

Cooperative Research and Development Project between FUB/CDT and TERRACAP

Technical and Economic Feasibility Study for
Digital Capital Technology Park
[Parque Tecnológico Capital Digital – PTCD]

| Product 5.2 – Market and Competitiveness Analysis | |
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1 INTRODUCTION

The Real-Estate Company of Brasilia (Terracap), created by law no. 5.861, in December 12 1972, is a public company from Federal District Government. Governed by the law which created it, by the social statute of the institution and by the legislation applied to the societies by actions, Terracap has the objective of executing real-estate activities for remuneration, including use, acquisition, management, disposition, merger, encumbrance or disposal of assets.

By Law no. 4.586 of July 13, 2011, Terracap also began to exert the function of Development Agency, responsible for the proposition, operationalization and implementation of economic and social development projects and programs which interests the Federal District. Terracap may also promote public-private partnerships, Specific Purposes Societies (SPE) and associated urban operations to implant and develop ventures which are strategic for the local government. In this context, Terracap is an important vector of the public policies defined in the programs the current government is installing, especially concerning Digital Capital Technological Park – PTCD.

Knowing that the University of Brasilia Foundation [FUB] already cooperates with the Federal Properties Management Office [SPU], of the Ministry of Planning, Budget and Management [MPOG], since January/2009, under the coordination of the Decision Making Technologies Laboratory [LATITUDE], of the Department of Electrical Engineering of the UnB, by means of three projects concerning process structure, methodologies and managing tools for the SPU, Terracap verified that the approach used for treating federal properties may also be applied for GDF properties, especially for what refers to the management of the PTCD project.

Futhermore, issues concerning the deployment of the PTCD were approached in previous studies ordered to the UnB by the GDF (FAPDF-FUB Project, 2008), giving previous background to the treatment of the management of the PTCD. Such experience justifies the participation of the LATITUTDE staff in this new situation. Considering that PTCD is a park destined for information and communication technologies, in its feasibility study, the following questions must be answered: types and sizes of companies in the ICT sector which can integrate the park; types of services and products with the greatest potential; productive capacity; necessity and availability of specialized professionals (electrical engineers, network engineers, computing engineers, production engineers,

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automation and control engineers, computer scientists, information scientists, technologists); academic units capable of researching, innovating and transferring technologies to the park, etc.

Therefore, considering the vast experience of the CDT/UnB in preparing technical and economic feasibility studies (TEFS), Terracap and LATITUDE Laboratory, with support from the CDT/UnB, began discussions on the possibility of conducting a cooperative project of research and development, in order to execute the TEFS concerning PTCD, in the context of improvement of local assets and of the promotion of strategic undertakings for the DF.

As a result, a contract was established between Terracap and FUB, focusing on a project of technological and information services to assist in the implementation of PTCD, working to prepare the products which constitute the referred Technical and Economic Feasibility Study.

The present technical report refers to one of the specified deliverable products: "Product 5.2 - Market and Competitiveness Analysis".

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2 CONTEXT

In the early 1950s, first at Stanford University and later in North Carolina, the city of science model has been adapted to a more manageable scale. Nicknamed as "Technology Parks", "research parks" and "science parks", these projects were guided by strategies aimed at attracting mainly industrial plants of regional branches of large companies. Over time these places have observed that an increasing share of their tenants performed research and development activities. In many countries, such as Japan, France and the Netherlands, central governments played an important role in creating research parks. The passage of time leads the parks to a tendency of becoming more specialized, targeting specific industries or sectors (Anthony Townsend, 2009)

In the 1980s, the strategic focus of technological development has shifted from the model of attracting and retaining industrial plants to a model based on business incubation. While technology transfer was an element of the underlying business model in technology parks, in incubators it becomes the flagship. Starting with the first known business incubator, based in Batavia, NY, in 1959, thousands of incubators were inaugurated worldwide.

Today, both the Technology Park as the business model of incubator are widely used. In their study from 1991, Luger and Goldstein found out that more than half of the Technology Parks fail in their objectives or change focus. Moreover, they found that "many Technology Parks are not suitable for start-up business, because many minimum requirements such as extension and high land prices make the cost of entry too high." However, the existing parks add great value to the tenants, not because of the business model, but because they have become key gears in larger ecosystems.

A scenario for the coming years tends to show that the launching of projects for new technology parks will not be significant, as well as the closure of some projects already started around the world. Some factors may lead to this scenario, such as a prolonged global recession, aggressive cost cutting from the companies or a return to the high cost of energy. The signs of this future are already around us, an example of this situation are the endless delays in the *Russion Technopark* project, ambitious Russian project. Even the current success stories, like the Biopolis in Singapore, have been challenged by the World Bank.

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Moreover, the threat to existing parks could come not from external economic changes, but from the emergence of entirely new models for new construction and organization of spaces for R&D.

A real possibility for many parks, is incrementalism – the promotion of evolution and modernization of infrastructure and of services for the next generation of parks, "Science and Technology Parks 3.0". In fact, an update is required. Cities and metropolitan areas are increasingly regarded as engines of national economic growth, making it possible to foresee a renewed interest in the model as a tool for economic development. This scenario may involve the survival and a limited degree of prosperity for some people who they do not realize the full potential for innovation and socioeconomic gains that future scientific advances may have. It is a likely scenario for many parks in the absence of external threats, but not necessarily the most desirable.

Despite their vast differences, in all these scenarios, it is possible to find a common element - some regions will play a more important role than it was played at any other time in the last century. A fact which can be easily verified is that the complexity of science and technology today is too high for any company, or Technology Park, to face in an isolated fashion.

The literature on knowledge ecosystems, developed in organizational studies over the past years, provides robust framework on which to develop a new understanding of how innovation happens in the regions. A knowledge ecosystem refers to how coded knowledge is transformed into tacit knowledge over time through learning and experience. Studies of knowledge ecosystems focus on how communities interact with established knowledge organizations and the tools and practices for updating knowledge over time (Anthony Townsend, 2009).

The framework of the regional knowledge ecosystem can be used by Technology Parks for the economic development of the community and for better understanding of the processes by which communities incorporate know-how in metropolitan areas, with real value and difficult replication.

The framework of the regional knowledge ecosystem has many advantages. First, it does not focus on the existent economic development institutions - universities, research centers, large companies, venture capital funds, etc. - but it focuses on the dynamics of their interaction with each other as well as with new institutional elements (talent, research

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groups, virtual communities). The field of economic development is saturated with "networks", and it has been losing prominence. Strict application of the theory of knowledge ecosystem will allow a resumption, specifying the types of networks and how they should operate. This framework also brings a holistic approach to how one conceives innovation in the regional context - not as an isolated activity that happens within organizations or groups, but as a cohesive system. Dysfunctional knowledge ecologies are expensive for the organizations, in a regional context, but they also impose costs on everyone else. Finally, knowledge tackled in the ecosystem form is particularly appropriate to understand how organizations operate in turbulent and chaotic environments, which certainly describes the current economic and technological global scenery.

Applying the framework of the regional knowledge ecosystem, diverse knowledge is immediately produced and it may dictate strategic changes in the way we approach the technology-based economic development. First of all, while land and properties lease continue to support the dynamics of creation of R&D spaces of all kinds, the real added value will be greater, not only for providing services (as many parks already do) but also for management activities and knowledge creation. Since scientific knowledge and its tools are available anywhere on-demand, focus on global domination of a particular sector will lose effectiveness. As long as the elements of the regional ecosystem continue to grow, reinventing the cluster will become a crucial measure. All these scenarios dictate a reduced emphasis on real estate and infrastructure development, and more emphasis on creating mechanisms which link local assets to global markets in order to generate value.

The understanding of this tool is in an early stage and it will require further investigation. However, prognostic exercises and points of scenario construction point to a critical need for new governance structures that are larger than a single industry, in all regions settled for technological development. Acting as a guardian of the regional ecosystem structure, this entity can perform several functions. In the short term, new tools are needed to measure and map the networks and flows of financial resources, knowledge and ideas. In the medium term, new business models for regional assets management and the creation of something greater than the sum of its parts are required. In the long term, the challenge will be to propel this ecosystem and its networks to help companies and clusters to compete globally – to collectively figure out where they fit in a global supply chain. Its goals should be encouraging the development of cutting edge knowledge and

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developing organizational, human and social resources to compete in the global economy. It must also build networks that extend far beyond the current main regional organizations to include informal networks of entrepreneurs, investors, professionals and other communities of learning and guidance.

2.1 CITIES AS REASON FOR INNOVATION

What are the characteristics that define 21st century cities? Are cities, as we know them, the new agents of economic, political and social changes? How do they relate to scientific and technological innovation?

The first hypothesis is that urban changes are characterized by the overcoming of industrial cities. The structural elements of economic, geographic and social structures, in different levels, are some of the signs that could be identified, which suggests the emergence of a society based on innovative forms of social coexistence. These new forms are no longer based on classical recipes (family, neighborhood, local community). They will eventually put aside their territorial attachment and will be characterized by a global wave of economic and social networks. At the same time, a new urban hierarchy will be constituted, based on a worldwide network. Saskia Sassen and Manuel Castells have created the concept of nodal global cities, according to the importance of financial and political flows, which are concentrated in such places (Sassen, 1994) (Castells, 1997).

Cities can be classified into central and peripheral to the urban society with respect to the information system, according to their ability to become a center of innovation. Castells define the innovative environment as: “The social, institutional, organizational, economic, and geographic structural system, which creates the conditions for a continuous generation of synergies, and for their investment in a production process originated from this synergic capacity, for production units, as well as for the environment as a whole”. The development of innovation environments is nowadays not only a decisive factor for local economic development, but also a matter of political and social prestige. Innovative cities are those which are capable of focusing on elements such as:

- i. Developing Technology Parks

Local production of high value goods, services and technologies for the Information Society. It refers mostly to hardware and software, but not exclusively: it also refers to cities' capacity to attract innovative companies, not

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only electronics manufacturers, but also companies which resort to ICTs, mainly internet as a means for network organization.

- ii. Intensive individual and collective consumption of ICT - urban services that use ICTs as tools for their operation and management.

Education, public health, transportation, etc; networks that require technologies such as water and sanitation, managed through ICT systems, and mainly electronic government.

- iii. The emergence of new social organizations, supported by ICTs

It refers specifically to electronic communitarian networks (telecentres and free network access), defined by the Spanish Association of Citizen Networks as "intervention systems, instrumentation, articulation and promotion of local development in all areas." Different social groups and movements found in these networks means of communication and development boards to convey their ideas to the people and the tools to interact with interest groups semi-ers around the world.

These cities attract interactions between venture capital and State actions focused on making them key cities in the new economy and high-tech production – high quality knowledge in universities, research centers and Technology Parks. Depending on the ability of these cities to fulfill this role, a new map of urban centralities will be established, with reflections on its periphery. A map, which will possibly differ from that inherited from the Industrial Society. Innovative environments are territorially concentrated in cities and their hinterlands, articulated and connected via telecommunication networks with the rest of the world.

The third hypothesis is that this network of central and peripheral cities, defined by their innovation capabilities, may not necessarily coincide with the current urban hierarchy - major cities, cities of intermediate size and small cities – or in developed or developing countries or regions. It may also be noncoincidental with the global hierarchy and the nodal cities preconized by Sassen. As in a juxtaposition of transparent maps, some central, global or hierarchically relevant cities in the present will be coincident with the innovative cities while many others will not. The cities that have the goal of becoming innovative environments (through the development of ST&I, and implementation of science and technology parks in their various forms) will achieve a new role.

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According to Sassen's theory, three factors in the current economy would explain why a network of 30 to 40 "global cities" has acquired increasing importance. First of all, the global economy is not just a market, but a system that requires specialized work that is concentrated in these cities. Secondly, privatization and deregulation have transferred certain functions from central, regional and local authorities to the private sector, concentrating these activities in some cities. Finally, the digital age leads dominant economic sectors into having access to an infrastructure of services that are found in the financial centers of cities. Instead of becoming obsolete, these cities now concentrate relevant functions, because they serve as production environments for financial activities and for leading industries in the "post-industrial" age. They provide the markets in which companies and governments can acquire financial instruments and technology, as well as a place to hire human resources they need.

Civil society has an important role to play in the construction of innovative environments: Castells establishes an intimate link between the citizens and the political development of the new economy and new information technologies. He develops the idea of local technology markets, intensive-information, based on civil and environmental policies and on advances in information processing, from the modernization of public services to the creation of interactive systems of citizen participation via the Internet. Not only do these changes can improve local management, but they can also improve the management of local markets, for innovative small and medium-sized companies, ie, the basis for future development.

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3 MACROENVIRONMENT FOR THE ENTERPRISE THREATS AND OPPORTUNITIES

The science and technology parks start to overcome the stage of creation of infrastructure and buildings, focused on the ownership and leasing of space, which was the reality of their early history (Rowe, 2003). In its dawning the science and technology parks had to establish the infrastructure, which worked well for the high-tech sector. They were forced to substantially increase the investment, which was seen as a highly speculative and risky action.

By the early 1990s, the opportunity presented itself to the more adventurous, when it appeared lenders who allowed the enterprises to move on. The next step was to start taking more seriously the ways through which a Park could stimulate technology transfer among its members (universities or research centers and companies), or perhaps develop methodologies that contribute to the development of new high technology startups and companies around the Park, as well as stimulate the creation of support for new businesses or research centers.

The news linking science and technology parks to strong innovative business creation and support programs have become increasingly interesting. This fact gave parks a relevant role in the global scenery for the first time. They came to be considered serious actors of economic development, and several parks strongly performed this role.

3.1 CONTEXTUALIZATION OF THE PARKS AROUND THE WORLD

Most Technology Parks in the world were created in the 1990s (48%), 18% after the turn of the century, and 34% are remnants of the period prior to 1990 according to information presented at the World Conference of the International Association of Science Parks - IASP, held in Lisbon in 2003.

From this fact, it is inferred that during the opening of the Brazilian economy there were many initiatives in several countries, concerning this type of venture. Brazil though did not capture at that moment the importance of this kind of mechanism to the stimulation of entrepreneurship and technological innovation.

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Technology Parks around the world emerged in a natural unplanned fashion, because of the need for clustering and joining forces. However there are factors which have contributed to this clustering and they still do. Among them, we may quote the industrial vocation, the market opportunity, the expertise already in place in the region and State support in the form of investment in public policies. It is worth emphasizing that due to the characteristics of each region, the time interval between the implementation of each park and the economic and cultural aspects of the countries where they are located, the dynamics and the scope of each park follow a different line.

The question related to policies that strengthen and promote the integration of science, governments and the private sector are crucial to the development of Science Parks. In all successful examples there are background proactive actions by the government setting the foundations for engaging the private sector and scientists.

Regardless of which name is given, Technology Parks, can currently be found at virtually any part of the globe.

According to the document "Science Parks in Brazil - Study, Analysis and Propositions" (ABDI & ANPROTEC, 2009) there are about 1,500 parks in operation around the world in many different countries.

While the United States concentrates most parks, a large number of parks have been installed in Europe and Asian countries bordering the Pacific. Some countries, like Japan and South Korea, took the concept of Science and Technology Park one step further, creating entire cities focused on this concept, including supporting infrastructure and even providing housing units.

According to the International Association of Science Parks - IASP, a science and technology park usually has formal links with one or more universities, it is designed to encourage the formation and growth of knowledge-based industries and it is responsible for actively engaged management of transfer of technology and business expertise to companies residing there.

Technology Parks in average have about 46 and a half acres (465,000 m²), and their occupants employ approximately 750 employees. A relatively new phenomenon: around 85% of Technology Parks currently in action have been established since 1980.

For companies, Technology Parks usually offer the maximum in terms of physical and aesthetic appeal – it is a key issue to attract qualified staff. Actually, more than 80% of

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the parks have high levels of development and are considered as having the highest quality for business parks. Parks that meet these standards should have an updating service for landscaping along its development. Likewise, the parking lots are underground and there is no rail access.

These operating rules suggest that the settings of the parks will not always meet the needs of certain types of companies, such as heavy manufacturing and large industrial facilities. However, its location must allow easy access to sources of skilled labor, and it must also provide twenty-four seven control, aiming to provide a constant sense of security.

The global economy has led companies to realize the need for complete access to all the resources required for their activities, including the resources from the universities. Technology Parks exist to favor the access to an interactive work environment, which benefits all the companies which are settled there. Most companies desire this kind of interaction and the parks are there to provide it.

3.2 UNITED STATES: LEADERSHIP IN NUMBER OF TECHNOLOGY PARKS:

There are more than 150 science parks in the United States (UNESCO,2011), more than any other country. California (35 science parks), Florida (25 parks) and Michigan, New Jersey and New York (16 parks each) are the leading states in number of science parks.

The concept of science park was, in fact, coined in the United States. Stanford Research Park, created in 1952, thrived in the fertile environment of Stanford University surroundings, in the area close to San Francisco Bay. The project was so successful that, by the late 1970s, the entire park of 265 acres was leased. The occupants of the park currently employ about 26,000 workers.

Parks which subsequently emerged in the U.S. aimed to become poles of attraction for high-tech activity. The Research Triangle Park, in North Carolina (created in 1959), and Cummings Research Park, in Huntsville, Alabama, (created in 1962) are two of the best examples of parks that have capitalized a connection with the university in order to become meccas of high technology. The Research Triangle Park, for example, currently has more than 32,000 employees, while the Cummings Research Park employs about 22,000, both focused on a variety of initiatives related to high technology.

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Obviously, the parks have some of the main attractions to attract a large number of occupants that employ thousands of workers. This fact has fueled the growth of Cummings Research Park, through companies related to aerospace and electronics.

The park has basically grown around the University of Alabama, in Huntsville. The university is in the geographic center of the park. The companies located in the park have access to basic research developed at the university. They also have the possibility of hiring the engineering and computer science undergraduates from that institution.

The following is a list of the 72 major parks established in the United States:

- 1) Arizona State University Research Park, Arizona
- 2) Biomedical Research Park, Louisiana
- 3) Cape Charles Sustainable Technology Park, Virginia
- 4) The Research Triangle Park, North Carolina
- 5) CURI North Charleston Research Park, South Carolina
- 6) Clemson Research Park, South Carolina
- 7) Cummings Research Park, Alabama
- 8) Dandini Research Park, Nevada
- 9) Delaware Technology Park, Delaware
- 10) EverGreen Technology Park, Pennsylvania
- 11) First Union Science Park, Colorado
- 12) Florida Atlantic University Research Park, Florida
- 13) Francis Marion Research Park, South Carolina
- 14) Fontaine Research Park, Virginia
- 15) Indiana University Research Park, Indiana
- 16) Innovation Depot, University of Alabama
- 17) Innovation Park at Penn State, Pennsylvania
- 18) Innovation Park Tallahassee, Florida
- 19) Innovator.net University of North Dakota, North Dakota
- 20) Iowa State University Research Park, Iowa
- 21) Kapolei Business Park, Hawaii
- 22) Los Alamos Research Park, New Mexico

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- 23) The Northwestern University Evaston Research Centre
- 24) The Olentangy River Wetland Research Park, Ohio
- 25) NASA Research Park, California
- 26) The Arrowhead Business and Research Park, New Mexico State University
- 27) Massachusetts Biotechnology Research Park
- 28) The High Technology Development Corporation (HTDC), Hawaii
- 29) Maui Research & Technology Park, Hawaii
- 30) Michigan Centre for High Technology, Michigan
- 31) Mililani Technology Park, Hawaii
- 32) Milwaukee Technopole, Wisconsin
- 33) Milwaukee County Research Park, Wisconsin
- 34) Thad Cochran Research, Technology and Economic Development Park,
Mississippi State University, Mississippi
- 35) Missouri Research Park, Missouri
- 36) Oakdale Research Park, University of Iowa
- 37) Piedmont Triad Research Park, North Carolina
- 38) Purdue Research Park, Indiana
- 39) Rensselaer Technology Park, New York
- 40) The Washington State University Research Foundation (WSURF),
Washington, DC
- 41) Research Park at University Illinois
- 42) Rheology Research Centre, Wisconsin
- 43) River Front Research Park, Oregon
- 44) Riverside Regional Technology Park
- 45) Sandia Science & Technology Park, New Mexico
- 46) Stanford Research Park, California
- 47) Sorrento West Life Science Park
- 48) Stout Technology Park, Wisconsin
- 49) Sunset Science Park, Oregon

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- 50) Texas A&M University Research Park, Texas
- 51) Texas Research Park Foundation, Texas
- 52) Tri-Cities Science and Technology Park, Washington
- 53) UAB Research Park at Oxmoor
- 54) UMBC Technology Centre, Maryland
- 55) University Corporate Research Park, Michigan
- 56) University Heights Science Park Newark, New Jersey
- 57) University of Virginia Research Park, Virginia
- 58) University of Arizona Science and Technology Park, Arizona
- 59) University of Colorado Research Park, Colorado
- 60) University of Idaho Research Park, Idaho
- 61) University of Maryland, Technology Advancement Program, Maryland
- 62) University of Minnesota Valley Technology Park, Minnesota
- 63) University of Nebraska, Nebraska Innovation Campus, Nebraska
- 64) University of New Orleans Research and Technology Park, Louisiana
- 65) University of Utah Research Park, Utah
- 66) University Park SIUE, Inc. on the campus of Southern Illinois University
Edwardsville, Illinois
- 67) University Research Park Wisconsin-Madison
- 68) University Technology Park at IIT, Illinois
- 69) Utah University - Innovation Campus
- 70) Virginia Bio Technology Research Park, Virginia
- 71) Virginia Tech Corporate Research Centre, Virginia
- 72) WMU Technology & Research Park, Michigan

3.3 TECHNOLOGY PARKS IN EUROPE

While the United States maintains the largest number of technology parks in the world, Europe has also developed several initiatives which result in their creation and maintenance.

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The United Kingdom leads the European continent with 63 parks, followed by France (60 parks), Finland (24), Germany (12), Sweden (12) and Switzerland (7).

Perhaps the best known among European Technology Parks is the Sophia Antipolis park, located between the French Alps and the Mediterranean coast in Valbonne, France, along the French Riviera. It was created in 1974 and has a total area of 5,000 hectares. The park houses over 700 companies and research institutes and employs approximately 14,500 employees.

Sophia Antipolis park is home to European research centers from several corporations and it became a major center in the continent for telecommunication operations. Moreover, the Japanese Ministry of International Trade and Industry chose the Sophia Antipolis model, adopting it in all Technology Parks in Japan.

Listerhills Science Park, in Bradford, West Yorkshire, England, is another example of successful European Technology Park. Listerhills Park, in particular, has capitalized on its proximity to the University of Bradford. Founded in 1983, the park now has dozens of high-tech companies and several hundred employees.

In general, the park has three features that help promote it as a desirable location. First of all, companies can use the expertise and facilities of the university. Second of all, the park offers high quality facilities for startups and established companies which deal with high technology, and offers easy access to knowledge related to the industries. Currently it is considered a center for science-based knowledge related to the industry.

Table 3.1 presents the main parks installed in Europe:

Table 3.1 Main European Parks

| Western Europe | |
|-----------------------|---|
| Belgium | <ol style="list-style-type: none"> 1) Brussel Technopole 2) EBN (European Business & Innovation Centre Network) 3) Parc Scientifique Université Catholique de Louvain 4) Parc Scientifique d'Université de Liege 5) Technopole Brussel 6) Fsgx Crealys Science Park |
| Denmark | <ol style="list-style-type: none"> 1) Dansih Science Park 2) International Science Park Odense 3) Science Park Aarhus 4) Symbion Science Park 5) Universität und die Fachhochschule Ulm |
| Finland | <ol style="list-style-type: none"> 1) Agropolis Oy 2) Culminatum 3) Finn-Medi Tampere 4) Foodwest 5) Helsinki Science Park Ltd. 6) Carelian Science Park |

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| | 7) Jyväskylä Science Park 8) Kajaani Science Park 9) Medipolis 10) Oulu Technopolis 11) Otaniemi Science Park 12) Oy Media Tampere 13) Prizztech Ltd. 14) Tampere Technology Centre Hermia 15) Technology and Innovation Centre 16) Technology Centre Kareltek 17) Technology Centre Teknia 18) Technology Center Merinova 19) Technopolis Hitech Oy 20) Technopark Raahe 21) Teknologikeskus Kareltek Oy 22) Turku Science Park 23) Vaasa Science Park 24) Viikki Science Park |
| France | 1) Agroparc 2) Agropole 3) Agropolis Science Park 4) Angers Technopole 5) Angers Technopole 6) APIS Technology 7) Atlanpole 8) Bordeaux Technopolis 9) Centre de Transfer Technologie du Mans 10) Centre d'initiatives locales de Saint-Nazaire 11) DigiPort Technopole Lille Metropole 12) Europole Mediterranee de l'Arbois 13) ESTER Limoges Technopole 14) Futura Corse Technopole 15) Futuroscope Technopole 16) France Technopoles 17) Geparc 18) Grand Lyon Metropole Technopolitan 19) Helioparc Pau-Pirenee Trechnopole 20) Helioparc Pau-Pirenee Trechnopole 21) Laval Mayenne Technopole 22) Lorient Technopole 23) Marseille Innovation 24) Montpellier Mediterrane Technopole 25) Nancy Technopole 26) Nimes Rhone Cevennes Technopole 27) Orlean la Technopole Nature 28) Parc Scientifique & Technologique de Marseille-Luminy 29) Parc Technopole de la Reunion 30) Pépinière d'entreprise de l'EMA 31) Pépinière d'entreprises Eurolacq 32) Promopole Saint-Quentin-en-Yvelines 33) Saclay-Scientipole 34) Savoie Technolac Technopole 35) Synergia Technopole Cean Normandie 36) Sophia-Antipolis 37) Soissons Technopole 38) St. Hyacinthe Technopole 39) Technoparc de Poissy 40) Technoparc de Pays-de-Gex |

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| | 41) Technopole Alimentech 42) Technopole Anticipa 43) Technopole de l'Aube en Champagne 44) Technopole de la Doua 45) Technopole Brest-Iroise 46) Technopole de Houte Alsace 47) Technopole de Monaco 48) Technopole de Mulhouse 49) Technopole du Madrillet 50) Technopole des 24 heures du Mans 51) Technopole Lyon Gerland 52) Technopole Marseille Provence 53) Technopole Mezt 2000 54) Technopole Micropolis Gap 55) Technopole Rennes Atalante 56) Technopole Quimper Cornouaille 57) Technopole de Villeneuve d'Ascq 58) Temis 59) Zirst 60) Zoopole |
| Germany | 1) ADT (Arbeitsgemeinschaft Deutscher Technologie und Grunderzentren) 2) International University Bremen Science Park 3) BACnet Projekt Tekhnopark 4) City of Science Bremen und Bremenhaven 5) Science City Ulm 6) Science Park Saar 7) Science Park Wuerzburg 8) Siemens Technopark Augsburg 9) Technopark GMD 10) Technopark Kamen GMBH 11) Technologiepark Braunschweig 12) Technopark Ettlingen |
| Greece | 1) Patras Science Park 2) Science Technology Park Crete 3) Thessaloniki Technology Park 4) Science and Technology Park of Epirus |
| Ireland | 1) Kerry Technology Park 2) National Technology Park |
| Italy | 1) AREA Science Park 2) Bioindustry Park Canavese 3) San Raffaele Biomedical Science Park 4) Science Park Raf 5) Technoparco del Lago Maggiore 6) Technopolis Novus Ortus (IT) |
| Luxembourg | 1) Technopole Belval |
| Norway | 1) Forskning Parken Oslo Inovation Centre 2) Rogaland Science Park |
| Portugal | 1) Taguspark |
| Spain | 1) Andalucia Technopark 2) Barcelona Science Park 3) Boicello Technology Park 4) Mediterranean Science Park 5) Technology Park of Basque Country |
| Sweden | 1) Aurorum Science Park 2) Berzelius Science Park |

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| | 3) Chalmers Science Park 4) Kista Science City 5) Karolinska Science Park 6) Lindholmen Science Park 7) Novum Research Park 8) Mjardevi Science Park 9) Pronova Science Park 10) Sceince Park Jonkoping 11) Swedepark (Swedish Science & Technology Parks) 12) Uppsala Science Park |
| Switzerland | 1) Berner Technopark 2) Haltestelle Technopark 3) Life Science Park Zurich-Schlieren 4) Technopark Zurich 5) Technopole Sierre 6) Technopark Winterthur 7) Y-Park Scientifique et Technologique |
| The Netherlands | 1) Amsterdam Science Park 2) Bio Science Park 3) Business & Science Park Enschede 4) Technopark Heerenveen 5) Zernike Science Park 6) Mercator Technology & Science Park |
| Turkey | 1) Odtu Teknopark |
| The United Kingdom | 1) Aberdeen Science & Technology Parks 2) Aberdeen Science & Technology Parks 3) Antrim Technology Park 4) Aston Science Park 5) Begbroke Business and Science Park 6) Birmingham Research Park 7) Brunel Science Park 8) Cambridge Research Park 9) Cambridge Science Park 10) Cheshire Innovation Park 11) Chemsoc Science Park 12) Chilworth Science Park 13) Coventry University Technology Park 14) Cranfield Technology Park 15) Durham University Science Park and Mountjoy Research Centre 16) Edinburg Technopole 17) Elvingston Science Centre 18) Granta Park 19) Heriot-Watt University Research Park 20) Hannah Research Park 21) Hillington Park Innovation Centre 22) Keele Science Park 23) Lee Valley Technopark 24) The London Science Park at Dartford 25) The London Science Park Innova 26) Manchester Science Park 27) Manchester Science Park 28) Malvern Hills Science Park 29) Northern Ireland Science Park 30) Northern Ireland Technology Centre 31) Norwich Research Park 32) Nottingham Science and Technology Park 33) Oxford Science Park |

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| | 34) Pentlands Science Park 35) Plassey 36) Portsmouth Technopole 37) Preston Technology Management Centre 38) Research Park of University of Ulster 39) Roslin BioCentre 40) Rosyth Europarc Business Innovation Centre 41) Science City York 42) Sittingbourne Research Centre science park 43) St John's Innovation Park 44) Sheffield Science & Technology Parks 45) South Bank Technopark 46) Staffordshire Technology Park 47) Stirling University Innovation Park 48) Sunderland Science Park 49) Surrey Reserch Park 50) Tamar Science Park 51) Swansea University Innovation Centre 52) University of Durham Science Park 53) The University of Essex Research Park 54) University of Reading Science & Technology Centre 55) University of Ulster Science Research Parks 56) University of Warwick Science Park 57) University Sunderland Technology Park 58) Virtual Science Park 59) Wolverhampton Science Park 60) West of Scotland Science Park 61) Westlakes Science & Technology Park 62) Wolverhampton Science Park 63) York Science Park |
| Eastern Europe | |
| Austria | 1) Technopark |
| Czech Republic | 1) SSTP (Society of Science & Technology Parks of the Czech Republic) 2) Czech Technology Park Brno |
| Estonia | 1) Tartu Teaduspark |
| Latvia | 1) Latvia Technology Park |
| Poland | 1) Polish Business & Innovation Centre Association (Poland) 2) Krakow Technology Park |
| Russia | 1) On Presnya Technopark 2) Science Park MPEI 3) Technopark in Moskvorechje |

3.4 ASIA: BIRTHPLACE OF THE SCIENCE CITY OR TECHNOPOLIS CONCEPT

Embracing the concept of Technology Park and taking a step forward, some countries are establishing whole "technology cities", in an effort to build a substantial base of research institutions and attract corporate facilities. Besides technology parks, these cities typically include supporting infrastructure and housing.

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For example, Taedok Science Town, in South Korea (located in Taejon, about 168 kilometers south of Seoul), is a major project designed to attract both private companies as well as government research centers. Its plan of land use designates 1293 hectares intended to be built as an area of research facilities and educational institutions, with an equal space reserved for green spaces. More than 7,000 people connected to research and development are bound to institutions installed there.

Still in the Pacific Rim, Japan has several technology cities in progress, including Chiba Prefecture's Kazusa Akademia Park (also known as Kazusa New Research and Development City); Kumamoto Prefecture's Kumamoto Technopolis, Tsukuba Science City, north of Tokyo, and Kansai Science City, near Osaka.

Located on the outskirts of Tokyo, with an area of 1,000 hectares, the Kazusa Akademia Park was designed to be a center of high technology for research and development, where companies, mostly private, can perform their research activities in the fields of electronics, new materials and biotechnology. Nine companies, including Fujitsu Ltd., TDK Corp. and Canon Inc. have laboratories in the park.

Likewise, Kumamoto Technopolis is also attracting numerous research centers. It was designed to create a city where "people can lead active lives, in a nice attractive urban cultural environment, capitalizing on the natural environment and good concentration of universities and companies."

Table 3.2 is presents the main parks installed in Asia:

Table 3.1 – Main parks in Asia.

| East Asia | |
|------------------|---|
| China | 1) Anshan High & New Technology Industrial Development Zone 2) Baoji Science & Technology Industrial Park 3) Baotou Rare Earth Science & Technology Industrial Park 4) Boading Science & Technology Industrial Park 5) Beijing Economic Technological Development Area 6) Caohejing Hi-tech Park 7) Changchun Science & Technology Industrial Park 8) Changsha Science & Technology Industrial Park 9) Changzhou Electronic Technology Industrial Park 10) China-Singapore Suzhou Industrial Park 11) Chongqing Hi-tech Development Zone 12) Chongqing High Technology Entrepreneur Center 13) Dalian Hi-Tech Industrial Zone 14) Daqing Science & Technology Industrial Park 15) Erlang Hi-Tech Industrial Park 16) Fengtai Science & Technology Garden of Beijing 17) Fuoshan National Hi-Tech Development Zone 18) Fuzhou Science & Technology Industrial Park 19) Goldennox Hi-Tech Industrial Park |

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| | 20) Guangzhou International Bio-island 21) Guangzhou Science City 22) Haidian (Zhongguancun) Science Park 23) Hainan Science & Technology Industrial Park 24) Hangzhou Hi-Tech Industry Development Zone 25) Harbin Science & Technology Industrial Park 26) Hefei Science & Technology Industrial Park 27) Heping Technology and Trade Development Zone 28) Hongqiao Economic & Technical Development Zone 29) International Hi-Tech Park for China's Textile Industry 30) Jiangmen Science & Technology Industrial Park 31) Lanzhou Science & Technology Industrial Park 32) Luohe Science & Technology Industrial Park 33) Luoyang Science & Technology Industrial Park 34) Minhang Economic & Technological Development Zone 35) Nanning New and Hi-tech Industrial Development Zone 36) National Health Technology Park 37) Nantong Hi-Tech Park 38) Ningbo Sci-Tech Par 39) Peking University Science Park 40) Qingdao Hi-tech Industrial Park 41) Qinhuangdao Economic & Technologic Development Zone 42) Qiaonan Economic & Technologic Development Zone 43) Science Park Xi'an Jiaotong University 44) ShangDi Information Industry Base 45) Shanghai Golden Bridge 46) Shanghai (Z.J) Hi-tech Park 47) Shanghai Jingan scientific and trade area 48) Shanghai Lujiazui Finance&Trade Zone 49) Shanghai Songjiang Industrial Zone 50) Shanghai CITIC-Power Zhanjiang Industrial Park 51) Shantou Science & Technology Industrial Park 52) Shenyang Science & Technology Industrial Park 53) Shenzhen Science & Technology Industrial Park 54) Shenzen Hi-Tech Industrial Park 55) Shijiazhuang Science & Technology Industrial Park 56) Suzhou Science & Technology Industrial Park 57) Tianjin University 58) Tianjin Tanggu Haiyang Hi-Tech Development Zone 59) Weinan High Technology Industry Development Area 60) Wuhu Economic & Technical Development Zone 61) Xiamen Science & Technology Industrial Park 62) Xi'an National Hi-Tech Industrial Development Zone 63) Xiangfan Science & Technology Industrial Park 64) Xiangtan Science & Technology Industrial Park 65) Xianyang New and High-Tech Development Zone 66) Xiaoshan Economic and Technological Development Zone 67) Xin Qing Science and Technology Industrial Park 68) Yantai Economic and Technological Development Zone 69) Yingkou Economic and Technological Development Zone 70) Zhangjiang Hi-tech Park 71) Zhengzhou Science & Technology Industrial Park 72) Zhongkai Science & Technology Industrial Park 73) Zhuhai BaiJiao Science and Technology Industrial Park 74) Zhuhai National Hi-Tech Development Industrial Zone 75) Zhuzhou Science & Technology Industrial Park 76) Zhongguancun Science Park 77) Zhongshan Industry and Development |
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| | 78) Zhongshan Torch Technology Industrial Park 79) Chines S&T Industrial Parks 80) China Association of Science and Technology Park |
| Hong Kong | 1) Hong Kong Science and Technology Park 2) Nansha Information Technology Park |
| Iran | 1) Arak Science and Technology Park 2) East Azerbaijan Science and Technology Park 3) Fars Science and Technology Park 4) Guilan Science and Technology Park 5) Hamedan Science and Technology Park 6) Imam Khomeini National University Science and Technology Park 7) Isfahan Science and Technology Town 8) Irrigation and Electricity Science and Technology Park 9) Kerman Science and Technology Park 10) Kermanshah Science and Technology Park 11) Khorasan Science and Technology Park 12) Pardis Hi-tech Park 13) Semnan University Science and Technology Park 14) University of Tehran Science and Technology Park 15) West Azerbaijan Science and Technology Park 16) Yazd Science and Technology Park |
| Japan | 1) Amagasaki Research Incubation Center 2) Biwoka Science Park 3) Chusei Hokubu Science City 4) Fukuoka Soft Research Park 5) Harima Science Garden City 6) Hiroshima Central Science Park 7) Ishikawa Science Park 8) Kanagawa Science Park 9) Kansai Science City 10) Kazusa Akademia Park Chiba City 11) Keihanna Science City 12) Kitakyushu Science and Research Park 13) Kobe Science Park 14) Kumamoto Technopolis 15) Kumure Research Park 16) Kyoto Research Park 17) North Chusei Scientific City 18) Mie Hi-Tech Park 19) Nagahama Science Park 20) Onaridia Science Park 21) Suzuka Sanroku Research Park 22) Tsukuba Science City 23) Yokosuka Research Park |
| South Korea | 1) Ansan Technopark 2) Daedaok Science Town 3) Kyongbuk Technopark 4) Songdo Technopark 5) Taiduk Science Town |
| Taiwan | 1) Hsinchu Science-Based Industrial Park 2) Tainan Science Based Industrial Park 3) Taiwan science parks and industrial zones |
| Southeast Asia | |
| Malaysia | 1) Johor Technology Park 2) Kulim Hi-Tech Park 3) Selangor Science Park 4) Subang Hi-Tech Industrial Park |

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| | 5) Technology Park Malaysia |
| Singapore | 1) Singapore Science Park |
| Philippines | 1) Laguna Technopark 2) Science City of Munoz 3) Science Park of the Philippines |
| Thailand | 1) Thailand Science Park |
| Vietnam | 1) Hanoi Hi-Tech Park 2) Hao Lac Hi-Tech Park |
| Sul da Ásia | |
| India | 1) Kerala Technopark 2) Gujarat Science City 3) Nanguneri Hi-tech Park 4) Science City Calcuta |

3.5 THE FUTURE OF TECHNOLOGY PARK

Given the advantages offered by their premises, technology parks seem to have a bright future.

Overall, the parks are bringing more results than other real estate ventures. New parks continue to be established between two and five per year, on average. But there will come a time when most places where parks could be successful are already taken by other activities, at which point there will be difficulties in installing new parks.

Strategic planning of Technology Parks requires a long-term perspective.

3.6 SITUATION OF BRAZILIAN PARKS

3.6.1 Parks in Brazil – Brief history

The theme "Technology Parks" has surfaced in Brazil since the creation of a CNPq Program in 1984 to support initiatives in this field. The absence of a culture focused on innovation and the short list of innovative enterprises existing at the time led the first projects of Technology Parks to yield the first business incubators in Brazil. These efforts bore fruit and initiatives expanded rapidly leading to significant current number of more than 400 incubators across the country that are home to over 6,000 innovative companies generated from incubators, universities and research centers.

In 2000, the idea of Technology Parks came back as an alternative for promoting technological, economic and social development. Thus, at the end of 2011 there were about 60 projects, including initiatives in operation, deploying or planning phases.

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3.6.1.1 Motivations for the increasing of initiatives

According to the document "Technology Parks in Brazil - Study, Analysis and Propositions," prepared by the Brazilian Agency for Industrial Development - ABDI, in partnership with the National Association of Entities Promoting Innovative Enterprises - ANPROTEC, the current growth in the number of park projects is mainly explained by a number of factors that act in an integrated manner:

- Strengthening the awareness of government actors about the importance of innovation for sustainable development and economic growth;
- Significant increase of companies interested in setting up in Technology Parks - companies generated or graded in incubators, multinational technology companies and national companies determined to strengthen its R&D units
- Successful experience of countries like Spain, Finland, France, USA, Korea, Taiwan, among others, which are consistently investing in this mechanism;
- Need for state and municipal governments to identify new ways to stimulate growth and drive the development of their regions.

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