

# **Territories and Innovation Systems: Cooperation Strategies Between Universities and Companies in Taguspark**

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## **Introduction**

The regional innovation system is constituted of elements and relationships that interact in the production, diffusion and use of new and economically useful knowledge. Hence, it is gradually becoming a crucial strategy for territories<sup>1</sup>.

In this context, Science and Technology Parks are supportive spaces with active innovation strategies and creative environments that can promote more meaningful communities of economic interest, define genuine flows of economic activities and can take advantage of true linkages and synergies among economic actors.

However, STP's are changing its initial concept to become creative 'learning villages' - a delimited geographical space that integrates not only business activities, educational and R&D centres and services but also residential, cultural, recreational and leisure areas.

The current paper discusses the relations between universities and companies, and its critical role in the innovation and technology transfer processes, firms' competitiveness and regional creative economy. TagusPark, an STP in Greater Lisbon is the case-study chosen.

The first part of the paper traces the portrait of the regional scale. The second part, describes the organic, spatial and actors dynamics of Taguspark. In the third part the analysis focuses on the cooperative relations between companies and universities, with its good practices and fragilities. And finally, a set of strategic guidelines is drawn to improve the performance of cooperation practices among local actors.

## **1 The Regional Innovation System**

### **1.1 *Framework to the Analysis***

The growing competitiveness derived from the globalization process is bringing a great deal of responsibility to the regions, on the fulfilment of conditions and skills that can capably answer to the fast changing that results from new technological patterns and from the systematic transformations of the productive sector.

The several guidelines that proceed from the European Union reports (for instance, 'Second Report on Economic and Social Cohesion') and from the Lisbon Strategy, sustain that innovation is the most efficient way through which less developed economies and regions can adapt to competitive conditions of global economy. Following a broader definition that can be used nowadays – innovation is the creation, development and implementation of a new product, process or service, with the aim of improving efficiency, effectiveness or competitive advantage. Innovation may apply to products, services, manufacturing processes, managerial processes or the design of an organisation.

Hence, according to Schumpeter<sup>2</sup>, innovation is central in the economic development process, impelling cycles of economic growth. The imperative of promoting a positive relation between the innovative performance of an economy or a region and its economical performance can be found in the *European Innovation Scoreboard*<sup>3</sup>.

In this way, the insufficiency of innovative activities is consensually considered as a key issue underlying inferior performances in terms of productivity and competitive growth<sup>4</sup>.

In this context, the globalization process is causing a strong reaction in the regions, which gradually try to turn into effective 'arenas of development'. It is on this level, according to Porter, that strategies are progressively being thought and implemented, mobilizing local (and translocal) actors and resources<sup>5</sup>.

Information Society and Knowledge Economy, demands a higher degree of connectivity and flexibility among the productive process actors, such as universities, companies, public research laboratories, and so forth. In this sense, it's important to enhance the regional networks, according to Lundvall, that constitute the vital framework for the settlement of trust relations, essential to the learning and innovation processes<sup>6</sup>.

In opposite to the linear model of innovation, the current approach sustains a more systemic condition. Hence, Regional Innovation System is understood as existing in regions that possess a great diversity of innovative organizations located in an institutional environment where systematic connections and interactive communication are rather often among local actors. These organizations are universities, fundamental or application-oriented research laboratories, technological transfer agencies, brokers, regional governance organizations, bank and the venture capital system and companies<sup>7</sup>.

Broadly speaking, the key dimensions of a regionalized innovation system are:

- a) The Processes and Policies supporting Education and Knowledge Transfer
- b) Arrangements for the Governance of Innovation
- c) The Level of Investment, especially in R&D
- d) The type of firms and their degree of linkage and communication in terms of networking, subcontracting, presence or absence of supply chains and degree of co-makership between customers and suppliers.

It becomes quite clear that an innovation system is a social system, which means that innovations are the result of social interaction between economic actors. Hence, actors shall promote active relations through coherent programs, research partnerships, value added flows of information and through political action guidelines from governmental organizations<sup>8</sup>.

Universities are currently, distinctive and fundamental actors in the regional development process. In fact, the role played by universities in the competitiveness of a region is crucial. These are the agents that provide the skilled technical resources and the applied knowledge directed to a product or a process innovation. On the other hand, universities promote the creation of new companies and entrepreneurial projects (spin-offs and technological transfer). In this way, universities are a dynamic space of opportunities and shared experiences promoting in its surroundings a significant circulation of financial flows.

However, this scenario is strictly dependent on the regional capacity to integrate and dynamize the relations between the different actors that constitute the innovation system. In fact, and despite the inherent regional gains, it strongly prevails a central problem – the cooperation process between universities and companies.

Generically, companies settle effective cooperative relations when internally, they do not retain all the resources and skills needed and because those relations allow them to reduce eventual risks associated with innovation, according to Bruce Tether.

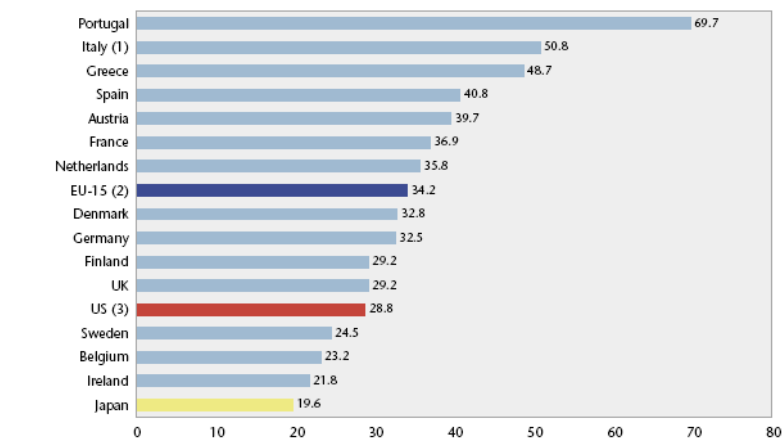
Therefore, a company with low capacity to implement research activities won't feel attracted to search for partners to start these activities. This is the symptom ruling in the entrepreneurial system in several member countries of EU, which negatively influences the European position versus other global competitors.

Actually, both universities and companies can benefit from systematic and collaborative relation. The knowledge and resource interchange between the actors is undoubtedly bi-directional. Universities are important input sources to the private sector innovative activities, and simultaneously, there is a precious empirical knowledge transfer from the industry to the university.

Technology transfer is in the heart of this unstable and uncertain matter. Its notion is based on an interactive process, occurring through the operational knowledge flows among the several innovation system agents that may unleash and enrich innovation, on a regional or sectorial scale. The interactive dynamism achieved by the regional innovation systems depends, to a large extent, in the efficiency of technological transfer process<sup>9</sup>.

## 1.2 National and Regional Profile

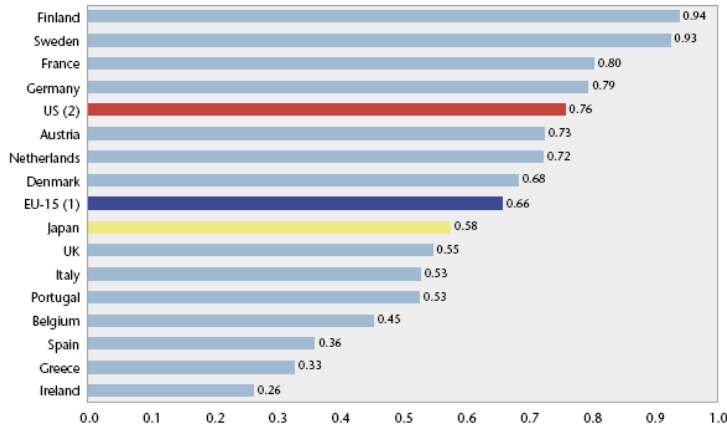
The following indicators show the Portuguese and Lisbon context on R&D matters.



The government share of total funding in 1999 was the highest in Portugal (near 70%) followed by Italy (49%) and Spain (41%).

Source: DG Research  
Data: OECD; DG Research  
Notes: (1) 1996. (2) L data are not included in EU-15 average. (3) US: excludes most or all capital expenditure.  
Third European Report on S&T Indicators, 2003

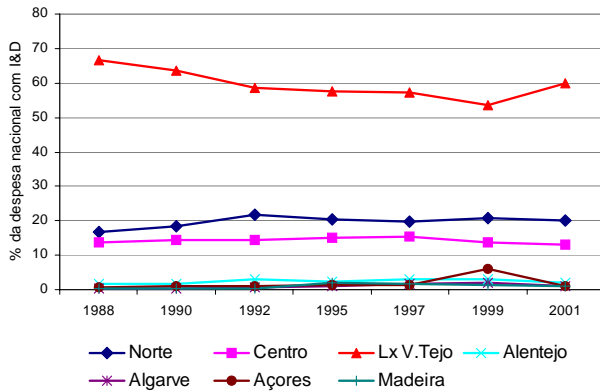
Fig 1 - Government financed R&D - % of total R&D funding<sup>10</sup>



Recent patterns concerning the level of government financed R&D as a percentage of GDP differ significantly across the EU countries.

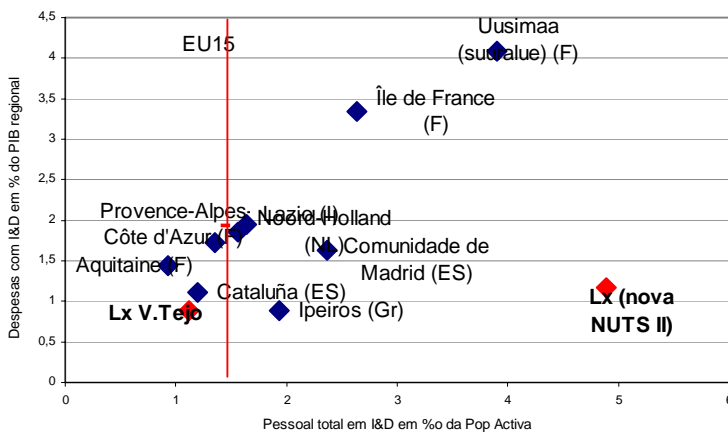
Source: DG Research  
 Data: OECD; DG Research  
 Notes: (1) L data are not included in EU-15 average. (2) US: excludes most or all capital expenditure.  
 Third European Report on S&T Indicators, 2003

Fig 2 - Government financed R&D as a percentage of GDP<sup>11</sup>



With a percentage of 0.79 GDP in 2003, the Portuguese System of Innovation is basically polarized in Lisboa Vale do Tejo region that obtained 1.17% of regional GDP in 2001.

Fig 3 - National R&D expenditure percentage by regions<sup>12</sup>



Despite recent governmental efforts, there is a long 'way to walk' in order to reach better positions, though geographical reconfiguration of Lisbon, changes the R&D portrait.

Fig 4 - Regional R&D expenditure in GDP percentage 2003 (European Regions)<sup>13</sup>

### **1.3 Science and Technology Parks towards the innovative 'Learning Villages'**

A most common notion of Science and Technology Park describes it as an organization, managed by specialised and dedicated professionals whose main goal is to increase the wealth of its community by promoting the culture of innovation and the competitiveness of its associated business, knowledge-based institutions and technology-based activities.

To achieve these goals, a Science Park stimulates and manages: the flow of knowledge and technology amongst universities; the growth of innovation-based companies through incubation and spin-off processes; and provides other value-added services together with high quality space and facilities.

At the moment, the Science and Technology Park concept is going through an important change towards the 'Learning Village'. This new notion describes a delimited geographical space that integrates business activities, educational and R&D centres, services, as well as residential, cultural, recreational and leisure areas.

With information technologies and communications infrastructures, these qualified spaces, are dynamized by local inhabitants and users, individual or organizations who are determined to participate in the creation, acquisition and distribution of knowledge through life learning processes and experiences.

Hence, in these no longer 'only-working-areas' open from 8 to 8 and moving towards an enriching complexity, evolving from parks to 'habitats', the culture of participation, collaboration and connectivity can help foster an innovative community which places learning and creativity at the forefront of every endeavour.

The profile of these knowledge workers or creative class was traced by Sanz that described them as the 'networking nomad' (teleworker, telecommuter or mobile worker) or the Glocal worker, due to their living is mainly based on time and space compressions, typical of the information society and knowledge economy<sup>14</sup>.

According to Sanz, and statistically, knowledge workers are mainly young people with high education (including foreign experiences) and technical or managerial skills. They commonly master several languages and are very comfortable in cross-cultural milieus, actively sustaining and participating in an open, tolerant and creative society.

In this way, the learning villages imply a new culture, new processes and new practices to be implemented in the functional dynamic of the park. In this paper we focus the collaboration dynamics between companies and universities, a crucial issue that can help Taguspark, chosen as case study, to become a more learning, creative and innovative space.

## **2 Taguspark: A Science and Technology Park in Greater Lisbon**

Taguspark is a Science and Technology Park in Oeiras, in the city of Lisbon, designed to encourage the formation and growth of knowledge-based industries or high value-added tertiary firms, resident on site, and to promote operational links and synergies with Universities, Research Centres and other Institutions of Higher Education.

Taguspark has several universities as partners that are in different states of development: Instituto Superior Técnico, Universidade Católica, Universidade Atlântica.

## **2.1 Location and History**

Taguspark is located in the Portuguese region of the Greater Lisbon, in Oeiras, a municipality near the capital. The region that integrates the city capital, is one of the two most economically developed in the country: it has the 62% of the total human resources of the nation and 60% of national R&D expenditures are invested there.

In cooperation with the municipalities of Lisbon and Oeiras, the government inaugurated the park in 1992. Taguspark emerged as a strategic triangle integrating universities, research and development bodies and technology-based firms, which constitute the three pillars based in the spatial extension of the park.

Operating since 1995, the early years were dedicated to select and install, up to one hundred advanced knowledge-based companies. Since 1998 priority was given to develop systematic forms of contact and cooperation among companies.

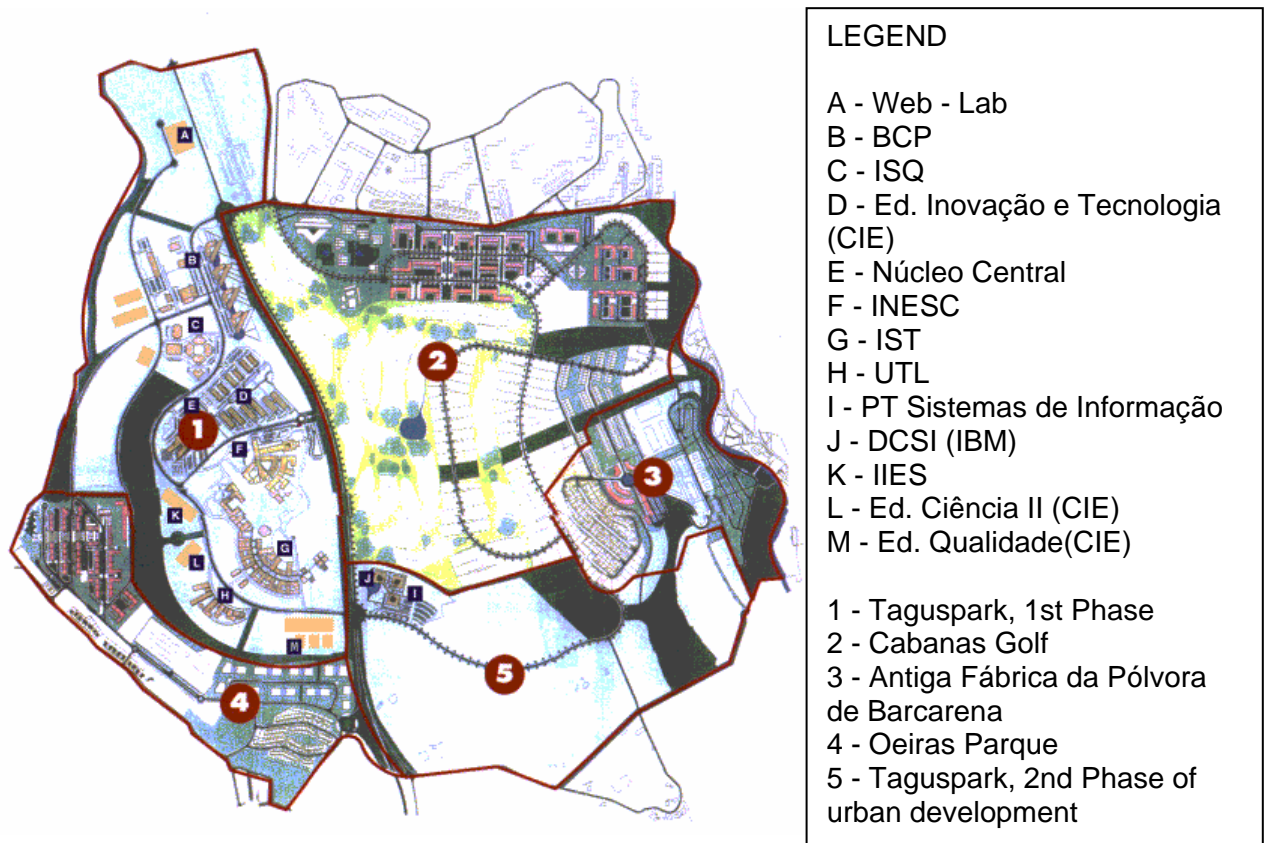
In fact, Taguspark was financed with 56% of public funds and 44% of them were from privates. There are 17 shareholders from several sectors, meaning that the equity is distributed in the following way, 31% - banking sector, 26% - universities and R&D institutions, 17% - private companies, 17% - local authorities, 7% - governmental agencies and 2% - other not identified with a sector.

Nevertheless, several structural funds from EU supported the initial growth of the STP financing strategic infrastructures created to unleash the Portuguese economic development. It was the highest national investment in private R&D until that date. An effective revaluation of the territory was, from the beginning, among the purposes of the project - the park was seen as a real estate investment allowing to transform a rural land into a serviced land for high tech uses.

## **2.2 Park Endowments and Spatial Dynamics**

Taguspark is the central component of the Science and Technology Park's project, which integrates science, technology, housing and leisure areas involving approximately 360 hectares. The Park occupies 200 hectares (111,4 in the 1<sup>st</sup> phase). Taguspark integrated plan is composed by four components, Taguspark, Barcarena's Fábrica da Pólvora Complex, Cabanas Golf and Oeiras Park.

- Fábrica da Pólvora Complex is a project that joins together cultural, patrimony, leisure, residential, educational and R&D elements. It is where Atlantic University is located and it is the only component of the integrated plan that is not private since is being developed by the Oeiras Municipality.
- Cabanas Golf was built to be an 18-hole golf course complemented with housing, commerce, services and tourist activities through its hotel units. The project is to be finished by the end of 2005.
- Finally, Oeiras Park is an area planned for residential functions, supporting services adapted to the needs in the park, for instance: second grade education, university, residences, commerce and services.



In such space, the process of localised externalities can foster local firms to create territorial networks linked to a fruitful exchange of localised knowledge, overcoming the problems related with an inefficient market.

In order to promote the new milieu innovator and with its cooperative dynamics, the Taguspark Management Society developed two types of settlement options with consequences on the STP urban design. Thus, four sectors were planned not necessarily contiguous, but with a determined use: central complex; SME sector; R&D sector; teaching/training sector, as represented in the map.

#### a) The Small Medium Enterprises Sector

A set of 10 buildings, with spaces for offices, laboratory and production, are intended to the settlement of small and medium technology-based enterprises or services companies. Due to their number, size and density they will ensure the creation of a potential synergy capable of generating positive effects. They are linked to the Central Complex - multifunctional building – that is the heart of Taguspark, operating as an experience and knowledge exchange catalyst between the Park tenants. This SME business sector occupies an area of about 60 hectares.

The Central Complex was designed to facilitate the interaction between the scientific and business communities. It is a multi-functional building which integrates the congress centre, the meeting rooms and also the residence for the SME tenants, with several support services to encourage the cooperation among them. The 'corridor effect' contributes to the informal relationship between the residents.

The urban planning that was behind the project has been materialized in low density buildings (construction index, area covered above of the ground/total area of the lot: 30%), and in a significant amount of green spaces (common 10%, inside the lots 50%) and parking places.

b) Anchor Projects, R&D Institutions and Business sectors

The R&D and teaching/training sectors occupy respectively 14 and 25 hectares and are intended to the settlement of companies which develop significant activities in research and development, university teaching and vocational training. Moreover, there are still 12 hectares allocated to common green areas.

These projects vocation is to attract foreign high-tech companies. The Park has already Portuguese subsidiaries of companies like: Microsoft, Convex, Intergraph and so forth.

Some companies have their own buildings willing to contribute to a successful image of the Park (ISQ, BCP and Portugal Telecom).

c) Taguspark 'effects' in the neighbourhood

The 'entrepreneurial effect' is undoubtedly the major impact that Taguspark brought to the urban territory. This effect generated new dynamics attracting new technology-based companies. In fact, as a consequence, several parks were born in this region (Lagoas Park, Quinta da Fonte, Parque Suécia and so forth) creating a rather new urban atmosphere. Effectively, Taguspark contributed to the birth of a real cluster.

This new type of land use (associated to the new technologies) caused a new demanding of people, skills, accessibilities and completely modified the region of Oeiras into a new technological and innovator cluster.

As a result, this territory was challenged with new realities and questioned about a new variety of demands, namely, real estate issues and accessibilities infra-structures.

These effects were visible in the real estate market exponential growth and in the improving conditions of urban mobility. On the other hand, a new range of services had to adapt to this new type of professional resources.

The new urban morphology linked to the new ways of land use attracted new kind of events related to scientific and technological domains which also promoted the creation of informal networks of cooperation.



### **2.3 The Park Organic Elements**

The specialised branches of the park assessed by the tenants' sectors of activity can be considered as follows: 80% of the park operates in telecommunications and electronics while the remaining 20% is shared among energy, environment, materials, fine chemistry, technology production and biotechnologies.

The "Competence Centre" has the mission to foster all the possible synergies available from the interaction of the multiple STP actors, as well as with other entities in the surroundings. Seeking customer satisfaction, the Centre analyses supply and demand locally and abroad, promotes the marketing of technologies and highlights competences installed in the park.

On the other hand, the Incubation structure aims to improve the growth of new technology based firms through the provision of services and temporary locations. Specific services provide support to entrepreneurial management. Among these services, it can be mentioned a kind of tutorial service that formally links young entrepreneurs to experienced ones promoting the creation of new partnerships to improve the growth of start-ups.

Concerning the financial tools, and apart from public supports targeted to new entrepreneurial activities, Taguspark is creating an own Venture Capital structure to support new firms with a high market potential.

Taguspark has developed several activities that contributed to the creation and implementation of several informal and formal networks, which involve the local tenants, entities from its influence area, as well as, entities with a national and international scope.

### **2.4 The Park and the Companies**

The resident entrepreneurs have chosen Taguspark as business place for a set of reasons: localization, possibility to widen the business physical area; conditions associated with the installation process; environmental and landscape quality, etc. These several topics flow into an idea of a prestigious place that will grant a better image to the business project.

Among the tenants, there are about 120 SMEs and 5 large firms; 3/4 of the tenants' sales are from large firms and the rest is due to SMEs. Apart from incubating enterprises, tenants do not have limits of time in staying in the park.

Statistically, 50% of present SMEs were born into the STP and almost all of them are spin-offs: 50 spin-offs were from enterprises and 10 were academic spin-offs. 90% of the firms overcome the incubation phase and this constitutes a remarkable achievement.

In the end of 2004, there were 160 tenants installed in a covered area above the soil of 145.053m<sup>2</sup>, distributed by the 114.4 hectares of land within the 1<sup>st</sup> phase of Taguspark. With more than 6000 employees, they represent a total aggregated revenue of 917.8 million Euros. In the Business Innovation Centre (CIE), 47% of the companies are installed in spaces with less than 100m<sup>2</sup> and 38% in spaces between 100 and 500 m<sup>2</sup>. The average size of those companies is 14 people by company, with the smaller having one person and the bigger 209 employees. This population is characterized by its youth, since 81% of the people are less than 40 years old, and by the high level of education, since 53% has a bachelor degree, 5% a master degree and 2% a Ph.D.

According to a study made on the Park users, dated of 2004, the average expenditure allocated by the resident companies to R&D represents 29% of its total investment, a number

clearly above the national average. Though it's impossible to operate a direct correlation between both topics (due to diversity of contexts), this is undoubtedly a positive figure. Nevertheless, and according to the opinions shown by the tenants interviewed for the present analysis, there is also a feeling of risk that is preventing fearless attitudes. This circumstance is due to the business premature situation (steady but emerged from the incubator process) of a reasonable number of tenants.

In what concern to companies of large financial size, R&D investment is a usual procedure, despite the still problematic issue related with strategic collaboration with universities and research centres. The relationships are, as we were told, still tenuous.

## **2.5 The Park and the Universities**

In his relevant book 'Technopoles of the World', Castells sustained that, in this global context that we are living, universities play three different roles<sup>15</sup>:

- Generate new knowledge, both basic and applied. In this sense, research-oriented universities are to the informational economy what coal mines were to the industrial economy.
- Training, in both requisite quantity and requisite quality, of the labour force of scientists, engineers and technicians, which will provide the key ingredient for the growth of technological-advance industrial centres.
- Universities may assume a direct entrepreneurial role, supporting the process of spin-off of their research into a network of industrial firms and business ventures.

However, it must be clear according to the sociologist, that Universities can only play their innovative role if they remain fundamentally autonomous institutions, setting out their own research agendas.

On the other hand, autonomous research universities, based on scholarly quality and academics independence, can be linked to the industrial world by a series of formal ties and informal networks.

In Taguspark area, Instituto Superior Técnico is in its fifth year of operation, offering four engineering degrees with approximately 500 students. Being the leading engineering school in Portugal, this university has already the three first buildings completed, which allows a reasonable activity. Computer science, networks, industrial management and computer engineering are the main field of education and research.

Since 1996, the Atlantic University is installed and operating in the area of the integrated plan of Taguspark. Finally, with its engineering faculty along with human sciences, there is the Catholic University, that started lecturing in January 2000, in the neighbourhood of taguspark (health engineering, urban engineering, and so forth). The Technical University of Lisbon is launching a proposal contest for its buildings in the Park. However, ISEG an economics and business faculty is already operating with IFEA – Instituto de Formação Empresarial Avançada (Advanced business Training Institute).

Furthermore, INESC, the Systems and Computer Engineering Institute, despite it didn't finish its building yet, will definitely have a presence in the Park.

### 3 Collaboration between Universities and Companies

Science and Technology Parks are relatively new realities that emerged to unleash regional economic and social development, acting on the undiscovered or unused potentialities of science, technology and innovation. This mission is only possible if operational links with universities, research centres and other institutions of higher education are effective and dynamic.

Among other factors, and according to several park experiences, synergies can be accomplished, with a steady management attitude, actively engaged in promoting partnerships and fostering the transfer of technology and business to tenant organisations.

On a comparative perspective with other Portuguese regions, Lisboa and Vale do Tejo has a distinguished concentration of resources related to R&D: universities, public research labs and other research infrastructures. However, it clearly remains an important progression margin to develop, if regional scientific resources and skills are adequately explored. In this chapter, all international indicators show that the cultural practices of cooperation must change towards a more collaborative attitude.

On the other hand, in the context of regional innovation systems, it is important to note that the scientific areas where innovation is achieved by R&D activities (like telecommunications, multimedia and biotechnology) it is fundamental to promote higher levels of cooperation between universities and companies.

Relations with the universities may nurture innovation processes within the companies. These are some fruitful aspects to firms<sup>16</sup>:

- a) Access basic and applied research results;
- b) Access economically relevant scientific and technological knowledge;
- c) Develop and test prototypes;
- d) Gain medium or long-term perspectives;
- e) Get support in solving specific problems and new products specification;
- f) Recruit highly qualified human resources.

On the other hand, universities also benefit from active relations with firms. These are some fruitful issues to universities:

- a) Added resources, financially and otherwise;
- b) Access to updated technical knowledge and good practices;
- c) Access to networks of knowledge creation and utilization;
- d) Access to industrial information;
- e) Access to applied knowledge, with positive effects on the academic research and teaching;
- f) Gains in image and visibility through the transfer of useful scientific knowledge coming from academic research to industry.

The empirical data gathered for the current research indicates that the following cooperation forms between Universities and Companies can be found in Taguspark. Nevertheless, and according to the opinion of the entrepreneurs interviewed in this research, its frequency should be more intensified and its nature should be diversified:

<b>Contracted Research</b>	Is centred on scientific knowledge production with fast commercial transition, which is dependent on the economical framework
<b>Innovation Centres and incubators</b>	Entrepreneurial forms with the aim of introducing technological innovation in medium and small size enterprises and improve management procedures providing these companies skill development in dealing with innovation and competitive challenges
<b>Innovation Related Services</b>	Innovation related Services, such as tests, consultancy and professional and personal training. These services are requested directly by companies or by client demands, but generally where company skills are considered insufficient
<b>R&amp;D Common Projects</b>	R&D common projects between private companies and knowledge institutions are based on three types of activities: fundamental research towards technological advances; application oriented research activities, towards technical problem solving; experimental development activities towards prototype production
<b>Technology Transfer Networks and Centres of Excellence</b>	Technology Transfer Networks and Centres of Excellence are advanced forms of interaction with companies that combine a proactive performance in the search for technology niches towards the industrial sectors development, with a direct or non-direct involvement in technological and industrial regional policies definition
<b>Informal Knowledge Trade</b>	Often used practice in research projects and environments between universities and knowledge institutions

The following items of the current study will describe, on one hand, the collaborative examples and good practices on cooperation between universities and companies, and on the other, some fragilities detected on the inquiry targeted to several agents working in the park.

### **3.1 Collaborative Examples and Good Practices**

The vision that is shared in the following examples, is based on the possibilities that are opened by the technological transfer process, allowing deep progresses on the scientific and everyday applications. To commercialize science, as a reflected attitude, can be the fastest and the sustainable way to turn useful to the great public the most recent achievements in science.

These examples proceed from the involvement of the three main actors of the park in several relational forms of collaboration: universities with their skilled researchers, companies with their business-oriented qualified technical team and Taguspark management team, providing support services to these different forms of cooperation.

Financed by the LisAction Program (Regional Program Innovative Action for Lisboa e Vale do Tejo) these projects aim to promote research activities differently from the strict way followed in the university. In this way the program is supporting researchers and professor's

work on application-oriented research, related to projects targeted to solve specific society problems.

<p><b>LEMe</b> Laboratory of Excellence in Mobility</p>	<ul style="list-style-type: none"> <li>• R&amp;D centre in mobile and ubiquitous computing</li> <li>• Telecommunications market-oriented lab</li> <li>• Well equipped lab to host projects previously accepted by the Strategic Council</li> <li>• Managed by the executive commission responsible for the regular daily activities</li> <li>• LEME will operate with the support of Taguspark incubator</li> <li>• A research space used to support the development of master and PhD thesis</li> </ul>
<p><b>TagusLIP</b></p>	<ul style="list-style-type: none"> <li>• A Taguspark Project on a partnership basis with LIP – Instrumentation and Particle Experimental Physics</li> <li>• Aim is to create an R&amp;D laboratorial infrastructure that has the capacity for development, characterization and test of instrumentation for Nuclear Medicine or similar instrumentation.</li> <li>• The current project has the objective to develop PET equipment, which is expected to have higher sensitivity for breast cancer detection than conventional methods (X-ray and ultrasound mammography)</li> <li>• The project is carried out by the consortium PET-Mammography formed by 7 institutions specialized in the areas of nuclear medicine, radiation detector physics, biophysics, medical engineering, electronics, computing and mechanical engineering</li> </ul>
<p><b>Competence Centre Network</b></p>	<ul style="list-style-type: none"> <li>• Network targeted to interchange different skills and technological resources that can be found in the different parks of Lisbon, that will facilitate cooperation towards common goals</li> </ul>

There are some services, provided by the park, that on a regular basis have the specific aim to promote collaborations between local actors in order to participate in public concursos or to answer to particular services demanded by clients (for instance, the conceiving of a webpage).

Finally, it is important to enhance the attempt of creating an STP's own capital to finance tenants' venture projects. Even if this approach is possible only to STPs with a sensible amount of financial resources, this practice states a sensible propensity in seeking an independent economic development and in supporting risky projects with high potentialities<sup>17</sup>.

### 3.2 *Main Fragilities*

The current statistical framing, concerning cooperation between companies, provided by the park is far from being similar to the poor level of R&D cooperation across the country. Even though, Taguspark tenants have shown in this study, a great deal of anxiety related to the 'not sufficient' level of cooperation between local actors. The apparent complementarities are very few explored. In this context, the space 'corridor', that gathers the several companies in the central building is the informal place to contact. But according to the opinion of several tenants, this practice does not maximize the different resources scattered across the park. However it is fundamental to understand that the general youth of the business projects is an obstacle for the cooperation improvement.

The precocious state of development is also pointed when the cooperation subject relates to university. In fact, the first students of Instituto Superior Técnico (Taguspark *campus*) are finishing their degrees in the current year. So there is still much more to see and much more to be maximized.

On the other hand, all the degrees existing in Taguspark universities are centred in computer science and computing engineering, which is compatible to the main demanding of companies settled in Taguspark, but insufficient to other business areas, like biotechnology or environment. This issue was mentioned by biotechnological companies.

Normally, it is expected that technological transfer evolve according to a logical process, in which R&D projects proceed into scientific achievements that will be valued and commercialized. Nevertheless, this rarely happens in Portugal. There is a clear absence of a common flow that would supply agility and dynamics to the process preventing eventual inhibitions and fears.

In fact, although human resources and R&D expenditure have slightly raised in the later years, there is an important debt to transform knowledge generated by research in innovative products and services with social and economic added value. To a certain extent, this aspect can also be witnessed in the park, though once more it can be claimed that the park evolution process is in an early stage.

On the other hand, it can be pointed out that the lack of technological transfer is also due to the incompatibility between the regular progression in the academic career and the entrepreneurial attitude of a researcher, which prevent the efficient exploration and commercialization of a patent or its intellectual property sharing.

In fact, universities are not showing a clear inclination to profit, despite its institutional autonomous process. This sign might reveal affirmatively that a university is not an enterprise, or it might represent a symptom of precaution. Anyway, in this context it can be identified a contrast of temporalities that literally distinguishes the researcher from the businessman. To the first, the payment to achieve rigour is time, and to the second, and legitimately, time is money. It is important to find a third way of understanding and compatibility, even if other partners or resources must be added to the equation.

And according to this perspective, it seems fundamental the necessity of a better venture capital system concerning the firms acting in technological sector (Biotechnology, telecommunication, electronics, etc.), the area where innovation is emerging.

A certain atmosphere of suspicion can delay many possibilities of dialog and even motivate lack of agreement between entities. This suspicion is often based in the conflict concerning intellectual property (the 'who owns what' complex equation). Trust is fundamental to common enterprises towards mutual benefits.

In those sectors where innovation is related to services, it is possible to identify an important debt of interaction between companies and centres capable of technical services supply.

Hence, and despite the innovative examples mentioned above, the real 'park effect' assessment on the subject of cooperation between companies and universities and its innovation dynamics must take the temporal dimension into account to be consequent or conclusive.

Actually, time is an important component to develop communication mechanisms among the park agents. Mutual knowledge, trust and shared values and practices are crucial to the development of socially built forms of proximity and innovative interplay – technological, organizational and institutional – which may favour the emergence of professional and technological networks that surely will facilitate locally sustainable innovation processes<sup>18</sup>.

## **CONCLUSIONS**

### ***- Strategic Guidelines -***

#### **Education**

- Promotion of an academic culture that grants the intellectual property sharing as well as the recognition of patents in the progression of the academic career
- To adjust the teaching and research academic career to become more compatible with entrepreneurial initiatives and activities.
- In the context of the restructuring promoted under the Bologna Declaration, create new important subjects (Management, Entrepreneurialism, Intellectual Property, and so forth)
- Creation of mechanisms to assess the results of Higher Education and High school education ensuring a best pedagogical quality
- Post graduation and research programs in scientific and engineering areas

#### **Knowledge Transfer**

- Better regulation and transparency attitude, among the entities, concerning the intellectual property in order to clearly define - who owns what
- Promotion of great mobilizing projects of cooperation in which the entities committed can share the risks and maximize the allocated and available resources
- Promotion of creative initiatives to cultivate the 'bridge' between universities and companies (workshops, meetings, and so forth)
- Creation of technical education units in technological centres and in other R&D institutions responsible for training according to companies needs.

#### **Business R&D**

- Promotion and diffusion of broker companies, capable to maximize the relations between scientific research and business initiatives towards patent commercialization
- Supportive framework to universities start-up's
- Promotion of Portuguese technology in international scientific organizations and events

- Companies should implement collaborative initiatives under the partnership with the municipality and with civil society, performing its duty on social responsibility as well as its role as regional and local development agents

### **Linkages**

- Systematic implementation of activities by the park services in order to facilitate an effective and continuous interaction among the park entities (Ex: Active interfaces with personnel dedicated exclusively to the task)
- Availability to integrate national and international consortiums concerning technological transfer
- *Industrial-liaison* offices network in universities. Diffusion of networks between universities allowing access to scientific knowledge and technological transfer among R&D institutions and international, R&D centres of excellence (following the example of Competence Centres Network-LisAction).

### **Investment**

- Tax facilities to R&D companies providing them capacity for risk taking
- To raise the R&D expenditure percentage
- Improve the venture capital system concerning R&D projects and companies, and improve the access to public and private funds

### **Communications**

- A better use of Taguspark's digital infrastructure, a Dedicated Highspeed Network, in order to promote a more cooperative environment in this Science and Technology park, for instance, communities of practice are an important instrument for collective learning.



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