

**EUROPEAN INNOVATION MONITORING SYSTEM  
(EIMS)**

**EIMS PUBLICATION N° 29**

**COMPARATIVE STUDY  
OF SCIENCE PARKS IN EUROPE:**

***KEYS TO A COMMUNITY***

***INNOVATION POLICY***

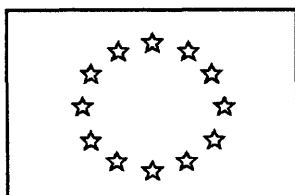
BY

**CURDS, University of Newcastle**

**Thierry Bruhat Consultants (TBC), Paris**

**University of Hannover**

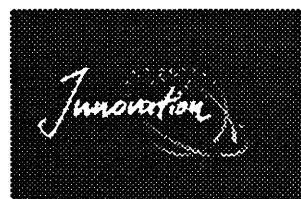
**Universitat Politècnica de Catalunya (UPC), Barcelona**



**EUROPEAN COMMISSION**

**DIRECTORATE GENERAL XIII**

***The Innovation Programme***



### **Legal Notice**

**Neither the European Commission nor any person acting on the behalf of the Commission is responsible for the use which might be made of the information in this study.**

**The views expressed in this study are those of the authors and do not necessarily reflect the policies of the European Commission.**

*Comparative study  
of science parks in Europe –  
keys to a Community  
innovation policy*

*THIS STUDY WAS COMMISSIONED BY THE  
EUROPEAN COMMISSION,  
DIRECTORATE-GENERAL "TELECOMMUNICATIONS, INFORMATION MARKET AND  
EXPLOITATION OF RESEARCH",  
UNDER THE  
INNOVATION PROGRAMME*

*Study produced by:*

CURDS, University of Newcastle  
Thierry Bruhat Consultants (TBC), Paris  
University of Hannover  
Universitat Politècnica Catalunya (UPC), Barcelona

STUDY COMMISSIONED ON: JUNE 94  
STUDY FINISHED ON: JUNE 95

© 1996, European Commission

## Table of contents

---

<i>Introduction</i> .....	5
PART ONE	
<i>Strategies, contexts, funding</i> .....	9
1. Regional strategies .....	16
2. Central government as a medium of regional development .....	18
3. Universities in the front line .....	19
4. Absence of a discernible national model .....	25
Conclusion .....	29
PART TWO	
<i>Physical and functional description</i> .....	30
5. Structure and location of the parks .....	31
6. Specific facilities and services .....	41
7. Selection: theory and practice .....	43
Conclusion .....	47
PART THREE	
<i>Management of parks, university links, image</i> .....	48
8. Management of the parks .....	49
9. Links with the university .....	54
10. Image of the parks .....	59
Conclusion .....	63
PART FOUR	
<i>Added value, future prospects</i> .....	64
11. Added value of science parks .....	65
12. Future prospects for the parks .....	71
<i>General conclusion</i> .....	75

## **Introduction**

---

In this document we present the final report of the *Comparative study of science parks in Europe: keys to a Community innovation policy*. This study has been produced by a consortium of three research laboratories and one consultancy agency: CURDS, the industrial economics laboratory at the University of Newcastle in the United Kingdom (Neil Alderman), the Department of Economic and Social Geography of the University of Cologne in Germany (Rolf Sternberg), the UPS (Universitat Politècnica de Catalunya) in Barcelona, Spain (Pere Escorsa), and Thierry Bruhat for TBC in Paris.

## **Objectives**

The following were the three objectives of this study:

1. To compare the nature of the parks and the functions they fulfil in their respective countries.
2. To analyse the development of the various parks and their attainment criteria as well as their development problems.
3. To define the main ways in which the parks can contribute to a Community innovation policy.

## **Notes on methodology**

The method we used comprised two elements:

- on the one hand, the experts in the consortium intend to create a common method of analysing and processing information;
- on the other hand, a field analysis of a sample group of science or technology parks was conducted. The selection criterion was that *the science parks should be representative of a variety of national situations*. We interpreted the term "science park" in the wider sense. The experts proposed case studies for their respective countries and selected the sample group together.

The consortium of experts chose the following 39 parks:

- Belgium: Antwerp, Brussels and Louvain (Leuven).
- Denmark: Symbion Science Park in Copenhagen.
- France: Bordeaux, Hélioparc Pau-Pyrénées, Metz 2000, Rennes Atalante, Savoie-Technolac, T2A (Atlantic Arc network of technology centres) and ZIRST (Meylan).
- Germany: Bremen, Dortmund, Freiburg, Hannover, Karlsruhe, Osnabrück and Sankt-Georgen.
- Greece: Thessaloniki.

- Ireland: Plassey.
- Italy: Bari, Genoa, San Raffaele in Milan and Trieste.
- Netherlands: Groningen, Leiden and Twente (Enschede).
- Portugal: Uninova.
- Spain: Barcelona, Bilbao, Seville and Valladolid.
- United Kingdom: Bradford, Durham, Loughborough, Manchester, South Bank, Surrey and Warwick SP.

Field surveys were conducted in each of the science parks. Each visit comprised about ten interviews. The experts questioned park management bodies, the local authorities affected by the park, heads of research centres established in the park, directors of some companies, etc. This field work was supplemented by analysis of the main reports compiled on national experience of science parks in general or, more specifically, on the parks selected for the study.

The distribution of the parks among the experts in the consortium was jointly decided. CURDS conducted the surveys on all the British parks, the Irish park, the Greek park and one Italian park (San Raffaele in Milan), Thierry Bruhat being involved in the visit to the Durham park. The University of Cologne, for its part, conducted the surveys on the German parks, two Dutch parks (Groningen and Twente) and the Symbion park in Denmark; Thierry Bruhat also took part in the visit to the Hannover park. The UPC conducted the surveys on the Spanish parks, four French parks (Bordeaux, the Hélioparc in Pau, Savoie-Technolac and ZIRST (Meylan)), one Italian park (Bari) and Uninova, the Portuguese park; Thierry Bruhat was involved in the visit to the Vallès park in Barcelona. Finally, TBC undertook the surveys on the Belgian parks, one Dutch park (Leiden), three French parks (Rennes, Metz and the T2A network) and two Italian parks (Genoa and Trieste).

## ***Common definition of the aspects to be covered***

An initial phase was devoted to the definition of an evaluation method. This method was devised, on the basis of the objectives of this study, by experts attending a workshop session in July 1994. A list of relevant aspects was drawn up at that session:

1. Park strategy in relation to local policies (is there a specific underlying strategy?)
2. History of the park (principal stages in its development, leading figures)
3. Statistics (size, jobs, number of enterprises, growth, etc.)
4. Place of the park in the urban context:
  - infrastructures linking the park to the local urban area
  - connections between the park and the other areas of economic activity
5. Organization of the park (governing body, members, etc.):
  - legal status
  - who owns the land?
  - economic functioning of the park
6. Networks (external systems to which the park belongs, internal systems within the park, etc.)
7. Specific services offered by the park (management, development agencies, etc.)
8. Local impact (taxes, business start-ups, etc.)
9. Property supply (overall availability, vacant premises, etc.)
10. Image (in relation to strategy)
11. Special fields of technology (motivating factors, criteria, etc.)
12. Park planning (development of objectives over the course of time)
13. Links between the park and the university (technology transfer, spin-off, etc.):
  - what instruments can be used to gauge the effectiveness of these links?
14. Technological intensity of the park (proportion of total activity devoted to R&D, etc.)
15. Success factors: opinion of managers, local development agencies, companies, cooperating bodies, etc.

These aspects served as an interviewing framework for field analyses.

## ***Field surveys***

The field surveys were conducted in the second half of 1994 and at the beginning of 1995. The experts then compiled case studies on each park. These reports constitute the substance of the comparative study.

## ***Analysis of interviews and production of preliminary synoptic reports***

All of the experts attended a workshop in Paris on 12 and 13 December 1994 with a view to sharing the results of field surveys on the one hand and drawing up a plan for the final report on the other.

At the conclusion of the workshop, the experts identified the following elements for the formulation of the final report:

1. Analysis of the national context (nature of the country's science parks, existence of national and local policies, legal aspects, etc.)
2. Strategies of the science parks (objectives and methods)
3. Selection of enterprises and activities for inclusion in the parks
4. Funding of parks (setting up, profitability, etc.)
5. Links with the university
6. Park management (organization, services, telecommunications, links between companies, etc.)
7. Physical aspects of the parks
8. Image and promotion of the parks
9. Added value of the parks (enterprises, environment, success factors, evaluation, etc.)
10. Future prospects for science parks.

Each research laboratory drew up a preliminary report covering the aforementioned elements of the parks it surveyed.

The final report, a collation of these preliminary reports, was compiled by TBC.

## ***The final report***

We structured this report with four main questions in mind:

1. Which strategies underlay the creation of science parks?
2. What are these operations in material and functional terms?
3. How are they directed?
4. What added value do they create, and what future do they have?

Each of these questions will introduce a section of the report. Each section of the report will cover various topics dealt with in the preliminary reports.



*PART ONE*

---

**STRATEGIES, CONTEXTS, FUNDING**

In this first section of the report we shall compare the strategies underlying the creation of science parks in each country. We shall approach these strategies from the basis of national and local contexts, aims pursued and funds committed.

The wide diversity of such strategies in Europe primarily reflects the diversity of national circumstances - differences in average levels of technological development among national companies and in national enterprise support policies, longer or shorter traditions of the science-park movement, etc.

We intend to interpret this diversity by comparing institutional frameworks. The identity of the institutions behind the development of science parks (regions, central government, universities, etc.), their own objectives and their sources of finance have also left quite widely contrasting imprints on the operations under scrutiny here.

For the sake of clarity, the four chapters of Part One are subdivided by countries, in order of their respective degrees of correlation with the identified institutional strategy. Germany is the country in which the overall situation seems to best fit the description "regional strategies", while the United Kingdom is the closest adherent to the "university strategy". Between these two poles, we shall also portray the situation in countries, such as Ireland, where central government plays an important role (we could also have included Eastern Germany and the Trieste park under this heading) and the French "technopolis" approach, which combines local policies with emphasis on state scientific and technological resources. And, finally, we shall deal with the country in which the science-park movement is too young to be categorized in any of these terms - Portugal, where no science parks are in operation yet.

## 1.1 Germany: instruments of regional development in contexts that still differ widely between East and West

In Germany there is no model, no official definition of a science park. Every manager calls his operation whatever he wishes, which imposes caution upon the observer - particularly with regard to the lists published by the German association of technology-transfer centres (ADT). In fact, a large majority of institutions can be categorized in a group comprising innovation centres, technology parks and business incubators, corresponding to the definition given by Sprint to its expression *science parks and associated structures*. In an increasing number of situations, the schemes are a combination of these types of organization, for which we shall use the global term ITB.<sup>1</sup>

The idea of ITBs originated at local level with some support from the *Länder*; Baden-Württemberg, Lower Saxony and North Rhine-Westphalia have been particularly active in this domain. Up to 1995, apart from North Rhine Westphalia, which has by far the greatest concentration of centres, all of the *Länder* in the western part of the country have stopped investing in the creation or further development of ITBs, although they do continue to help with running costs; this is adding to the already considerable overindebtedness of the local authorities. Since 1996, however, regional as well as local governments in Bavaria and Hesse begin to support ITBs. In Bavaria there is already a small number of older ITBs whereas Hesse up to now was the only Land which refused to invest in ITBs. This was the reasons for the absence of any of these centers in Hesse until 1996.

The first ITB was opened in West Berlin in 1983. By the end of the eighties the number of such schemes had risen to 70. Three factors account for this explosion:

- the Federal Government waged a campaign to promote SMEs with a view to increasing their relative advantage in innovation processes<sup>2</sup>;
- greater emphasis was placed on new technology in SMEs to reduce the quality deficit in relation to other industrialized nations;
- following the failure of the main pillar of local economic development policy, namely the bid to attract branches of large companies, there was a desire to encourage the preservation and promotion of existing enterprises.

The ITBs in East Germany were developed under different conditions. After unification, the first eastern ITB was opened in East Berlin in 1990. Unlike West Germany, where virtually no federal funds were used to establish these structures, most of the operations in East Germany (25 out of 36) benefited from grants from the old Federal Ministry of Research and Technology. These subsidies, limited to 25 million marks, represented 75% of the cost of programmes, land and the erection or renovation of buildings. Moreover, this was the first time that the technology policy of the Federal Republic of Germany had explicitly

---

<sup>1</sup> ITB stands for Innovation centre, Technology park, Business incubator

<sup>2</sup> The Federal Government did not support ITBs directly but SMEs in general

contained a spatial component. The absence of regional governments in the early days of reunification explains this significant commitment to ITBs on the part of the federal ministry. It should be noted that there was another source of federal funding, which was at least as important: the entire territory of the former German Democratic Republic was eligible for support under the federal programme for the improvement of regional industrial structures, the principal instrument of German regional policy.

In Germany as a whole, the local authority is a shareholder in two-thirds of the ITBs; in 8% of cases, it is the sole investor. Most of these centres are organized as companies, but any financial losses are guaranteed by the public shareholders. So maximization of profits is scarcely ever a stated objective, except in the case of a very small number of private technology parks such as Sankt-Georgen, which is maintained by a foundation with mostly private capital, and Stuttgart, in which local and national banks invested.

In Germany, local economic development aims are paramount, a corollary of the extensive involvement of public bodies. The most frequently identified aims are to support (technology oriented) start-ups, the creation of skilled jobs in the region and the "*translation of research findings into practice*". The ITBs are a political response to severe economic pressure.

In East Germany, besides the federal policy of promoting ITBs and the creation of high-tech enterprises, the very high unemployment rate has served - and continues to serve - to legitimize almost every economic measure. In both parts of Germany the ITBs rely on local development potential, since founders of new businesses tend to be fairly immobile.

Finally, the aims pursued and the strategies adopted depend on regional constraints. In the agglomerations (the "heart of Germany"), such as Berlin, the Rhine-Main area or Munich, ITBs are but one of several elements of the technological infrastructure. In the outer regions, such as the borderlands where East and West Germany once met, there are few or no institutions for the support of new technological companies or for technology transfer in general; in these areas, the ITBs are at least potentially far more significant than in the agglomerations.

Anyone interested in the motives behind local decisions to back ITBs would soon come to recognize that in most cases there is no real underlying strategy or serious quantitative evaluation of the local potential in terms of high-tech enterprises. It is most often a matter of seeking to benefit from an opportunity to obtain funding under national or international programmes for ITBs.

## **1.2 Spain: modernizing regional industries**

In Spain, technology parks were created by the authorities of the autonomous communities without central government participation. Sometimes, as in Barcelona, the initiative was taken by a local body then embraced by the region. In general, the universities played no more than a passive role, scarcely taking any part in devising the various schemes. Nor did the private sector (property companies, professional organizations, major companies, etc.) show any greater interest. Consequently, following the American and British models, the Spanish parks have tried to attract companies specializing in advanced technology to locate on land which is generally close to a city and, if possible, to a university. The city of Seville, which inherited the infrastructure installed for Expo 92, is, of course, an exception.

By the end of the eighties, four parks were operational - Zamudio (Bilbao), Tres Cantos (Madrid), Vallès (Barcelona) and Paterna (Valencia). Only the last-named of these has experienced teething difficulties. The

early nineties were marked by a second generation of parks, such as Andalucía, Llanera (Asturias), Boecillo (Valladolid), San Ciprian (Orense) and finally Cartuja 93 (Seville). There are about ten other schemes, some of which have already taken off with a business nursery. In the cases dealt with in our study, we met a wide variety of local situations.

The Zamudio park is part of the Basque Government's technology policy, the main aims of which are to support technology centres and to foster R&D by companies. Historically, the Basque Country has been dominated by the iron and steel industry, which provided 60% of all Spanish production. The move towards electronics and information industries began in 1985. In eight years the Basque Country's contribution to national production in these sectors rose from 35% to 11%. The Zamudio park, where newly created research centres and branches of major companies have located, has been contributing to this growth. It should also be said that this concentration of high-tech activities in the park has not been detrimental to the development of regional industry because of the geographical proximity of all these activities.

The capital of the Zamudio Park Association, founded in 1985, is today held primarily by the Basque Government (almost 75%) and by the Provincial Council (almost 25%), with the commune of Zamudio holding a token 057% share. The Autonomous Community of the Basque Country (Euzkadi) increased its share from 51% to 75% when fresh capital was injected in 1994, while the province cut its percentage share by half.

Catalonia, in 1985, was lagging behind in the race to develop new technology. The metropolitan area of Barcelona and the consortium for the *zona franca*, the free economic zone within the city, drew up a project for a park which was intended to "incorporate high-technology industries into regional industrial activity". Two years later, the park was founded as a public limited company, with the Autonomous Community (under Convergence and Union administration) and the consortium each holding 50% of the capital. Token shares were later allocated to the three universities and the town of Cerdanyola. The park received 800 million pesetas from the ERDF, the consortium remaining the owner of the land and the region guaranteeing any deficits. The original ambition to create a regional institute of technology and technology transfer was soon subordinated to the need for short-term profitability. The role of the park today is that of a location for prestigious companies without any great local impact.

In Castille and León, in the absence of other institutions, the Boecillo park is the key instrument of regional technology policy, the primary goal of which is the modernization of local industry. Its promoters have pursued a long-term wide-access strategy by accommodating 18 research centres and one education centre for information technology in a village nine miles (15 km) from Valladolid. Operational since 1992, the park is intended to facilitate exchanges of knowledge and know-how between universities and industry, to encourage the local development of innovative businesses and to attract foreign investors. The park is a public limited company financed by the region, which is the sole shareholder, and has received two billion pesetas in assistance from the Stride programme as well as grants from the Spanish Government. The new technology centres, on the other hand, are non-profitmaking organizations and are cofinanced and directed by large private enterprises.

In Seville the Cartuja 93 operation is carried out in a quite different setting. The park is situated on the site of the Expo 92 world trade fair, the island of Cartuja, which the local authorities have long been loath to industrialize. It was decided to use the site for cultural and/or scientific and technical purposes and to make it a "medium of scientific and technical innovation", on the basis of the study compiled by Manuel Castells. The island was divided into four zones - a technopolis, a theme park, a cultural area and an administration

and service zone, three-quarters of the Expo 92 buildings being retained. The principal promotion targets in the park are research centres, university campuses and innovative enterprises; it is envisaged that the park will specialize initially in environmental science. The promoters wish the park to develop in line with the needs of the regional economy. The Cartuja 93 company organizes all the activities in the park. As a result of a recent injection of capital, the majority shareholding has passed from central government to the Autonomous Community of Andalucía along with the city and province of Seville. Although the land is the property of the local authorities, the buildings belong to the countries represented at Expo 92, which are entitled to use them until 2033, for example by locating businesses whose activities conform to the criteria laid down by Cartuja 93.

### 1.3 France: the technopolis - a local multi-purpose operation

The technopolis movement in France has come of age. It is now more than twenty years since the pioneering schemes of Sophia Antipolis and ZIRST (Meylan) near Grenoble were launched. Today there are around forty *technopoles* dotted across the map of France. Apart from Sophia Antipolis, the nature and scale<sup>3</sup> of which is untypical, the technopolis parks are the fruit of *local policies*, initiated by the municipalities. The main aim of these policies is to encourage the location and development of "high-tech" activities by setting up business parks and by promoting local scientific and technological resources. These parks require technological themes (focusing on biological, mechanical or electronic engineering, etc.) and are generally situated near universities or research centres. This concentration accords with the principle whereby the geographical proximity of research, higher education and business should encourage skill and technology transfer and the creation of activities.

If the first operations were able to serve as models, experience has shown that the technopolis parks are the result of specific vocational training drives, each adapting the general idea to the specific features of the local economic, technological and urban situation. This was how a technopolis operation could be based on the aim of organizing a technology park (Metz 2000 in the city of Metz), development of an urban district comprising universities, research establishments, business parks and residential areas and services (the Coesme Beaulieu site in Rennes Atalante), promotion of several technopolis sites (Bordeaux Technopolis) or even the promotion of an entire town or city as a depository of scientific and technological resources. Practice has shown that expansion of the radius of action of a technopolis from the business park to the entire urban area effects a radical change, *le technopôle* - the technological hub - becoming *la technopole* - the city of technology.

Furthermore, the large metropolitan areas with their fabric of research and higher education no longer have a monopoly on such projects. Some medium-sized towns (Chambéry and Pau, for example), working within their means, have demonstrated a great deal of imagination in this domain. Lastly, it must be mentioned that some technopolis networks have also been created, as in the case of the technopolis parks in the Atlantic arc.

The phenomenon of the technopolis developed in France under the influence of the decentralization laws, profiting in the course of the eighties from the dilution of national town and country planning policy. This movement went hand in hand with the emergence of the municipality as an active participant in economic development, asserting its claim to an identity, to its human, scientific and technological resources and its own history and industrial traditions. Nevertheless, although operations have reached a certain critical

---

<sup>3</sup> Sophia Antipolis is an operation of national dimensions, with a total surface area of around 2 000 hectares .

mass, the technopolis sites are still the subject of *experimentation*. By linking the organization of sites with the promotion and activation of local scientific and technological resources, such experiments seek to combine elements of what are normally quite distinct functions: urban development, planning, economic development, technology transfer, etc., and have to prove their effectiveness in institutional environments which are not always favourable to them.

In the early nineties, the technopolis landscape in France was marked by operations of highly disparate scale and importance, with the aim of planning specialized parks still paramount, but this situation may not continue for much longer. In fact, the activation of links between players in research and industry is tending to assume ever greater importance in the sense that it is emerging as a favourable condition for business start-ups and hence as a means of filling business parks. It must be recognized that the business property crisis has helped to change attitudes in this sphere. Similarly, local strategies today are geared more towards promoting cooperation between institutions assisting in technology transfer and in the creation and development of innovative businesses as well as towards creating networks. Certain technopolis parks are developing *catalytic* strategies in so far as they are seeking to make projects possible without necessarily intervening directly. The responses to the demand for technological modernization of local enterprises (Pau-Hélioparc) confirm this trend.

If a global approach to the funding of technopolis parks is sought, the following factors must be taken into account. On the one hand, the planning of parks is essentially undertaken by local public bodies, even if they frequently act through a mixed enterprise (SEM) which is charged to procure, prepare and market sites. On the other hand, the promotion and activation measures are financed by the technopolis from budgets averaging two to five million francs per annum. Finally, the research and higher education facilities and institutions are financed by the state and are sometimes cofinanced by the region under state/region agreements. These facilities often predated the technopolis operation. In fact, the budget allocated specifically to technopolis ventures remains limited.

Nevertheless, for more ambitious projects which aim to achieve, either from scratch or on the basis of existing resources, effective integration of research, higher education and business, it is difficult to keep the finances of the planning component on an even keel. The time needed to market sites or offices to selected companies and the cost of high-quality facilities and infrastructure make it difficult to conduct such operations profitably in the short term. Such expenditure is sometimes compared to research investments, which are expected to yield a financial return in the long term. A debate is currently raging in France about the indebtedness of the state and of local authorities and about the sizeable stock of business property that exists in urban areas.

The French technopolis parks, the vast majority of which derived from local initiatives, are confronted today with numerous initiatives generated by local communities, as well as by the state, for the promotion of technological development. The French scene is characterized by an abundance of public appraisals and funding, signs of growing interest in these questions on the part of the public authorities. By establishing a role for themselves in local technological development, the technopolis parks are demonstrating the need to match the supply of expert appraisals with company demand and to coordinate public supply. Finally, they underline the importance of linking these functions to urban and regional development goals.

## **2. Central government as a medium of regional development**

---

In Greece, the creation of science parks is a means of achieving regional development goals. Whereas in France central government is approached by towns and cities pursuing technopolis strategies, in Greece it is the generator of regional technological development. In Ireland, the Plassey park is also a central government operation, but the regional objectives coexist with a national objective, namely to attract foreign investment, to keep it flowing in and to increase its value.

### **2.1 Greece: promoting technology transfers**

Greece was late in developing its science parks, but the operations that have been launched look promising. To date four cities - Athens, Patras, Iraklion and Thessaloniki - have each completed the construction of a science park. The last three are associated with the National Foundation for Research and Technology (Forth), which runs a number of research institutes. The most recent park, in Thessaloniki, became operational at the end of 1994. The orientation of the Greek parks reflects the paucity of investment in R&D by industry as well as the absence of regional technological development agencies. The parks' mission is to encourage technology transfer in their respective regions, especially on the basis of research conducted by universities and research centres in the Forth network. These centres, founded about ten years ago by means of a finance package involving European and national research funds, have managed to develop an industrial orientation and to attract Greek scientists who had been working abroad to return home. The science parks are the next stage in the construction of regionalized research and development infrastructures.

The parks are financed primarily by the European Structural Funds as well as by national funds and specific measures of support (framework programmes, Sprint, etc.). In several locations the state owns the sites, subsidizes the cost of constructing the park and waives its entitlement to rent. The park then levies charges on its tenants, which enables it to cover its administrative costs and to pay for the services it provides.

Finally, although several regions are currently trying to develop their own technology parks, the Greek Government is determined to take stock of the existing parks before launching any new operations.

### **2.2 Ireland: an element of the national industrial strategy**

Ireland has only one science park in the strict sense of the term, which is the park at Plassey, near Limerick, and some incubators or university campuses such as the one at Trinity College in Dublin. Plassey was founded as a "national technology park" in 1993 on the basis of American models. It was organized and financed by a regional development agency created by the central government to foster the economic growth of the area surrounding Shannon international airport. Another government agency - the Industrial Development Agency (IDA), which is responsible for foreign investments in Ireland and for company



development - and the University of Limerick, which occupies part of the site, lent their support to the operation.

The park should be seen as an element in the national industrial strategy, which, in the early eighties, was very much geared to attracting international investors. When the park was founded the IDA was developing a more selective approach to foreign investment in Ireland, specifically targeting high-tech industries such as pharmaceuticals, electronics and information technology. This strategy, into which Plassey fitted perfectly, was later supplemented by policies aimed at the development of links between international companies and local suppliers. The networks of companies initiated by the park certainly seem to be transcending the limits of the "enclave" and to be serving a far wider hinterland. This regional outlook also depends on the University of Limerick, which occupies part of the site and is regarded as a key resource, especially in view of the spin-off it can generate in terms of economic activities.

### **3. Universities in the front line**

---

In Surrey or Louvain-la-Neuve, the university is a landowner which enhances the value of its heritage by means of targeted property operations. Although all universities in these countries enjoy the same prerogatives, the situation is more complex at the other sites, where local authorities, especially those in the most depressed regions, development agencies and often major companies work alongside the universities to mount combined planning operations; the aims of technology transfer and exploitation of research findings have to prove their compatibility with the imperative of economic viability. The same institutional configuration is to be found in the Netherlands within a national context which is generally less conducive to the creation of science parks.

#### **3.1 United Kingdom: different strategies depending on the age of operations and the regional context**

The first experience of science parks in the United Kingdom was obtained in the late sixties at the University of Cambridge, which opened its science park in 1971 and was followed by Heriot-Watt University in Edinburgh. No other university developed a park until 1981, yet six years later all but six of the nation's universities had established their park or had conceived a project. Most of the parks are property-based operations, as in Cambridge, and some have a technology-transfer component on the Heriot-Watt model. To these two approaches was subsequently added a concern for local economic development - the creation of businesses and jobs and the qualitative growth of regional economies. The parks reflect the varied weighting of these approaches and the respective interests of the institutions at the time of launching. The early eighties, the period during which most of the parks were founded, were marked by both economic recession and public spending cuts. The universities had to find new resources - research contracts (which continued to increase) and revenues from other assets such as land and buildings. The science parks were regarded as a response to both of these needs, for they could put university land to profitable use as well as attracting companies that were liable to place research contracts. It is important to note that, although universities are independent organizations and in some cases wealthy landowners, the government was trying at that time to obtain the revenue from the sale of university properties, which meant that the universities had to hold on to property if they were to derive any benefit from it. This property-based strategy was a key element in cases where the university had reserves of land and buildings. A university would appeal to private promoters to manage the park project and to raise the necessary funds. Surrey is a good example of a situation in which the prime objective was to increase the university's income, and a science park was the only type of operation permissible under local development plans. This type of development is rarely part of a strategic regional framework, especially not the Surrey development, since the university is in a region that is ineligible for economic development aid, and indeed economic development is not even a priority for the local authorities there.

By contrast, in the depressed cities of the north and west of the United Kingdom, the local authorities, the regional development agencies (where they exist) and other public bodies such as English Estates, a government industrial promotion agency, have shown a genuine political will to support new forms of local initiative. In these regions the science-park idea tended to come from the public sector rather than universities. Nevertheless, the universities were able to provide land or to see the park as an opportunity to

increase their income through new research or service contracts. At the beginning, these parks benefited from a more resolute strategy aimed at development of the local economy and technology transfer; however, a lack of real involvement by the university or the developer in matters of technology transfer quite frequently meant that parks were unable to maintain any on-site facilities for activating or supporting technological development; this was the case in Bradford. The Manchester science park, on the other hand, benefited from the proximity of three particularly active universities which established their business service units in the park itself.

Warwick reveals an interesting combination of these strategic objectives. The university recognized the advantages of a park installed within the university campus in terms of capitalizing on its research, while the project was supported from the outset by local development agencies.

Contrary to the impression created by the promotion of science parks by both central government and local authorities in the early eighties, the parks have never really been part of a coherent policy. The British Government was happy to support these operations but only took part through its property investment agencies. Local councils had the same attitude; their financial investments in science parks bear no comparison with the amounts committed to the struggle against unemployment. In fact, many local decision-makers felt that innovation and technology-transfer centres serving a wider body of SMEs were better instruments of economic development than science parks.

Consequently, national technology policy underwent a sea change, abandoning a strategy, which some critics termed élitist, of direct support for science parks and for high-tech companies' R&D in favour of the dissemination of technology across the broader basis of the SMEs. Attention was thus shifted from a small number of "centres of excellence" to a mass of SMEs, with the improvement of their competitiveness becoming the main objective. This change manifested itself in the founding of regional technology centres, in the new initiative known as Business Links, in the reduction of government R&D grants and, lastly, in the importance accorded to training and collaboration initiatives between research bodies and industry. The science parks found themselves sidelined by strategies which, in accordance with the goals of both Business Links and the European Structural Funds, refocused the support effort on training within SMEs. Very few parks were able to maintain a sufficiently active technology-transfer function to become involved in these initiatives. We should mention the exceptions of Warwick and Merseyside, the latter having invariably been a distinguished centre of innovation.

One point that all the UK parks which are analysed in this study have in common is the obligation to finance their own activities. But they differ in the ways in which they do this from any of three main sources of funding - the university, the property developer (in the widest sense) or the local authority. The following models may be cited:

- **University investments.** This is the case in Surrey, where the university invested in the research park in order to generate income because of the weak financial state of its founding capital. The park benefited from government funds allocated for the decentralization of the University of London; the university set up a company to manage and develop the park.
- **Development by a property developer or public agency.** This model applies to a large number of parks in which the property development agency English Estates was involved. In Bradford the land was obtained by the city council, whereas in Durham both the land and the initiative came from the university.

- **Development by a local authority.** This is the case at Loughborough, where the technology centre was founded and developed by the County of Leicestershire in response to a lack of premises to house high-tech activities. Its subsequent development suffered as a result of the decision by British Gas to create a ten-hectare park nearby to centralize its R&D operations.
- **Development by a private organization.** This is the case with the Newcastle technology park. Although there was a public body, Tyne and Wear Development, to manage the property, the development of the park was entrusted to a private property developer, which posed problems when the latter became bankrupt.
- **Multiple investment.** In Manchester and Warwick the development of the parks is the responsibility of a consortium. At Manchester the shareholders in the park company are the universities, the city council and four organizations from the private sector; at Warwick the shareholders are the University of Warwick and three local authorities. In addition, Barclays Bank provided 1¼ million pounds to fund the construction of a business incubator.

The self-financing imperative implies that the rent structure must generate an attractive level of income for investors. And indeed rent levels in science parks are relatively high for the type of building on offer (office-workshop units). According to a park manager, the region's most expensive office space probably costs only 20% more to rent than these units, which makes such premises far more expensive than the business-park type of accommodation designed for new companies.

Rent prices inevitably influence the type of occupant. Although many tenants consider the rents too high, in practice they have proved more negotiable than other property rents. Moreover, their relative value may make them attractive propositions in areas suitable for major companies relocating from London (such as Surrey). Conversely, at Durham, in an area where there is little pressure on land, the level of rents in the science park (£15 per square metre) is considerably higher than for office accommodation in the centre of Newcastle.

The income generated by activities in the parks is used first of all to remunerate investors then allocated to the development of services for occupants. In general, there is little direct impact on the local economy, for example in terms of services offered to a wider body of companies in the region. In Surrey profits are reinvested by the university in the construction of other buildings, in its founding capital and, lastly, in research programmes.

### **3.2 Netherlands: science parks linked to universities**

In the Netherlands, the germs of science parks, in the sense of growth areas for new technological enterprises, had been visible since the seventies. The first initiatives date from the early eighties, coinciding with the first reflections on how to improve the relationship between university research and its economic applications. Of the proposals that were made for the establishment of science parks, the scheme put forward by the University of Groningen was the first to be implemented by the government. In the Netherlands, the availability and involvement of a local university is an absolute prerequisite for any operation that lays claim to the title of science park. A science park is a business centre situated near a university in order to facilitate the transfer of knowledge and know-how.

Central government intervention does not seem to have been a decisive factor in the development of the Dutch science parks, with the exception of Groningen. Most of the initiatives may be termed "bottom-up" approaches, since they were initiated by local universities and sometimes by the local authorities. Leiden seems to be a successful, though rare, example of a convergence of interests between the university and the municipality. It should also be emphasized that the Dutch Government, which plays a dominant role in financing R&D, has been showing less interest in science parks than most other European governments. It is true that certain parks in the northern Netherlands and along the German border receive considerable subsidies from the national government, but this is only because of their peripheral location. Furthermore, the science-park landscape is marked by competition rather than cooperative networks. There is no national umbrella organization for science parks.

The strategy underlying the development of science parks in the Netherlands consists in creating adequate conditions for companies to locate in the immediate vicinity of research establishments, universities or colleges (knowledge-based strategy), which should facilitate the transfer of knowledge and know-how, for example through the use of libraries or laboratories, cooperation on research projects or recruitment of students for practical training and postgraduates for research work.

Science parks have not developed spontaneously in the Netherlands for two reasons. Firstly, the number of potential entrepreneurs is limited, students and academics having generally opted for careers in teaching, with major companies or in public administration. Very few academics seek work in SMEs, whose employees come primarily from commercial or technical colleges of further education. Unfortunately, there is little vertical movement between these two levels, which is why those who start up businesses in the Netherlands have not normally received a university education. The second reason lies in the fact that the best young engineers and scientists are recruited by large companies, government agencies and non-university research establishments.

The aims and strategy of Groningen, the Leiden incubator and Twente are similar: provision of space and services within a global infrastructure to increase the survival rate of new businesses close to the university.

As far as funding is concerned, the Ministry of Economic Affairs, the Ministry of Education, Culture and Science and the University of Groningen cofinanced the ten million guilders invested in the Groningen park. Three northern provinces and the university hospital are also represented on the council which administers these funds. At Leiden the same ministries invested in the incubator along with the university but were joined by banks (which provided 60% of the capital) and the local authorities. The same sort of mixed system operated in the case of Twente with banks, major companies and a regional development agency.

In Leiden, the city council supported the science-park project from the outset. This city of 100 000 inhabitants, situated in the conurbation of Randstad and long dependent on the textile industry, is suffering today from a shrinking industrial base and job losses and is seeking alternatives in the tertiary sector and advanced technology. In 1985, in collaboration with the university and the chamber of commerce, the city began to establish an incubator for projects conceived by faculties of medicine in the field of life sciences and to develop a business centre near the university and the university hospital. These two form a flexible structure which has attracted major companies and has developed the university's potential for business start-ups.

For the incubator, the three founding institutions pooled their resources to produce a lightweight organizational structure, both in its conception and in its day-to-day administration. While the university

provides its chemical waste processing plant and administrative staff and seconds the director of the transfer centre on a full-time basis to forge links between the incubator companies and public institutions, the chamber of commerce and the city have also each provided an executive officer. The three founding bodies administer the incubator funds along with an organization of industrialists from Leiden.

### 3.3 Belgium: from incubator to technopolis

In Belgium, the idea of a "science park" or "research zoning" was introduced in the decision adopted on 29 January 1971 by the Ministerial Committee for Economic and Social Coordination, which stated that "*These zones shall be essentially reserved for research activities, which may include the industrial manufacture of prototypes as well as production systems requiring constant scientific control. (...) The designated zones shall be accorded the status of facilities of national interest and shall be located close to centres possessing an entire faculty of science. (...) The universities shall be intimately associated with the development of these zones (...)*". The major Belgian universities were relatively successful in creating such zones, all of which, as facilities of national interest, enjoyed the same financial advantages, with the state meeting the cost of all property-development work and of financial incentives to investors.<sup>4</sup>

The science park at Louvain-la-Neuve was the first to be created in Belgium. Following the outbreak of linguistic tension in 1968, the administrators of the Walloon campus of the Catholic University of Louvain (Leuven) decided to create a new city of science on the 900-hectare site acquired by the university at Louvain-la-Neuve. In 1972 the association of communes of French-speaking Brabant and the university founded a joint management committee to undertake the planning and development of a business centre of around 160 hectares in accordance with the recommendations of the Ministerial Committee. The aims of this park were to improve cooperation between industry and the university by effecting technology transfers, to contribute to regional economic development by attracting investors who were interested in locating near the university and to enable the urban area of Louvain-la-Neuve to diversify its sources of income and employment. In 1972 Monsanto became the first company to locate its research centre there, and the park really began to take off in 1976. Today the park accommodates 82 businesses in an area of 210 hectares. It should be noted that the university has two campuses - Louvain-la-Neuve and Louvain-en-Woluwe in Brussels, where the faculty of medicine and the university hospital are situated. Each site has a science park, the Woluwe park being a small-scale operation (five hectares).

This entrepreneurial capacity of the Catholic University of Louvain must be seen in relation to its budget. The university's annual budget amounts to approximately five billion Belgian francs for 21 000 students and 200 research units (1000 teaching staff and 600 assistants). Some 26 billion Belgian francs come from external contracts (placed by international bodies, the government and companies).

In Brussels university sites have long borne the name science park without actually being strategic resources for either the universities or the local authorities. The four universities of the Brussels region have differed widely in the extent to which they have capitalized on their land. The largest park, founded in 1975 in the grounds of the Free University of Brussels and now housing around 40 businesses, a quarter of which employ over 100 people each, accommodates more administrative and commercial centres that serve as a Belgian or European base for major multinationals than research units working with the university. The other parks, of more recent origin, house a total no more than about 20 enterprises; they are situated on land granted to the *Société de Développement Régionale de Bruxelles* (Brussels Regional Development

<sup>4</sup>

Cf. Claire Demain and Daniel Mercier: *Dossier Louvain-la-Neuve, technopole*, August 1990

Company, SDRB), which has effectively been the main agent of local economic development for the last twenty years.

The "prospect and develop" thinking of the SDRB which prevails in the management of science parks, as in any industrial estate, is now being challenged by the "activate and coordinate" approach adopted by the new regional organization *Bruxelles Technopole*. But the situation certainly cannot be reduced to a bipolar configuration; in fact the SDRB, like the chamber of commerce and certain regional ministries, conduct information and activation campaigns directed towards the economic fabric. The two separate bodies overlap. This somewhat confused situation is largely explained by the fact that the region has only had its own government and parliament since 1989. Prior to that date its powers in matters of research, economics and foreign trade were delegated by the national Ministry of Economic Affairs. Another handicap is that the economic area of Brussels does not coincide with the political entity. The capital region comprises only 160 square kilometres; it is a highly urbanized environment where land is at a premium, especially since the administrative centres of both the European Union and NATO are located there, an area where it is difficult to find any room for manufacturing activities. Even production plants on the immediate periphery are situated in Flanders, as is the airport. Before this latest political reorganization, the SDRB administered land over a far wider area, corresponding to the ancient province of Brabant.

In the Brussels region, where the economy is becoming increasingly service-based, the fall in industrial employment has not been fully offset by an increase in service jobs. The relative decline in the region's economic importance compared to the rest of the Kingdom has been observable since 1975 in terms of GDP, revenue, number of companies and employment. The technopolis should help the region to respond to a twofold challenge:

- to allow the traditional SMEs to remain in Brussels by increasing their added value in relation to the space they occupy, and
- to develop high-tech activities even though the technical substratum is in Flanders.

So far these two goals seem to have been pursued independently of each other. The technopolis finds it difficult to mobilize the support of enterprises such as Solvay, Digital or Alcatel for its efforts to promote innovation and transfers of technology to SMEs, while the science parks on which multinationals have established large units have not yet become technology development centres. But other industries such as information technology, biomedicine and electronics may in due course become the engines of a truly dynamic technopolis.

In Antwerp, where the university was ineligible for research zoning because it does not teach applied science, the establishment in 1994 of the scientific incubator UBCA (*Universitair Bedrijven Centrum Antwerpen* - Antwerp University Business Centre) was tantamount to a *coup de force* by the provincial authorities. (With the law having subsequently changed in its favour, the province now awaits a retrospective regional grant for the incubator.) This transfer centre represents an important commitment for the university, whose administrators will be the generators of the take-off phase. The province also has a strategic interest in the operation. Antwerp is undoubtedly wealthy: the province, though only one of nine, produces one-fifth of Belgium's GDP, and three-quarters of the province's wealth is concentrated in the city of Antwerp. But the port of Antwerp, which depends heavily on the foreign capital generated by the petrochemical, automotive and metallurgical industries, is vulnerable to cyclical instability in the world economy; it is already suffering job losses in the industrial sector, with the exception of the chemical industry, and does not have the land required to accommodate new industrial companies.

In the local strategic plans, which are drawn up on a subprovincial scale, the key to the future is seen in the development of the service sector and technology. The purposes of this dual approach are

- to anchor decision-making centres (the Belgian tax system favours "coordination centres" established by multinational companies),
- to favour those activities which yield the greatest added value per job and per hectare rather than freight services and heavy industry (logistics, commerce, processing of orders in the port environment, business services).
- to support local businesses, especially by increasing their technological capacities; at the present time only a handful of large companies maintain contacts with public laboratories.

In the light of these aims, science parks are regarded as fairly cost-effective instruments, although they are expected to yield more in terms of quality than quantity. This configuration is quite close to the German or French models with regard to the motivating role played by the local authorities (the province voted 80 million Belgian francs for the construction of the building, and the university is contributing six million francs' worth of its land). But it should be emphasized that the Antwerp situation differs considerably from these models in the size of the contribution (without any direct return) made by major industrial companies and banks from the private sector. Of the 17 million Belgian francs in capital held by the non-profitmaking association which finances and administers the incubator, two million were provided by all of the higher education establishments in the university environment, whereas fifteen million came from about twenty large private industrial enterprises and banks. Those who are administering the operation recognize that this sort of goodwill patronage by the multinationals which enjoy a high profile in the port environment would probably be more difficult to obtain today.

The administrative council comprises the governor of the province, the principal of the university, the chairman of the chamber of commerce and the presidents of two multinationals.



## **4. Absence of a discernible national model**

---

### **4.1 Italy: from transfer centre to virtual technopolis**

Over the past ten or so years there have been numerous schemes to create science parks in Italy, eleven of which were mooted recently for southern Italy, but there have been few successes to date. In general terms, the envisaged strategies are characterized by

- **the goal of developing and applying national scientific research both in the international context and through transfers to the private sector;**
- **massive financial intervention by the state, either directly (Trieste, Bari and San Raffaele) with funds from the Ministries of Research, the Budget and Southern Development or through the agency of large national companies (Bari and Genoa);**
- **local development as a second goal of the science parks, although this seems to be no more than a good intention as yet (at the planning stage in Genoa, expected to feature in Trieste and Bari, but not mentioned in connection with San Raffaele), even though the regions are involved in the projects; local development means supporting new high-tech businesses and sometimes the whole body of SMEs in the region but rarely the planning and development of enterprise zones (except in Trieste, where it will be part of a later second phase);**
- **European, national and regional public funding (the latter often with resources received from Europe) is therefore channelled into the establishment of research, innovation and/or transfer centres and into subsidies for client enterprises to enable them to participate.**

**The San Raffaele park** was born of the research and training activities of a university hospital built in the seventies. In 1993, following a Sprint study, a science-park project, conceived within the hospital, sanctioned the opening of facilities, skills and premises to private-sector businesses. A company was to locate in the hospital premises and some ten others were to set up nearby, as were university departments and public research centres.

The private company managing the "park" has set itself the task of ensuring that the public research is turned to good account, transferring technology to the national health system as well as to businesses by means of the joint research which it hopes to initiate and, finally, to attract companies and promote business start-ups. An incubator is on the drawing-board. The provision of services, consultancy and training give the park an income of its own, but its operation depends especially on grants from the Ministry of Universities and Scientific Research, the Ministry of Health and regional funds. The commercial aspect, however, is not a priority consideration.

**Bari and Genova Ricerche** have a similar structure, but there is one great difference between them: whereas the former has become a model, the latter has not survived! These transfer and innovation centres, organized into associations (*consorzi*) which develop and sell their own products and services, are not *a priori* property-development operations. In Genoa, before the liquidation of the *consorzio*, all that had been created was the potential for a science park. In Bari, only half a hectare is available to house businesses (or

simply teams) engaged in a project with the *consorzio*. But the large national companies are not far away, either geographically or economically. Playing a leading role, and virtually the only bodies involved alongside the CNR network of research centres in Genoa, they hold almost half of the shares. In Bari the university is the majority shareholder, but large companies are also important partners and clients of *Tecnopolis CSATA Novus Ortus* (TCNO).

The aim of local development was adopted at Genoa in the context of the restructuring of heavy industry. But the few innovative companies that were created in order to market the products developed by the transfer centre did not constitute an adequate return. The modernization of the local SME fabric remains at the heart of the new project for which the region has assumed responsibility after having played no part whatsoever in the previous adventure.

The task appears to be identical in Bari, the object being to market the results of research; this is being done successfully, to judge by the number of client businesses (650) and the field offices opened in the region. The specialization in information technology by the Bari centre is perhaps more appropriate than the multisectoral services and consultancy offered by *Genova Ricerche*. Moreover, Bari can claim to act as a catalyst, mobilizing public and private, local and international operators and obtaining suitable funding in order to assemble the package of skills needed to solve the technological problems presented by companies. In fact, 85% of this revenue has come from contracts with enterprises, the initial investments having been funded by the *Cassa del Mezzogiorno*.

Trieste is in the same situation of dwindling employment in the major public industries, but since 1982 the region, which also benefits from measures of positive discrimination taken by both the Italian Government and the EC, has been pursuing a voluntarist policy which neatly complements national policies. The Area park is the fruit of the region's desire to promote both new technology and access to the world market. The city is blessed with a university of 10 000 students and a more commercial than industrial tradition which has long made it a place of exchange between Europe and the Orient. The science park will continue that tradition, thanks to the research centre for biotechnology established by the United Nations and particularly Ellettra, a synchrotron that is likely to be used by researchers from the neighbouring countries of Eastern Europe.

Besides this regional challenge, the creation of the park by the Ministry of Universities and Scientific Research met the need for visibility of Italian research within the international scientific community. The major national research centres are the main employers in the park. Today, since this need is felt to have been satisfied, the purpose of the park is to release synergism through cooperation with local and national industry and to create new businesses.

Unlike the other *consorzi*, the Area park is a land and property-development operation, and above all an enterprise backed by considerable capital, wide powers of financial intervention and realization that profits will not begin to accrue for quite some time. In terms of its means of intervention, the Trieste consortium would seem to a French observer to be more akin to a public institution than a technopolis association. With the help of the finance companies of the IRI and the region, but especially with the contributions made by the state (70%, either directly or through the CNR), the consortium has been able to undertake the acquisition and development of the 50 hectares, the construction of 23 000 square metres of offices and laboratories in the first phase and of the 25 000 square metres of the synchrotron. The Area park is the majority shareholder in the Synchrotron Trieste company (with capital of 300 billion lire) along with the IRI and the national hydrocarbons society. The consortium can also inject capital into research centres or park companies to develop programmes of applied research up to a limit of 70% of the total budget for the

current development phase. This effort accounted for 10% of its 1993 budget, a total of 53 billion lire, five billion lire of which took the form of shortfall grants. It finances 16% of its own annual budget by providing services and through rent revenues.

It should be noted that the direct assistance it offers is available to private enterprises as well as to public research laboratories, thanks to the special statute of the Friuli region which grants it greater autonomy in matters of economic intervention. But the region's financial resources do not always allow it to exercise this freedom, which explains why few enterprises have been able to benefit from such assistance.

## **4.2 Denmark: promoting the creation of technological SMEs**

Until recently, science parks were not at the heart of support policies for R&D, technology transfer or technological business start-ups. But politicians' interest in science parks has grown over these past few years. Today Denmark contains five parks, which have received one million Danish krone from the Ministry of Research and Technology in each of the last five years. According to an OECD recommendation, the Danish Government should intensify its efforts to promote the creation and growth of small technological businesses by improving the environment in which they operate so that capital, managerial training and business services are available to them. Science parks are regarded as an appropriate means to this end. Be that as it may, the Ministry of Research and Technology considers that the parks should be organized as private companies without any very significant input in terms of involvement or subsidies from the public authorities. Government funding applies only to the purchase of land and buildings, the launching phase and 20% of the running costs, but this figure may rise to 70% for a park in a depressed region eligible for regional development aid.

The first Danish park was opened in Aarhus in the mid-eighties, and was followed in 1986 by the Symbion park. By contrast with other European countries, such as the United Kingdom or Germany, Denmark has never seen a period of explosive growth in the number of science parks. However, it must be emphasized that, given the small size and low population density of the country, gross figures are always less important in Denmark.

The five parks, all supported by the central government, should achieve at least one objective, namely to initiate or intensify the transfer of technology and innovations by broadening the scope for cooperation between private companies and public research establishments. But as far as technology transfer is concerned, the parks are in competition with the Danish Institute of Technology, which has a large staff and receives a substantial amount of public funding.

The Symbion park was conceived in the early eighties in the Copenhagen region, which was then in the throes of economic recession, with unemployment threatening even university graduates; the university had been compelled to reduce its complement of researchers, although 70% of the national R&D potential is concentrated in Copenhagen. Symbion was founded by a group of six scientists from the University of Copenhagen (one of whom is the present managing director of the park) in collaboration with representatives of industry who took part as individuals and had to overcome the reticence of both university and business circles. The aim of the park was to induce young graduates to start their own businesses and to improve the survival rate of these young companies. The Symbion foundation, with 20 million krone in private funds, was able to obtain ten million krone from the government and the same again from the city of Copenhagen.

### 4.3 Portugal: projects

The projected science parks, all concentrated within an 18-mile radius of Lisbon, suffer from a patent lack of coordination on the part of the Ministry of Industry and the Ministry of Planning and Regional Development. There are three important projects within that area: *Lisbon Pólo Tecnológico* (Lispolis), Taguspark and Uninove. The fact that there is no regional government makes the situation even less transparent, especially with regard to objectives.

Although all the parks proclaim the development of local resources as a priority, it does seem, on the one hand, that the three projects together exceed the needs of the region and, on the other hand, that the funding is entirely external, the main envisaged sources being the PEDIP programme (European Fund for the Development of Portuguese Industry), Ciencia, Stride and Praxis XXI.

The Uninova project is financed by PEDIP, the Portuguese Government and the District of Setubal. In the other two projects, the private capital provided by companies (in exchange for significant price reductions in the park) have been the key to 50% cofinancing by the European Community. By the beginning of 1995, none of the parks was operational. Taguspark comprises only an institute of welding and a standards institute, while Lispolis only has an incubator; Uninova, the case studied here, is scheduled to start operations in 1995.

The Uninova project is similar to the British model. The park is an area close to the university and its technology centres, and its aim is to stimulate the growth of SMEs in which new forms of technology are being developed or used. It should complement the activities of Uninova, namely realizing innovation projects developed at the university, supporting new businesses, helping to provide companies, where possible, with a certain amount of technological and organizational innovation if their modernization needs can be met by the park organization. In addition, the park forms part of a broader development scheme which includes housing; the presence of telecommunication and electricity companies in the park ought to hasten the completion of that operation.

## Conclusion to Part One

---

Concealed within the term *science park* are various concepts, ranging from a technology-transfer centre through technological business parks to the virtual technopolis. In this domain the label does not guarantee the contents in any way; these have to be discerned in specific urban, economic and technological as well as national contexts.

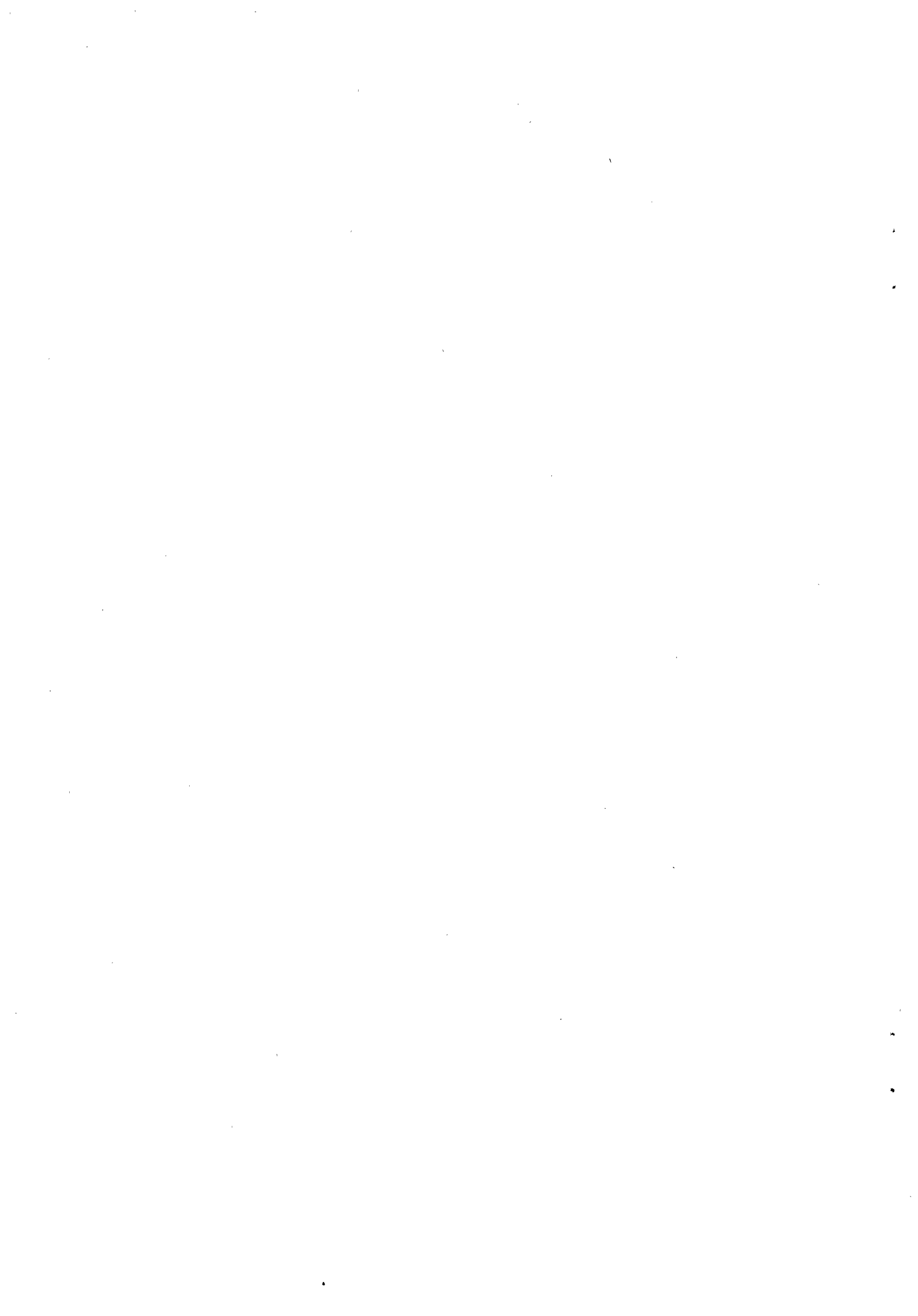
Nevertheless, two "standard profiles" emerge:

- **The science park as an instrument of technology transfer** within a long-term strategy for the modernization of the production system. The driving forces are the public bodies, regional and/or central. The private sector and the universities are only called upon to provide resources (with the exception of Louvain).
- **The science park as a property-development operation** as part of a strategy that combines exploitation of real estate and the scientific skills of a university or public research centre; the other public and private partners may or may not adopt complementary strategies.

This first categorization has to be crossed with another dimension, which brings in the economic and technological contexts in which these operations develop. In general terms, in the countries of southern Europe the parks or associated structures are an opportunity to create concentrations of scientific and technological skills which can be transferred; conversely, in the countries of northern Europe they have to find their place in an environment of technological development aid structures and instruments, where land and buildings are available from existing companies.

Despite the special nature of these operations and the importance of local and national contexts, there is a convergence of interests and concerns in Europe today with regard to science parks. Serving as structures for the reception of incoming companies and as business incubators, the parks and associated structures have demonstrated the importance of small technological enterprises, of scientific environments and of the services that are essential to the development of such enterprises and environments.

For all that, the science park is still too often a mere image or label rather than an easily discernible economic reality. In the next section we shall present the physical and operational reality of the parks examined in this study.



*PART TWO*

---

**PHYSICAL AND FUNCTIONAL DESCRIPTION  
SELECTION OF COMPANIES**

## **5. Structure and location of the parks**

---

The science parks examined here constitute a wide spectrum, covering the entire diversity of the science-park phenomenon in Europe. Main types can be distinguished: the incubator and the innovation centre, the scientific and technological business park, the technopolis and the network and "virtual" park. Incubators, innovation centres and technology parks, often interlinked, very much dominate the European scene. The urban dimension of the technopolis appears to be restricted to France and Belgium. And lastly, networks, still an emerging phenomenon, are being established at both interregional (Atlantic arc) and intraregional (Genoa and Bari) levels.

### **5.1 Innovation centres and science parks**

#### ***Germany***

Most of the German projects are formulated to suit the needs of a body of newly created enterprises which are developing, producing and marketing high-quality technological goods, services and processes; in the ITBs (innovation centres, technology parks and business incubators) they find services and facilities adapted to their needs. In physical terms, an ITB comprises one or more buildings situated within an urban area or on its periphery.

In Osnabrück (Lower Saxony) the *Centrum für Umwelt und Technologie* accommodates 21 enterprises - most of them newly created - which employ a total of 130 people, the great majority of whom are university graduates. The centre has a surface area of 2700 square metres. At Sankt-Georgen in Baden-Württemberg, the *TechnologieZentrum*, opened in 1984, houses 22 enterprises - mainly small technological businesses, although three large companies also have facilities there - in an area of 7400 square metres. In Karlsruhe (Baden-Württemberg), the *Technologie-Fabrik* has 46 enterprises in a surface area of 18 000 square metres. Two-thirds of these enterprises are newly created, and 420 people work in them. The *TechnologieCentrum* in Hannover houses 24 enterprises and eight institutions. The centre uses the former headquarters of the Continental tyre company. It is situated less than two kilometres from the university and was renovated in the mid-eighties. In Freiburg (Baden-Württemberg), 12 enterprises with 55 employees rent a total surface of 1300 square metres. In Bremen, the *Bremer Innovations- und Technologiezentrum* (BITZ), which was created in 1986 and is thus one of Germany's oldest innovation centres, today houses 36 undertakings, six of which are associations, with 280 employees. It is fairly close to the university. The adjoining technology park provides around 2000 jobs. Finally, the *TechnologieZentrum* in Dortmund accommodates 63 enterprises, including associations, in an area of 21 500 square metres; 3170 people are employed in the adjacent technology park. The centre and park form a unit that is unique in Germany in terms of its proximity to the university and other public bodies such as the Fraunhofer institutes.

The eastern and western ITBs have much in common but also differ significantly. In the west they are older and bigger on average. Moreover, their locations within their respective regions vary considerably. In Bremen, Dortmund and Karlsruhe the ITBs adjoin the university campus, but in Dortmund and Bremen these sites are quite far away from the city centre. The rent paid by businesses is below the local market rate



in the east and in two cases out of three in the west. However, whereas in the west rent prices are the main reason for locating in an ITB, the predominant motive in the east is the lack of availability of suitable premises for new enterprises.

## ***United Kingdom***

The general conditions of location and the characteristics of the UK parks examined in this study may be summed up by the following categorization:

- Urban innovation centres (*intra muros*): the science parks of Manchester and Newcastle.

Each of these science parks is on a single site accessible on foot from the university; in the case of Newcastle, the park is even within walking distance of the city-centre shops. Both centres have good road access and are close to an airport.

The Manchester park adjoins an underprivileged district which is the object of an economic development programme; its location there was decided upon as a means of compensating for the lack of private property-development initiatives and because the park is to play a role in the economic development of the city. In Manchester an incubator and three buildings designed to accommodate larger companies are located in a surface area of 62 hectares. In Newcastle, the site is even smaller, at 22 hectares. The main building, with 52 000 square metres of floor space, is divided into units of 200 to 1000 square metres.

- University innovation centres: Mountjoy in Durham and Loughborough

This type of innovation centre is a single building on one hectare of land in a peripheral setting near the university and benefits from a good communications infrastructure.

- Peripheral parks (*extra muros*): Warwick and Surrey

This is the traditional form of science park in the United Kingdom: a vast area of land (240 hectares in the case of Surrey, 17 hectares for Warwick) outside the urban environment, combining various accommodation options: individual or shared buildings, empty premises or offices and workshops equipped and fitted to order. The communications infrastructure makes the main national and international destinations accessible. In many cases these sites have attracted R&D or commercial departments of multinationals.

The research centre of the University of Surrey is situated in the south-east of England in one of the country's most prosperous regions. 500 000 square metres of business units have been constructed and are occupied at present by 65 companies. Warwick, by contrast, is on the edge of the West Midlands, a region undergoing economic restructuring. Only 14 hectares have been developed and 28 550 square metres of accommodation built. In 1994, this accommodation housed 65 enterprises, while a further block of 1000 square metres is due for completion soon.

- Urban mini-business parks: Listerhills Science Park in Bradford

These operations combine an inner-city location (like the innovation centres) in a larger site with the capacity to accommodate companies which erect their own building. They look like business parks or upmarket industrial units. The Listerhills park is situated two kilometres from the centre of Bradford. It adjoins the university campus, a business park and a Business and Innovation Centre. The entire operation, on a seven-hectare site, consists of five buildings offering premises with variable configuration; about 50% of the accommodation is currently occupied. The park tends rather to convey the impression of a high-quality industrial estate than a science park. In the absence of reception services or catering facilities, the opportunities for exchanges between companies are scant.

On many sites, especially the larger ones such as Surrey and Warwick, large companies may construct their own buildings, but they must adhere to strict planning requirements and are not permitted to buy the land.

The flexibility and quality of the supply of accommodation is characteristic of all these parks, as are security and parking provision, but the quality of layout varies widely; some of the parks (Durham, Manchester, Surrey and Warwick) are landscaped. The occupation rates vary from 70% in the largest parks - Warwick and Surrey - to around 50% on inner-city sites, which is attributable to the economic recession in the late eighties.

## *Netherlands*

The Netherlands contains seven science parks, which housed a total of 300 enterprises, employing 3000 people, in 1993. Small enterprises tend to predominate, with an average of ten jobs per enterprise. Enschede, Leiden and Groningen typify the Dutch science parks in terms of aims and content.

A business incubator, situated in a building of its own, is integrated into the Groningen and Enschede parks. In these two parks, services to new high-tech companies are considered to be an essential aspect of development. This is a package of services (consultancy and shared logistical and telecommunication services) which may be used by enterprises outside the park. The shared material facilities seem to be used more than the consultancy services, which are available for every aspect of business operations - financing, organization, marketing, accounting, access to public markets, etc.

In Leiden too, an incubator is linked to a business zone. Having begun life in temporary premises, the incubator now has 1000 square metres to let out, two-thirds of which is laboratory accommodation. In 1995 it housed 15 enterprises, almost as many as the neighbouring science park but with a total of only about 1000 jobs. The incubator not only serves as a launching pad for new activities initiated by the university; it is also a temporary base for national or international companies which have tested the feasibility of locating in Leiden prior to investing in the *Bio Science Park*. Apart from two consultancy services in organization and advertising, all of the incubator companies come from the biomedical sector. Half of them combine research with production and distribution; a quarter of them live entirely from research. In the science park, almost all the companies belong to the pharmaceutical, chemical and biomedical industries, but the one non-medical company on the site, Fokker, accounts for 35% of all jobs. Similarly, although most of the enterprises belong to the private sector, the public research institute TNO provides more than a quarter of the jobs. On the whole, the park seems to be fulfilling its mission of attracting and bringing together businesses with high levels of R&D activity.

## ***Denmark***

Situated fifteen minutes by road from the centre of Copenhagen, twenty-five minutes from the airport and ten minutes from the university, the Symbion park is the largest and most successful of the five Danish parks, with 250 jobs in 45 enterprises. Between 1986 and 1992, the park leased 3000 square metres belonging to the University of Copenhagen. Today it possesses 20 000 square metres of renovated accommodation, thanks to public funding. Only 60% of the main building, however, is occupied, and that figure includes sizeable areas housing the large Danish pharmaceuticals company Novo and the university chemistry department and management institute. Three American companies are also renting units.

## ***Spain***

In Spain, the parks are of various sizes:

- The site of the Expo 92 world fair comprises 213 hectares, 138 of which are assigned to the science park and to administration and services. By the end of 1994, a quarter of the area had been developed and 30% was undergoing development or rehabilitation.
- Zamudio currently comprises 68 hectares, and it is planned to add another 75 hectares in a second phase. In a rural environment, the park is characterized by a very spacious layout, with buildings restricted to 25% of the total surface area. Only one service building has been completed.
- Vallès - 585 hectares, of which 185 are used for infrastructural purposes - has good links with Barcelona, nine miles (15 km) away. At the end of 1994 the site was home to 65 enterprises, employing 1300 people, of whom 219 are directly engaged in research and development.
- Boecillo covers 45 hectares in the heart of a pine forest nine miles from the regional capital of Valladolid and an hour and a half by road from Madrid. It benefits from direct air links from the regional airport to Barcelona and Paris, with a service to London due to be inaugurated shortly. At the end of 1994, the park had 20 enterprises, providing almost 300 jobs, which represents an increase of 300% in the course of one year. One-third of the developed sites had been sold by that date.

## ***Portugal***

In Portugal, it may be remembered, the parks are still at the planning stage. These projects essentially coincide with enterprise zones characterized primarily by their geographical situation. The Almada park is sited near the campus of the New University of Lisbon. The Uninova organization is located on the opposite bank, in an area well served by road and soon to have a motorway. A second bridge over the Tagus is planned. The situation of the Taguspark is also very good in terms of transport and communications infrastructures, but Lispolis, sited in the suburbs of Lisbon, cannot hope for much growth.

## *Ireland*

In keeping with the national importance of its role, the Plassey park is large: 220 hectares, of which almost half is university property, the rest being divided among the public-sector agencies, promoters and companies. The available floor space amounts to 130 000 square metres. The supply of premises is varied in terms of surface areas and uses, and the rents there are particularly competitive by comparison with the United Kingdom.<sup>5</sup>

Situated three miles north of Limerick, near the university, the park is occupied by 80 enterprises accommodated in 25 buildings. Inside the park, three common facilities are available to businesses: an innovation centre, an international business centre and an international science centre, as well as a number of reception offices (free-standing units), among them the Plassey Enterprise Centre. The park is characterized by a high percentage of private and public services relating to the activities of the three centres, which corresponds to a great extent to the aim of stimulating the development of the local economic fabric.

The experience of Trinity College, which is launching an incubator, is obviously different. The building, situated on the fringe of the university campus in the heart of the city, currently houses eight enterprises and the university's industrial liaison cell; other nearby spaces are leased by businesses linked to the university, and a science park is planned to provide these spin-off activities with a location suited to their rate of growth.

## *Greece*

The Thessaloniki technology park is on the periphery of the city near a rapidly expanding village as well as near the motorway linking the airport and the city. The university, six miles away, is easily accessible by road, as is the main industrial estate. The park is situated near the seat of its sponsoring body, the Research Institute for Chemical Power Engineering. The planned developments will take place on farmland belonging to the College of Agriculture. The entire area covers 25 000 square metres, on which several groups of buildings have been erected. The first phase comprises 250 square metres of administrative offices and conference facilities, an incubator, laboratories and workshops. There were no occupants as yet on the day of the visit, but the first three had been identified (two local companies and one located in Athens).

## *Belgium*

In Belgium, aims and strategies differ from one site to another, which accounts for the wide diversity in the operations examined: an incubator in Antwerp, a park/incubator complex in Louvain integrated into the university structure, and several enterprise zones in Brussels - each at a different stage of development, and all of them part of an effort to form a technopolis.

The Antwerp incubator is located on university land, seven miles (12 km) from the city centre along the Antwerp-Brussels motorway corridor, but twenty minutes by motorway from the industrial dockland complex. The site is in a predominantly agricultural peripheral zone. A building with 1300 square metres

---

<sup>5</sup> Between £4 and £8 per square metre.

of floor space is occupied by seven companies employing a total of 35 people, twelve of whom are employed by the largest of these companies. They are engaged in two different fields of business - information technology and biomedicine; these fields correspond to flagship activities of the university, and are also dictated by the proximity of the university hospital, to which several of the companies act as suppliers. The principal activity there is research and development, but there is also some simple distribution of pharmaceuticals or computer hardware. The majority of the companies located there have recently started up with Belgian capital but there are also agencies of major companies.

The science park in Louvain-la-Neuve has a surface area of 210 hectares and is situated 18 miles (30 km) to the south-east of Brussels, within easy access of Brussels international airport (about half an hour by road). The park currently accommodates 82 enterprises, providing work for 3200 people. The aim of defending the environment, vaunted by the park as a hallmark of its quality, is explicitly defined in a list of specifications which stipulates that companies must not build on more than 40% of their plot, that they must finance a tree-planting programme and that 2% of their construction costs must be allocated to the creation of a work of art. In physical and operational terms, it is difficult to distinguish the park from the city of science to which it belongs.

## *Italy*

The Trieste park is a zone dedicated to science that has been developed on separate sites several kilometres apart, with 45 hectares almost completed and five hectares assigned to the synchrotron. The entire zone, situated on the karstic plateau overlooking Trieste, is linked by expressway to the airport and by motorway to Venice and Trieste. The university lies halfway between the city and the science park, but public transport services are not yet adequate. The concentration of activities on the designated sites reflects the desire to preserve most of the plateau in its natural state.

At the end of 1994, there were 700 employees in the park, excluding occasional staff, in twenty centres and SMEs engaged in research-related activities. More than half of these employees are research staff with an average age below thirty. Employment is concentrated in the public research centres (150 employees for the construction of the synchrotron and 120 in the research centre established by the United Nations), but there are now more companies than centres.

## **5.2 Technopolis ventures and park networks**

### *France*

An examination of the French technopolis ventures referred to in this comparative study reveals highly varied physical characteristics. We have parks devoted to technological activities (Metz 2000, Pau-Hélioparc, Savoie Technolac, Bordeaux Montesquieu and ZIRST in Meylan), multiactivity zones, combining universities, urban districts, sites devoted to technological activities, etc. (the Beaulieu site at Rennes Atalante and the Bordeaux Unitec site), multipolar technopolis complexes, each comprising several sites (Bordeaux Technopolis and Rennes Atalante) and, lastly, networks of technopolis sites, like the Atlantic arc "system within a system". This assortment is fairly representative of the overall situation in France. While the technology parks still predominate, they are gradually becoming integrated as urban districts. Moreover, the main French conurbations often possess several technopolis sites and ensure that such multipolarity is encouraged. As for the technopolis networks, they exemplify cooperation in specific

fields - business start-ups, exchanges of technology or scientific and technological information, etc. In the French context, the technopolis complexes are more interested in cooperation than was previously the case. This is demonstrated by the vitality of the *France Technopoles* association, whose high profile derives from the experience-sharing it promotes.

What do we find on technopolis sites? These sites have a surface area of several hundred hectares, and yet the area reserved for technological activities often measures less than 100 hectares. We should bear in mind that it took the promoters of the ZIRST site in Meylan twenty years to market the sixty hectares of their technology park. At Metz 2000 - a technopolis site created in 1983, which has a total surface area of 400 hectares, including the 220 hectares of the university campus - 162 listed enterprises provide 2410 jobs.<sup>6</sup> Half of these enterprises employ between one and five people, and only ten have more than 50 employees. Twenty-three per cent of the enterprises are from the realm of information technology (computer software), around 25% are consultancy agencies, 15% work in the telecommunications sector and some 40% provide commercial and non-commercial services. It took four years for the first thirty enterprises to locate in the park and another four years - 1988 to 1991 - for it to rise from 30 to 150 enterprises, but the growth in locations slowed down considerably over the following three years. Some big names can be seen on the site - Hewlett-Packard, IBM, Bull, Matra Communication, etc. - but these companies' presence extends only to commercial agencies or regional technical centres and not to major operations.

Metz 2000 is fairly representative of the French technopolis sites. A high percentage of its enterprises are small, and large companies are thin on the ground, except for commercial agencies. In Meylan, the ZIRST technopolis accommodates 170 enterprises, providing 5000 jobs; 60% of the enterprises have fewer than ten established posts.

The activity sites in the technopolis complexes are essentially occupied by small technological enterprises from the local economy. Business nurseries provide accommodation for new enterprises; the various French technopolis ventures possess 60 business nurseries. Resource centres grouping business services together and acting as business centres can also be found on these sites; the Montesquieu resource centre at Bordeaux Technopolis and the Condorcet centre on the Bordeaux Unitec site are examples. It should be noted, moreover, that external services in the form of decentralized government industrial and technological agencies often set up offices on these sites, as has happened on the Beaulieu site belonging to Rennes-Atalante or at the Pau-Hélioparc complex.

These sites, however, do not constitute the only material resources of a technopolis. In Rennes, for example, 44 research or educational institutions are members of the technopolis (containing 81 enterprises), but only half of these members are located on the technopolis sites.

The quality of site development and the architectural quality of the buildings on the sites is another original feature of the technopolis operations in France. At Savoie-Technolac, architects' plans are subject to approval. The promoters of this operation are anxious to ensure that the technological activities do not detract from the natural beauty of the site on the shores of Lake Bourget with its Alpine backdrop. Furthermore, where there are business resource centres containing services, restaurants and so on, these are the subject of sophisticated architectural designs which serve as flagships. The resource centre at Bordeaux Montesquieu is an example of this approach.

---

<sup>6</sup> Figures as at the end of 1994.

## ***Belgium***

The **Brussels technopolis** comprises four science parks, each linked to a university, covering a total area of 60 hectares, which is half the area of the region's industrial zone. The park at the Catholic University of Louvain (35 hectares) is the only one whose land belongs to the university. The land on which the other parks were built was handed over to the federal ministry, then to the region. The Da Vinci park of the Free University of Brussels is by far the largest at 25 hectares. Bordering the Brussels-Zaventem motorway, it boasts 3900 jobs and 39 enterprises, which equates to more than half the enterprises and over 80% of the number of jobs in the Brussels science parks. Launched in 1975, it now accommodates around ten units with more than 100 employees; many of the occupants are international groups and marketing organizations, although others are developing products, especially software. The remaining parks account for a total of 20 enterprises, three of which employ around a hundred people; biomedicine predominates with the production and distribution of cosmetics and pharmaceuticals and a processing centre for haematological products alongside small metalworking or mechanical engineering units.

In addition, two incubators, one of them a European Business and Innovation Centre, each offer 5000 square metres for rent, divisible into very small units. Financed by the region but developed by the university to which they are answerable - the Free University of Brussels or the Catholic University of Louvain - each of them comprised about ten businesses by the end of 1994. The Free University of Brussels park also offers collective buildings near the airport for sale in lots of 600 square metres with variable configuration. National and regional investment companies cofinanced the operation.

## ***Italy***

The Genoese experiment is an example of an approach in which the transfer of technology and infrastructure take priority over the location of companies on specific sites. This experiment began with an innovation centre, Genova Ricerche, which had up to 30 salaried employees. After flourishing for a time, during which the structure was financially self-sufficient, thanks to the products and services it had developed, the *consorzio* has now gone into liquidation.

The region has now assumed responsibility for a new programme of a quite different nature, the Liguria science and technology park. Its promoters define their approach with reference to the projects being undertaken by local enterprises - often low in technological content but promising in terms of job-creation potential - in order to help them to find the required resources (bottom-up approach). This park will be a "network" park, with no walls or predefined location and will serve to generate exchanges on a regional scale (four provinces) instead of being purely Genoese like Genova Ricerche; it will be organized into ten technical categories of regional relevance. In tangible terms, the project is restricted to the establishment of telecommunication infrastructures between research centres and major companies.

Situated eight miles south of Bari, Tecnopolis CSATA Novus Ortus (TCNO) is not, according to its organizers, a property-development operation but a "virtual" park. TCNO is equipped today with a high-capacity computer centre, research laboratories for microelectronics, robotics and telecommunications, a demonstration centre for new technology, a documentation and training centre and a business incubator. This incubator has already assisted in the creation of 32 new businesses, 15 of which are located in the park at the present time. According to a local study<sup>7</sup>, if we examine the companies which maintain business

<sup>7</sup> M. Marinazzo (1994): *Dati di Impatto ed indicazioni di metodo nella esperienza del Parco Scientifico e Tecnologico di Tecnopolis Novus Ortus* (currently being edited).

relations with the TCNO, only ten are located at the Tecnopolis and six in the surrounding district. These 16 enterprises, eleven of which are branches of international IT companies (IBM, Olivetti, etc.), employed 812 people in 1994. The Tecnopolis *consorzio* directly employs a staff of 236. Since being created, it has established business relations with over 650 companies.

The original feature of the San Raffaele park is its location in the very grounds of the San Raffaele hospital. The hospital is a key component of the park. The park buildings are organized around four blocks housing the biological and technological research department, the department of rehabilitation therapy, the Milan University department of biology and biotechnology, a CNR centre for nuclear medicine, the Roche research centre, the interdisciplinary laboratory for advanced technology and lastly a conference and reception centre. In the functional organization of the various floors, the biological and technological research department houses research laboratories, scientific service areas and conference and teaching areas on the two basement floors, while the remaining floors are occupied by offices for administration and logistics and financial services.

In a traditional park, it is hoped that exchanges will materialize between enterprises located there, so San Raffaele has a great advantage in that respect, with complementary activities taking place within the same block; it also benefits from the fact that the projects generated by such exchanges should help it in its mission of caring for patients.

### *A European technopolis network*

The technopolis network of the Atlantic arc, T2A, comprises 23 technopolis complexes<sup>8</sup> and science parks in 13 oceanic regions of the European Community. The network is supported financially by the Atlantis programme of Directorate-General XVI and by every region in the arc. The network has three main aims: to strengthen cooperation among enterprises and between enterprises and laboratories, to raise the qualification levels of technopolis managers and to create a common identity for the technopolis complexes and parks within the arc. The pursuit of each aim is masterminded by a committee comprising members of the network. It gives rise to specific actions directed by technopolis managers. In the framework of the first aim, a forum on the subject of venture capital and the funding of innovations was organized in June 1994 by the Galician technology park; a database was created, listing the "innovative" enterprises located in the spheres of influence of the technopolis sites; more than 100 enterprises are listed today by activities and by partnership offers and requests. Another scheme relating to this aim is the opportunity offered to enterprises and research laboratories from the parks to visit other technopolis complexes in order to canvass for partners. T2A seeks to promote technological partnerships between enterprises; a catalogue of 130 requests was produced in 1994.

---

<sup>8</sup> Argopole in Agen, Angers Technopole, Bordeaux Technopolis, Brest Iroise, Cartuja 93 in Seville, Hélio parc in Pau, Instituto de Fomento Regional de Asturias in Llanera, Izarbel in Biarritz, Lispolis in Lisbon, Lorient Technopole, Madeira Technopolo in Funchal, Nantes Atlanpole, Parque de Ciência e Tecnologia in Oporto, Parque Tecnológico de Galicia in Ourense, Parque Tecnológico de Malaga, Parque Tecnológico de Zamudio in Bilbao, Poitou Charentes Technologies, Pôle d'Innovation Quimper Atlantique, Tennes Atalante, Somerset Technology Centre, Synergia in Caen, Taguspark near Lisbon and Trégor Technopole.



This network is essentially Latin, although various parks in Ireland and the United Kingdom have observer status: Plassey, by Limerick, the University of Portsmouth and the Mid-Glamorgan Innovation Centre in Cardiff. However, significant discrepancies do exist between the parks, their content, their financial capacities and the expectations of their managers.

For its French members, T2A offers opportunities to come face-to-face with other companies' experiences. These members hope to see great benefits flowing from the technological partnerships initiated at the meetings that the network organizes for the enterprises in the parks. In the spring of 1995, 55 enterprises (38 of them French) met at Nantes Atlanpole to discuss technological questions and seemed satisfied with the exchanges that took place there.<sup>9</sup>

---

<sup>9</sup> The vast majority of the enterprises indicated their satisfaction in an evaluation questionnaire issued at the end of the day's meetings.

## 6. Specific facilities and services

---

The specific facilities and services of science parks cover quite a broad spectrum, but one that is fairly uniform throughout Europe, ranging from a "shared" secretarial staff through preparatory installations (computer trunking, technical networks) to development consultancy. The recurring issue concerns the difficulty of balancing supply and demand, but the very quality of those services may also be called into question.

In Germany, the services offered are divided<sup>10</sup> into shared facilities and central services (*hardware*) on the one hand and consultancy (*software*) on the other. The first group usually comprises secretarial services, a telephone exchange, communication media (telex, photocopier) and conference rooms. These services are invoiced individually as they are used; very few of them are included in the rent. In most of the ITBs, consultancy services are also offered to non-resident companies, but at a higher rate of charges. In certain cases there are more costly facilities (Nordhorn, Hagen and Osnabrück), such as restaurants, workshops for prototype construction and videoconferencing systems. In a general sense, the parks offer a far wider range of shared services and facilities than the traditional industrial estates, and in the opinion of their founders, this range seems to fulfil entrepreneurs' expectations. Services such as graphic design and information technology are available from private companies located in the park.

In the other countries of the Community there are variations on this pattern. In France the technopolis services are available to enterprises on the site and often to external member companies under the same conditions. However, the success of shared facilities among young businesses is limited; such businesses seem to show more interest in the services offered by the liaison team of the technopolis - visits to other companies, establishing contacts with researchers, compilation of files in support of bids for public aid, etc. - or in services supplied directly by companies located in the parks.

The Cartuja site possesses a fibre-optic network. In Antwerp and in other parks conceived by universities there are more often trunking facilities for telecommunications, connected to the university installations or to existing research centres (Internet, etc.). The use of these facilities, like the administrative services of the incubator, is on a pay-as-you-use basis. These infrastructures, however, require specific IT services which do not always exist. In addition, the added economic value of connection to these networks for an enterprise in a park has not yet been properly assessed.

In Thessaloniki, the direction and administration of the park are undertaken by the staff of CPERI, one of the institutes in the Forth network. Apart from the services normally offered by a science park (secretarial staff, conference rooms, documentation centres, cafeteria), the park will provide access to the national scientific network and to the Internet. If the Greek "megastream" network develops as envisaged, the park will be the only regional entry point.

The Bari park, which sees itself first and foremost as a business service centre, offers telecommunication services (access to national and European networks and data transmission by satellite, both of which meet

---

<sup>10</sup> Cf. R. Sternberg, *The Impact of Innovation Centres on Small Technology-Based Firms : The Example of the Federal Republic of Germany*, in *Small Business Economics*, vol 2, 1990, pp. 105-118.

the requirements of the Star programme) as well as technological services (studies, evaluation of electronic components, information technology, measuring, etc.). The facilities comprise a data centre, laboratories and demonstration areas for new technological products.

The facilities offered by the Area park in Trieste go even further. Area has a data centre with technicians and a local computer network connected to the national research-centre network, but it is also prepared to obtain additional facilities required for the work of prospective tenants. The operational team can thus compile files for aid applications made to international organizations, organize placements for young graduates in the research centres at Area and provide legal or marketing assistance to developing enterprises located in the park.

In general, because they are aimed at a type of entrepreneur whose training is likely to have been predominantly technical, the parks accentuate the personalized consultancy service provided by the park management team and/or associated experts, such as local R&D institutions. The sum of the services provided by the university environment and by the management of the innovation centre or incubator often justify the higher charges than are payable in neighbouring general business parks. Whether it is a matter of staff transfers or of legal or technological problems, the quality of advice greatly depends on the specific knowledge of the consultants and their number. In the parks where all of the management functions are performed by one person, that person cannot be in touch with company managers as often as they would wish. In addition, when it comes to technical questions, the consultant depends on support from external sources (universities or private R&D centres). Although it is difficult to evaluate this type of service, it may be stressed, on the one hand, that entrepreneurs consider technical consultancy to be the Achilles' heel of most parks and, on the other hand, that it is regarded by founding institutions as a secondary service.

## 7. Selection: theory and practice

---

Although the selection procedures and criteria for enterprises wishing to locate in a park are similar from one country and one park to the next, the way in which they are applied differs more widely. Two questions reveal the implications of criteria such as *technological orientation* and *sectoral specialization*:

Who is actually responsible for selection?

To what extent is this choice subject to constraints?

### 7.1 Who selects the enterprises for a park?

In **France**, selection committees generally consist of representatives of the various public bodies participating in the technopolis venture: researchers, property-developers, representatives of local authorities, etc. In the Symbion park in **Denmark**, locations must be approved by three members of the foundation board, a requirement designed to guarantee the maintenance of the park's professional and technological quality. In practice, it is the manager alone who decides whether a business is to be integrated into the park. In **Germany** too, the selection of tenant companies was also carried out, during the initial development phase of ITBs, by a broad committee of representatives of various institutions: universities, engineering colleges, economic decision-makers from local authorities, chambers of industry and commerce and park management teams. For practical reasons, the number of members on selection boards has been gradually reduced in many West German ITBs; in some cases, the manager of the centre has sole responsibility for shortlisting.

### 7.2 Technological orientation

Because many parks target businesses developing new technology, the characteristics of that type of enterprise govern, at least officially, the selection criteria; in **Germany**, as in the rest of Europe, the quality of the business concept and the technological orientation figure prominently among the criteria most frequently applied. The age of the enterprise, more important in East Germany, is rarely used as a criterion in the west. Needless to say, the development of these criteria depends on the level of demand; in general, if demand falls, the criteria are applied less rigidly. Another means of filling parks is to lengthen the term of leases, which are normally for a three- to five-year period in Germany.

Similarly, in the **United Kingdom** most science parks put the accent on attracting or developing activities centred on new technology or on R&D. In Manchester, for example, the selection criteria include R&D, consultancy and design activities and "light" manufacturing incorporating new forms of technology. In Durham, as in Warwick, the list of criteria is very strict: the tenant companies must be innovative and financially viable and must demonstrate potential for collaboration with the university and work on the basis of technology or knowledge (knowledge-based operations).

In general, these requirements are to be considered as objectives; in practice, the application of these criteria is very often entirely at the discretion of the managers responsible for selecting enterprises. It is noticeable that the universities generally wish for more rigorous selection in order to ensure better coherence between the activities carried out in the park and the expertise of their own research teams, but

in practice these wishes have little impact. Conversely, when selection procedure is controlled by the property developer, financial considerations result in the criteria being interpreted less strictly. In Bradford, for instance, a large amount of floor space is up for sale, whereas in Loughborough a shortage of industrial premises has been the stimulant of the park's growth.

Where there has been a conflict between the financial imperative and the selection criteria, park managers have most often preferred to relax the criteria. In Durham, for example, the university exercised a considerable degree of control when the park was first launched, which resulted in a very low level of occupation; on the arrival of the public agency English Estates, the modified criteria resulted in the mix of activities which now characterizes the Mountjoy Centre. When a park is originally conceived as a property-development scheme which is supposed to generate revenue - as in the case of Surrey Research Park - development is geared to companies with a technological purpose, but the question of selection criteria is not central.

In **Antwerp**, the main criterion is a proven or foreseeable link with the university research centres. But this criterion is an objective rather than a barrier, since the nature of the link is not precisely defined. A company's inclusion in the incubator is not determined by its age, its autonomy in relation to a larger concern or its field of activity. In **Louvain** the following types of company may set up: research businesses, manufacturing companies whose activity is based on advanced technology, enterprises providing services which complement the research activities and enhance the urban location, and enterprises whose creation has stemmed from the university. The fuller the park becomes, the more demanding do the promoters become in terms of the technological quality of prospective tenants. Following the departure of some businesses, their former premises have remained vacant because no applicants satisfied those demands.

In the **Netherlands**, the definition of a science park is based primarily on the criterion of links with a local university. It is not surprising, then, that in the selection of businesses account is taken of the existence of, or potential for, links with the university. The technological orientation of the product or service and its quality are the specified basic criteria; the admission of an enterprise to a park is decided in a two-stage process involving the park manager and representatives of the local university, the municipality and the province.

Although the criteria are fairly broad, the target enterprise types are precisely defined:

- Businesses spawned by the university (spin-off) or other knowledge-based institutions, such as academic hospitals. The demand of such companies, normally for small premises, is best met by the university business centres located in the parks.
- Companies in the region: it is a known fact that every year 6,5% of the country's businesses change their location, generally moving only a short distance, but it is not known how many companies would be interested in having a science centre nearby.
- Activities spawned by major companies: these are numerous during recessions (e.g. Philips in Nijmegen), but are mostly production activities, which explains their sparsity in science parks.
- National or international high-tech companies seeking a foothold in central Europe: these are only found in any significant numbers in one science park, Leiden, which has built up a reputation as a biotechnology centre as well as enjoying a favourable political and financial climate.

To sum up, university spin-offs and regional businesses make up the bulk of applicants for location in science parks. According to a study covering 25 enterprises (comprising 488 people) in the Groningen, Nijmegen, Wageningen and Leiden parks, it seems obvious that not all of the enterprises in parks are knowledge-based.

### 7.3 Sectoral specialization

In the United Kingdom, sectoral specialization is a criterion that is very difficult to apply, as CURDS has emphasized, since any specialization in university disciplines runs counter to the observed tendency of parks to attract footloose high-tech office activities, especially in the realms of electronics and software. So it is not surprising that the profiles of the enterprises in most UK parks are highly uniform, even though this may run counter to a declared specialization policy.

There are nevertheless two important examples of specialized parks in the United Kingdom: Warwick, where the accent is on companies engaged in advanced manufacturing technology with a view to creating, in collaboration with the Department of Production Systems, a centre of excellence in that particular discipline, and Belasis Science Park in Cleveland, developed with the aid of ICI on a site that is particularly well suited to companies in the chemical industry; the latter, however, is not one of the sites dealt with in the present study.

In France, sectoral or "thematic" specialization is often a specified criterion. The technopolis complexes have set themselves apart from the traditional business parks by the way in which they select their companies. In general terms, the selection criteria are linked to knowledge-based activities of a nearby university or public research centre or else to an established concentration of technological activities in the area. When technopolis managers define the criteria by which they wish to select companies, various choices have to be made:

- Single-discipline activities or multidisciplinary activities? A park specializing in a single discipline, such as Metz 2000 with its focus on communication technology, is easier to promote but restricts the cross-pollination of different technological developments from which innovations grow. In other cities, either the selection criteria for a site are broader or several sites are created near research centres or university campuses, providing a range of technological disciplines; this is the case at the Bordeaux Technopolis and Rennes Atalante.
- Activities relating to existing centres of excellence or activities anticipating future technological developments? The commonest approach consists in focusing the park on existing technological activities, either on those in which the research laboratories engage or on an accumulation of technological enterprises in a given urban district, such as Bordeaux TechnoWest, which is developing near a concentration of aviation companies. Nevertheless, the example of the birth of ZIRST in Meylan must be borne in mind by technopolis promoters. The forms of technology around which ZIRST - *Zone pour l'Innovation et les Réalisations Scientifiques et Techniques* - was to develop, according to initial studies drawn up in the early seventies, were not the ones on which the development of ZIRST came to be based, namely electronics and microcomputer technology, which were in their infancy when ZIRST was first mooted. All technopolis promoters must stop and consider the durability of the technology on which they intend to base the development of their operations.

- Should activities be based on an analysis of local economic demand? This is the least common situation but is certainly the most interesting. In most of the French technopolis ventures, supply-led strategies prevail. There are, nevertheless, some approaches that we consider to be extremely promising. The strategy pursued at the Pau-Hélioparc is one of attracting technological resources with a view to anticipating the need to revitalize the local economy in the wake of the forthcoming departure of a major enterprise, Elf Aquitaine, which is currently exploiting the deposit of natural gas at Lacq in the Pyrenees. The forms of technology targeted by the technopolis were those identified by a demand analysis of the local SMEs, which will have to become the engines of long-term economic development. The technology selected in this way comprised materials, pure chemistry, agricultural resources and information technology.

Incidentally, the application of criteria in the selection of technopolis enterprises does not necessarily guarantee the technological dedication of a site in the long run. In fact an enterprise that owns premises could sell them to another enterprise whose business activity does not correspond to the original technological orientation. In practice, however, such aberrations are rare, and indeed certain contracts concluded between enterprises and the host technopolis contain special clauses to safeguard the latter against the establishment of excessively heterogeneous activities.

Lastly, the criteria debate seems to be evolving in the sense that some promoters now acknowledge that they are no longer selective about business activities on technopolis sites but state that a process of natural selection occurs by virtue of the specific characteristics and environment of these sites. According to them, specialization in terms of infrastructure and services is enough to ensure the presence of a certain type of company - the very type they would seek to attract.

This approach, more pragmatic than prescriptive, has been adopted by the Leiden park, where biological specialization was envisaged and has been successfully encouraged, although it is not an imperative criterion.

## 7.4 Tertiary v. industrial

The criteria may also affect the selected business sector - services and/or industry. In France, a majority of technology parks are occupied by businesses from the tertiary sector, but this situation sometimes attracts criticism, since the parks have no production operations to complement the R&D activities. The ZIRST promoters in Meylan regret having excluded mass-production activities at the outset of the project.

In the Plassey park, the operations of the on-site businesses, which relate more to applications than to the development of new technology, are a product of the selection criteria and strategy of the IDA. The requirement that companies be technology-based is broad enough to include foreign investors, particularly from North America, who wish to have a production or marketing base in Europe.

As CURDS pointed out, the emphasis placed on R&D by most parks is itself inconsistent with the nature of the businesses targeted by the incubators and of those which can be housed in small premises. For university spin-off SMEs or independent start-ups, the premises in the park are generally their sole location, and so they cannot restrict their activities there to R&D. They must at least establish an administrative framework and may even engage in production and sales. The R&D criterion is therefore only appropriate to large companies which can set up a separate R&D operation.

## **Conclusion to Part Two**

---

What is the physical reality of the science park? Let us recognize, on the one hand, that there are few large science and technology parks in Europe. In practice the special nature of the target companies and the unusual type of environment created for them are conducive to small-scale activities. On the other hand, while the geographical dimension is paramount in some parks, it is the functional dimension that prevails in others, in the form of technology transfer, business incubation, etc. Lastly, it should be noted that projects of an intangible nature seem not to be taking root in the European park landscape. Experience shows that technology transfer and the establishment of young businesses need specific locations and organizational structures. Goodwill and networks are not ends in themselves.

The material and functional settings created by the parks still remain very conventional. Despite the selection of enterprises and the efforts made to enhance the architectural and environmental quality of sites, they remain extrapolations of traditional business parks. ITBs are housed in conventional buildings, as are business incubators and other innovation centres. The technological development nurtured by the parks or technopolis complexes still needs to be translated into new types of working and functional environment.

Moreover, although the development of networks is inevitable, they will be no substitute for the working areas necessitated by the development of innovation projects or innovative businesses. In fact, the parks allow small businesses to obtain facilities or services that would otherwise be unaffordable and to benefit from places where information from various sources can be exchanged.

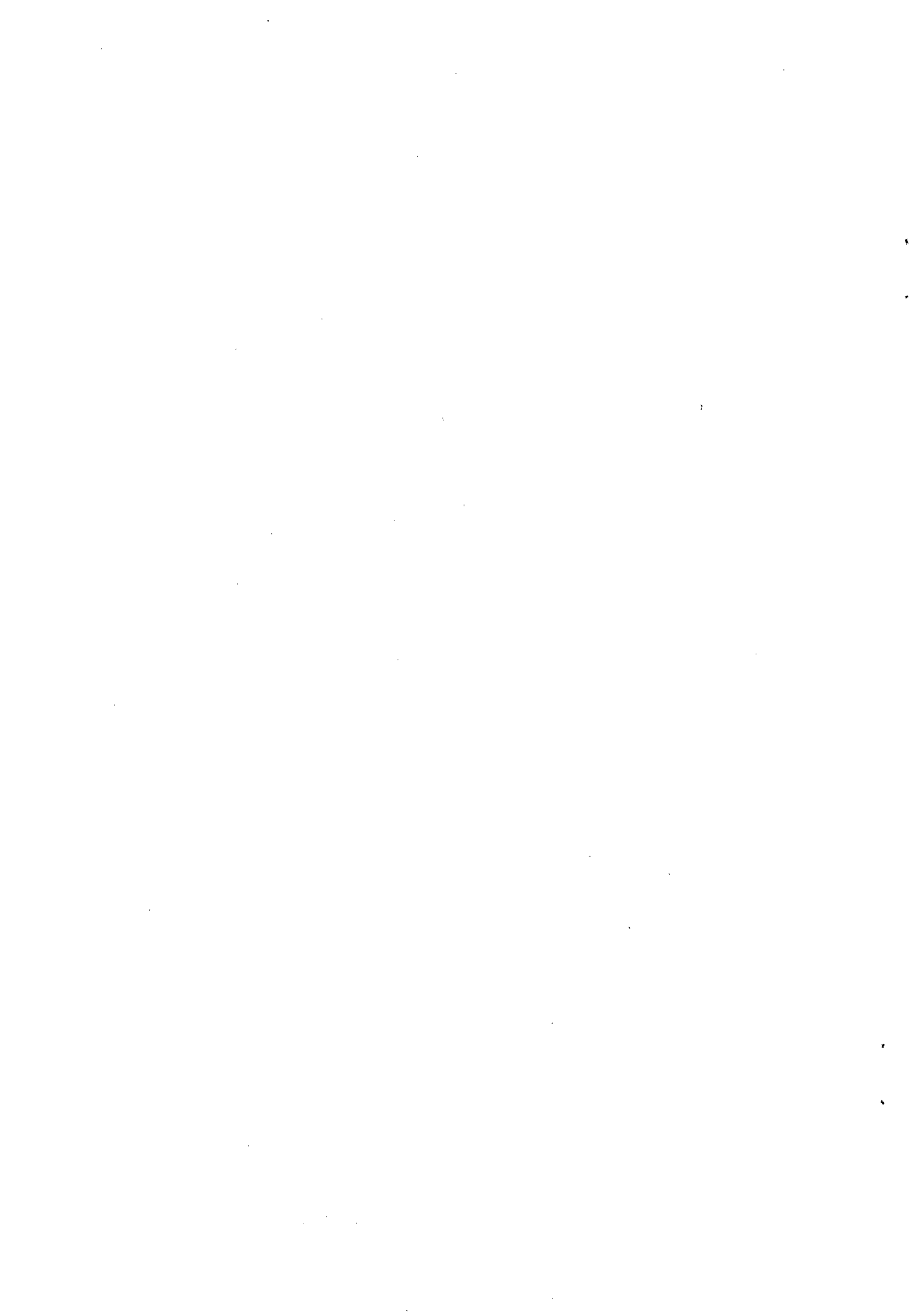
The fact remains that the physical dimensions of these parks are insufficient for their development. The skills of company staffs and their management on the one hand and the organization of these structures on the other are equally important issues.



*PART THREE*

---

**MANAGEMENT OF PARKS,  
UNIVERSITY LINKS, IMAGE**



## **8. Management of the parks**

---

In Germany, most ITBs are managed by private companies in which the host city is a shareholder on the same basis as local chambers of commerce, chambers of handicrafts and trade businesses, certain banks or savings banks and private companies. In Freiburg, the centre is managed by a foundation responsible to the federal state of Baden-Württemberg, in which the city of Freiburg, an association of Baden industrialists, the chamber of commerce, the chamber of handicrafts and trade businesses and some local savings banks. This means, on the one hand, that any losses can be partly covered by the public authorities and, on the other hand, that their operations are not under severe pressure to yield profits.

The teams that undertake the day-to-day management of these centres are small - five people in Dortmund, two in Bremen, a single part-time manager in Freiburg, and so on. The services supplied by the management company's partners are commissioned to meet the needs of the enterprises in the centre or, more generally, the needs of local SMEs. In Karlsruhe, the chamber of commerce is responsible for managing the centre through the agency of its technological consultancy company. In Sankt-Georgen, one person sees to the management of the centre with the principal task of mobilizing the other technological resource centres, the services operated by the federal state, the Steinbeis Foundation, etc.

Local institutions can occasionally be in competition with each other for the management of a centre. Since 1993 the Hannover centre has been managed by a private company owned by the Greater Hannover Association, a public institution. However, the city of Hannover remains the owner of the building and of the land on which it is located. Cooperation between the two bodies does not run as smoothly as it could, which affects the way the centre is managed.

In terms of investments, various models exist. In Bremen, the federal state financed the building; in Sankt-Georgen, the centre is managed by a private company (in which Perpetuum Ebner<sup>11</sup> has a 70% stake, the town of Sankt-Georgen owning the other 30%). This company owns the building and the land and financed the renovation work. In Osnabrück, the centre is managed by a private company of which 50% is in the hands of the city, the other shares being owned by local businesses. The city owns the buildings and the park. The city and the federal state of Lower Saxony have jointly financed the construction of new buildings.

In the United Kingdom, the most common organizational structure among the science parks comprises a manager who reports to a management committee comprising representatives of the various associated founders and sometimes industrialists. But there are variants:

- In Bradford and Loughborough, the Director of City Planning delegates the task of shortlisting applicant companies to a consultant, and a liaison officer employed part-time by the university is responsible for relations between the university and the enterprises.
- In Durham, the park manager acts as liaison officer with the university, whereas these functions are separate in all the other centres. But since the establishment of the UDIL industrial research

---

<sup>11</sup> Perpetuum Ebner is a private company commissioned to administer the economic restructuring required after the bankruptcy of DUAL.

laboratory in the park, there are two channels of access to the university for prospective industrial partners, and an eventual duplication of roles is inevitable.

Communication between the park manager and tenant companies varies from one park to another. Whereas Bradford has a straightforward landlord/tenant situation, the managers of the other parks play an active service and consultancy role, which is generally appreciated more by SMEs and university spin-off businesses than by mature companies. The quality of such communication very much depends on the professional abilities of the communicator.

Many park managers are also expected to activate synergetic potential by encouraging cooperation between enterprises. It is difficult to gauge their success, since companies seem to attach higher priority to relations with their respective markets. Moreover, some parks do not offer an environment that is conducive to intercompany liaison; Manchester, for instance, has no cafeteria, but this defect should shortly be rectified.

In France, in institutional terms, technopolis operations are mostly funded by cities or associations of communes and sometimes by mixed consortia, comprising local authorities, chambers of industry and commerce, universities, etc. In operational terms, we find associations (Rennes Atalante) and private or mixed public/private companies, as in Metz, Bordeaux and Pau. Finally, the technopolis is also identifiable by its radius of action, by the urban area or economic territory that constitutes its sphere of influence, within which it has its various poles, its sites devoted to specific types of development. While the operational structure retains responsibility for animating the park (information, promotion, organization of social events, etc.), the property development as such is most often carried out by local mixed companies (SEMEAB in Rennes, SAS at Savoie-Technolac, SEM Bordeaux Technopolis at the Montesquieu site, etc.). The degree of involvement of the technopolis structure varies; certainly, their small size makes them tend to initiate projects and promote partnerships rather than undertaking operations of their own.

As far as the stimulation of activity within the park is concerned, the French technopolis operations are overseen by small teams comprising an average of three to seven members. In the best-case scenario, these teams can receive support from other public economic development agencies set up by the local authorities, chambers of industry and commerce, etc. Nevertheless, rivalries exist between local structures, which means that technopolis management teams cannot aspire to coordinate all of their actions. These teams also offer specific services to enterprises on site - postal services, mechanisms for welcoming new enterprises, which can extend to finding work for the spouses of staff and housing too (Savoie-Technolac) - as well as to those enterprises associated with the technopolis; these are generally on-site enterprises, but not exclusively.<sup>12</sup> It should be noted that services enterprises located in parks provide services to other companies.

Nevertheless, the organization of the technopolis complexes remains an unresolved question and one which is particularly interesting to study. In fact, at a functional level - links between research and business, the creation of technological enterprises - and in geographical terms - development of sites, location of research centres, etc. - the technopolis has to integrate into its planning various functions that are already provided locally by separate bodies. For example, the economic promotion of a town is carried out by a unit within the municipal administration, while other agencies promote the local *département* and the region; the local chamber of commerce has its own services, and the university its publicity office, etc. As for urban planning and the development of sites, of the districts in which sites are located, these are also administered and financed by different organizations. This begs the question whether the technopolis

---

<sup>12</sup> Rennes Atalante consists of the enterprises in the Rennes area which have subscribed to the technopolis and not only those located on technopolis sites.

should invent its own structures and, if so, what their precise remit should be in relation to the structures already in existence. Or should it combine existing structures? The answer to this question differs according to the context in which it is asked, and hitherto unknown operating methods are often adopted in a specific location. Such forms of organization develop as the role of the technopolis crystallizes or as cooperation between the various players becomes more effective.

For the business incubator at Leiden in the Netherlands, the three founding institutions pooled their resources to produce a lightweight organizational structure, both in its conception and in its day-to-day administration. While the university provides its chemical waste processing plant and administrative staff and seconds the director of the transfer centre on a full-time basis to forge links between the incubator companies and public institutions, the chamber of commerce and the city have also each provided an executive officer. The three founding bodies administer the incubator funds along with an organization of industrialists from Leiden.

Groningen stands out on account of two key mechanisms. Firstly, the park management coordinates and directs projects that are intended to result in new products, procedures or businesses. These projects may be initiated by researchers, interested companies or the park team. In every case the participation of a commercial partner (for new or established businesses) is required before the project can begin. Each participant who has a project makes a material contribution to it. The second mechanism is the innovation bursary, whereby the park supports an individual with an interesting idea rather than a complex project. Following negotiations with the University of Groningen, the beneficiary is granted access to the university facilities and laboratories and possibly to an indemnity enabling him to turn his idea into a prototype. In order to achieve the objectives of the park, i.e. to become self-financing within five or ten years, innovation bursaries have to yield a return on the investment.

The Plassey park in Ireland did not have any formal orientation until it became the National Technological Park Company in 1990. One of the functions of the management committee is to attract and assemble partners and associated bodies, such as the Department of Industry, the university and the private enterprises in the park. Contrary to UK practice, the subcommittees appointed to assist in park management and programming are responsible for coordinating the wide range of diverse players involved in the operation. In particular, the Innovation Committee, comprising members of the park management, Shannon Development, the university and the park businesses, meets once a fortnight for informal discussions. Although it possesses no executive power, the Committee is an important institution which has proved effective in solving problems that threaten to impede the development of the park.

With a Fiscal Planning Committee and an Information Technology Committee too, this form of organization has fostered the development of informal collaboration on matters concerning park management and strategy which is far in advance of the collaboration observed in the United Kingdom. The business managers who were interviewed, all of whom had sat on one of these committees, revealed considerable personal involvement in the science park. Likewise, network operations seem to be more highly developed among the Plassey businesses than in the United Kingdom; these operations are based to a greater extent on exchanging information and sharing experience than on research projects. Other initiatives (forum, computerized courier service) serve to promote the aim of making Plassey a strong R&D base, endowed with high-quality subcontractors and likely to appeal to foreign investors. The synergetic effects that seem to be developing at Plassey are perhaps a result of the large number of public services present in the park as well as its wide variety of business activities. It should also be emphasized that the various bodies represented in Plassey work very hard to integrate incoming companies into the local economy.

In Denmark, the Symbion park is organized as a business foundation with an administrative board of fourteen members on which scientific institutions and businesses (industrial and commercial) have equal representation. Symbion Ltd is the landowner and has responsibility for the new buildings. Although it is non-profitmaking, the foundation enjoys the rights of a company under Danish legislation. In addition, the *Kobenhavns Foskerby Initiativ* association, which is represented on the administrative board, brings together a significant network of leading figures from the worlds of science and industry.

In Spain, the management of the parks is carried out by an association at Cartuja and Zamudio and by a public limited company at Boecillo. In the last case, the board comprises only some representatives of the region and one representative of the town. The region, which is the park's sole shareholder, controls the real estate through the agency of another public limited company. The management team comprises a managing director, a director of finance, project and installation managers and a liaison officer. At Vallès, a small team carries out the day-to-day administration, in other words welcoming enterprises, promoting the park, organizing working breakfasts, etc.

In Belgium, the administrative board of the Antwerp business incubator comprises the governor of the province, the principal of the university, the chairman of the chamber of commerce and the presidents of major companies. A Science Council, with fourteen representatives of the university and the colleges and three business representatives, advises on admission criteria and strategic options for the incubator. The management team organizes meetings devoted to specific subjects and conferences for founders or potential founders of businesses in order to bring forth initiatives and create an informal forum for discussion between academics, engineers and economic operators. This animation work, which began before the incubator opened, is intended to create the type of environment that is essential for the development of entrepreneurial dynamism. For the time being, the most obvious synergetic effects around the incubator seem to come from the so-called "technological" universities and higher-education establishments, which are trying to assemble a pool of skills of which the industrial sector could avail itself. The interfaces between research and industry are already in place at the university, and the incubator could ultimately come to play the role of a launching pad. But the large companies and banks represented on the administrative board are not playing an active role in that area.

As we previously indicated, the science park at Louvain-la-Neuve stands out from other Belgian and European parks by virtue of its very close link with the Catholic University of Louvain (UCL). To prove this point, the research and development liaison unit promotes the park at the same time as it "*undertakes the promotion of basic and applied research, examines the legal and financial aspects of all research contracts with the university, seeks out companies liable to embrace the technologies perfected by university members, registers patents on behalf of the UCL, issues marketing licences to companies, encourages the creation of new companies...*"<sup>13</sup> This combination of functions gives the head of the unit the means of selecting enterprises which conduct significant research and are willing to establish links with university research. Besides, in terms of planning and architecture, the park is part of a general plan piloted by the university. In fact, the scientific city of Louvain-la-Neuve provides a legal, environmental and planning framework in which the various functions that shape its development can coexist.

In Italy, the newness of the parks and the fact that technology transfer takes precedence over the development of business zones and property marketing mean that the management of the parks perhaps assumes greater importance than in other countries, in the sense that expectations will depend on contacts

---

<sup>13</sup> Cf. factfile *Louvain-la-Neuve, technopole. Un projet, une réalisation*, compiled by Claire Demain and Daniel Mercier.

established between structures and between individuals. That is the case at San Raffaele, where the management company provides access to scientific facilities and research laboratories for external companies and is able to define cooperation agreements, assist in the creation of new research activities, offer a certain degree of logistical support, organize training courses and conferences, etc. These services are available both to research operations situated within the park and to external bodies, including the national health system. In Genoa, Genova Ricerche is a technology-transfer structure financed by the major public corporations. Various innovative products resulting from research conducted jointly by staff seconded from the enterprises and the university and by experts from Genova Ricerche have been perfected in the park.

In Trieste, the promotion, management and development of the Area park are the responsibility of an association (*consorzio*) under the aegis of the Ministry of Universities and Scientific Research; it comprises territorial authorities (region, province and municipality), national research centres located in the region and the universities of Trieste and Udine. The team of 44 people in charge of Area offer park tenants logistical, technical and administrative services at cost price, on the business-centre model, but the Area services also include facilities, such as a data centre with its technicians, a local IT network, etc. Moreover, the operational team also liaises between the tenants and external administrative, industrial and financial bodies by preparing documentation in support of grant applications, providing legal assistance, etc.

In Bari, the *Centro Studi ed Applicazioni in Tecnologie Avanzate* (CSATA) was created in 1969 by the university, banks and various private enterprises as a training and applied research unit. In 1978, CSATA was changed into a research consortium linking public and private enterprises. The centre forms the nucleus of *Tecnopolis CSATA Novus Ortus* (TCNO), created in 1984. In actual fact, TCNO is closer to the Batelle Institute in France or the Fraunhofer Institute in Germany than to conventional science parks. Today TCNO directly employs 236 people.





## 9. Links with the university

---

In Germany, links with institutions of higher education are neither a necessary nor an adequate prerequisite for defining an operation as a science park or, in more general terms, as an ITB. Many towns have an ITB without possessing a higher-education establishment or private research centre worthy of the name. Moreover, it is not difficult to find cities with universities or technical colleges which have no formal or informal connection with the local ITB; Hannover is one example. In other regions, however, such connections produce fruitful cooperation (Dortmund, Aachen, Sankt-Georgen and Karlsruhe, but no examples in East Germany). Geographical proximity is evidently not a major factor: the Sankt-Georgen technology centre is nine miles (15 km) away from the nearest technical college, whereas in Hannover there are no contacts between the two institutions, despite their being only two kilometres apart.

So the universities are neither participators nor investors in these operations. Nevertheless, although there may be no links between them and the ITBs, the same does not necessarily apply to individuals working in the centres.

In the United Kingdom, links with the local university are evident from the spin-off activities they generate. The science parks are generally regarded as offering better opportunities for the development of activities stemming from a university. But in practice the amount of creativity generated by universities is relatively low, only two or three enterprises per park maintaining links with their local university. In some cases, the entrepreneurs have graduated from other higher-education establishments in the region.

Moreover, a high percentage of university spin-off businesses is not necessarily a sign of success - it may reflect the failure of the science park to attract companies from the private sector. In that case, the spin-off companies may only be decentralized university activities, such as Nomis at the Mountjoy Centre, which is a University of Durham enterprise set up with funds from the Department of Employment to develop and manage the national computerized employment register.

In certain cases outside the scope of this study, such as Kent or East Anglia, this process of colonization by university activities is resulting in the absorption of the park by the university.

Elsewhere, links of a technical nature may exist. Despite the customary rhetoric, the links between entrepreneurs located in the parks and the university are few in number and very often predate the creation of the park, decisions to locate having been influenced more by established links than by a wish to forge new ones. In addition, a significant number of entrepreneurs, disappointed at not finding potentially useful specific skills at the local university, are now working with other establishments. These results confirm the findings of previous research, which indicate that geographical proximity has no greater bearing on liaison between universities and industry than informal links.

One of the reasons why links fail to materialize may be found in the very definition of the criteria for selecting businesses, which most frequently stipulate no more than a "*possibility of collaboration*". The universities are often accused of not encouraging the establishment of formal links and even of not responding to entrepreneurs' requests. It is certainly true that, in cities where they do not participate officially in the science park, universities may find themselves in competition with the park itself or its stakeholders.

Universities frequently open their services to enterprises from the park. The types of service offered to such enterprises, in return for a financial consideration, include libraries, restaurants, sports and social facilities and conference halls. These services are not used intensively, although their usefulness is universally acknowledged. In Loughborough, the university also opens its crèche to company employees.

At some sites, such as Durham, the university offers membership of its industry club, either free or at a preferential tariff. Others have established computer links, but there is some dubiety about the legal conditions governing the use of university IT facilities by commercial organizations.

Finally, there are many cases in the United Kingdom of park enterprises taking on postgraduate students or undergraduates for practical training in connection with projects of limited duration, as in Warwick and Durham; in Bradford, a group of companies took part in the establishment of a new process aimed at helping young graduates to look for work, which includes offering them a period of practical training to give them their first experience of professional life.

At Plassey in Ireland, although the number of university spin-off businesses is still very low, there has been no shortage of efforts, either by the innovation centre or by the technology and business centre, or by the centre for microelectronics applications, which was relocated in order to foster links between the university and industry. The feedback obtained in our interviews suggested that these efforts have been fruitless. Today, the innovation centre looks to students rather than academics as potential entrepreneurs. The Plassey problem is symptomatic of the difficulty involved in marketing university research, and a science park seems no better suited to that task than any other structure. Some of our interviewees pointed out that, since Limerick was a relatively new university, its growing stature within the university system over the coming years could enhance its capacity to take risks. In the meantime, it is playing an active part in the promotion of the park conducted by the Industrial Development Agency (IDA) and offers the occupants of the park a package of services similar to those provided by the British universities: libraries, sports facilities, graduate and student recruitment service. Those research links that do exist are fairly limited.

In France the links between technopolis complexes and universities have two dimensions. The first link is geographical. A majority of the technopolis sites are established close to existing scientific universities. That is the case with Bordeaux Unitec, Rennes Atalante, ZIRST in Meylan, etc. In the last-named technopolis, studies conducted in 1969 defined the aim of the ZIRST project as "*to locate near the university an industrial estate for scientific and technical research which could realize on the ground the ideal of cooperation between university and industry*".<sup>14</sup> The aim of this strategy was to use geographical proximity as a means of encouraging exchanges and cooperation between university research bodies and businesses in the technopolis parks.

There is another, more functional type of link. In numerous cases, the university is a member of the promotion or management bodies of the technopolis. At Pau-Hélioparc, the university is a partner in a mixed company with the regional council, the town of Pau, the chamber of industry and commerce and various financial bodies and local economic development agencies. At Rennes Atalante, the principals of the two local universities are members of the administrative board of the association that manages the technopolis.

---

<sup>14</sup> Cf. *Livre blanc pour l'aménagement de la région grenobloise*, AUAG - Grenoble 1969, p. 71.

Finally, a more recent development is that parks can give a university the opportunity to locate new departments or research centres with a view to encouraging exchanges (Savoie- Technolac). This may be interpreted as a sign that the public universities in France are starting to become attuned to the technopolis culture.

However, these two types of link - the geographical and the functional - are not sufficient to guarantee effective exchanges between the university and the world of the technopolis. Intermediary structures have emerged in the last few years with the primary function of enabling businesses, especially local SMEs, to capitalize on research conducted by the universities. That is the case at Ezus in Lyon, a public limited company in which the Claude Bernard University holds 67% of the capital, or the Ovi park, in which the University of Bordeaux II has a 40% holding. These structures are no substitute for unilink departments within the university, which serve as unique commercial bridges between university research and industrial production. Ezus and Ovi are proper companies; in their eyes, the university researchers and the SMEs with which they work are seen as customers.

In the Netherlands there is no correlation between the importance of a university and the size of a park. Small universities such as Twente in Enschede and the State Agricultural University of Wageningen possess highly developed science parks, while in the central belt between Eindhoven and Rotterdam there are high-tech parks with no university links. For that reason, these parks were not included in our list of science parks. Most universities are directly involved, both financially and in terms of organization, in the development of their respective science parks.

Among the parks linked to universities, relations between businesses and the university cover a wide spectrum - use of library facilities, employment of graduates, training, part-time work at the university, etc. The importance of the local university varies considerably in accordance with the different types of link that exist. Whereas the use of R&D, service facilities and training is almost entirely restricted to the local university, the quest for research partnerships and graduate recruits usually results in overtures to universities outside the local area. In general, it should be emphasized that the vast majority of enterprises in science parks affirm their preference for the nearest university.

In Denmark, although the declared aim of the country's science parks is to turn university research into commercial production, actual links between local R&D institutions and science parks are generally tenuous. This even applies to the largest park, Symbion in Copenhagen. The four institutions of higher education and/or research in the city, with a total of 35 000 students, do not engage in a particularly significant amount of interaction with the science park. Having remained relatively passive when the park was first created, these establishments continue to debate among themselves whether public establishments ought to pursue a "commercial" strategy. The Symbion park serves as a focus for this controversy.

In Spain, Zamudio is the park where links with local universities and research centres are most clearly defined as objectives, especially by the province, which finances programmes of familiarization courses in enterprises for university lecturers and students. It should be remembered that Zamudio is set in an industrial region in the throes of restructuring. Twelve years ago there were no IT specialists in the region and no computerized machinery. The park therefore has an important card to play in the modernization of the industrial fabric.

In Boecillo, the research centres that occupy the lion's share of the park were created in response to a perceived incapacity of the university to forge links with industry. Other options could have been explored, such as adjusting the orientation of the university, as was done with other Spanish universities, or locating

the university's technical institutes in the park in order to avoid duplication of institutional effort and rival bids to fund facilities from the same sources. In addition, the position of a lecturer working for both the university and a research centre needs to be clarified. Rethinking the strategy behind the Boecillo technology centres appears to be a matter of urgency.

In the two other analysed sites, links between the park and the university are not a burning issue. In Vallès, such links are the fruit of individual initiatives alone. Although most of the enterprises state that they maintain links with one of the three universities in the vicinity of the park, the close proximity of the independent university, which is less than five minutes away, does not seem to have been a decisive location factor for the companies occupying the park. In Seville, links are practically nonexistent, and the institutes of engineering and industrial management planned for the site have not yet been completed.

In Belgium, there are two points to be noted. On the one hand, the parks in Brussels are not specialized, which means that they can be more widely marketed but does not make it easy to tap the potential generated by companies' cooperation with other companies or with the university. The Brussels Regional Development Company (SDRB) organizes meetings, as well as conferences on public aid or specific technological developments, but relations between business and the university remain the Achilles' heel of the Brussels science parks, apart from the Brussels park of the Catholic University of Louvain. For a long time the universities did not have a very clear policy of making "their" parks instruments of technology transfer. Selection of businesses on the basis of their links with the university is a recent practice, and these links are not the sole criterion - the SDRB also considers the economic interests of the region, particularly in terms of direct and indirect job-creation.

Research contracts, and especially development contracts, which were already in existence between certain private and public laboratories, both inside and outside the parks, have been catalogued, formalized and checked as a result of the establishment of intermediary bodies in every university. They have been placed under the charge of the technopolis structure, a non-profitmaking association financed by the region and by the European Community (10%). Its administrative board, chaired by a representative of the Ministry of Economic Affairs, comprises universities and public research centres, the chamber of commerce, the employers' federation, the trade unions and the regional investment and development companies. It organizes termly "demonstration" sessions in the university laboratories, which are attended by representatives of 40 SMEs and have resulted in the signing of several research contracts. *Brussel Technopol* is also party to the establishment of a teleport, a resource centre specializing in agro-industrial biotechnology and a computerization consultancy service for SMEs.

An approach based on specialization is more likely to make the most of the expertise and products of the regional economy. For each identified sector there are around 5000 corresponding businesses. Such an approach is a means of establishing a network, under a director from the *Brussel Technopol* Association, of research centres, businesses from the relevant sector, a professional organization and research units from the same sector to define sectoral strategies, respond to international or European invitations to tender, launch a joint marketing campaign, etc. To date the farm-produce industry, which has long been highly structured, has been the only sector capable of establishing, for example, a common resource centre for some 30 businesses.

In Louvain-la-Neuve, the links between the science park and the university stem from two sources. On the one hand the science park is an example of the creation of "zones reserved for research activities (...),

located close to centres possessing an entire faculty of science",<sup>15</sup> while on the other hand its development and management have been undertaken since 1972 by the Catholic University of Louvain (UCL) and by the association of communes of French-speaking Brabant (IBW) through a joint management committee. Moreover, the park was promoted from the outset by the university administration and, more recently (since 1984) by the R&D liaison unit of the UCL, whose function is to promote cooperation between the university and industry.<sup>16</sup> In this context, the purposes for which the park was created relate to the aim of capitalizing on the university through cooperation with industry and technology transfer and by attracting businesses to locate near the university. The park is an element in the strategy of exploiting the technological assets of the university.

In Portugal, the organization established to promote the Uninova park acts as a liaison body between the university and the private sector. Fifty universities are engaged in research for Uninova. Most of the contracts with university laboratories are channelled through this organization. It does not have exclusive rights to administer such contracts, but seems to be able to do so more flexibly than the university itself. Uninova is run by an assembly comprising representatives of the faculty of science and technology and business representatives. The other two projects are linked to public research centres or higher-education establishments, Lispolis being associated with the INETI public research laboratories and Taguspark with the INESC and IST centres which should be locating there shortly.

In Italy, the San Raffaele hospital cooperates with the University of Milan in the domains of molecular biology, clinical research and tests and with the Polytechnic Institute of Milan in the fields of biotechnology and medical instrumentation. In addition, the park benefits financially from training given by the university. In Bari, the university is the major shareholder in the TCNO technopolis and owns the land on which the TCNO is located. Be that as it may, the university does not seem to have much interest in the services provided by the technopolis. In Genoa the university laboratories are part of the park consortium, although the university as an institution is not directly involved in the initiative.

---

<sup>15</sup> Cf. decisions of the Ministerial Committee for Economic and Social Coordination (CMCES) of 29 January 1971.

<sup>16</sup> Cf. *Louvain-la-Neuve, technopole. Un projet, une réalisation*, factfile compiled by Claire Demain and Daniel Mercier, August 1990.

## 10. Image of the parks

---

In Germany, to judge by statistics alone, the ITBs have a very favourable image. Their number is steadily increasing, as is their popularity in political and financial circles at regional and local level. That also applies to the general opinion of entrepreneurs, a vast majority of whom cite the existence of an ITB as an important factor in the decision to locate in a given region. In the opinion of the founders, the advantages of locating in such centres, especially the reduction of overheads, far outweigh the disadvantages. So the image of these operations "from the inside" is positive.

The success of the enterprises and innovation centres will depend on the ability of the latter to project or develop a favourable image among the potential customers of the enterprises. Ultimately, that external recognition factor will determine whether an enterprise receives orders because of or in spite of its location in a science park or technology centre.

That external recognition - of which we can form a fairly accurate picture by studying the attitudes of the entrepreneurs themselves - differs considerably between East and West. The West German entrepreneurs rank the favourable image of their ITB fifth among their reasons for locating on a particular site, whereas in the East only a quarter of the recently created enterprises regard location in a science park as giving them any benefits at all in terms of marketing. Nevertheless, in East Germany innovations centres mainly serves as a 'good address'.

Since the evaluation of the image of the ITB has never been the subject of serious study, the universal favourable image is essentially based on a myth; similarly, the percentage of people who are aware of the existence of an ITB is equally difficult to evaluate. While the major operations such as Dortmund or Aachen have captured the attention of the national media, most of the 120 ITBs appear only to have access to the local press. Despite the growth in the number of these structures, due in great part to financial support policies in East Germany and North Rhine/Westphalia, it seems likely that these institutions will have a diminishing impact on regional development policies.

In the United Kingdom the image of the science park is linked to the way it is perceived by the public at large. The "prestige" of a location near the university, the "cleanliness" of a working environment from which manufacturing activities are excluded, the importance of the address from a marketing perspective and, occasionally, the direct links with the university which enable a company to raise its profile above that of its rivals were recurring themes in the statements of our interviewees. The promotional literature of the parks took up these themes, emphasizing the "semi-rural" or "city-centre" location of the site as appropriate.

For certain analysts, like Massey *et al.*,<sup>17</sup> this image is based on an antithesis: presentation of the science park as "different" and "superior" implies that the rest of the local economy, and particularly local industry, is "less superior" and indeed outdated. This is a means of justifying rents in excess of the local norm, as is demonstrated by a similar study by Segal Quince Wicksteed at Cambridge ("*You have to pay for image*").

---

<sup>17</sup> D. Massey, P. Quintas, D. Weild: *High-Tech Fantasies: Science Parks in Society, Science and Space*. Routledge, London, 1992.

Likewise, this image reinforces the idea of "high tech" and feeds the widespread optimism about the ability of the new enterprises to regenerate the economy and create wealth in the long term. Politicians have presented advanced technology as the avenue leading to a bright economic future. Similar sentiments can be found in the British press (*The Times*).

This positive image invites another significant criticism. The idealization of high-tech businesses leads to idealization of their working methods and of staff-management relations within the enterprise, which are very different from the hierarchical relations in "conventional" companies. There is no trace of trade unionism within these parks; one of our interviewees stated that the prestige of his location in the park enabled him to recruit a better class of graduate.

The involvement of the university in the park is sometimes presented as "honest speculation", which places the park on a pedestal, above mere commercial operations. Nevertheless, some interviewees do not share that view; a representative of the University of Surrey, for instance, stated unashamedly that the park is nothing but a property-development operation designed to bail out the research budget. Other universities which have no commercial or technical control over the local park (such as Bradford), show little or no interest in the widely idealized aims or philosophy of science parks. And some heads of tenant companies even believe that the environment and image of the park, being divorced from reality, actually impede their commercial development; others feel that the proximity of the university creates an "ivory tower" image that is detrimental to their business.

Finally, the physical separation of R&D and production met with criticism. Often the park is not as "clean" and devoid of production activities as its promoters proclaim it to be, and its manager may not be a fierce opponent of such activities. One can subscribe to Massey's conclusion that the image is riddled with ambiguities and is just as paradoxical as the linear model of scientific research and industrial innovation on which the science-park concept is based.

In Ireland, most of the comments harked back to the familiar image of the science parks as prestigious institutions; however, certain tenants voiced reservations about the links between the university and the commercial world. The images projected by these two worlds are not necessarily compatible.

For the Thessaloniki park in Greece, the main priority was not links with the university, which is very far from the park in both institutional and geographical terms. Moreover, to concentrate on links with one particular establishment would be contrary to the task of regional development assigned to the park. The services provided by the university in other countries are provided in Greece by Forth, the national network of research centres. Although it is too early to say whether the park will actually attract university spin-off businesses, it is envisaged and hoped for.

The Thessaloniki park is apparently well known in the region, which is hardly surprising in view of the small number of science parks in Greece and the national aid this operation receives. The two enterprises which intend to locate there have a favourable starting position in terms of the capacity of the Chemical Power Research Institute (CPERI) to carry out this initiative. The involvement of the park in regional technology policy suggests that it will be able to fill the role of "honest speculator".

In France, some observers criticize the technopolis ventures because image seems to them to be all-important in such operations. They feel that the prime motive is to promote a town or city by vaunting its research facilities, universities, high-tech enterprises and technology parks. In a number of cases, however,

the technopolis has become an indispensable component in an image-building strategy for a large urban area. In that respect, certain operations, such as Rennes Atalante, have helped to modernize the economic image of their host city by lending it an aura of technological sophistication; in the case of Rennes, that applies particularly to the field of telecommunications. The same situation applies to the effect of Metz 2000 on the city of Metz and the Lorraine region, which has been hard hit by the demise of the steel industry. In Lorraine, the Metz 2000 technopolis site is not only an example of development based on economic activities other than those which have hitherto been the lifeblood of the region and a technological image that serves to promote the city and the region.<sup>18</sup> The park has been used and turned to good account by the local economic decision-makers, who negotiated the establishment of a plant in the region by the Korean Daewoo corporation. The image of a technopolis reflects on that of the region in which it is located, but it also reinforces the image of the companies it houses. In a recent survey conducted by the association *France Technopoles*,<sup>19</sup> one of the foremost reasons advanced by the companies on technopolis sites for their decision to locate there was the quality of the sites, coupled with the image they evoke. A technopolis address was said to bring benefits, especially to small enterprises.

Nevertheless, experience has shown that the French technopolis organizations which overstressed promotion and image-building, believing that they had to "induce" the development of park enterprises and the transfer of technology, are now having to refocus their strategy by adjusting the balance between activation of innate economic development potential, recruitment of high-tech companies and promotion functions. Image alone is not enough; its impact depends on the quality of the strategies it is intended to serve.

Besides, the content of images and messages tends to evolve. It is no longer a matter of simply presenting the technopolis through its facilities, its research centres and its main companies, but also of focusing on the people, the skills and the projects that exemplify the technopolis ideal. So the image of the technopolis reflects an entire system, especially in the eyes of the economic operators and researchers for whom it is intended.

In **Belgium**, the Louvain-la-Neuve science park undoubtedly benefits from the reputation of the university and the city of science, in which the observer sees embodied the link between the worlds of urban planning, the university and the economy. It is to be seen as a whole. In Brussels, the parks are swamped by the multiple image-building strategies pursued in the capital; they do not yet have an image of their own.

In the **Netherlands** the image attaching to location in a science park is important to small technological enterprises, even if their links with the local university are nonexistent. In the case of some large enterprises, particularly foreign companies, the situation is reversed, for it is these companies' presence that enhances the reputation of the park. This applies to both Enschede and Groningen, two parks that enjoy a very favourable image among the young businesses in their region but whose fame does not match that of their respective universities. In the two cities, half the population is aware of the existence of the local science park, and attitudes are generally favourable, not only within business circles.

The efforts made by the management teams at Groningen, Twente (Enschede) and Leiden to promote the internal and external image of the parks differ considerably. Only the Twente park benefits from good signposting in the city, where numerous direction indicators guide visitors to the park, and from a major communication effort designed to ensure that visitors are properly welcomed and that a collective identity

---

<sup>18</sup> Cf. interviews with the head of the Apeilor association, the local agency of the Commission for Regional Planning and Action (DATAR).

<sup>19</sup> Cf. *Entreprises et technopoles*, survey conducted by France Technopoles, 1994.



is forged among enterprises, employees and partner institutions. As for the image attaching to "green" developments or facilities ("green outfits") or to specific forms of enterprise culture, this does not appear to play a major role in the management of the parks.

In Denmark politicians and institutional decision-makers remained rather sceptical towards the science-park idea for longer than in other western countries. Over the past few years their attitude has changed, the concept is now fashionable, at least in political circles, and the parks are believed to achieve considerable results for less effort. For the time being, the image of the science parks is very good as far as the media, politicians and young entrepreneurs are concerned.

Nevertheless, whatever a well-meaning press may say, the reputation of the Symbion park within its own region leaves much to be desired - surveys indicate that only 10% of academics are familiar with it. It seems to us that the park management team will need to work on improving its marketing strategy. Besides, the site is very difficult to find for want of suitable signposting.

In Italy, contrasting images are associated with the parks. In Genoa, the large enterprises in particular expected the prestige of Genova Ricerche to rub off on them. In Trieste, the park's image is bound up with that of the town, as the promotion brochures clearly show. At San Raffaele, the image of the park is projected within the confines of the hospital and the world of biomedical research. Finally, in Bari, the TCNO technopolis has adopted a strategy of regional reconnaissance, with offices (*sportelli tecnologici*) in Brindisi, Foggia, Lecce, Taranto, etc., and international reconnaissance, to which end it organizes conferences and takes part in numerous European programmes. But in general the Italian parks are still too recent in origin for any conclusions to be drawn about the effectiveness of their image at national level.

## **Conclusion to Part Three**

---

The parks and innovation centres are usually managed by small teams. Their primary task is to assist the enterprises that occupy or depend on the park in their development by providing them directly with services or advice but most often by putting them in touch with other partner organizations. This type of management calls for specific skills, which are not limited to the management of business services or property. This emerges in situations in which managers make overtures to enterprises and researchers in order to bring forth business start-up or technology-transfer projects. As some parks have clearly demonstrated, the establishment of contacts on the one hand and the financial and legal spadework involved in setting up projects on the other demand new management skills or a combination of existing skills. In either event, the quality of management of a park is a condition of its success.

In organizational terms, these operations often involve several partners - public authorities, chambers of industry and commerce and some enterprises. This situation generally results from the need to obtain funding from various sources rather than from any real strategic alliance among the partners.

The British science parks served as models for a long time. Their closeness to and their links with the universities set them apart from other business locations. It is evident today that, although links with one or more local universities are enshrined in the strategy of the park, these do not materialize to any great extent, not even in Britain, where analysis reveals that such links have been overrated. With the exception of the Louvain-la-Neuve park and perhaps San Raffaele, the European universities do not seem to regard the parks as components of their strategy. At best, the links that universities maintain with park businesses are expressed in their making university facilities available. The effect of cultural and financial obstacles must not, of course, be ignored, but universities often have no academic strategies relating to technological development, be it local or national.

Finally, the image of the science parks is positive. That is not surprising in the sense that their image benefits from their association with the latest technology and, in some countries, from the status accorded to the entrepreneurial class. Nevertheless, these images are sometimes window-dressing which obscures the real nature of such operations. High-profile promotion campaigns tend to exaggerate the reality of science parks and to overestimate their effectiveness. The enterprises which use these images to enhance their own image are the first to distinguish the wheat from the chaff.

In Part Four, we shall look at the added value created by the science parks and try to infer some hypotheses about their future.

*PART FOUR*

---

**ADDED VALUE,  
FUTURE PROSPECTS**

## **11. Added value of science parks**

---

In **Germany**, although no scientific evaluations or politically independent reviews have been carried out<sup>20</sup>, several factors seem to indicate that this situation will not last. On the one hand, the traditional costly ITB model cannot meet the expectations of the political authorities in the long run; on the other hand, even if the potential demand from predominantly technological enterprises were realized, it would still be insufficient to fill the existing parks.

We might well ask what really constitutes success for an ITB. If all the accommodation in a centre is occupied by factories belonging to major companies without any particular technological orientation and the centre provides around a thousand jobs, mainly in manufacturing, is it a failure or a success? Alternatively, in a rural region without a university, where unemployment runs at 25%, a centre housing the only three technological enterprises in the region guarantees their long-term survival and creates one job per enterprise every year; should that centre be considered a failure or a success?

One solution would consist in evaluating the situation and the orientation of companies in relation to the stated objectives of the centre management. Unfortunately, a definition of objectives in quantifiable terms is conspicuous by its absence.

It is certainly possible today to list simple data giving the number of companies and jobs and the amounts invested, but not to assess the added value which these data could represent by means of an objective method of comparison of the "with or without" type. A total of around 120 technology and science parks and centres can be found in Germany which fit our definition of an ITB. These sites accommodate 2200 enterprises with some 17 000 employees. The association of German technology centres, for its part, has 180 registered centres with 3700 enterprises and 28 000 jobs. According to the managers of these centres, success depends on the quality of the management team, the quality of the political strategy on which the structure is based and the opportunities to establish contacts with the universities and technical colleges.

Specialization in particular industries or areas of technology is the exception in Germany (Heidelberg and Osnabrück may be cited here, but no parks in the East). The risk of insufficient local demand seems to be far too great. In the place of such specialization we find a very wide range of R&D-orientated activities, in which the production of IT facilities and software predominates; but only one-third of the enterprises engage in R&D or in high-tech production.

In the **United Kingdom**, the assessment of added value brings us back to the question regarding the strategic aims of the partners involved in developing the park. These may be different and sometimes conflicting, like the aims of the promoter seeking a quick return on investments and those of the university which favours enterprises likely to conclude research contracts. The parks can only be evaluated on the basis of these different aims. Moreover, it is important to relate the assessment of the added value of science parks to their level of development. Whereas there were 20 000 people employed in science parks in the United Kingdom in 1993, the fact is that the active population of the UK amounts to 22 million

---

<sup>20</sup> H. Behrendt, H. Seeger, R. Sternberg, u C. Tamásy (forthcoming), *Superships, Subventionen und Synergien - eine empirische Wirkungsanalyse von Technologie- und Gründerzentren in Deutschland*. Dortmund, Dortmund Vertrieb für Bau- und Planungsliteratur.

people and includes almost three million unemployed. 20 000 jobs do not even represent a major part of the labour force in the high-tech sector; and besides, the jobs connected to the parks are not all in R&D - far from it. Lastly, it should be mentioned that a large number of these jobs are concentrated in the three biggest parks - Cambridge, Surrey and Warwick.

There is little in the way of local evaluation of science parks, and only two evaluations have been made of the parks studied here. Surrey conducted an evaluation, and Warwick University financed a global study of its economic impact which included the science park. There have, however, been numerous studies of science parks in the United Kingdom, either focusing on the parks and their successes or comparing companies inside and outside the parks. In all of these studies, points of comparison, or representative groups, are a constant problem, for two reasons:

- First of all, the science parks were launched at a time of important changes in the economy in general and in the world of science in particular. Links between universities and industry were growing, and not only in science parks; the park effect cannot be isolated. Furthermore, it is impossible to determine whether the growth in commercialization of research findings is linked to the cooperative capacity of the university or to an increase in industrial demand; moreover, studies of location motives reveal that conventional property criteria were paramount.
- Secondly, the parks attract enterprises that are already mature or have at least started up. This suggests a marked lack of added value; but this question ought to be kept separate from that of the growth of enterprises within the parks. Some fast-growing enterprises may have been attracted to the park in preference to other companies.
- Another point is that a large number of enterprises, some of the most dynamic as well as some of the least dynamic, have left the parks for a variety of reasons; it is also necessary to subtract from our figures the number of jobs resulting from university activities and public technological projects (initiatives) unless it can be proved that these projects came about because of the park.

Be that as it may, the conclusions of a recent study<sup>21</sup> covering the entire United Kingdom are worth reporting here. The study assesses the added value of science parks from a company perspective on the basis of five criteria:

- the survival rate of businesses; as far as independent enterprises are concerned, the same rate obtains inside and outside the parks, but companies that are part of larger concerns have a better survival rate outside the parks;
- employment growth in independent enterprises between 1986 and 1992 was higher in the science parks; 80% of enterprises in parks increased their manpower during that period, as against 46% outside parks, and the average number of additional jobs was twice as high inside the parks; these averages, however, do not properly reflect the fact that the bulk of this growth was concentrated in a small number of enterprises;
- location in a science park has no effect on the overall financial performance of independent businesses, but their turnover seems to benefit from location in a park;

---

<sup>21</sup> P. Westhead and D. Storey: *An assessment of firms located on and off science parks in the United Kingdom*. HMSO, London, 1994.

- the technological quality of enterprises: there is no difference in the number of vocational training qualifications and degrees between comparable on-park and off-park companies, but the levels of qualification (of management and staff) are higher in scientific enterprises;
- links with the local university: the difference lies above all in the use of university facilities (library) and recruitment; for both on-park and off-park firms, such links have grown over the years, but there is still a "latent" demand for better contacts among the majority of entrepreneurs; enterprises in parks are no better informed than other firms about research conducted at the university.

In France, on the initiative of the *France Technopoles* association, the evaluation of science parks has resulted in several types of work:

- Statistical analyses, the aim of which was to identify the activities carried out in the parks and to quantify the jobs involved, the area occupied, etc. At the end of 1993,<sup>22</sup> *France Technopoles* surveyed 15 multi-site technopolis complexes, 26 single technopolis sites and three networked technopolis structures. This sample covered more than 50 science parks, 50 technology parks and 60 business incubators. The parks housed 3664 enterprises with 84 000 employees. The incubators accommodated 1265 enterprises with 5500 employees.
- Satisfaction analyses of the enterprises present in the parks. A survey was conducted by *France Technopoles*, with the aid of the University of Lyon II, among 471 enterprises located in the parks of 26 technopolis companies belonging to the national association. This survey showed that "*the highest expectation of firms with regard to a technopolis concerns location sites. Help in promoting the firm is the second expectation. Contacts between companies is the third expectation. In this domain, there seems as yet to be little satisfaction with the package of "services" offered by the technopolis. As regards links with the university and research centres, satisfaction levels are average.*".<sup>23</sup>
- Analyses designed to identify empirically the value added by technopolis sites. These analyses are based on the hypothesis that technopolis operations are experimental by nature and indeed genuinely innovative in some cases. It is a matter of pinpointing innovations in terms of organization and methodology effected by technopolis structures in the sphere of public/private partnerships, technology transfer, promotion of on-site activities, business start-ups, urban development, etc. These analyses have revealed the existence of original approaches, such as those which seek to catalogue all the scientific and technological resources in the sphere of influence of the technopolis, as well as project consultancy services which match requests by technopolis businesses relating to innovation or technological development with local sources offering expert appraisals and public and private funding. These connections are made in the framework of development projects within enterprises. In more general terms, such consultancy can also relate to the creation of public research centres, technology-transfer centres, etc., for which money and expertise is required from various public or private partners. Since technopolis operations are directed by local authorities, such centres are created on the initiative of the public operator. In this case, a technopolis would have an indirect effect on the technological development climate for companies.

<sup>22</sup> These figures are currently being updated.

<sup>23</sup> Cf. conclusions of the first analytical report on the survey *Entreprises et technopoles*, presented in Marseilles on 1 and 2 December 1994.

The Greek parks are still in their infancy. Nevertheless, the central government assumes responsibility for evaluating projects in each phase of their development. Thus the Thessaloniki park was evaluated on completion of the building work, when decisions had to be taken on new financing to continue the building programme parallel to the leasing of the first units. In addition, the region was selected as one of the four Objective 1 regions for the regional technological planning programme administered by Directorate-General XVI, and the park will coordinate the programme. There seemed to be no other organization that could have coordinated the project, which is seen locally as recognition of the park's capabilities. The development of the parks in Greece is based on a quite different rationale to that which normally prevails in Europe in so far as the Greek parks have to demonstrate that industrial R&D is important to the economy. Thessaloniki is an example of an industrial city in which the university still remains distant from the world of business and its preoccupations.

In the Netherlands, the commercialization of technology developed by the universities is the paramount aim of the science parks. If this aim is to be achieved, the traditional barriers to technology transfer must be lifted. Foremost among these are the weakness of the universities' potential to capitalize on research and their resistance to the secondment of university staff for assignments of a commercial nature. As for the parks, they would have to improve their provision of accommodation for spin-off activities with due regard to local competition, to target enterprises more effectively and to adhere to their selection criteria in the longer term.

The comparative study of Groningen and Enschede allows us to conclude that a situation on the periphery of the country's main economic centres does not constitute a significant handicap and, at the very least, that any disadvantages may be overcome by means of rigorous organization. According to the firms surveyed in the two parks, an average of 30% of their activity relates to R&D. The more exclusive services account for almost half of the enterprises in the Twente park in Enschede but only 10% of those in Groningen. Three sites are specialized: Zernicke and Leiden in biotechnology and medical equipment and Wageningen in agricultural science. Groningen is also preparing to launch a medical park attached to the local Academic Hospital.

When the park managers were asked about the recipe for success, the following factors emerged:

- In the case of Groningen, special emphasis was placed on local resources in terms of research establishments, a full-time management team and good transport links. Less importance was felt to attach to cultural facilities, subsidies granted to the park and its enterprises and local development policy.
- In the case of Enschede, a strong institutional environment was considered to be more of a determinant factor in a park's success than subsidies or geographical proximity of markets.

In Denmark, links with local researchers and transport systems, as well as the presence of a full-time director with appropriate qualifications, availability of venture capital in the region and a favourable institutional environment are considered to be important success factors. The geographical proximity of customers and leisure and cultural facilities are least important. As in the Netherlands and Germany (but unlike the United Kingdom), the "park" image in the sense of a green landscape was not very strongly emphasized.

With the exception of the Roskilde Centre for Advanced Technology, which specializes in nuclear research, specialization does not occur in the Danish science parks. None the less, in Copenhagen there has been a significant increase in the number of businesses from the medical technology and biotechnology sectors, and if this trend continues the park could effectively become specialized.

As far as the Symbion park management are concerned, every scientist integrated into the economy counts, so every scientist who manages to start a business with the aid of a science park is, *a fortiori*, important to the local economy. In this respect at least, the Symbion park has created added value; before it was established, prospective businesses in the Copenhagen region did not have appropriate support or premises to launch their ventures.

In Spain, the situation is highly diverse in terms of the roles played by the individual parks. According to various observers, the Cartuja park in Seville is experiencing development problems. Several experts, including Manuel Castells, have criticized the substance of the project. Even if we bear in mind that the operation is very new and that most of the institutions have not yet set up their offices, it has to be recognized that the first enterprises do not meet the original criteria (R&D and innovation). The complexity of the property structure, and perhaps promotion errors which left the park with a slightly backward image, ensured that the venture would not bring immediate success. Nevertheless, the park enjoys an exceptional setting, and it seems premature to write off the operation. The difficulties relating to its title are symptomatic of this hesitant approach. The park has been successively called "medium of scientific and technological innovation", "science and technology park" and finally "Cartuja Tecnopolis 93". Present strategy is focused on a single goal of 50% occupation by the end of 1995. According to the manager, the rate of occupation is likely to grow more rapidly than in the other parks. There are also plans to launch a centre devoted to energy matters and probably to develop a specialization in agricultural biology. An incubator is also planned to complement the one that already exists in Seville.

By comparison, Zamudio, in the Basque Country, looks like a programme that has come to fruition, well integrated into the fabric of regional technology policy. In the view of its management, the park is a venture that can only prove its worth in the long term. It cannot be expected to yield short-term results, particularly in terms of an impact on local employment. The scheduled extension (construction of two buildings with a total surface area of 18 000 square metres and development of more land) ought, in the view of its management team, to cover demand until 1998.

At Vallès, near Barcelona, the park is fairly large (65 enterprises employing 1300 people), but its impact is difficult to assess. There is no university or public research centre on the site, only in the surrounding area, and the park offers no technical services. The location in the park gives large and medium-sized enterprises no advantage over nearby companies. In that respect, Vallès is more of an upmarket industrial estate than a technology park in the true sense of the term. Although there are plans to double the surface area in the near future, the park has no ambition to enhance the regional technological and industrial system. And yet the area possesses a wealth of academic and industrial potential: a conurbation of three million inhabitants, five universities and a considerable range of services. It is obvious that the park enterprises cannot only be linked to the institutions and companies within the park boundaries and that the success of the park does not derive solely from its intrinsic qualities. In the future, it may be desirable to integrate Vallès into a strategy of the "Barcelona Technopolis" type, which would coordinate a variety of centres.

The future of the Boecillo park will involve strengthening the links between industry and university by creating new technology centres. Eight enterprises and three research centres should have erected their buildings in the park by the end of 1995, which will enable it to achieve an occupation rate of 45%. It is



also hoped to have two enterprises in the building that is available for rent and around ten in the Business and Innovation Centre.

In Portugal, it is still too early to talk of added value in the conventional sense. On the other hand, a real learning process has taken place among local political institutions with regard to the development rationales that underlie technology parks.

In Italy, if we examine the added value of the operations carried out by Genova Ricerche, it emerges that innovative products were created, including a dual-energy bus (thermal and electric power), research consultancy offices were opened in the fields of oceanic research, information technology, etc. What lesson is to be learned from the demise of that structure? When the large founding companies found themselves in difficulty, they hesitated to reinvest in a structure that would only yield a return on investment in the long term. At San Raffaele, the links between the various public research centres and private laboratories that make up the park are difficult to evaluate. At all events, apart from the pharmaceuticals group Roche, there seems to be little interaction between tenant companies. In Trieste at the end of 1994 there were 700 people employed in the park in 20 research centres and SMEs; the average age of these employees was low (less than 30). There are now more businesses than research centres. Several ventures have located there from the university (e.g. Poly Bios).

Between 1989 and 1993, a total of 330 projects were studied at the TCNO technopolis in Bari. Of these projects, 664% were conceived by technicians or managers of existing companies, 107% by companies, 92% by lecturers and researchers and 137% by students. These projects led to the creation of 17 new small enterprises. More recently, the TCNO has applied for support under the Sprint programme to enable it to design and implement a global evaluation method.

## **12. Future prospects for the parks**

---

In Germany, certain general trends can be identified:

- More and more ITBs will be created, combining incubators and a technology park, so that developing businesses can be accommodated near their incubator premises.
- A growing number of centres are seeking to free themselves from dependence on public subsidies by increasing the percentage of their income that comes from the provision of services to off-site customers. To that end they will have to make considerable improvements in the quality of their consultancy-type services.
- Finally, the operations in East Germany are entering into partnerships with new science parks in Eastern Europe in order to assist these countries in their transition to the market economy.

As in other European countries, it seems that the high-tech boom of the eighties has come to an end in Germany. ITB managers and politicians are gradually coming to realize that the regional high-tech business potential cannot fill every centre in the long term. The focus on technology will have to be replaced by a focus on innovation, especially in East Germany.

We can suggest two future scenarios:

- The parks' target group may be enlarged, either to all businesses starting up or to all high-tech enterprises. In either case, the majority of parks would have to change their name, which, unfortunately, is unimaginable. If this scenario materialized, the number of parks could be the same or even higher.
- In the second illustrative case, the target group would remain the new high-tech enterprises, and this selection criterion would be strictly applied. The number of parks would be considerably reduced, since the supply of business premises would far exceed demand. Even now in East Germany there is clearly a large amount of industrial land available, surpassing local demand in many regions.

As for the United Kingdom and Ireland, national and local policies have generally switched the focus of their interest from science parks to other forms of property development; but there are new parks currently being launched on the initiative of private promoters or research bodies.

Most universities in a position to set up a science park have done so, and some of these are still growing. Today it is the public research centres that are adopting the same strategy. Threatened by privatization and forced to become more self-financing at a time when contracts from the private sector are difficult to obtain, many are trying to find new sources of income in their landholdings. These landholdings, generally quite large and situated in rural areas, benefit from an institutional climate that favours the development of property operations on a modest scale. But the promise of technology transfers could prove even more illusory than in the case of the universities.

For the latter, the current trends were analysed in a publication compiled by CURDS on behalf of the Committee of Vice-Chancellors and Principals (CVCP). Technology transfer appears there as one element in a far wider involvement of universities in their local environment. While research contracts remain essential to the most research-orientated universities, they are mostly concluded with public and extraterritorial bodies. In addition the universities receive European (Structural Funds) and regional (Single Regeneration Budgets) financing, of which only a very small amount is allocated to the science parks.

The recession of the late eighties and early nineties led to the emergence of new imperatives, namely the renovation and construction of teaching buildings and student accommodation; new programmes were launched to channel private and public investments into these priority tasks. In this context the science parks constitute marginal developments at best and in many cases are regarded as pointless distractions.

This fairly adverse situation contrasts with the growing interest in science parks in countries such as Greece, where they constitute a national mechanism for the development of regional infrastructures.

The French technopolis ventures are at the crossroads. On the one hand, there is a serious danger that the technology parks will lose their special character because of the problems involved in marketing them, which result in the operations becoming less selective than was initially envisaged. On the other hand, the experiments initiated here and there in the realm of urban site development and in the encouragement of exchanges between research and business are recognized as interesting but are not yet numerous enough to be significant.

Moreover, by virtue of the scientific and technological resources that the technopolis organizations wish to put into the local plan, they expect central government and its external services to show understanding and to find new assistance mechanisms, which the latter are not always inclined to do since the technopolis ventures sometimes lack credibility. Although DATAR<sup>24</sup> is following the development of this phenomenon attentively, having initiated a dialogue and evaluation measures with the *France Technopoles* association, the other main administrative bodies still remain wary. Nobody can deny that the technopolis organizations need to increase their credibility and in particular to gain the respect of a greater number of enterprises.<sup>25</sup>

Being the result of local initiatives, the *technopoles* also have to furnish proof of their added value in environments in which many public bodies and trade corporations become involved in technology transfer. The challenge for the technopolis ideal is perhaps to move out of the rarefied world of high-tech SMEs and to organize local areas into their functional components - the total of the existing instruments and skills - and their physical components - the science and technology parks and the location of transfer centres - so that they can instigate, monitor and promote the technological modernization of enterprises and the development of innovation in local businesses. Time will tell whether the *technopoles* are to be the key players in this transformation.

In Belgium, the question of the future of the analysed parks presents itself in various different forms. The Brussels technopolis will have to weave the various technological specializations in the capital into a complex institutional tapestry featuring a predominance of registered offices of companies with no territorial involvement. The management of the Antwerp incubator wish to stabilize their operation and make it pay its way before moving on to create a technology park. Since Louvain-la-Neuve is a city of

---

<sup>24</sup> DATAR = *Délégation à l'aménagement du territoire et à l'action régionale* (Commission for Regional Planning and Action)

<sup>25</sup> In fact, the science parks, by selecting their clientele, only deal with an élite set of companies

science, the future of the park is linked in part to that of the university. The reputation of the Catholic University of Louvain is well established in Belgium and in the rest of Europe too. While it wishes to consolidate its centres of excellence, it also intends to promote the development of interdisciplinary research. Those in charge of the university's R&D unit want their park to be more selective about its enterprises in view of the decreasing availability of marketable space. An ambitious research policy and selection of businesses therefore go hand in hand.

In Denmark, to judge by an evaluation of Danish science and technology policies compiled by the OECD, the number of enterprises using science parks is insufficient. An independent body would have to conduct an audit of the parks to determine whether their activities ought to be broadened on the present basis or whether they should be altered to enable a greater number of enterprises to benefit from them.

Only a tiny percentage (far lower than in Germany, for instance) of the 15 000 businesses created each year are predominantly technological in nature. The handful of science parks has not been able to solve this problem, which is related to the lack of start-up funding in the country; recent legislation may improve the situation.

The management of the Symbion park is trying to extend the science-park model from one building into an entire district of Copenhagen comprising research institutes, university campuses, new businesses and large enterprises with high levels of R&D activity. This scenario seems rather unrealistic in the present financial climate and in the light of current urban-planning philosophy. Strengthening the functions of the park as the sole gateway to economic activity in the region would perhaps be a simpler objective in the short term. Moreover, the park could benefit from the foreseeable economic recovery in the Oresund region, which covers part of Denmark (around Copenhagen) and part of Sweden (around Lund and including IDEON, northern Europe's largest science park). The improvements that are now under way in transport links between the two parts of Oresund should permit a greater amount of communication between students, inhabitants and enterprises of the two countries.

As in other European countries, the growth of science parks in the Netherlands is limited by the small number of enterprises eligible for location and by the shortage of potential entrepreneurs who are qualified in science and technology. According to most park managers, the present supply of accommodation will suffice for many years to come. However, if other research institutions besides universities involve themselves in this approach, it is conceivable that the number of parks may grow, provided that centres of specialization are developed.

In Portugal, according to the managing director of Uninova, the park is now entering a development phase. The technological infrastructure of the Uninova centres is of a very high quality, thanks to the funding it has secured. Uninova and Taguspark should be welcoming their first enterprises in 1995. An improved system of coordination among the political decision-makers is imminent, which should enable each park to play a specialized role - Uninova as the small science park, Taguspark as a site for multinationals and finally Lispolis as a type of macroincubator for the metropolis of Lisbon. Lispolis is deadlocked for the time being as the result of a dispute with INETI over land management. At all events, the experts agree that these projects will inevitably become rivals, at least in the bid to attract SMEs. A great deal of uncertainty prevails as to whether sufficient demand (projects and entrepreneurs) will be forthcoming and whether these operations will be sustainable when the European funds eventually run dry.

It is certainly still too soon to identify the collective concerns about the future among the Italian science parks. In Genoa, after the attempt by Genova Ricerche to establish links between the major enterprises and research bodies in order to promote the development of products with a high added value in terms of

innovation, the region of Liguria, the Genoa chamber of commerce and the university, with the aid of the European Community, are trying to create a park "without walls", with no predefined location. This operation, launched in 1995, sees its aim as helping those regional SMEs which are hatching projects to find the financial and technological resources to bring them to fruition. Ten thematic categories, corresponding to various sectors of activity, have been identified from surveys: the farm-produce industry in the Imperia province, marine equipment and shipbuilding in La Spezia, etc. At San Raffaele, the aims are to reinforce the park's specialization in research areas of direct interest to the hospital and to assist in the creation of SMEs, especially in the domains of gene therapy and biomedicine. In Trieste, the management of the Area park hope that the research focus created in this way will attract enterprises from the private sector. This operation is confronted today with the difficulty of switching from a philosophy of public facilities to that of private-sector development at a time when connections with large companies have not yet been firmly established. In Bari, the ambitious aim of the TCNO is to be "*an enterprise that generates enterprises*" on the basis of the facilities and skills that new businesses need in order to emerge and grow. The ultimate aim is to create a technological district in the form of clusters of technological enterprises. The TCNO will thus become a tool for assembling metropolitan *technopoles* in which partnerships and interactions will be the ingredients needed to sustain the processes of economic and technological development.

Finally, let us recall that in 1994 the Ministry of Universities and Scientific Research decided in favour of the creation or development of 13 science parks in central and southern Italy. The principles guiding the project and the selection of sites are the following:

- One project should be devised per region for the creation of a main park to coordinate the other regional parks.
- Cooperation with the private sector and private funding should be sought.
- The feasibility studies should draw inspiration from the existing parks.
- Local research should be the starting-point of the park project.
- The park project should benefit the entire body of regional enterprises.

## **General conclusion**

---

In what ways can the European science parks and related structures serve as keys to a Community policy on innovation? Can the parks be instruments of such policy? Can the European dimension become a relevant dimension, recognized as such, in the realm of innovation?

The 39 operations analysed in this report show that, although they were originally launched with the aim of creating tangible and intangible conditions beneficial to small technological enterprises or associated activities, this aim has only been partly achieved. Nevertheless, these projects, with their aims and methods, should be reconsidered today in the context of the general movement to create technological activities, for which purpose numerous public and private bodies are becoming involved at local, regional, national and European levels. So what is to become of the parks in this new situation? Are they pointless distractions, or can they make an original contribution to this general economic transformation?

In their role as immovable property, the parks only interest their promoters as marketable assets and enterprises as desirable addresses, so their contribution to the general transformation of the economy in this role is bound to be limited. These so-called high-tech centres, precisely because they are isolated, run the risk of becoming ghettos. On the other hand, as the report has shown, the geographical proximity of enterprises to research activities is no guarantee that links will be formed between them. It is certainly true that not all of the opportunities offered by such proximity have been explored; at any rate, the European science parks all too often remain hotbeds of concentrated technological activity without generating any great synergetic effects.

No, the geographical or property dimension is not the most interesting feature of the science-park phenomenon; the contacts established by the parks between entrepreneurs and researchers, lecturers and various experts from the public and private sectors are far more promising. Now in the majority of the parks we examined, this latter dimension is present, sometimes as a central feature, sometimes in embryonic form. This establishment of contacts serves to identify experts, as well as technical and financial resources, that are available locally or outside the local area, but also to pinpoint where these are lacking and perhaps need to be created.<sup>26</sup> Contact is sometimes established by activating existing structures, in which case the park becomes a sort of *networking agent* for people and resources.

Even if one were to wager on the capacity of the parks to develop by benefiting from this ability to establish contacts, various questions nevertheless remain to be asked.

First of all, if the parks are operations in which local or national public bodies are totally or partly involved (cf. the German ITBs), do they represent sustainable and viable strategies for the public authorities and, above all, to what ends? In this sphere, fashion or imitation have all too frequently obscured the absence of a strategy. Consequently, if private investors with an interest in technological innovation do not involve themselves in these operations, is that a sign that they are of no economic interest or that they are too risky

---

<sup>26</sup> This is especially true of the countries of southern Europe, which is not to say that the local areas of northern Europe always possess all the economic and technological know-how required for their development.

or too uncertain? However that may be, the public/private relationship that currently prevails in the parks is not a stable and effective relationship in economic terms. Both from the point of view of the public interest and in conformity with the logic that governs private investments, science parks will have to be regarded in future as investments. Conclusions will therefore have to be drawn with regard to professionalism and efficiency.

Secondly, should parks base their development on sites? Our interest in the parks' go-between function is reflected in the way in which enterprises, especially SMEs, use external resources in order to introduce technological innovations and, in fact, ask for such contacts to be established. For all that, we shall not opt for a dematerialization of the parks or associated structures in favour of virtual operations or operations based on computerized telecommunications networks. On the contrary, we believe that the innovation processes call for physical spaces, special environments where knowledge and skills are created and from whence they flow. As far as scientific knowledge is concerned, the great European universities took decades, and indeed centuries, to create such places. And if this spatial dimension is not exploited as it could be by parks today, it is because of the continued existence of organizational and cultural barriers between the worlds of research and business on the one hand and the way in which the geographical location of these organizations in a town or urban area are conceived on the other hand. A majority of urban planners and architects replicate in this way the divisions that exist in people's minds and ways of working. In this respect, although telecommunication networks may be indispensable as a means of circulating information in physical terms, they will not replace these anchorage points which we consider necessary, not only to life in general but to the innovation economy in particular. Certainly, if this spatial dimension is to be achieved, this will have to be done in a context in which the parks wield real economic influence, as referred to above.

Besides, how can the organization of the parks develop? The parks and associated structures, in their endeavour to establish contacts between players, often adapt traditional forms of organization (foundations, mixed companies, consortia, etc.) for a project that demands new approaches. In fact, if we take businesses as an example, the link between innovation projects and organizational innovation has long been recognized. Consequently, if the parks wish to strengthen their capacity to create genuine added value for businesses, organizational innovations will have to be effected, especially in the way they link their various component parts.

What new element can the parks bring to the innovation economy? Whereas the parks have focused their action on the technological SMEs and technology transfer, there are new challenges to be faced today. It is a matter of making European economies competitive in their entirety and not just in their centres of excellence, of coping with change, some of which has resulted from technological innovation, and finally of employing and training people. The problems associated with the modernization of our systems are becoming globalized. In the face of these new concerns, the new element that the parks can contribute lies in the association they are trying to create between establishing contacts among operators and institutions and the development of sites, of locations - sometimes a single building will suffice. How can the local territory, as well as the territorial entity that results from the establishment of contacts between businesses and researchers, help to generate innovations? This is one of the specific questions introduced by the parks.

Finally, what role should Europe be expected to play in this context? As we have shown, Europe is rich in terms of the diversity of its parks and the commitment of their promoters and managers. This phenomenon should be considered as an evolving process, even if certain experiments sometimes appear to be leading nowhere. But how can Europe become a reference territory in this movement composed of strong local and national elements?

In this area, we have to reason in terms of supply and demand. In the course of this study, a park manager revealed his expectations of Europe when he voiced this concern: *"How can Europe help my researchers and my businesses to inject dynamism into the technopolis ideal of exchanges and development projects? What does Europe give me by comparison with other organizations?"* For managers of such operations, Europe will exist when it is perceived as a partner, consistent in its actions and contributing real added value to locally conceived projects. For the time being, because of its various different ways of proceeding, Europe is all too often regarded as a bank.

And so any policy for the promotion of innovation that Europe adopts must take account of the needs of the moment - but also the emerging needs - of the various existing or planned science parks and associated structures.

What is also expected of Europe - and this highlights the supply side - is that it defines future prospects, as well as the general framework in which these local microstrategies are to take place, in terms of competitiveness and technological progress vis-à-vis our main competitors. Equally, it is expected to make use of the wide range of local and national experiences in order to enrich every one of the park operations. Finally, just as parks do in many cases at local level, Europe is expected to mobilize initiative and imagination in the various parts of the European continent in pursuit of its own aims.



