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Technology Parks – Concept and Organization

Summary Report

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Executive summary: This study presents a conceptual and organizational framework for establishing a pilot technology park and incubator in Bulgaria. Such a park might initially focus on the telecommunication and information technology (IT) sector (including software development), where the country displays strong, albeit under-utilized, technical talent. The park might encompass an export-oriented IT service firm and an incubator that will nurture hi-tech companies and help them commercialize innovative ideas and technologies. The study presents the experience of leading technology parks and incubators in the U.S., Israel, India and elsewhere and draws upon an on-going project of the Institute for EastWest Studies to establish a technology incubator in Budapest. The purpose of the paper is to identify the existing models of technology parks and to suggest organizational, legal and management solutions that can be applied in Bulgaria.

Part 1 of the study clarifies terminological definitions in order to facilitate comparison and discussion of international efforts in the fields of "science" and "technology parks". Part 2 explores the conceptual framework of science and technology parks. Part 3 presents the functions that technology parks and incubators perform. Part 4 deals in more detail with their organization, legal framework, and financing. Part 5 illustrates a successful software technology park scheme in India and a Technology incubator program in Israel. Part 6 offers recommendations for establishing a technology park and incubator in Bulgaria based on the country's comparative advantages and economic circumstances.

1. Definitions.

The International Association of Science Parks defines a science park as:

- a property-based initiative, which has formal and operational links with universities or other higher educational institution, or major centers of research;
- designed to encourage the formation and growth of knowledge-based industries or high value-added firms, normally resident on site; and
- has a steady management team actively engaged in fostering the transfer of technology and business skills to tenant organizations.

There are currently about 700 parks worldwide that meet the foregoing criteria. The first park was founded in California in 1951, at what is now the center of the Silicon Valley – the University of Stanford[1].

Science parks are also known as technology or research parks, or innovation and science centers. The term technology park usually denotes a focus on technology innovation and tenant company involvement in applied science. In presenting the relevant international experience in this study, we use the term "technology park" (TP) since it seems to capture the purpose of a prospective Bulgarian initiative aimed at software and information technology development.

A business incubator is most broadly defined as a facility providing favorable controlled conditions for the development of new companies. The controlled conditions include at least three types of resources: facilities support, administrative assistance, and professional expertise, e.g., management, marketing, accounting, financial and legal services (Smillor and Gill, 1986). There are currently 550 incubators in the United States and Canada.

The business incubator is also referred to as innovation center, enterprise center, and business and technology center. A technology incubator is a business incubator that is focused on development of technology-based companies.

2. The concept.

Technology parks are designed to facilitate the production and commercialization of advanced technologies by forging synergies among research centers, education institutions, and technology-based companies. Tenants of technology parks are usually small companies at an early development stage pursuing an ambitious growth strategy based on the incubation of new ideas. To facilitate the successful adaptation and take-up of these ideas in the market place, the technology park provides:

[1] In his end-of-the year speech that year, the Stanford University Dean, Frederick Terman, announced the formation of small enterprises on campus, managed by students and developing innovative product for local industries.

- cooperation in R&D with scientific research institutes and laboratories;
- financial consulting and assistance in obtaining venture capital;
- professional, technical, administrative and legal assistance;
- information and telecommunications services; and
- supportive business infrastructure.

By aiding the growth of tenant companies, technology parks play a significant role in the development of local economies. They help create new jobs, attract foreign capital, and increase local and national competitiveness. This developmental role is particularly important in transition economies, which must absorb a great deal of structural unemployment and "catch-up" with rapid technological developments in the global economy.

The technology incubator is an integral part of most technology parks and a major contributor to their success. The incubator is considered one of the best means of promoting business growth by effectively linking talent, technology, capital, and professional know-how. The incubator helps overcome bureaucratic obstacles and provides affordable space and business facilities, thus reducing the costs of start-ups. Most importantly, it provides advisory, training and information services, management and marketing support, linkages to research facilities, and access to capital, thereby greatly enhancing the chances of success of the early-stage “technopreneur” (Lalkaka, 1996).

The incubator idea gained popularity in the U.S. in the early 1980s with the advent of a more robust entrepreneurial culture during the Reagan years. In Central and Eastern Europe, the incubator attracted attention as an effective mechanism to utilize the scientific potential of state universities and research institutions and channel existing engineering talent into commercial uses. Incubators were also seen as a way of renewing the careers of highly qualified specialists and scientific workers who lost their jobs through the reorganization of the state funded science and high education in the region.

3. Functions of technology parks and incubators.

Most of the science and technology parks, especially those in the US, are built around universities. This allows for:

- access to faculty and staff on a consultative basis;
- access to graduate and undergraduate students through internships and co-op arrangements;
- access to university facilities and proprietary technology and intellectual property;
- contractual use of university owned scientific, engineering and computing equipment;
- access to the university library system;

- the ability to receive on-site customized training and education offerings, as well as access to regular and continuing education offerings on the university campus; and
- adjunct faculty positions for employees of park tenants.

In addition to the above university-specific services, university-linked tech parks can also develop services providing support in the areas of:

- scientific, engineering, financial, tax, managerial and business planning;
- copy, fax facilities, telephone answering and on-site fiber optics; and
- shipping and receiving capabilities.

Appendix I summarizes the experience of one of the most successful university-linked parks in the United States – the Raleigh-Durham Research Triangle Park in North Carolina.

Many of the university-centered technology parks in the US receive federal support through the Small Business Innovation Research Program and state and local assistance in the form of direct funding of R&D, development of high-technology initiatives, and tax incentives.

Technology incubators are most often organized around a company providing basic business and administrative support and tied to university or research center facilities. The incubator is a physical unit, a single building or a group of buildings in which participating entrepreneurs can be housed together, thereby facilitating spontaneous interaction. To support start-up businesses, the incubators perform the following functions:

- assist in conducting technological and marketing feasibility studies and in preparing an R&D plan (generally intended to be implemented over a 1-2 year period);
- assist in recruiting and organizing R&D staff;
- provide physical facilities suitable for carrying out each project, including plant and equipment and administrative offices;
- provide professional and managerial guidance and direction;
- provide secretarial, administrative, maintenance, purchasing, bookkeeping and legal services; and
- assist in recruiting investment capital and preparation for commercialization and marketing.

The major success factors for technology incubators are:

- availability of on-site business expertise;
- access to financing and capitalization;
- provision of entrepreneurial education;
- link to a university or research center.

4. Organization, legal framework and financing of technology parks

4.1. Organization.

Technology parks and incubators vary in the way they are established and managed. They can be founded as independent legal organizations by state and local governments, universities and research institutes, development foundations, private corporations or any combination of those. Depending on the institutional character of their founders, parks and incubators can be public or not-for-profit, private, academic-related, hybrid, and other. This classification is used by the American National Business Incubation Association in Athens, Ohio, in relation to incubation facilities, but can be extended, in principle, to include technology parks.

Public or not-for-profit parks and incubators are sponsored by government and non-profit organizations, and serve primarily the purpose of local economic development, i.e. job creation, economic diversification and/or expansion of the tax base. According to the National Business Incubation Association, 49% of the business incubators in North America are in this category.

Private parks and incubators are run by investment groups or by real estate development partnerships. Their primary interests are economic reward for investment in tenant firms, new technology applications and other technological transfers, and added value through development of commercial and industrial real estate. 12% of all North American incubators are private.

Academic-related parks and incubators are affiliated with universities and colleges and share some of the same objectives of public and private incubators. In addition, they are actively engaged in transferring research and development activities, spinning-off university research efforts, providing faculty with research opportunities, and alumni, faculty and associated groups with start-up business opportunities. 13% of North American incubators are academic-related.

The so-called hybrid parks and incubators are joint efforts of government, non-profit agencies and/or private developers. These partnerships may offer the incubator access to government funding and resources, and private sector expertise and financing. Hybrid incubators constitute 18% of all North American facilities.

Other parks and incubators can be sponsored by a variety of non-conventional sources such as art organizations, church groups, chambers of commerce, etc. 8% of incubators in North America fall in this category.

While in the US there is a diversity of park and incubator sponsorship, in the industrializing countries (e.g. China, Taiwan, and to a lesser extent India,) parks usually rely on a strong government support. Sponsorship, however, is not a defining difference when it comes to the overall effect of technology parks' operations: they all serve the

broad mission of developing knowledge-intensive businesses and increase the competitiveness of local economies.

4.2. Management.

For the purpose of administering the park, its founders establish a managing company. The managing company is responsible for the day-to-day management of the park and has full authority over the park's infrastructure and development. The company can be established as a non-profit institution or foundation, public corporation, or a private company with the express purpose of managing the park. In Central and Eastern Europe management companies are most often non-profit, limited liability companies (the Latvian Technological Center), or joint-stock companies with government participation (The InfoPark Budapest).

The management company can set up a subsidiary to run most of the special supporting services in the park: maintenance of infrastructure, security, central heating and air conditioning, etc. The subsidiary can be financed by tenants in proportion to the area they occupy.

An important part of the management company's portfolio is to provide information services to tenant companies (Orminsky, 1991). Since park tenants tend to be small and young companies, their business plans are rarely adequately developed to include a systematic approach to information gathering and use[1]
should create an information providing service that can:

- possess basic business knowledge and speak the language of business;
- define carefully the information products of the service so that they can be identified by potential clients and be recognized to have value for the
- with casual, informal contacts (Orminsky, 1991).

4.3. Legislative and policy framework.

The success of technology parks and incubators depends on how effectively they create an environment conducive to business development. State policies and regulations can significantly contribute in this direction by:

- simplifying the regulatory system to facilitate the registration costs and time for starting a business;
- encouraging the creation of flexible funding mechanisms, including venture capital funds, loan-guarantee schemes, etc;

[1] There is, however, a growing tendency among small and medium enterprises to use highly developed forms of electronic communication (telematics).

- providing tax incentives for corporate and co-operative research and venture creation;
- strengthen the legal system to protect business rights and intellectual property.

In the US most of the business incentives for the park tenant companies are provided at the municipal level, e.g. low-cost facilities, preferential income taxes. In some industrializing countries, such as India, the national government can relieve park tenants from national income tax for an initial period of time and grant them exemptions from import and export duties.

4.4. Financing.

The existence of well-developed university and research facilities and strong technological talent is one of the conditions for the success of technology parks and incubators. Another is availability of financing. There are basically four models to structure the financing of a technology park/incubator (Lalkaka, 1996). One is for the state to cover the initial investment and then let the park/incubator meet all operating cost on a fee-for-service basis. The other is to cover both the capital and continuing operations as a social investment[1]. The third is to structure the park/incubator as a private, for-profit, real-estate based undertaking. The fourth model is for a public-private partnership, whereby the state meets capital and initial (3 to 5 years) operations, on the premise that private investors will eventually take-over the entity.

Governments in transition countries can be reluctant to commit public funds to technology parks for a variety of reasons: limited budgetary resources (in the case of Bulgaria restricted by a currency board), more urgent priorities (wages and pensions due), the lack of guarantee for quick returns and job creation, or simply because there is incomplete understanding of the longer-term benefits of investing in technological enterprises (Lalkaka, 1996). For these reasons, a more acceptable form of government assistance can be an in-kind and indirect (for example relief of import/export duties) public support. India is a good examples of this case.

5. Example: The Software technology parks scheme in India and the Technology incubator program in Israel.

5.1. The Software technology parks scheme in India.

[1] In China, the State Science and technology Commission supports 72 technology incubators. In Turkey, the Small enterprise promotion agency has financed incubators at Istanbul Technical University and at Middle East Technical University in Ankara. Taiwan largest (out of 73) science park in Tapei is managed by the government. Established in 1978, it houses 150 enterprises with 29,000 employees.

India today has the second largest English speaking scientific manpower pool. There are over 1,670 educational institutes including engineering colleges, technical institutes and polytechnics that train more than 55,000 people annually. The software professionals in the country number 140,000, their median age is 29 years, and half of them have at least 5 years of experience. On the basis of this human capital, the compound annual growth rate of the Indian software industry during the last ten years has been 42.35%, with the share of software export industry 54.31%. Software technology parks, operating under a government-sponsored scheme, played a major role in that impressive growth.

The Software Technology Parks Scheme is instituted by the Department of Electronics of the government of India as an autonomous organization (Software Technology Parks of India - STPI). Its objective is to promote export of computer software. The scheme provides for preferential export and import regime and includes approximately 450 software units operating in software technology parks. It is oriented to the development and export of computer software using data communication links or physical media and export of professional services.

A Software Technology Park (STP) or a STP unit may be set up under the scheme by the central government, state government, public or private sector undertakings or any combination thereof. The STP acts as a resource center for the member computer software units by offering general infrastructure facilities like utility power, ready to use built-up space, centralized computing facilities, and high speed data communication links. Besides providing necessary support in infrastructure facilities to the member units, STP also performs various functions like the issuance of import certificates, software valuation, attestation of export declaration, etc. This enables the STP units to commence their operations with a minimum gestation period. Successful examples of software technology parks set up under the scheme are those in Bangalore, Pune, Bhubaneshwar, Thiruvananthapuram, Hyderabad, Noida (near Delhi), and Gandhinagar (near Ahmedabad).

The major characteristics of the STP scheme are:

- A STP unit may be a stand-alone unit or one of the units located in any STP.
- STP units may be set up anywhere in India.
- An organization setting up a STP for development and export of software through STP scheme may import, free of duty, the requisite infrastructure equipment with no export obligation.
- The centralized infrastructure created by STPs can be accessed by the educational & research community.
- STP/STP units can import telematic infrastructure without any custom duty and export obligation.
- STP/STP unit is a duty free and bonded area under section 65 of the customs Act, 1962.
- All the imports to STP units are duty free.
- STP units are exempt from payment of income tax for a block of five years in the first eight years of its operation under Section 10 A and 10 B of Income Tax Rules.

- STP units are entitled to sell the computer software in Domestic Tariff Area (DTA) up to 25% of the software exported in value terms.
- The capital goods purchased from the Domestic Tariff Area (DTA) are entitled for the benefits like levy of excise duty and reimbursement of Central Sales-Tax (CST).
- 100% foreign equity of STP/STP units is permissible.
- Computer systems in STP units can be made available for training purposes within the premises of STP unit.
- Capital invested by foreign entrepreneurs, as well as know-how fees, royalty, dividends, etc. can be freely repatriated after payment of income taxes due on them if any.
- Export obligation on the STP unit on Net Foreign Exchange (NFE) terms is as follows: "Export obligation = 1.5 times CIF value of the hardware (including software) imported + 1.5 times the annual wage bill.

For setting up a unit under the STP scheme, an application along with project report, including marketing arrangements and business plan must be made to the Jurisdictional Director of the STP scheme. Projects costing less than or equal to Rs.100 million and not involving foreign equity participation are considered by the Jurisdictional Director of the STP scheme. Projects costing more than Rs.100 million and not involving any foreign equity participation are considered by Inter Ministerial Standing Committee (IMSC) of STP scheme. Projects involving foreign equity are considered by the Foreign Investment Proposal Board (FIPB). The approval process takes 8-10 weeks approximately.

5.2. <u>The technology incubator program in Israel.</u>

The development of the Israeli economy during the 1990s has been marked by the spur of small homegrown technology companies (formed at a rate of about one every 36 hours). With the exception of the United States, perhaps no other country in the world has managed to build a technology sector based on start-up companies rather than older, established businesses. High technology has fueled much of Israel's growth, certainly since the middle of the decade when the rest of the economy began slowing down. The Bank of Israel estimates that high technology accounts for two thirds of Israeli industrial output and 80 percent of its industrial exports.

Much of the success of the Israeli hi-tech industry stems from the government's sustained effort to make Israel a source of high technology based goods and services, rather than a supplier of intermediate products. Towards this end, the Israeli Ministry of Industry has designed and implemented an industrial policy that considers support of technological innovation a priority economic task. A good reason for that policy orientation was the huge inflow of well-educated Russian immigrants in the early 90s. It was at that time when the Office of the Chief Scientist in the Ministry of Industry established the Technology incubator program as an instrument for channeling the increased technical talent to innovative and hi-tech commercial uses.

The Israeli program was designed to support technology incubators that would provide entrepreneurs with the financial, managerial, and professional support to commercialize innovative ideas. Executed by the Office of the Chief Scientist (OCS), the program aimed to fill the gap in seed investments caused by the financial community's focus on later-stage investments. With an annual budget of USD 30 million, the program currently supports 26 technology incubators with 200 projects under process, employing some 800 professionals.

Each incubator, operating under the program, is an independent legal organization, governed by a Board of Directors. The Board is assembled by OCS and comprises of selected professionals from the industry (e.g. general managers in high-tech companies or conglomerates), representatives of the academic and research centers and senior officials from the local government (often the mayor). All Board members serve on a volunteer basis, bring the support of their own organizations to the work of the incubator, and are encouraged to invest in or partner with tenant companies.

The average technology incubator houses 8 to 10 innovative projects and provides working space, administrative services, management skills, and professional and commercial assistance with the objective to help the projects' successful transition to commercial viability. To enter incubators, projects must propose a new product or service based on R&D and suitable for commercialization. Upon approval, the Office of Chief Scientist grants the incubator USD 360,000 to support each project/inventor over a two years span[1]. That sum constitutes as a rule 85% of the approved project budget. An outside investor, identified with the help of the incubator, usually provides the balance. In addition to the USD 360,000 for each project, the incubator receives USD 170,000 per year to cover administration costs. The incubator must re-apply every year for this funding. Prior to approval, OCS checks its operations, status of the Board of Directors and whether enough projects are being developed. An incubator housing less than six projects over a sustained period of time is considered "underemployed" and, unless the situation is remedied quickly, the OCS withholds funding.

The projects hosed in the incubator are incorporated as a commercial company as soon as possible and an outside manager is often recruited to help the entrepreneur develop business skills. The typical ownership structure of such a company is as follows:

- 50% – inventor
- 20% – investor (in return for 15% of the budget)
- 20% – incubator (representing government)
- 10% – key employees (e.g. company management)

This distribution can be altered via sale of additional shares to the investor (this occurs usually when the chances of the project success look good). The incorporation of projects provides for a legal interface in negotiating with prospective partners/customers and defines clearly legal rights (in regard to intellectual property rights, for example).

[1] The OCS gives full license to the incubator to manage the inventors, which the latter accept as a condition of receiving support. The inventor and the incubator sign a contract, which stipulates when and how to pay the inventor. The two-year period can be extended if the funds are not fully absorbed at its end.

The goal of the two-year "incubation" period is to arrive at the point at which a functioning product or service prototype has been built and is supported by feasibility tests (clinical tests in the case of biotech), market research, and product definition.[1] Upon "graduating" from the incubator, the company goes on the market and is obliged to return 3% of annual sales to OCS until the USD 360,000 is repaid. This makes the initial grant effectively a loan. Upon repayment to OCS, the USD 360,000 goes back to the incubator and thus provides for a cyclical nature of the process.

The results are convincing. By the end of 1997, 400 projects had "graduated" from the Israeli incubator program. Over half of them have continued as independent commercial entities, producing viable products. 40% have raised commercial investment ranging from USD 100,000 to USD 8 million per project, and commercial investment in these projects has totaled over USD 100 million.

For an example of technology incubator operating under the Israeli incubator program, please see Appendix III.

6. The Bulgarian Technology Park – foundations and perspectives.

6.1. The rational.

The economic rationale for developing a hi-tech park with an incubator in Bulgaria rests on the existence of well-trained scientific and engineering personnel in the country, particularly in the field of microelectronics and software development[2]. As a result of budget cuts at technical institutes and research centers, a significant amount of the research capacities developed in this field are currently under-utilized and qualified human capital is being wasted. At the same time, the information technology revolution has become a dominant force in the global economy, defining national and firm competitiveness and shaping flows of foreign investments. National investment in and support of information and high technologies have proved to be a major factor in the economic renaissance and growth of countries as diverse as India, Israel, and Taiwan. In Bulgaria, however, bureaucratic obstacles and lack of supportive legislative and regulatory policies at the national level have substantially weakened the sector. The recent economic upturn, brought by the election of a reform-oriented government and introduction of currency board in 1997, has created another chance for the country to "catch up" with fast-track Central European economies. It has also opened the opportunity to utilize more intelligently the country's scientific talent by directing it to hi-tech, export-oriented commercial ventures that can generate sustainable and even

[1] The incubator has the power to shut down any project with mostly automatic approval from OCS. Roughly 3-5 percent of projects are closed each year.

[2] The existence of this talent is partly due to the specialization of Bulgaria in microelectronics within the former Soviet-block Council on Mutual Economic Assistance.

accelerating economic growth. One of the creative mechanisms to spur the development of such ventures is to host them in a technology park, a designated special place with supportive business services, shared research facilities, and intellectually stimulating environment.

A 1997 Phare study conducted by the Kantor Management Company for the Ministry of Science and Education concluded that Bulgaria has a strong technology base in the areas of information technology, telecommunications, and advanced engineering. (Phare, 1997). Kantor surveyed 109 laboratories in three Bulgarian universities (St. Kliment Ohridski University of Sofia, Technical University in Sofia, and Assen Zlatarov University in Bourgas) and assessed their areas of research interest, qualification level of the personnel, products and patterns developed, and services provided to outside companies. The analysis showed that the three universities have a sufficient number of laboratories and institutes developing innovative products and services with commercial nature. Many of those university units have entered subcontracting agreements with enterprises. Based on the results of the study, Kantor proposed the establishment of a university-based science park comprising small fully-equipped units to house start-up or spin-off companies, or R&D departments of large companies. The best suited laboratories or institutes would become part of the science park as university spin-offs. The park will also host a business incubator and a technology-transfer unit (Phare, 1997).

6.2. The focus.

A university-based science park can certainly aid the transfer of laboratory research and development to industrial uses. What is very important, however, for the success of any science and technology park is the choice of a commercial niche in which the park can develop competitive edge on the basis of the locally available human talent and professional tradition. Such niche in Bulgaria is the software development and information technologies sector. The country has computer specialists and engineers with excellent mathematical training and programming talent, mostly known to the world, unfortunately, for sophisticated software piracy and virus development. Part of that potential can be channeled to more productive (and legitimate) uses with the help of a technology park that will focus on software development and information technologies and will host an incubator to assist start-ups in those fields.

6.3. The organization.

The park can be hosted at one of the available university (or the Academy of Science) buildings in Sofia, whose other tenants are computer and hi-tech laboratories and institutes[1]. Establishing the park on the basis of existing facilities is much less costly

[1] The international experience shows that start-ups demand on average 100 m2 to 150 m2 each, growing small companies around 200 m2 and corporate tenants between 500 m2 and 2000 m2, depending on the size of the park. Science parks in Europe usually host less than 25 tenants after the first five years of experience, mostly small start-ups with less than 15 employees (Phare study, 1997).

than building new premises. As in the case of a university-based science park, those university institutes and laboratories that are at an advanced stage of developing commercially suitable products and services can become the first tenants of the park. A young IT-service firm can also serve as a major attraction to software development and information technology-related companies. The research personnel and faculty of the host university (or the Academy of science), as well as its students will be encouraged to participate in the park as consultants and interns.

Another major component of the park can be a high-technology incubator that will provide professional and business support to software development and hi-tech R&D projects. The incubator will offer:

- technical assistance and consulting in information technology and software development;
- information service, linked to the University (Academy of Science) library;
- professional services – financial and management consulting, accounting, marketing, and legal services;
- logistical support – utilities, secretarial and communication services, office equipment, etc.
- training and education.

The incubator's professional services can be staffed by the faculty of the host University or the Academy of Science. If suitable professionals are not available, some of the services can be provided by an outside firm on a contractual basis. To facilitate research and development activities, tenant companies will be encouraged to interact with one another and hold joint seminars/workshops at a common conference place in the incubator or the park.

In addition to the incubator, it will be extremely beneficial for the marketing image of the park if a foreign company (e.g. the IT service firm) is attracted as an early resident.. An emerging trend in science and technology parks around the world is their internationalization; i.e. attraction of foreign companies through a preferential regime of registration and operation. Evidence of this trend can be found in Hungary (see Appendix II) and China.

6.4. The financing.

There are at least three aspects of park financing – financing of the initial investment for the park, financing of its continuing operations, and financing the business plans of its tenant companies.

A 1985 Study of the National Science Foundation in the US found that:

- Support for a technology park within a university budget is unlikely, unless the university has strong economic development ties with the local community.

- At least ten years are required before a park can become self-sustaining by obtaining equity position in tenant companies; five to ten years should be allowed before expecting economic development results from a center functioning with public funds.

In the case of Bulgaria, there is an additional reason to look for innovative, non-public financing of the technology park. The country is under the financial discipline of a currency board, which has severely limited the state finance for R&D and start-up capital.

Bank finance is an alternative option for financing the start-up costs of the park, its continuing operation, and the business of its tenants. The difficulty in the case of Bulgaria comes from the reluctance of major banks to finance longer-term projects and their inexperience in lending to small and medium companies. On the other side, the park tenant companies will also be most likely inexperienced in dealing with banks. To facilitate bank financing, the park's incubator can develop a special financial service unit to assist tenant companies prepare loan applications and service bank debts. A loan-guarantee scheme can also greatly enhance the availability of bank financing.

Another financing option is provision of development capital by multilateral institutions (World Bank, EBRD, EU - through the Phare program, etc.). An outside investor or a venture fund can provide funding for specific projects in the incubator or park companies on a commercial-success basis. Seeking such investments should become one of the major functions of the park's management.

Venture capital funds have been especially instrumental in the growth of hi-tech start-ups in the United States. Their usual structure consists of limited partners, who invest their own capital in the fund, and a general partner, responsible for the day-to-day management. The usual exit strategies of a venture capital fund are a buyout from another company, often a strategic foreign acquirer, or a public offering, including on foreign markets.

In regard to financing continuing operations, the park should try to become self-sustaining as soon as possible. The park's operating budget will come mostly from rent of space, utilities, and common facilities and fees for park services. Costs will be incurred from maintenance of buildings and infrastructure, security, utilities, management salaries, and advertising.

To facilitate the development of the park and the attraction of foreign companies, the government and the municipal authorities can create a favorable economic regime as a quasi-public support for the venture. As in India, tenant companies can be relieved of import and export duties and exempt from income taxes for the first several years of operations. This will be particularly beneficial for the start-up companies in the incubator and for foreign companies resident on site.

6.5. Legal form.

The park can be incorporated as a non-profit organization (foundation) and managed by a limited liability company[1]. An alternative is to establish the park as a for-profit joint stock company with shares distributed between the government and participating university institutes. Most of the technology parks and incubators in the US operate as non-profit organizations, supported by local governments and business development association. As pointed in part 4.1, however, there are growing number of for-profit incubators, run by investment groups or real estate development partnerships. The legal status of the technology park in Bulgaria and the form of its incorporation should be chosen in view of the parties involved and on the basis of the legal framework of the country.

6.6. Steps in establishing a technology park in Bulgaria.

The following is a non-all-inclusive and not-necessarily-sequential list of steps that should be taken towards establishing a technology park in Bulgaria. It should serve as a planning tool, not a comprehensive blueprint:

- Clearly define the mission of the park.
- Select founding partners that subscribe to the mission.
- Generate support for park at relevant state institutions (Ministry of Industry, Ministry of Science and education), Bulgarian universities, and the Bulgarian Academy of Science.
- Win for the idea dynamic companies from the software development and information technology sector.
- Select a site for the park.
- Prepare a feasibility study on the building reconstruction and modernization for the purpose of hosting a park.
- Prepare financial projections based on the start-up costs, investments, and revenues of the park.
- Develop different financing options on the basis of the number of tenants, the rent and maintenance costs of the incubator and park.
- Secure start-up financing.
- Establish a screening/selection procedure for incubator projects and park tenants.
- Incorporate the park and appoint a managing company.
- Set up the incubator.
- Market the park.
- Select projects for the incubator and tenant companies for the park.

[1] Such is the case with the Latvian Technological Center in Riga, created by the Municipality of Riga, Municipality of the Vidzemes District of Riga, Latvian Academy of Sciences, Institute of Physical Energetics, Association of Latvian Scientific and technical societies.

Appendix I. The Raleigh-Durham Research Triangle Park

The Raleigh-Durham Research Triangle Park (RTP) is one of the largest research parks in the United States, home to more than 130 organizations, 99 of them research and development related. With over 39,500 employees entering the 8-mile by 2-mile Park each day, it is a vital foundation to both the state's and Southeastern region's economies.

Recognized internationally as a center for cutting-edge research and development, the Park is owned by the private, not-for-profit Research Triangle Foundation. The Research Triangle itself is named for the Triangle formed by the three cities and universities: Duke University at Durham, the University of North Carolina at Chapel Hill, and North Carolina State University at Raleigh. All three consistently rank in the top national listings for graduate and undergraduate research in such areas as medicine, law, engineering, business, computer science, chemistry and journalism. The region itself offers a varied and well-qualified workforce, a good governmental atmosphere for business, and excellent transportation and communications infrastructure (the Raleigh-Durham International airport is only 5 miles away). It has repeatedly been honored with such titles as Best Cities for Business (Fortune Magazine) and Best Place to Live in America (Money Magazine).

I.1. The origins of RTP.

In the 1950s, the economy of central North Carolina depended on maturing industries such as agriculture, furniture, textiles, and tobacco. At the same time, the state's government and business leaders were fostering economic development investments in universities, technical colleges, highways, seaports, and telecommunications. The question, however, was where would the graduates of higher education work and can the state attract technology-based industry?

Against this background, the idea for the "Research Triangle" emerged. Leaders from universities, business, and government cooperated to create what has become one of the most successful planned science park in the world, the Research Triangle Park, and one of the world's most diverse research institutes, the Research Triangle Institute.

Both the Park and its centerpiece, the Institute, came into formal existence at the end of 1958. Their seed money, $2 million between them, came from anonymous private donations.

I.2. RTP’s development.

The Research Triangle Park is a center for a wide variety of research organizations to call home, created by leaders from business, academia and industry. The purpose of the Park’s founders was to provide an economic development initiative that would attract companies doing world class research and development in growing scientific areas. They

proposed to offer companies the available resources of the Triangle's three world-class universities - Duke University, North Carolina State University, and the University of North Carolina at Chapel Hill, which surround the Park. The Park's biggest drawing cards were the resources of the Research Triangle Institute, a collection of educated and talented students, opportunities for interactive research, and the pool of labor and talent from other fine institutions throughout the state.

The Research Triangle Institute was the Park's first tenant and served as a focal point for companies interested in the Park, as it still does today -- RTI is now the fourth-largest non-profit contract research organization in the United States. Its areas of research range from statistics to virtual reality; cochlear implants to advanced pharmaceutical projects.

The Park overall grew slowly through the early 1960's. Then, in 1965, with the advent of both International Business Machines Corp. (IBM) and the National Institute of Environmental Health Sciences (NIEHS) the Park began to grow in earnest. By 1969, 21 companies had located in RTP. From 1970 to 1979, 17 additional companies located here. By 1989, 28 more companies chose locations in the Park.

In the 1990s, nearly 30 new companies have established facilities in RTP. Development has included land sales of over 300 acres to new tenants and over 150 acres to existing tenants for expansions. New construction and expansion has totaled over 2 million square feet. In 1994, construction began on another 400,000 sq. ft. A research business incubator has been formed to provide interim laboratory facilities for early-stage companies.

Also located in the Park is the North Carolina Biotechnology Center, a state-supported initiative that provides grants and creative services to support biotech companies. The partially state funded MCNC offers advanced resources in microfabrication and telecommunications and houses the North Carolina Supercomputing Center. Together, they provide unparalleled resources to North Carolina companies, the universities, and area entrepreneurs. All of these institutions work together with the Park companies, engendering a special spirit of cooperation and learning within the scientific and technological community.

The Park encompasses 6,900 acres of North Carolina pine forest and is still offering approximately 1,400 acres for development. It currently houses more than 98 research and development facilities, which employ over 37,000 Triangle residents. The combined annual salaries in RTP amount to over $1.2 billion dollars.

Appendix II. InfoPark Budapest

Since 1989, Hungary has attracted over half of the foreign direct investments in Central and Eastern Europe. A large part of those investments came from technology-oriented companies who transferred production and R&D activities to utilize the traditionally high level of scientific and engineering talent in the country. To fully utilize this advantage, the Hungarian government decided in 1996 to sponsor the creation of an information technology park (INFOPARK) in Budapest. The purpose of the park is to:

- serve as a platform for R&D activities of companies from the information technology and related industry;
- utilize the experience of two leading Hungarian academic and scientific institutions - the Budapest Technical University and the Faculty of Natural Sciences of the Budapest University;
- create a basis for the development of information and other high technologies, on which multinational companies can base their development strategies for the region.

The intent was to attract companies from the following sectors: informatics, telecommunications, data processing equipment, consumer electornics, multimedia technologies, process control/automation technologies and software development.

The government provided a site for the park, initially developed for the canceled 1996 World Exhibition and adjoining the buildings of the Budapest Technical University and the Faculty of Natural Sciences of the Budapest University. A joint stock company - the InfoPark RT - was established at the initiative of the Ministry of industry and trade with the express purpose of administering the INFORPARK as a business venture. The company was incorporated in December 1996 with the Ministry of Industry and Trade taking 75% minus one share, and the two universities jointly holding 25% plus one share. To facilitate the build-up of the park, the government simplified permit and registration regulations for tenant companies.

In April 1998, the InfoPark Rt and a German consortium established a joint venture with registered capital of HUF 1.8bn to develop the InfoPark.. Deutche Telecom and Industrie Vermogens Gesselschaft Immobilien GmbH provided HUF 1.26 bn of the new company's capital. The InfoPark Rt will contribute the 14.2 hectare site. The Trade and Industry Ministry also transferred the management of its assets in InfoPark Rt to the national technical development committee (24%) and to the Hungarian Development Bank (49%) and will retain a single share.

So far, several companies have expressed interest in renting office and laboratory facilities constructed for them on a tailor-made basis - or, in the case of smaller tenants, standard facilities and business services. Two candidates have submitted letters of intent: IBM Hungary and MATAV, the Hungarian telecommunication company (privatized in 1996 by a consortium including AMERITECH and Deutsche Telecom.) MATAV plans to locate in the park its research and development headquarters.

Appendix III. The Ashkelon Technology Incubator in Israel

The city of Ashkelon (population 100,000) is situated about 100 kilometers south of Tel Aviv on the coast. The Ashkelon Technology Incubator (ATI) was established in 1990 by the Office of Chief Scientist with the objective to:

- develop technological innovation;
- develop employment in and around Ashkelon;
- contribute to raising national income levels.

Another major reason to create the incubator was the desire to alleviate local unemployment stemming from large Russian immigration and to make use of the new immigrants' considerable science skills.

The incubator is a collaborative effort of the Jewish Agency of Israel, the City of Ashkelon, and local businesses. It is housed in a building measuring 1,500 square meters of office, laboratory and light manufacturing space, provided by the Ben Gurion University. ATI pays rent but is not liable for taxes, and the municipality covers maintenance expenses.

The ATI's Board of Directors consists of twelve members coming for various industrial sectors, with the Mayor of Ashkelon serving as Chairman. The Board meets twice a year, occasionally on an extraordinary basis, and is responsible primarily for confirming budgets and policies.

In taking on projects, the managing director of ATI needs approval of the OCS, not the Board (ATI selects on average 5 out of 40 project applications for close appraisal). He makes a recommendation first to a Project Committee (not necessarily Board members), upon whose approval he gathers in-depth documentation and supportive evidence and prepares market research for submission to OCS, along with his own recommendation. This process takes about two months. OCS then sends the application to a "tester" within the Ministry of Industry for a "second opinion". The tester is a specialist to whom the ATI's managing director and the inventor make a formal project presentation, "selling" the project as a feasible innovation in both the technological and business senses. The managing director's job at this point is to prove that the product will be marketable, that possible partnerships have been identified and that the competition has been assessed. Projects can be terminated at any point on his recommendation.

In case of project approval, OCS provides USD180,000 per year for two years in support of R&D and administrative expenses. The project is established legally as a company with its own Board and budget covering salaries, equipment, marketing, patents and miscellaneous expenses. In addition to the OCS allotment, the budget can be enhanced by selling company shares via dilution. The incubator itself also receives roughly USD180,000 per year assuming around ten projects in "tenancy" (the level of support varies according to the number of projects). In addition to the USD180,000, the incubator also receives 15% from each project budget's salary category, which comes to around USD 10,000 from each project.

An average incubator company budget looks as follows (USD ‘000 per year):

Salaries	70
Equipment	50
Marketing	30
Patent	20
Miscellaneous	10
Total	180

ATI’s 20 percent share can, but need not, be sold when the company goes on the market.

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