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Science and technology parks as leaders of urban and industrial areas' innovation systems

PARALLEL 5
Linking STPs to people and cities

Ricard Esparza Masana, ricard.esparza@uab.cat

UAB Research Park, Spain

Executive Summary

The present paper aims to introduce a model that must support the promotion of innovation, technology transfer activities and entrepreneurship in a concrete region, where all agents working on these fields have their role and where a STP must lead these activities given its position as the institution devoted to connect science and technology with the industry and the society. We present some potential programs to be executed by the STP in collaboration with firms, associations, public administrations, research and technology centers, and high education institutions, all them helping to improve the region's capacities around the knowledge economy. The initiatives presented have been already tested by the UAB Research Park in the B30 region near the city of Barcelona and they can be extrapolated to all the STPs aiming to cooperate with the other agents of their regions looking to achieve the optimal results regarding innovation and technology transfer projects.

1. Introduction

For the better part of the past fifteen years, we have been living in the knowledge economy. In the European context, supranational development directives have understood this and progressed accordingly. Evolving from trying to consolidate Europe as the "most competitive and dynamic knowledge-based economy in the world" –as claimed in 2000's Lisbon Strategy [1]–, to much more encompassing, yet specific, innovation-centric objectives –as found in the Europe 2020 plan [2]. For instance, the plan outlines the creation of a research-fostering framework in the form of an "Innovation Union", champions a broad overhaul of the productive and labor markets toward more competitive, innovation-intensive sectors, and advocates for the establishment of a "3% of the GDP" benchmark for investment in R&D activities on the national level, to name but few of the regional innovation-strengthening objectives specified by the plan. But aside from these, more "traditional" goals have also been established by the Europe 2020 directives, like the improvement of educational systems or the modernization of national industries; all of which connect too with the broad vision of Europe as an innovation-centric supranational project, as envisioned by the EU for the region's near future. In other words, it would not be inaccurate to say that Europe is well on its way to becoming an innovation-based society. This context has been also developed all over the world, and most countries have started to apply their own initiatives and policies aiming to promote these activities.

All of the objectives discussed above would seem to hint at a shift in regional innovation management, moving closer to a systemic approach that allows the region to acquire the efficiency benefits of unity and coordination, without losing the independence and focus that local institutions bring. Clearly, the driving force behind this new perspective of innovation management seeks to foster, track and evaluate innovation in an integral way. In order to do this, we need versatile institutions and agents, who can easily move between the academic and productive worlds, bringing them together so that agents can find an efficient place to match their needs. The daunting requirements of such a role are fulfilled by scientific and technology parks. Furthermore, we believe that STPs offer the most efficient mechanism to coordinate and improve knowledge generation, technology transfer and entrepreneurship. In this paper we will present successful experiences of a STP leading a regions' innovation and suggesting possible ways to extend and generalize the model we have built, hoping for it to be applied in other different situations.

2. A survey of the STPs literature

It seems natural, given their advantage in the production of knowledge and the development of its technological applications, to try to bring together the academic and industrial worlds together in STPs. Precisely, the hybrid nature of Science and Technology Parks is more than a natural fit for an organization/agent to lead the confluence of groundbreaking technologies and brisk entrepreneurial competitiveness. Though the integration of STPs in regional and supranational policies is rather recent, the idea of creating an environment for firms, research institutions and universities to interact, goes

back a long way. In this section we will very briefly present an overview of previous attempts to lead regional innovation systems through STPs.

Perhaps the modern conception of STPs comes from Castells and Hall (1994) [3], who defined them as spaces where fundamental knowledge and cutting-edge technology are found, but also where these "raw materials" can be developed, transformed and manufactured into other products. We adopt this definition for our paper, but we must also remark that, besides the usual physical meeting spaces that STPs provide for researchers and entrepreneurs, it is necessary to open a virtual environment for these agents to meet. Running in parallel to the regular STPs spaces, this virtual network enhances and expands the interaction possibilities usually offered by STPs through an intranet or other possible ways.

STPs have arguably been appearing and operating in a spontaneous manner since at least the first half of the 20th century, but the first example of an STP that was developed with the intent of creating an institutional environment with those precise characteristics, was Sophia Antipolis Science Park in France (Longhi 1999) [4]. Other notable examples of the development of spaces for research, educational tasks and technological activities, as well as business creation and industrial production, are: The Hsinchu Science and Industrial Park in Taiwan, The Research Triangle Park and the Purdue Research Park in the United States, the Tsukuba Science City in Japan, the Daeduck Science Park in Korea and the Campina region in Brazil, among several others (Castells and Hall 1994, Chan and Lau 2005, Dong-Ho 2001) [3] [5] [6] Among the motivations for creating an STP we find the desire to lead the transition of a region's productive structures to activities where the innovation factor plays a stronger role. These activities usually carry a larger added value for consumers and a market premium for producers. In a nutshell, they increase a region's welfare[1].

The evaluation of STPs performance has usually been a contentious task. The same way there is no unique definition for the characteristics and attributions a STP must accomplish, one cannot easily find a go-to evaluation technique to assess their performance. Naturally, looking at quantitative indicators for number of projects managed, spin-offs created, products taken to the market, and similar deliverables, are the most common and direct way to obtain a snapshot of an STPs' degree of success. Yet, the particular timing each transfer project has and their inherently different features mar the establishment of an across-the-board evaluation method, relying on a single, common indicator, for STP's performance. Hence, it is also frequent to employ techniques coming from the more qualitative side of the management world, like SWOT analyses or Delphi studies [13]. For instance, Dong-Ho Sin (2001) [5] evaluates the Daeduck Science Park using a SWOT matrix. In that line, it is usual for STPs to look for the following indicators of a successful implementation:

- The creation of (physical) environments for the different agents to gather and meet
- The existence and upkeep of adequate technical facilities
- The provision of support services (housing, transportation, etc.)
- The quality of the research and educational activities taking place in the STP and in its sphere of influence
- The number of emerging spin-off companies and their development state
- The impact on regional employment (at least in the non-qualified, support and service areas)
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Similarly, it may be beneficial for STPs to be established in areas where collaborative relationships already exist between the agents and institutions involved. This recommendation applies in all the possible levels, from research coordination between the different branches of a same research institution, to areas where the interest of local industries on innovation and scientific expertise is well-known. On the location of STPs, Wright et al (2008) [7] analyze the location choice of Chinese scientists who return from abroad and decide whether to stay in a university-based STP or to go to an external one. This, as the authors point, is a "major strategic decision" for innovation-intensive ventures. Applying econometric methods to a representative sample of SMEs from the Zhongguancun Science Park

[1] Not to mention that go in line with the fulfillment of the Europe 2020 strategies.

in China, which comprises both university-run and independent SMEs and is the largest technology-based entrepreneurial cluster in the country, the authors observe those returning researchers who possess patents from abroad or an innovation in a high state of development, tend to prefer non-university parks. On the contrary, researchers who do not hold any technology transfer from abroad or whose research is still far from reaching a marketable state, choose university parks to settle down.

The explanation for this behavior is found in the complementary assets that each location offers. Non-university locations allow SMEs to exploit closer links to the productive/commercial world, whereas university locations offer more intense interactions with research institutions. It would seem that, in general for early-stage transfers or environments with a low volume of transfers, to locate in universities. For example, in the case of the UAB Research Park, in the region of Barcelona (EU), since the mass of research projects reaching a transferable state is still small –and given the strength UAB (Autonomous University of Barcelona) shows as a knowledge-generating agent– it seems appropriate to locate the STP within the university's control. Even so, the proximity of Spain's most active industrial center to the site, somewhat downplays the fear of a potential disconnect between these two facets of the STP's task.

Nevertheless, it is important to note that locating an STP in a university environment will not guarantee academic links to appear by default. Papers as early as Quintas, Wield and Massey (1992) [8] already note that there is no empirical evidence on the positive impact of STPs on the creation and strengthening of academic-commercial links. STPs need to be designed in a way that not only fosters this linkage, but makes it unavoidable. Academic expertise must flow to the production branch of the park and obtain feedback from it, such that firms' needs suggest the academic agents further research opportunities. The development of a mechanism with these characteristics is the core of developing an efficient STP.

In terms of the innovation promotion effect of STPs, Lindelöf and Lösften (2003) [15], look at a sample of "new-technology based firms" located in an STP and outside of it, comparing these two subsets of firms in their innovation-intensity. The authors find significant strategic differences among these samples: On-Park firms develop a greater innovation ability than off-park firms, but also have higher growth numbers in terms of sales and firm size. Conversely, off-park firms again exhibit strong links to other, usually large, firms in the sector. While it is not possible to draw a conclusion on the correlation of these characteristics and the location of the firms, the evidence would seem to support the idea that those firms that locate in an STP remain closer to innovation-intensive markets, and are thus able to attain higher short-term growth numbers.

On the role of STPs as central actors of National Innovation Systems, the literature offers unsurprisingly little insight, given the novelty of the topic. What nevertheless becomes clear is the positive impact STPs have on the technological competence of a region, the size and influence of R&D expenditure on a region's industrial sectors and the quality of educational and research activities (Nelson 1993) [12] Leaving the production/commercial branch aside, Huggins et. al. (2008) [16] looks into the role of universities and research centers in the development of regional knowledge networks, pointing at the improvement on a region's "knowledge-based infrastructure" due to the presence of an STP. Perhaps the closest effort to what we try to suggest in this paper comes from Chung (2002) [14], who presents a plan to implement a national innovation system through several, smaller, local ones. Using the South Korean innovation system as a case-study, the author maps the actors and actions that can be carried in order to solidify the existing (admittedly weak) innovation systems, outlines some policy recommendations and chiefly draws potential cooperation paths for central and regional governments, in order to foster the NIS. The main difference between our paper and Chung's is that we do not take a country-wide scope, but rather analyze how a specific STP can dynamize and lead a region's innovation system. Unlike Chung, we do not look at several different STPs and check how they can specialize and cooperate among each other, but focus on a single STP.

Finally, assessing the role of STPs as local innovation dynamos, Tan (2006) [10] remarks how STPs have a strong impact in the creation of "territorial systems" of firms that gravitate around similar production

fields and feed-off of the university's scientific production. Usually small or medium in size, the firms that form this network create a de-facto cluster, establishing strong local links (among themselves and to other regional industries, suppliers, etc.), and exploiting flexible production models, adapted to technological advancement. In Tan's word going as far as becoming a "collective entrepreneur". This spontaneous clustering effect is interesting for it is believed to play an important role in facilitating technology transfer (Tallman et. al. 2004) [11]. However, unlike regular industrial clustering, where resource agglomeration or isomorphism are the leading rationales for integration, STPs' clusters seek to stress the innovation-enhancing properties of integrating research centers, spin-offs and SMEs in this network. To wit, the cluster´s foundation comes from potential innovation alliances instead of commercial coordination. The benefits of research and entrepreneurship are believed to generate important spillovers under this model of STP clustering[2].

Similarly, Yang et. al. (2009) [17] observes, looking at Taiwan's Hsinchu STP data, that new-technology-based firms invest more efficiently when located in an university-owned STP. Moreover, Motohashi (2005) [18] suggest an increasingly important role for university-industry collaborative firms on the volume and relevance of R&D on Japan's system of innovation; to the point where these research-centric links may overtake in-house knowledge generation. To summarize, it is clear that STPs play an unquestionably positive role in fostering a region's innovative-competitiveness, in particular through industry-firm collaborations. The benefits of locating a STP on-campus, and making it lead a national innovation system, are evident as well. Hence, as we propose in this paper, the development of an integral innovation system based on a STP is one of the most pressing tasks any society willing to compete in the knowledge-based economy today, must take.

3. A model for a STP as an innovation-leading system

In this section we will first describe the characteristics and agents that an STP-lead innovation system must have. Then we discuss how the system operates, which are the tasks it must perform and how they interact, connecting the research and commercial worlds. Finally we present an algorithm for the cooperation between firms and research institutions, with the STP working as a link. This algorithm, once the STP has been established as a coordinating mechanism between the productive and knowledge generating worlds, will describe the steps that must be followed in order to identify the needs of the region's firms, and try to answer them with the technological solutions that the research institutions provide. The final product of this section will thus be a series of guidelines for a broad interaction between the agents that fall under the tutelage of an innovation-system lead by a STP.

3.1. The Innovation System and its tasks: a description

There are three main vectors in an innovation system, which must be taken care of by the STP: knowledge transfer, innovation and entrepreneurship[3]. These come from a basic analysis of the expertise and performance area of the system, as well as following the natural progression of a research park's activities. What's more, while it is true that not all innovation systems will demand the same intensity from each of these three facets, the three of them will most likely be present –in a more explicit way or another– in all the activities a STP faces. To wit, there will be a portfolio of technologies and products that can be transferred to the productive agents that are currently in (or joining) the STP, aside from setting new relationships in motion between these agents. These two will be the main lines of action of the system. Our design addresses each of the tree vectors with a specific branch of the project.

1. *Transfer Unit*

[2] In particular, the literature mentions the increase of development investments and marginal returns on research for firms located in a STP cluster.

[3] This section was developed as an extension/generalization of the UAB Research Park's experience. Nevertheless, we have tried to stress the common aspects of this innovation system, trying to maximize the generality of our model.

Its main task is to get the entrepreneurial side of the park in touch with the research agents. It will take the form of a technology marketplace that will be initially operating through a mediated intranet, but with the perspectives of being open to external costumers. There will also be conventional meeting spaces, including permanent channels (the technology marketplace) and events (conventions, fairs, etc.), available for these encounters to be efficient. In a nutshell, this side of the STP takes care of finding the efficiency in the interactions between all the agents involved.

2. *Innovation Unit*

   In a very elementary level, this unit will track, register and profile innovative ideas coming from projects, labs and other research venues in the system. In a more advanced stage, this unit will foster the creation of SMEs that can transform the innovation transferred in results, progressively incorporating in their network and activities those firms that do not actively innovate. The main "tool" –for the lack of a better word– in this transition will be the project-monitoring algorithm that will be presented below.

   This unit will also be in charge of supporting the creation of an "innovation culture" in the system. In order to do this, the unit will have to establish regular training programs on management topics, to be held for the staff of the STP.

3. *Entrepreneurship Unit*

   This unit will be in charge of successfully supplying the projects with managerial and coordination skills. On the one hand, workshops to foster self-employment and entrepreneurship should be held among the research and teaching staff, in order to fortify the development of market/production intuitions (if not an entrepreneurial culture) in research-centric agents of the system. Additionally, support and productive staff must be trained in the importance of creating products with high added value and a professional education, in the line of the innovation-formation that is taken care of by the "Innovation unit".

   In parallel to the project execution stages describe by the algorithm we will present next, the innovation system should consider the creation of a projects incubator, to prepare future projects that may be far from the market or in need of further work but in terms of technology.

3.2. A brief description of the system's operation with pre-existing projects and agents

In a first stage it will be necessary to activate and consolidate the existing links between firms and knowledge-generating agents, and stimulate the emerging ones. An initial elicitation of the firms' needs will also allow the STP to detect new links between existing institutions and firms, through means already established –perhaps in the form of cooperation agreements for research and innovation. Very simple activities like a research projects fair, focused on the technologies already profiled by, for example, the technology transfer office, will work in this sense. The objective here is to promote the information exchange between research agents and firms working in similar areas, or whose interests converge. The result will be to increase the innovation and competitiveness of the firms already established in the area. Later we will see how to deal with new projects, but the STP will have to deal with the previously existing ones too.

In a second step of the introductory phase, the STP needs to define general lines of action for the support of already existing projects. Namely, if these or the research institutions that harbor them need highly trained staff (PhDs, postdocs), the STP will see if these needs can be internalized or sponsored by any of the firms in the park. This process is the reverse of what takes places when the STP

pitches technological solutions from the park to existing firms; but, instead, here the STP tries to satisfy the knowledge-generating agents' needs with the firms' resources. For immediate support in terms of managerial skills, the STP must establish an expert team devoted to offering consulting services to the research institutes and to the firms that want to take part in the park.

Finally, before moving onto ways to deal with new projects, the STP's expert team must present an assessment of the most promising technologies currently in the portfolio, their development state and a prediction on how far they are from the market (including the time and resources needed for this). This comprehensive list will, in time, evolve into an intranet that all the agents in the STP will be able to access to screen the state and ilk of the innovation initiatives taking place in the park. Lastly, the innovation environment will be open to all agents in the STP, for them to spontaneously search for possible future cooperation and interaction agreements.

3.3. An algorithm for projects management in an STP-lead innovation system

In this section we present the most general part of our paper: an algorithm to apply whenever a new project arises in the environment of the STP-lead innovation system. Bear in mind that the primary lay-out, the actors and their interactions have been described in the preceding section.

Here we present a seven-stage model which aims to establish STPs as promoters of projects devoted to increase the capabilities of local and regional companies, through innovation projects with a high technological added value. This model's objective is o define a system that is able to identify and select projects that respond to firms' technological needs. Moreover, these needs can currently be satisfied by the research and technology centers present in the region, though the lack of a mediating agent –a role the STP would come to play– makes this process difficult.

3.3.1. Agent's description

The agents that would be involved in this system, starting with the STP, are described below:

a) The STP: It must be the agent that leads the whole project for a simple and obvious reason: it possesses all the tools necessary to connect research and innovation with the productive and commercial world, working as a natural nexus for any innovation-intensive project that either the firms or researchers want to carry out.

b) Local and regional governments: They play a dual role in the project, first identifying the firms that can cooperate with the knowledge-generating agents found in the STP, and fostering their involvement; but also in a position to fund and finance the initiatives generated within this framework.

c) Firms associations: Their main function is to detect the firms facing technological challenges, and classify them according to the nature of such challenges: individual, collective, etc. These associations can also act as a support system for newer firms and spin-offs, given their experience and resources in the entrepreneurial world.

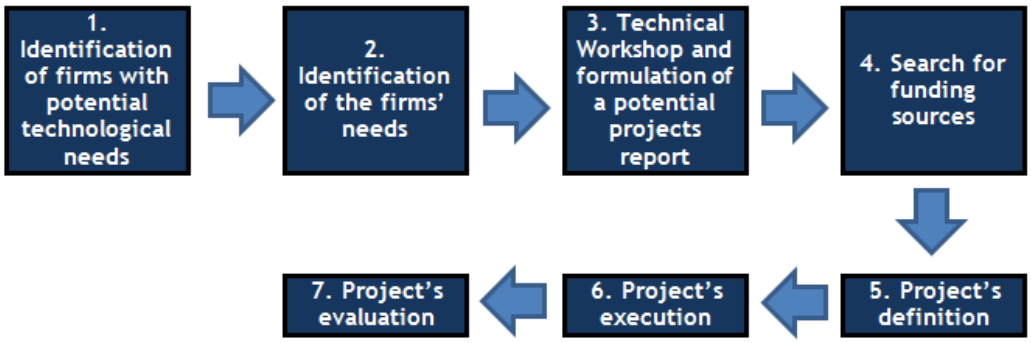
d) Research centers: These are the suppliers of knowledge and technology that will satisfy the firms' needs. Universities are also included in this category, as well as research institutions, technology centers and other institutions involved in the generation of knowledge and technology.

3.3.2. Algorithm's steps description

The following seven-stage algorithm represents the process that the STP must follow every time a new project appears, suggesting the collaboration between the firms and the knowledge-generating agents.

Naturally, the process is iterative and is subject to adjustments according to the specific context and characteristics of each case. We now proceed to describe these stages.

Figure 1. Phases of the model



Source: Own elaboration

First step: Identification of firms with potential technological needs

Agents involved: STP, government institutions and firms associations

This stage comprises a wide survey, with the help of local government institutions devoted to the promotion of innovation and entrepreneurship in a region, as well as firms' organizations, of firms that can require and support technological and innovation-intensive projects. The STP itself must identify the on-site firms that may be up to support innovation-intensive projects. The access to pre-existing networks, ran by regional institutions or firms' organizations, is very important to guarantee a wide reaching impact and efficient data collection for the STP. Similarly, entrepreneurship promotion must go hand-in-hand with innovation promotion, so that all firms in the region become aware of the opportunities they have in collaborating with knowledge-generating agents through the STP. The information that regional government institutions have on firms and their characteristics is not to be disregarded, as it can become an important resource for the STP. Furthermore, regional and local government institutions must become partners in the creation of a broad innovation-centric initiative, which will be led by the STP but cannot be understood without these agents playing a central role in identifying the opportunities to generate new, innovative projects involving local firms.

Furthermore, firms' organizations usually have firsthand knowledge and information regarding the technological needs and opportunities that companies in a region face. This will make them specially relevant agents, as they might be able to make very concrete suggestions on what projects are more pressing or viable, or which firm (or conglomerate of firms) could better support a given innovation initiative. Special interest must be set on firms' organizations that represent SMEs, since fostering the adoption and development of innovation-intensive projects by small firms is one of this project's objectives. Similarly, clusters and non-innovation-intensive industrial parks should be considered as important agents in this stage of the process.

The STP representatives must meet periodically with the agents we have just described, helping them identify the most likely candidates to work with; ultimately elaborating a priority list. Thus, before actually contacting any firm in particular, the STP and the agents who represent the mass of firms, must evaluate the potential firms to be involved and establish a roadmap for the interaction to take place in the next stages.

Second step: Identification of the firms' needs

Agents involved: STP, firms, research centers (including universities).

The first meetings with the firms are essential for the project's later success. It is important that in these preliminary meetings, besides the STP and firms' associations representatives, for each firm's specialized/technical staff to actively participate. That is, beside managerial and coordination representatives, agents that are set to become technical/scientific leaders of the projects, must take part in the meetings.

Ideally, these meetings' purpose is for the technical and managerial staff of the firm to present their line of activity, their challenges and needs, so that the STP agents can identify possible project opportunities. The STP's staff should help the firms' to identify those needs and potentialities that they have not explicitly mentioned. However, it is important to keep in mind that the results that come from these meetings are far from being well-defined projects; nonetheless, the meetings must help to identify potential cooperation initiatives. In case these opportunities exists, the STP representatives must proceed to prepare a technical workshop to develop them, a we explain in the following stage of the process.

Third step: Technical Workshop and formulation of a potential projects report

Agents involved: STP, firms, research centers (including universities)

Having identified areas for cooperation, the objective for the Project in this stage is to carry on a technical workshop, where the research centers, universities and knowledge-generating agents are to take the role of suppliers of the firms' needs. The STP is to foster the creation of synergies among the workshop's participants, so that the resulting projects and initiatives satisfy the interests of all the involved parties.

It is also very important for the involved parties to nominate a representative, as well as a coordinating and follow-up commission, which will monitor the progress of the project as well as take care of formal requisites like keeping a project's log, satisfying the funding institutions requirements (if the case applies) or preparing report's on the project's state of execution. This commission will also make sure that the timetable agreed upon in the workshop, is followed accordingly. It is in this stage that funding opportunities for the project must be discussed and pursued.

Forth step: Search for funding sources

Agents involved: STP, public administration (local and regional governments), firms' associations

As it is the case with most project's the funding may come from public or private sources. The STP staff will evaluate the project's profile and what are its funding opportunities, and consequently move the project in such direction. One of the responsibilities of the STP is to be on the look for public funding in the form of grants, fellowships, subsidies, etc. which may fit the profile of the firms and projects under the STP's tuition. The breadth and number of these means and support initiatives varies greatly from region to region.

However plentiful public fund may be, private investment remains as one of the main sources of financial aid that innovation projects can count on. It is extremely important for the STP to make sure that firms perceive the allocation of funds to research and technology transfer as an investment, albeit with returns just visible in the mid to long term.

It must be noted that the most common way to fund these type of projects if co-financing them. This means that a public entity funds partially the project (usually through grants to the research centers and universities), and the firm taking the technology to the market cover the rest of the project's funding needs.

Fifth step: Project's definition

Agents involved: STP, firms, research centers (including universities)

Once the sources of funding have been secured and the timetable for the project's activities set-up, the project enters in its definition stage. What we mean by definition is the creation of something akin to a business plan, which encompasses the detailed to-do list for the project's execution. This plan must be written by all the agents involved in this stage, with the STP working as a linking agent between the practical aspects of the project, the firm backing the project up and the research centers providing the firm with innovation or technological solutions.

Sixth step: Project's execution

Agents involved: STP, firms, research centers (including universities)

The project is set in motion according to the plans devised in the preceding stage.

Seventh step: Project's evaluation

Agents involved: STP, firms, research centers (including universities)

Following the implementation plan developed in the corresponding stage, the project's evaluation will be an ongoing process; running in parallel to the project's execution. However, there will be some major deliverables that will determine the project's transition between different stages. Furthermore, there will be a handful of goals that, upon being met, the project must be evaluated in depth.

4. Examples of projects led by a STP to promote innovation environments in a region

Besides the model presented in section 3, which is to be the main program under which all the mentioned institutions can collaborate, we also want to introduce other potential initiatives that require the collaboration of these agents to promote technology transfer, innovation and entrepreneurship.

4.1. Knowledge and technology transfer actions to firms and institutions

4.1.1. Improving firms' capacities through innovation and technology transfer projects

We already described this main program in section 3, but we want to stress again the fact that this represents the best opportunity for the different institutions and agents working to promote science, technology and innovation to cooperate.

4.1.2. Creating synergies with and among knowledge and technology intensive firms

Basically, the idea is to offer the firms the possibility to create permanent links to the research and innovation institutes under some agreements which permit the long-term collaboration to develop R&D and innovation joint ventures. An interesting example can be found at the Massachusetts Institute of Technology (MIT), where they developed the Industrial Liaison Program (ILP) [19]. Through this initiative, companies may sign an agreement with a research institution that will provide them with some services that can be of their interest like, for example, meetings with the researches and technology developers, evaluation by the experts of the potential new products and services that could be developed under a joint venture, or analysis on the technological problems that a firm may present.

One more time, the STP appears to be the most indicated to lead this initiative and put together different institutions, beside firms, that could join this kind of programs to cooperate, not just with the industry, but with other research centers and institutions working in technology development to define

these joint ventures and engage in innovative projects with firms and where the STP could provide its high experience in creating these synergies among the different partners.

4.2. Innovation systems and environments

4.2.1. Ideas lab and innovative projects

This program is devoted to the definition of proposals and the development of new ideas around a concrete topic or technological challenge. The objective is to define a working methodology that aims to integrate the interests of the different agents developing their activity in this topic: firms, researchers, consulting firms, representatives of public administrations, potential clients, and other people that can be directly or indirectly involved in the problem or challenge that the project that must be created aims to solve.

The STP must establish a topic and decide which agents could be involved. After this first analysis, they must create this 'Ideas lab' which is defined in some meetings where all these agents are together and they interact ones with the others, listening to and contrasting their ideas and the potential projects that may appear in these sessions, with the aim to integrate new knowledge, identify new opportunities and improve the already existing products and services.

4.2.2. Open science and innovation forums

The STP must aim to support the knowledge and technology transfer to the society. A good opportunity appears in the execution of brokerage events to promote the open science model and stimulating the acquisition of knowledge and technology by the industry. In these brokerage events, the STP must put in contact all the regional agents involved in the projects that we have been mentioning: firms, research centers, high education institutions, representatives of the industrial sector, consulting firms, investors and public administrations, all with the same goal: meet other agents with whom they could engage on innovative projects.

Besides this main event, other actions may be developed in parallel to make these forums more influential for the innovation environment of the region. For example, awards can be given to the best or most successful projects that came out the previous year or those with a highest innovative component. Some conferences can also be hold at the same time where all the mentioned agents present they vision trying to attract potential partners to develop their projects.

4.3. Promotion of entrepreneurship and business development

4.3.1. Program for the promotion of entrepreneurship

This activity aim to create synergies among the different agents that support entrepreneurship processes and add value to their programs exchanging models and knowledge through initiatives that can help to implement a better ecosystem around these agents.

Some of the activities of the program can be: setting up and management of a net of facilities for business incubation, join training and awards for entrepreneurship projects, models to develop connections between different types of entrepreneurs (for example those coming from research and others coming directly from the industry), or professional training.

The main objective is to define and implement a joint model between all of the agents to achieve better results through this cooperation.

4.3.2. Incubation programs and associated services

Literature around the services that a STP can offer to help in the incubation process of new firms is broad, so we want to just remind the main activities that a STP can develop to have a main role in this process which, for sure, is one of the bases of the development of a city or region. To list these services, we can divide the entrepreneurial process in three main phases:

a) Setting-up of the new firm: writing of the business plan, collaboration in the planning process in terms of marketing studies, technical and scientific support, advice in terms of legal and financial aspects, training in business skills, help in the search of public and private capital, etc.

b) First years of the firm: additionally to the services mentioned before, we can add the renting of spaces and facilities, the setting up of conferences and seminars, help with the communication aspects of the new company, search of new clients or partners for developing joint projects, etc.

c) Growth period: besides the services already presented, the STP can help the firm to define a post-incubation strategy that must allow it to start being completely independent of the STP's support. The access to financial resources is usually the main activity where the STP can help before the firm is ready to be completely established by itself.

5. A successful example: The UAB Research Park leading the B30 Project

Following all the initiatives that we have described in the previous section, the UAB Research Park is currently leading a project of promotion of the industry and the knowledge economy in the region B30, which comprises an important area near the city of Barcelona in terms of R&D capacities and industrial activities. This initiative is based on the concepts of knowledge transfer and innovation and aims to define and develop an strategy of collaboration among the different agents that we have been mentioning and which execute their activity in the B30 area, in order to promote it and establish it as the region with the highest volume of innovation in Catalonia, Spain and the south of the European Union. The possibilities for the economic development of this area and its contribution to the economic growth, based on a true knowledge economy, are extraordinary, given this region has already been described as an innovative district.

The activities that the UAB Research Park is already undertaking are centered in the connections of the industries with the research institutions. Additionally, and following the activities proposed in this paper, the STP is promoting the participation of SMEs and their contact with universities and research centers promoting activities of innovation and technology transfer. The project also aims to create positive externalities regarding the employment, the entrepreneurship with a high added value and the professional training. The implementation of this project has been financed by the Catalan Service for Employment through the European Union's founds.

6. Final remarks

We have presented a model for the development of joint programs to promote innovation, technology transfer and entrepreneurship, all them helping to promote growth and competitiveness in a region. Through the presented initiatives all agents working in these fields in a region should cooperate to support better programs to achieve the optimal results. Only through collaboration, the proper synergies can be created leading to the best activities and results. In this context, the role of the STPs is clear; they are in position to lead all these programs since they are able to connect the industry and the society with the research and the innovation environments, being the key elements on all the process.

There is no need for all these programs to be implemented at the same time, not even the execution of them all, they are only proposals that must be analyzed and considered by each STP in order to see if they can be of interest and adapted in their own regions. The main goal is to define some strategies that can help the STP, as well as all the other agents involved, to promote innovation, technology

transfer and entrepreneurship in their regions based on sustainable programs that can become one of the pillars of the region's knowledge economy model.

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