reifessenbank, Salzburg Sparkasse, Volksbank, Hypobank).	2 areas	22 new International firms 2 German Venture Capital Funds have been opened
Lund	SW	City with 90,000 inhabitants	"Teknikbrostifteesen"	1 scientific and technology Park	"TeknoSeed ab", 15 Million €; 50% given by Teknikbrostifteesen Another 50% given by 4 local saving firms and the Regional Development Fund	√	In the Fund also participate union trade organisations

Therefore, integration into the territory allows: first, an interaction between the scientific and financial skills and competences for the growth of local markets and also creates the physical places where host spin-offs and start-ups: the combined effect of this allows to qualify internationally a

geographical area in which to attract new investments and where SMEs can flourish and/or consolidate.

When a territory is part of the programming of promoting high-tech, and is also capable of attracting investment, the benefits are obvious and evident. Over the past 15 years only from the east coast of North America have settled in Europe more than 5,000 companies (including the opening of branches, acquisitions, joint ventures, etc.), , nearly one and a half per day. In fact, high-tech companies in the United States have been attracted to specific programs: in Ireland, for example, the plan promoted by the government: "Come back to your Country Programme", aimed at executives with Irish roots; in Berlin, where until the last decade did not have any programs and skills in molecular biology, the Centre "Max Delbrück" in a year's programme has facilitated the launch of nearly 30 start-up from U.S.A., thus creating a critical mass enough to be considered on the international circuit in biotechnology research.

The network of Venture Capitalists in northern Europe extends the phenomenon of integration between scientific knowledge and financial markets: a record for a start up you can immediately discuss among institutional investors which, through union pacts, manage to reduce the risk designing easier *exit route* for their joint investments.

An initial analysis in several Latin America areas and its territorial contexts (socio-economic characteristics of the territory, geographical location, industrial structure and academic presence of Research and Development Centres, etc.) show that there are situations similar to those described for Europe and, hence, there is the base to promote both the Regional Innovation Systems and Venture Capital Funds for high-tech.

Further, venture capital funds can act as initial nucleus and catalyst for the creation of regional innovation system by promoting dialogue and interaction with technology centres, the universities, the industries (and industrial districts), the local financial systems and also with other national, international and multi-laterals partners so promote technological and academic development supporting the development and transfer of high technology to industrial clusters.

In this regard, it should be noted that the basis of a success of venture capital funds is the quantity and quality of investment proposals that the Fund can evaluate. Indeed international experience shows that out of 100 proposals only 3-4 become funded projects, after careful due diligence phase, while needed for 3 to 6 months for making decisions: i.e. from the scouting phase of the proposal to its conclusion in a detailed business plan, the formation of the syndicate between institutional investors and industrialists, to the establishment of start up (or participation in the equity of the company, and if this already exists).

The close collaboration with the Regional Innovation System (technology centres, universities, industries, industrial districts, the local financial system, etc.) enables the Fund Management Company the following comparative advantages over other similar Venture Capital Funds:

- Continuous flow of proposals and business opportunities
- Portfolio of projects more competitive
- Pre-selection of proposals and projects
- Reducing time and costs of evaluation and process as a whole

The Fund can thus justify its existence and create prerequisites for significant financial returns for their subscribers and also act as a real instrument of economic development for the territory.

PRESENTATION OF INNOVATION CENTRE PROJECT

The project aims at improving the economic competitiveness of a territory by creating an Innovation Centre (IC) that articulates and promotes Regional Systems Innovation (RSI). The IC is conceived as a hub of knowledge and technology, whose action radius may include a territory, a country or sub-region including several countries. With this overall objective, the specific objectives are as follows:

(a) To identify and integrate the areas of opportunity for clusters of SMEs of the territory (ies) to innovate products and processes, through building a network of technology services, training and technology transfer.

(b) To promote and encourage local knowledge institutions to develop applied research and improve university-enterprise connectivity.

(c) To encourage business projects in goods and services of high technological content, by creating a Venture Capital Fund (VCF).

Regarding the first issue, the scenario of the development of enterprise conglomerates in Latin America shows that it is mainly *grassroots systems* characterized by a locally based organization, funds for widespread innovation and incremental innovation applied.programmes. Specialization is not very high and coordination among several operators is limited. The main actors are small enterprises that have low levels of research & innovation.

Therefore, this kind of productive systems requires interaction between local actors and institutions accompanied by connections with more mature global innovation systems. The systems must expand their territorial borders through a process of integration with the international knowledge and skills for innovation with the aim of creating business and territorial alliances, based on innovation, along the productive value chains at the international level[10].

The main mechanisms for this purpose referred to the innovation centres are:

(a) Mutual knowledge, experience sharing and replicable methodological tools

(b) Promotion of international alliances for the supply of goods and services of the local productive systems to large and medium-sized enterprises.

(c) Creating new companies technologically advanced

(d) Creation and support intermediate service structures for innovation

(e) Support and incentives to local institutions of knowledge

As regards to the establishment of a Venture Capital Fund, the European experience of success stories recommends not design the fund so isolated from the local or regional context, but talking and interacting directly with the innovation centres, with technology centres, universities, industries (and industrial districts), the territory's financial system and also with other national and international organisations.

Normally, where it has decided to invest, the Fund should not have participation over 30-35% of the total equity in companies' shares. Hence, there is the need to create a "*syndicate of investors*" (including, of course, one part, albeit small, subscribed by the promoters), which ensures the financial requirements as stated in the business plan.

Similarly, it is important that the Fund has operating agreements with local scientific and technological institutions, universities, industrial associations, etc., which then produce proposals

[10] Bathelt, Malmeberg, Maskell (2002), "Cluster and Knowledge: local buzz, global pipelines and the process of knowledge creation", DRUID Working paper 2002-12.

that will form the portfolio of the Fund. As has already been indicated, the Venture Capital Fund should review numerous investment proposals a year but only a few will be considered for investment. In general all relations with institutions / entities that may submit proposals for high-tech businesses must be promoted.

Finally, a careful business plan must be prepared, evaluated and agreed with potential partners. From above stated, this document has to identify and present in a very clear form, the following issues:

- Macroeconomic framework
- Operating Framework
  - *Defining the operational parameters of the Fund Management Company*
  - *Defining the criteria for investment*
- First Group of Partners Fund (the Fund investors, including the Innovation Centre)
- First Group of Allies Program.
- International links
- First Projects portfolio
- Financial Analysis and financial indicators

Among the partners (investors) the Fund must acknowledge the presence of innovation centres, which will enable the Company Management comparative advantages mentioned above.

ILLUSTRATION OF SEVERAL PROGRAMMES AND PROJECTS OF INNOVATION AND TECHNOLOGICAL DEVELOPMENT. THE PILOT PROJECT OF THE STATE OF GUANAJUATO, MEXICO

In order to provide more specific elements of the interactions between knowledge institutions, public institutions (and public-private) and economic actors, Innovation Centre "*clients*", the pilot project of the State of Guanajuato, Mexico is illustrated in this chapter. These interactions present different levels of maturity: in some cases, it is possible identify elements of formalized policies and instruments, in other cases specific operational projects or proposals are seeking to find a real demand.

Prior to observe interactions for innovation is important to consider the *knowledge infrastructure* which the State of Guanajuato counts with. The number of universities and research centres in relation to the size of the State is significant: 10 public and private universities, 7 industrial parks and 5 Technology Centres oriented to technologies such as nanotechnology, new materials, biotechnology with a total of more than 350 researchers in different areas.

Moreover, the region has a Council for Science and Technology (CONCYTEG), founded in 1996, its purpose is to *"model* State Government Agency to identify, timely, prospective challenges and opportunities as well as the management of science and technological integrated projects to ensure that most of the population and companies have a culture of innovation, human and financial resources sufficient and appropriate for science and technology"[11]. The CONCYTEG supports and follows up research projects under a call or *open demand* , as long as an institution of higher education or research centres secure the needed backing; awards scholarships to students and supports the high academic level training of human resources.

The CONCYTEG estimates that the State of Guanajuato counts with 45 research units which cover a lot of areas and disciplines and are distributed in various cities throughout the state. CONCYTEG emphasizes that the state has 219 researchers recognized by the national research system and 24 postgraduates from the roll of excellence of CONACYT (National Council for Science and Technology).

Finally, it should be remembered that in the State of Guanajuato is particularly active the national policy of innovation and technology transfer developed by the CONACYT.

Automotive Industry and Auto parts.

The institution for innovation in this sector is the Integrate Centre for Automotive Industry (CiiAB). It is a private association founded in 2006 by two agencies: the State Council for the promotion and development of the automotive sector and auto parts (COFODESA), comprising 21 companies and an association of machine shops, and the Mexican Foundation for innovation and transfer technology in small and medium enterprises (FUNTEC).

The CiiAB intends to develop and implement programmes to raise the technical level and competitiveness of automotive enterprises of Guanajuato, strengthening the productive chain,

[11] See www.concyteg.gob.mx/quienes.htm.

promoting and attracting supplier companies and retention of large terminals enterprise in the State of Guanajuato.

Through its Technology Management Services CiiAB promotes research, technological development, planning, innovation and technology management. Its clients are enterprises across the chain automotive (150 companies in Guanajuato) and its partners are public institutions, State, national and international knowledge institutions and, particularly universities and technological institutes, research and specialized technology centres (CIATEC, CIO, CIDESI, CIATEQ).

The strategic importance of CiiAB stems *in primis* on technological and economic weight of this industry in the State, however this is a young industry (14 years is the average age of companies). Its 73 automobile companies directly generate over 20 thousand jobs (2006), 32 of which are companies providing first level (*tier one supplier*). These companies allow Guanajuato ranks fifth among the States of Mexico (after the traditional automotive States: Queretaro, Coahuila, Chihuahua and Nuevo Leon). The automotive industry accounts for 44% of GDP manufacturing of Guanajuato and 80% of total exports.

Diagnosis

On a more specific diagnosis of CiiAB indicates the need to concentrate efforts on the second and third level in the chain automobile, i.e. in segments of company supplying the assemblers (T1) and supplier firms (T2) of T1. 76% of the inputs for companies T1 coming from outside of Guanajuato while the remaining 24% has origins in the State. In companies T2, by contrast, 70% of their inputs originate in the State and 30% outside the State. The CiiAB believes that while companies T1 performed its technological development and design stage mainly outside the State (and country), there is an area of opportunity for regional companies in that 76% of inputs that originates outside the State. A field investigation of CiiAB also shows that companies T1 and T2 indicated its main concerns in the process technologies and design as well as in the equipment.

The CiiAB indicates as additional difficulty the lack of interconnection between resrecah and investigation and research centres and companies. The 41 companies T1 surveyed mentioned to only know or have worked with only five centres. If this happens with companies T1 even less connections have companies T2 (or T3). In fact, the CiiAB analysis indicate the an highest percentage of companies that require technology services at the corporate level abroad.

In conclusion, the CiiAB believes that in companies T1, the technology development takes place corporately outside the country, while local SMEs do not meet the profile that is required to join the automotive supply chain as T2 (and T3), mainly due to the technological backwardness in its machinery, equipment and processes and lack of management systems and quality certification. To sum up, much of value creation is generated elsewhere.

CiiAB Proposal

To achieve a truly integrated cluster for the automotive industry in Guanajuato is indispensable a network of technological innovation, which integrates the different actors necessary for its operation. In practice CiiAB proposes setting up an innovation system from a central core[12].

The CiiAB identifies three specific strategies and objectives for the technological innovation network they propose:

A. Encourage the creation of value in companies of the production chain through:

[12] UNIDO, "Innovation Systems in Practice. Charting a new path for UNIDO", Position Paper Draft, 2008.

- Detection of the demands and technological trends
- Formalization of the activities of technology management at the members of the Network
- Linking with institutions providing technology
- Cooperation with other networks of technological innovation (opto-mechatronics, textiles and energy)
- Training of human resources responsible for the assimilation, transfer and development of technology.
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B. Ensure the economic and environmental sustainability of the production chain

- Access to the best practices of environmental certification through training and technology
- Promotion of intellectual property registration
- Advice for access to fiscal stimulus programs
- Linkage with the support programmes of the various entities of government and national and international institutions.

C. To facilitate better horizontal and vertical productive articulation and economic integration in the region through:

- Establishment of cooperation mechanisms that facilitate the exchange of knowledge, experiences and resources among the various players in the network
- Formalization and systematization of production processes for identifying and solving common problems of technology.

The methodology involves the systematic articulation between bidders and applicants for technology and other very important actors as national and international support agencies and other similar networks, considering the Integration Centre as central hub of the network.

As it is easily observed, the automotive chain is one of the most important test-beds for the repositioning of the economic system of the State of Guanajuato in a better competitive condition. But at the same time, local integration in the automotive chain is one of the most complex and difficult. This is a highly competitive chain with contents of excellence in terms of technological innovation. However, some experiences shown territorial integration processes with some success

Overall automotive chain is composed of clusters of the typology *hub and spokes* , that is characterized by a limited number of *anchor companies* non-local owned, around them some of supplier and services firms are organized. The cluster is heavily dependent on the decisions of the company hub with a vertical relationships as well as not too narrow in horizontal terms.

The three elements of relative success experiences must be considered. On the one hand, as indicated CiiAB, creating a system of supply and demand for technology services is one of the essential conditions. On the other hand, the European model *hub and spokes*, such as Renault or Fiat, provides methodologies and very interesting public-private mechanisms to integrate many small companies with high technology contents into the chain into. It is symptomatic of the goodness of this model the fact that Fiat has "exported" it in its plants of Belo Horizonte in Brazil. Last but not least, it has to be considered, that local companies usually do not have technical expertise, nor manage to make the technological leap required, for this reasons the clusters of small enterprises in the automotive chain are often formed by new firms, which also are often founded by ex-technical or ex-workers of the anchor companies. In this regard, while Guanajuato in the automotive industry is a relatively young, probably, shortly, new entrepreneurs start supply to the sector and this is an interesting line of work for CiiAB.

Biotechnology

In the case of biotechnology, rather than the linkages and interactions between institutions and actors provided by innovation systems, we can talk about the existence in the State of Guanajuato of scientific capabilities to incorporate incremental innovation on this topic at the fabric partner - economic development tissue of the region.

Particularly interesting for this purpose is the Institute for Research in Experimental Biology. This is an institute founded in 1981 by the University of Guanajuato, the Ministry of Public Education (SEP) of the Federal Government and the Centre for Research and Advanced Studies (CINVESTAV) of the National Polytechnic Institute (IPN), Guanajuato campus. The Institute established the doctoral program in 1999 and in addition to its educational activities offered advice, consulting and product development in the following fields: bio-ethanol, bio-treatment of industrial effluents, molecular diagnostics of white rot of garlic, silver nano-bio-particles, plants benefits and protease for use in the tannery.

The main project of the Institute is called "*Microbial Biotechnology with environmental impact for social and economic development of State of Guanajuato*". The project is a research and technological development aimed at three sectors: the processing industry, the primary sector and health sector.

As regards the environmental impact of the processing industry, the goal is the "*Design and application of microorganisms in monitoring and remediation of environmental contaminants*". With this component of the project seeking: to develop and transfer technology for detection and removal of pollutants (metals, organic molecules), reduce the environmental impact of enterprises, reduce inorganic and organic pollutants in the atmosphere and thus improve quality of life in the region. This sub-project also intends to develop human resources with professional backgrounds in environmental biotechnology and create companies specializing in the implementation of biotechnology for the removal of environmental contaminants.

As regards the primary activities (aquaculture, agriculture and livestock) is proposed biological control that breaks the chain: pest-chemical pesticides-environmental pollution of difficult diagnosis. Main objective is to "*production of organisms to control pests and weeds without pesticides*" (*entomopatological fungi* and *filopathologic ones*), through improved research laboratories in biological control to the "Improvement of genetic strains of mushroom and development of micro herbicides, this is validating molecular systems that are specific for detecting fungal phyto-pathogens to prevent diseases and improve the economic benefit to producers. In particular, the development of technology for development of a diagnostic test certified help eradicate a major problem for farmers in the region: "*the white rot of garlic*".

In the health sector, the Microbial Biotechnology Project aims to improve the diagnosis of infections of the digestive system and the construction of a kit for simultaneous detection of several pathogens, the main cause of most infections of the digestive system in the region. This sub-project aims to: reduce hospital admissions by diarrhoeal diseases, lower infant mortality rate in these cases, reduce the rate of diarrhoeal infections not diagnosed and improve control areas of microbiological food industries. Lastly, the sub-project envisages the training of personnel specializing in biomedical research and the creation of biotech companies to produce a diagnostic kit.

Technologies MEMS (Micro Electromechanical Systems)

This development and technology transfer project of micro-electromechanical systems, namely the set of mechanical and electronic components placed on a chip, is carried out by the Technology Higher Institute of Irapuato (ITESI). It is a decentralized public institution of the State Government, founded in 1995 and restructured in 2001. In the past year opened the degree on Materials Engineering and later (2004) the Mechatronics Engineering degree. In addition to his academic activities, ITESI has a linkage the program with the productive sector and most of its graduates has been integrated into the productive sector regionally, and set up his own company.

Regarding the development of MEMS technology projects, ITESI have focused on several proposals of sensor for the electricity sector (sensor of pollution in electrical insulators suspension, sensor for detection of electrical equipment fault) and for agriculture (sensor safety in peppers).

Materials Engineering	Designing a proposal for a MEMS micro system for the characterization of materials with electric properties
Electronics Engineering	Determination of insecticides in pepper using MEMS technology
	Developing a sensor for measuring the leakage current generated by the accumulation of pollution in electrical insulators suspension
	Developing a sensor for detecting faults in electrical contactors from the emission of infrared radiation due to electric arc in the areas of contact
	Development of a theoretical multi sensor system to determine critical variables in power transformers of the national electricity grid

Source: Egla Y. Bivián C. Y Agustín Cú G., "Proyectos de Investigación y Desarrollo Tecnológico 2007", ITESI, Irapuato, 2007.

Finally, ITESI proposes the development of RFID systems for the sensing of physical variables (pressure, temperature, humidity, etc.). As well as control systems for handling electronic signals from sensors into a single integrated, incorporating capabilities of telemetry and communication network, all using technology based on MEMS. In particular, it seeks to develop systems RFID tags assets (900 Mhz) and sensors of physical variables in MEMS technology. Also, developing a platform of a common control system to integrate different applications and software support.

The other lines of research and technological development of ITESI are as follows:

Biochemistry Engineering	Isolation and characterization of microorganism degradation of aromatic hydrocarbons
	Obtention of a series of similar auxins and its compounds with zinc
	Design and optimization of a biodigestor for treatment of wastewater from orígen pig
	Identification and characterisatión strain Yarrowia lipolytica for the degradation of heavy oil
	Design team for demineralised water
Materials Engineering	Obtention of coordination polymers with zinc and cadmium with binders nitrogen donors
Electrónic Engineering	Converters CD-CD phenomena analysis of non-linear design and synthesis of controllers
	Comparative analysis between manufacturing processes *polimums metalmums* to develop a sensor of magnetic fields
Computer Systems Engineering	Software for mobile devices that allow the extraction of data from a remote and heterogeneous database

Source: Egla Y. Bivián C. Y Agustín Cú G., "Proyectos de Investigación y Desarrollo Tecnológico 2007", ITESI, Irapuato, 2007.

Information and Communication Technologies (ICTs)

The project "Creating a laboratory for software development and testing in the State of Guanajuato." is the most important in this sector. This project is promoted by the CONCYTEG, with the participation of numerous academic institutions. Its aim is to provide software

development services that comply with internationally recognized standards and software testing services of quality, compatibility, accessibility and functionality. Its target market is public-private organisations that need testing to the software they develop or acquire.

The project is divided into 8 municipalities of the State and develops four strategic lines: Technical Training, Training in Quality and Process, Human Development and Basic English Mathematics. In operational terms the project aims:

- Development of the software industry
- Human resources training
- Creating and strengthening of enterprises
- Decreased the gap academy-industry
- Attracting investment
- Economic development
- Social impact

In terms of human resource training in the ICT sector of the State Guanajuato has more than 15 thousand students from higher average level, 3 thousand 600 students at higher level and 230 graduate students. An estimated of 600 graduates per year.

Finally, it is important to note three actions cross covered in the project: (a) Formation of an experts team on implementation of quality methodologies and processes, (b) incubators and accelerator of companies and (c) Carrying out projects to productive articulation University - Industry.

The State of Guanajuato shows a high concentration of enterprises (proto-clusters), especially small ones, and the presence of major international industrial brands. This is because the presence of brands has generated the need to project Guanajuato companies on a *large network of relationships* Such network, through the various dimensions of international cooperation and the expansion of the productive chain of value, drive the companies to collaborate with other territorial spaces to face the new international market conditions.

This strategy, if done in the correct manner and with due assistance, allow overcome the divide between what today is local and what is not, and will favour identifying the elements of reciprocity of vocations and interests among the various companies in the territory, collaborating with a comon view to competitive insertion in international markets and mutual growth.

In short, the insertion of local productive systems of the State of Guanajuato in international circuits passing through the construction of strategic alliances of companies and territories along the value chain. This process can be developed both within the State itself, insofar anchor companies, some of them foreign, act as engine of the local productive system and pave the way for production processes technologically complex and articulated. Obliviously if demand is not satisfied locally, it inevitably runs out of the territory. These alliances can also be developed with other territories and enterprises not present in the State, through policies that will attract a "new" investment, based on alliances within the same (or related) value chain.

Both strategies become imperative with a strong and conscious participation into such growth processes by local small and medium-sized companies. To achieve this objective the key instruments that are proposed are:

- Innovation (of products, production processes and systems management)
- Technological development
- Achieving and maintaining high standards of certified quality.

OPERATIONS MODEL AND SERVICES OF INNOVATION CENTRES

Mission of the Innovation Centre: Services Centre to support the generation and transfer of innovation of product, process and market in the economic and business tissues of the region and to generate the innovative company in the field of new technologies.

Targeting priority:
(a) Definition of sectors to develop high-tech, promoting birth and growth of specialized companies and transfer innovation generated by such companies to the productive groups of firms existing in the region and those foreseen by the Strategic Plan.
(b) Innovation of the productive chains of existing industrial sectors, considering the infrastructural programmes, the possibilities of introducing new specialized segments of the productive chain, the application of new technologies to process and product segments within the production chain

Main services:
Hard Services: These are services that provide to the firms: reduction of direct cost and investment cost for prototypes. That is, these are services that support the stage of start up or the transfer process of innovative applications to the enterprises.

Soft Services: these are services of value-added (informational, methodological, organizational, managerial, training, coordination, business, financial), supporting and contributing to the start up of innovative high-tech companies and the introduction and implementation of innovative product, process and market in the present and future industrial sectors.

In its initial phase the IC will be focused mainly on soft services and successively will complete the offer with the availability of hard services.

Hard Services
Services for companies and / or entrepreneurs who want to initiate start up or develop spin-offs outside the academic world in which may have already come a period of incubation or pre-feasibility of the business idea. (It is important to bear in mind that the company cannot be developed completely in academia, so that after a certain time must be incubated in appropriate areas that support business development).
Services for the individual enterprise might include: availability of logistics areas to facilitate the operation of the company; availability of technological infrastructure and ICT (common services for enterprises); general services and cost structure shared with other companies and made available by the IC.

Objective: to facilitate the start up of the company in the market reducing overall costs and structure, so that companies could focus on their core business.

Laboratories: The CI consistent with terms already exists at the regional level, or available through its network and in accordance with the priorities outlined in the strategic lines of regional development, makes available to the companies on a cost sharing bases, laboratories and manufacturing prototypes of industrial processes necessary for the development, transfer and application of new technologies.

Objective: verify and establish the industrial feasibility and facilitate the introduction of the firm in emerging markets, reducing its costs of logistics and investment.

Soft Services:
These are services that the IC offers to firms of the region either directly or indirectly through its network partners:

Dedicated office: for the start up of entrepreneurial innovative and high-tech initiatives as well as for the companies or entrepreneurs who wish to innovate their own products and processes to operate in the field of new technologies. The services include: coordination and management of the feasibility and technology transfer stages, pre-incubation, incubation and launch of the business idea, involving skills and existing structures in the territory and/or partners of the network built and coordinated by the IC.

Promotion, development and coordination of an international network of innovation servicing the development of the territory in the field of new technologies. The main hubs of the network are companies interested in the development of such initiatives and specialized partners (knowledge institutions, business associations, regional players, public institutions) that represent the best practices of industry or process in new technologies at the international level. Such partners make available to the Network, its information resources and tools. In this context, the IC acquires the functions of a hub of new technologies for acquiring and disseminating information and resources on the Network.

Provision of services to both firms and territory in the areas of new technologies, both directly, through their own skills and resources, or indirectly, through the network of national and international partners. Particularly:

Information services:
Specialized Observatory: applied research solutions, application of new products, market research, business models and best practices of industrial development, industrial processes and technologies enabling the new technologies, labs and suppliers manufacturing process, direct connections with similar international companies, etc.
Matching services: matching between demand and supply of resources. Availability of laboratories and manufacturers, internships for managerial and entrepreneurial training, specialized human resources, placement firms in international chains in the sector, demand for new markets, exchange among international scientific-technological parks and incubators, promotion of joint ventures with similar or complementary companies to address new markets, sources of funding and international stakeholders, partners for applied research, etc..
Dissemination: structured treatment of the information, matching services for diffusion to the local network (institutions of knowledge, clusters, medium-sized enterprises, public organisations) as well as dissemination on the network driven by the demand. Finally, dissemination on the network as well as in international innovation markets of innovation product and process, generated by enterprises and institutions in the region.

Support services for the transfer of innovation product, process and market to companies as well as fro the set up and scale up of innovative companies in the field of new technologies

Services coordination and involvement of specific regional actors (knowledge institutions, companies' associations, governmental organisations) and/or international partners interested in: sustain companies in various stages of the transfer of innovation; to generate and develop initiatives for business in high-tech sectors (including, if necessary, entrepreneurial project management services).

Support services to the transfer of innovation to enterprises and their development in the marketplace: generation of ideas and selection of opportunities with the knowledge institutions at regional, national and international levels; feasibility analysis and assessment of opportunities under economic, technological and market profile; development of prototypes of innovative solutions and services to make them available to companies, including launching new enterprises (logistics, facilities, organizational and financial support, regional and/or international productive laboratories); impact assessment for the introduction of innovative product and process into the market; promoting organizational models suited to the company's competitiveness in the market for high-tech products, finding partners and international companies accompanying regional companies (*market incubators*) at the stage of start up and/or to launch new products; investigation of more appropriate manufacturing technologies and/or providers of excellence for the industrialization of production processes and support for its introduction; identification of regional markets, national and international necessary business alliances; fund raising activities that sustain the incubation stage and launching new businesses and/or transfer initiatives of innovation in existing businesses; search and selection of personnel both for the manufacturing of prototypes and the industrial production; support training and continuous training of highly specialized personnel; registration, recovery and dissemination of industrial patents.
The IC offers its services directly or indirectly through the network of partners, managing on behalf of companies or business initiatives, relationships, provision of services and the necessary agreements.

Event organization and communication: The IC must have tools and services for communication and dissemination of projects and business initiatives with the aim of fostering an innovative enterprise culture in the region.

Priority areas of intervention
Target sectors: The focus of services and activities of IC is orientated in the first instance to the transfer of innovation and/or generating new companies for applications of new technologies in priority identified chains.

The IC in addition to promoting the introduction of new materials and new products in the indicated areas (to produce innovation) and to provide adequate support for the industrialization of related work processes (innovation process), it will also support the birth of both companies of innovative product that have an impact on traditional sectors and high-technology companies (or knowledge intensive), which from similar industrial processes can produce for various other sectors different from the current ones.

Typology of Target Company: defined the chains and contexts priority for the intervention, it is important to establish the focus and distribution of IC services towards a typology of enterprises or entrepreneurial initiatives characterized by rapid growth and decision-making and structural flexibility. Such companies stress a typology that the international literature called *Gazelle companies*. That is, companies or business initiatives able to react in time to renew their strategies with respect to the competitive market and the introduction of innovation.

The IC must therefore encourage the processes of birth and acceleration of such companies which are the driving force of innovation and entrepreneurial dynamism and competitive growth for the territory. In fact, entrepreneurs often inspired by models of success under rules of imitation, creating a dynamic *fast follower model* who favours the setting up of clusters.

Without neglecting any size companies, the IC will prioritise actions and services for SMEs, particularly towards new business initiatives or even towards those companies that operate in

mature sectors of industrialization, manifested signs of vitality and subtracted to decline, thanks to the force of ideas. That is, those companies moving against the trend respect to their own industrial sector, with high growth; more precisely the *Gazelle companies*.

Possibility fields of application

The evolution of materials and industrial level implementation of various nanotechnologies (optical, plasma, coating, etc.) represent a strategic factor in competitiveness for many sectors. To lead such applications and technologies in these sectors is a key factor for economic development of the territory.

The acceleration of the process of acquisition and introduction of high technology products in the priority sectors of territory favours the creation of *global companies* that can operate in international markets able to attract and develop transnational business.

The indirect aim of IC is promoting the so called *market and competition leadership* among local firms that operate with new technologies in the sectors identified as priorities. In particular, leading companies in the sector in the domestic market and nearby markets of Latin America.

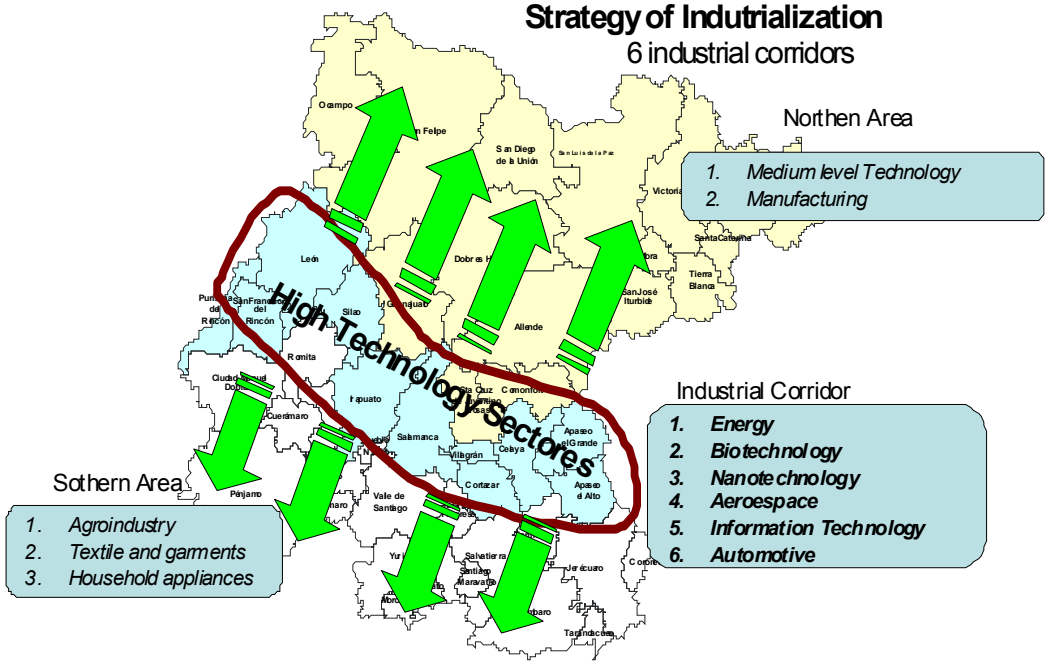
Purpose and scope derivatives

The IC in addition to its mission aims to support and create synergies with existing initiatives and agencies in the region to encourage the introduction of innovation, increasing competitiveness and generating new enterprises along the production chain and other strategic sectors. That is, in those sectors where clusters of firms are likely to lead various segments of the chain. All this in order to generate higher value added production system at regional level.

The existence of infrastructural projects could give a significant boost to the development of logistics and the possibility of using innovative applications in this area, thus increasing the competitiveness of some existing production chains.

VENTURE CAPITAL FUNDS IN HIGH TECHNOLOGY

The Government of the State of Guanajuato has charted a "vision of the future" with the development plan 2006-2012. As shown in the table below, this strategy is mainly based in the economic restructuring that places to the centre of the region's competitiveness, six industrial corridors with high technological content: energy, biotechnology, nanotechnology, aerospace, information technology and automotive/auto parts.



As structuring axis to increase the competitiveness of the industry by adding innovation, it is proposed a programme to attract investments based on building a chain of Value Added Dynamics. Its main component is the Industry Support (investments in supply chains for productive second and third level), Industrial Prospecting (investments accordingly to the talent and strategic industrial development) and investment in indicated *new sectors*.

The strategic plan considers a specific programme for strengthening the micro, small and medium enterprises (SMEs integrated to the Value Network), which comprises eight lines of activity:

- Increased productivity
- Modernization of business
- Strengthening the centres for social provision
- Innovation and technological development
- Products
- Promotion and marketing
- Productive projects
- Regulatory improvement

The programme integrates strategic industrial projects with two ambitious infrastructural and logistical services: the customs office and industrial corridor's rail.

In this area, the State Government has shown great interest in implementing the model of Innovation Centres as a tool for development in support of technology centres already established, supporting the promotion, development and transfer of high technology to industrial clusters of the

State, including an Investment Fund to finance high-tech application of advanced technologies that the Centre will develop and also will promote innovation.

The State of Guanajuato, with almost 5 million inhabitants, it is the fifth State in terms of country's GDP, invests in Research and Development an average of 0.8% of GDP similar to many countries around the world. Guanajuato is centrally located in an area that totals more than 50% of the country's GDP (Federal District, States of Mexico, Jalisco, and Nuevo Leon).

Based on the interest shown by the State of Guanajuato and the socio-economic situation in the region, it has been decided to prepare a draft business plan to verify the technical and financial parameters of a venture capital fund for high technology to be supported by the Government Development Plan (2006-2012).

PROPOSAL FOR THE ESTABLISHMENT OF THE MEXICAN VENTURE CAPITAL FUND FOR HIGH TECHNOLOGY

The proposal consist of establishing the Mexican Venture Capital Fund for High Technology with an initial capital of $ 20 million to allow the rapid implementation of high-tech projects, similarly to what is happening in other parts of world. The synergy with the innovation centres that the Government of Guanajuato has been implemented, with financial institutions will be one of the key issues for the success of this fund. At this preliminary stage it was decided to structure the Fund as a Closed Fund with its Management Company.

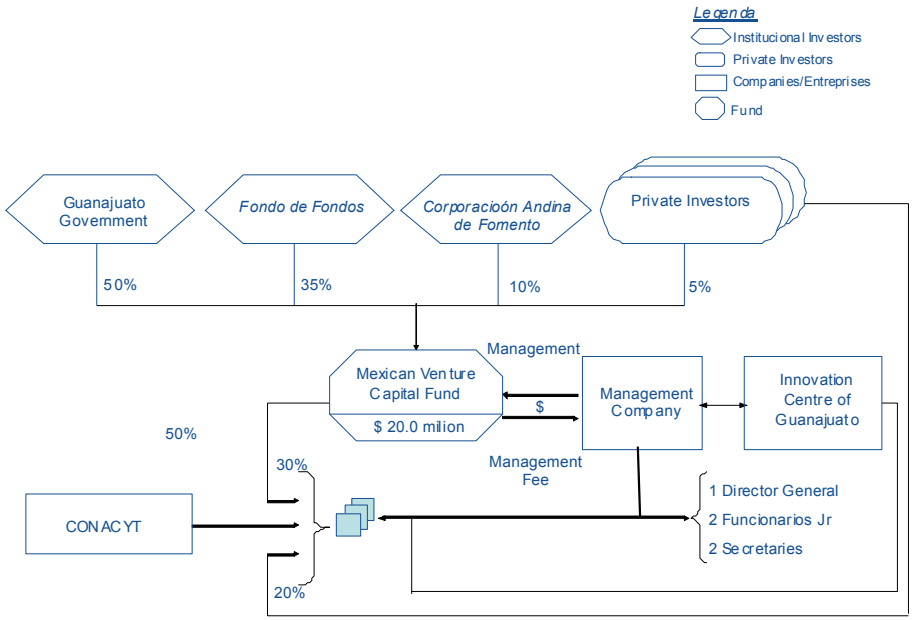
Operating Framework

Part of the Fund with a capital of $ 20 million, of which 50% subscribed by the State of Guanajuato, and the remaining 50% subscribed by several institutional investors including: Fondo de Fondos and CAF (Corporacion Andina de Fomento)

The Fund will operate through the Management Company, which is responsible for managing the Fund for a period not exceeding 10 years. This is a simple structure, formed by a Board of Directors, a Director-General, two junior officers and two secretaries.

The following table shows the operational plan.

Mexican Venture Capital Fund – Operative Flowchart



Source: Results of discussion with all stakeholders

The tasks of the Management Company are the followings:

- Generating proposals for the Fund
- Evaluation;
- Autonomous funding decision
- Support also in the management , especially for companies in the early stages of start up
- Organization of co-investors 'syndicate'
- Exit-route of the investment made by the Fund

Criteria for investment

- Technology projects that possibly cover the priority areas identified in Development Plan of the Government of Guanajuato i.e.: nanotechnology, biotechnology, energy, aerospace, ICTs, automotive.
- New SMEs
- Participation Fund up to 30% of the investment, with a maximum of 0.7 million dollars per project
- Participation Fund up to 10% of investment in the case of seed capital

First Group Partners Fund

The primary operating Partner of the Fund is the Innovation Centre that is being created in Guanajuato with the participation of the State Government and the following Universities and Research Institutes:

Higher Education Institutions

- Higher Technological Institute of Irapuato
- Humanities Institute of Science and Technology of Guanajuato, A. C.
- Higher Technological Institute of Southern Guanajuato
- University of Technology, Leon
- Technological University of Southwest from Guanajuato

- De La Salle University Bajio, A.C.
- University of Guanajuato
- Technological Institute of Leon
- Institute of Technology Roque
- Technological Institute of Celaya

Research Institutes

- CIATEC, A. C.
- Research Centre in Optics,
- Research Centre in Mathematics, A. C.
- Institute of Science in Human Reproduction, SC
- Centro de Investigación y de Estudios Avanzados del IPN - Unit Irapuato

Allies in the Program

A number of potential strategic allies for the Fund were identifies and selected. These local and foreign financial institutions may be potential subscribers of the shares of the Fund or co-investors in the companies and the science and technology institutions to generate proposals for high-tech businesses.

Normally, the Fund should not have participation over 30-35% of the total capital in shares in companies where it has decided to invest. Therefore, it is necessary to form an investors 'syndicate' (including, of course, one part, albeit small, subscribed by the promoters), which ensures the financial requirements stipulated by the business plan. Although data are still preliminary, the attitude of the 30 financial institutions operating permanently in the territory of Centre-North of the country seems positive towards the establishment of the Fund or towards investment proposals.

Similarly, it is important that the Fund can count with operative agreements with local scientific and technological institutions, universities, industrial associations and so on, which select and prepare the proposals will form the portfolio of the Fund. In general relations with institutions/organisations that may submit proposals for high-tech businesses has to be promted.

This fund has a comparative advantage quite remarkable for having been designed in the context of the Innovation Centre that the State government of Guanajuato has shown great interest to implement. As already indicated in the preceding paragraphs, the IC will play a major role as a development tool in support of technology centres already established in the region to support the promotion and development of high technology and its transfer to the State industrial clusters. In addition, the State Government has also confirmed his interest in becoming one of the main promoters of the Fund with the aim to finance leading edge technologies implementation that the Innovation Centres will promote and develop.

In parallel to the scientific definition of deals, the proponents can use the Internet Network launched and managed by some multinational companies (see table below). In fact, large companies are outsourcing parts of their R & D activities, creating a sort of *subcontract scheme* for World Community Research, in which researchers from Guanajuato and Mexico can be involved in, and can benefit from the financial resources of the Fund.

Mechanisms in operation to support proposals for research and development of some multinationals

Reference	Country	Iniciative	Details	Notes
Eli Lilly Inc.	USA	www.innocentive.com	*Market Place* of meeting between "Researchers" and "Supply of scientific solutions"	Around 70 mil members with Funds up to 40,000 spent in the month of assignment
Royal Dutch / Shell Group	UK – NL	Program "Business Technology Managers"	Availability of 1 *Middle Manager* to assist the institution or person proposing a technology project/idea. The group can decide to option a the financial participation	√
Procter & Gamble Inc.	USA	www.connect&develop.com	The American group intend to move 50% of its R&D activities abroad and has activated an specific site for the technology scouting	√
Nine Sigma Inc.	USA	www.ninesigma.com	Private society operating in the technology transfer with an own marketplace used by 50 groups listed within the "first 500 of the Fortune magazine	Payment of *success fee*
Air Product Inc.	USA	"Identify and Accelerate"	In the stage of collection of information	√
Glaxo Smith Kline Inc.	USA – UK	"New Business Accelerators"	In the stage of collection of information	√

Source: web sites and interviews.

Moreover, there is also the possibility of a connection with international funds which can provide the Fund with an international dealflow that in the future can be transferred to Guanajuato.

International links

To increase the possibility of ensuring the success of this proposal and consequently of the Fund's activities, it is necessary to identify and manage a locally and regionally critical mass; quickly establish of institutional arrangements for the generation of high-tech business and consolidating these possibly agreements in a "geographical corridor". For example, between Europe and Mexico where the city of Guanajuato and Leon can serve as a centre of this network.

In fact, to feed the flow of proposals for the fund and create after 4-5 years of the capitalization of companies in the portfolio, the exit strategy of the Fund's investments, it is necessary to have access to connections with other operational areas and with similar potential in the areas of interest of the Fund. For example, in Europe: Brussels, Utrecht and Dortmund:

> *Brussels (Belgium)* possibility to operate with Information Technology and Innovation, non-profit association, in a position to introduce the Fund into an international network, and strengthen the position of the Fund (and Guanajuato) at the international level. In this context it is possible to organize training courses in technology management with Universities of Northern Europe.
> *Utrecht (Netherlands)*possibility to operate with "Money Meets Idea" a mechanism for business enterprises and high technology designed by Rabobank, one of the top 10 banks in the world who are interested also in creating high tech companies

Dortmund (Germany), which could create a connection with MST Factory, a centre of excellence in the field of nanotechnology. MST was created by public institutions and venture capital funds to convert a steel plant in a Technological Park, where 24 high-tech companies with 1,600 employees are now in operation

First portfolio Projects

The basis for the success of a venture capital fund is the quantity and quality of investment proposals that the Fund may assess. The Fund thus justifies its existence and creates prerequisites for significant financial returns for their subscribers, also considering that in the area of reference are available other excellent investment proposals that will increase the number of projects under the Fund's portfolio.

A first group of projects can originate from programs already partially funded by CONACYT (National Council of Science and Technology) to institutions of Guanajuato in the following sectors:

Biochemical Engineering
- Isolation and characterization of degradation microorganisms of aromatic hydrocarbons
- Obtention of a series of similar auxins and their compounds with Zinc.
- Design and optimization of a bio-digestor for sewage treatment of pig origin.
- Identification and characterization of Yarrowia lipolytica strains for the degradation of oil.
- Design of equipment for demineralised water

Materials Engineering
- Obtention of polymers coordination of Zinc (II) and Cadmium (II) with nitrogen binder donors
- MEMS micro system design for the characterization of materials with electrical properties

Electronic Engineering
- Determination of insecticides in pepper using MEMS technology
- Developing a sensor for measuring the leakage current generated by the accumulation of pollution in the electrical insulators suspension
- Developing a sensor for detecting faults in electrical contactors from the emission of infrared radiation due to electric arc in the areas of contact.
- Theoretical development of a multi-sensor system to identify critical variables in Power Transformers of the national electricity grid
- Converters CD-CD nonlinear phenomena analysis, design and synthesis of controllers
- A comparative analysis between manufacturing processes *polimums metalmums* to develop a sensor of magnetic fields

Systems Engineering
- Software for mobile devices that allow the extraction of data from a remote and heterogeneous database.

Additionally, other potential initiatives/projects (start up and joint ventures) originated outside Mexico, have been already identify which combined with other strategic alliances, could foster growth in technology degree of spread throughout Mexico. These are 13 proposal in the high tech sector with a total investment of about $ 4 million dollars with a potential of at least 30 new jobs..

Financial results

With the assumption that the fund can cover up to 30% of each project, CONACYT is committed in covering 50% of the total investment, leaving private capital, including the sponsor, the other remaining 20%.

With these considerations and assumptions the first version of Business Plan for the Fund has been updated with the following envisaged results

with an initial capital of $ 20 million and a portfolio of at least 30 business projects, the Fund could generate an internal rate of return over 20% in view of its liquidation, 10 years after its launch.