SCIENCE PARK NETWORKS

A report to the European Commission

Volume Two continued

Segal Quince Wicksteed Limited

economic and management consultants

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LUXEMBOURG

EXECUTIVE SUMMARY

LUXEMBOURG

1 The area of iron and steel industry common to Luxembourg, Belgium and France has lost more than 20,000 employees over 20 years. The European Development Pole (EDP) programmed financed by the three governments and the European Community was created in 1985 for the reconversion of the area, to attract new industrial investment and to organize regional development. The purpose is to create 8,000 jobs in 10 years. At the last evaluation, 2,700 jobs have been created (1,500 in France, 1,000 in Belgium, 200 in Luxembourg), and a further 4,500 are planned.

2 Telecommunications was one of the first areas of development in the EDP. Firms in the area are generally connected for data transmission with their headquarters by private lines. A critical issue remains: it is still necessary to get through the international lines to contact other parts of the area! The difficulty is in managing the different standards and strategies of national telecommunications operators.

PORTUGAL

Chapter One

INTRODUCTION

1.1 The science park movement, which originated in the United States in the 1950s, is premised on the hypothesis that advanced technology is the key to industrial regeneration. In facing the challenge of convergence, Portugal has accepted this hypothesis and invested heavily in its RTD system and, as part of that investment, has recently joined the science park movement with four planned science parks in Lisbon and Porto.

1.2 Science parks are designed to play a role appropriate to the needs and characteristics of their region. They provide axes of innovation support to link local actors with each other as well as with other innovation communities elsewhere in their country and abroad. Telematics could play a role in assisting the development of such linkages. In this study, Segal Quince Wicksteed Ltd and INESC were asked to review the development of science parks and business innovation centres in Portugal, consider their networking and communication needs and identify possible lines of action.

1.3 This report is structured as follows. Chapter two provides an overview of the current Portuguese context in which these science parks are developing. Chapter three considers the Lisbon metropolitan area, where a cluster of three science parks is developing. In Chapter four, the Porto region is reviewed; Porto is hosting a tri-pole science park project. Finally, conclusions and recommendations are presented for Portugal in Chapter five.

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Chapter Two

COUNTRY OVERVIEW

2.1 Portugal is one of the periphery countries of the Community, which it joined in 1986. It has 10.5 million inhabitants and, like Greece and Ireland, has Objective 1 status as a Less Favoured Region within the Community. There are two significant conurbations - Lisbon and Porto - which represent most of the industrial activity and a substantial proportion of the population in Portugal. Most economic strategy and policy is decided at the national level, directed from the centre of government in Lisbon, and thus it is essential to understand the national framework in which these science parks are developing.

2.2 Strength in trade was developed at the expense of industrialisation in Portugal. Centuries of development have been based on the Portuguese flair for exploiting comparative advantage across the world which was premised on unequal trading positions. Entry into the European Community is forcing Portugal to compete with equal and stronger trading partners and therefore to develop their internal potential for production and services.

2.3 While international trade and travel have been a cornerstone of Portuguese development, the Portuguese themselves remain quite parochial in their outlook and in their politics. This feature was identified in 1992 as the "real stake for Portugal . . . the passage from a closed society to a society which is more open to the outside."[1] It is a feature which has influenced economic development, RTD and innovation policies, and cohesion with the more advanced economies in Europe.

Current economic development

2.4 In 1990, Portugal had the lowest GDP per capita in the Community (4,465 ECU compared with an EC average of 13,339 ECU). Greece, which was its closest comparator, had a GDP per capita of 5,170 ECU.

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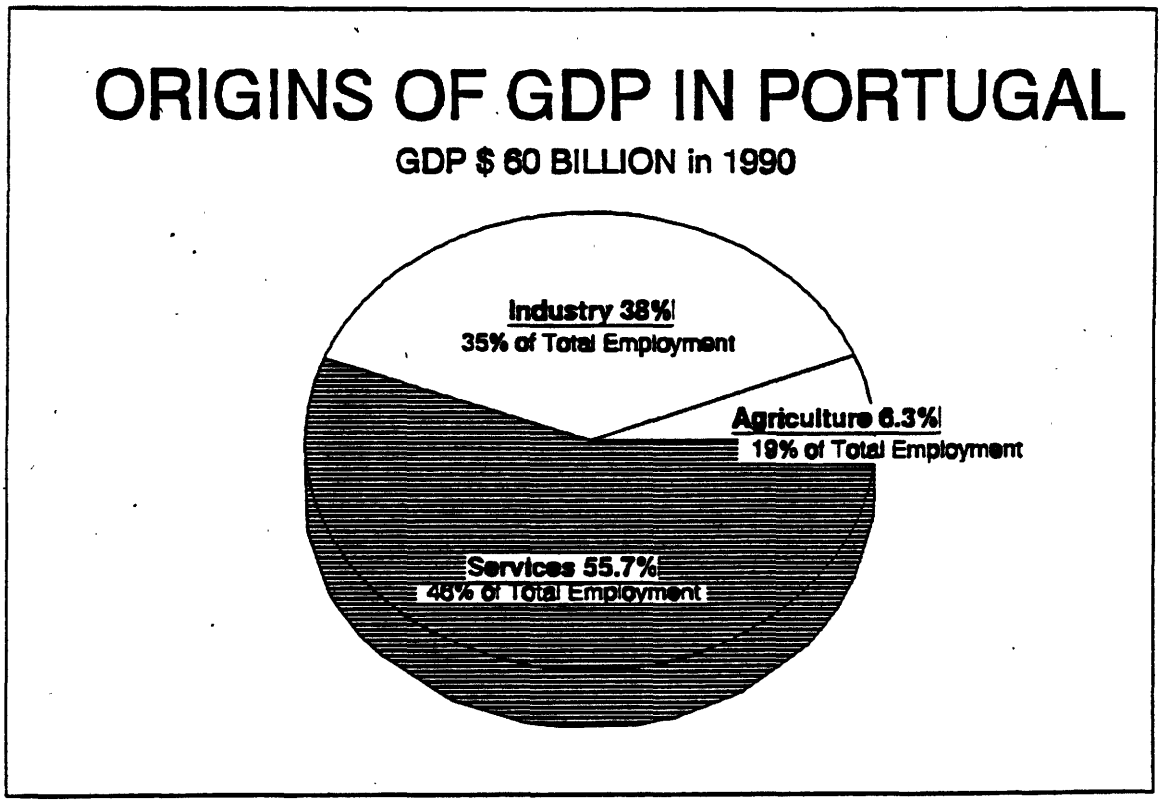
[1] "Portugal: Shaping Factors", The European Challenges Post-1992, p 377.

2.5 Total exports in 1990 were valued at 12.8 billion ECU. Principal exports were: textiles, clothing and footwear (38%), machinery and transport equipment (20%), forest products (13%), foodstuffs (7%) and chemicals and plastics (6%). Germany, France and Spain are the largest markets for Portuguese exports.

Macroeconomic conditions

2.6 Portugal suffers from relatively high inflation (6% consumer price inflation in 1993), which puts it in the broad band of the ERM. Thus, very high real interest rates prevail. Discussions with SMEs in Portugal reveal interest rates of over 20% and difficult lending conditions. The forecast is that bank interest rates will fall drastically when capital movements across the EC are freed up towards the end of 1995.

Figure 1



2.7 There is relatively low unemployment in Portugal (5% in 1991) compared with other Less Favoured Regions (LFRs). Hidden unemployment is highly significant, leading to some future concerns.

2.8 Portugal has a relatively low cost of labour in Europe. The difference in wages between Portugal and the EC average in 1992 was 1: 4. However, a key issue for the policy makers presently is the erosion over time of this differential, due in part to the free mobility of labour in the EC and the continued growth and development of Portuguese industry. If the wage rate rises too quickly, it may stimulate higher inflation and limit job growth across the country through more capital intensive production. Furthermore, unless Portuguese exporters can switch to higher value added products and services, higher wages will erode their competitive advantage.

Industrial composition

2.9 Small and medium size enterprises (SMEs) - which here refer to companies with less than 500 employees and 6 MECU in turnover - represent the great majority of Portuguese companies. Furthermore, there is relatively high proportion of micro firms, generally family owned businesses, with less than fifty employees.

2.10 Services is the largest and most dynamic sector of the Portuguese economy. Since 1980, the sector has grown as a share of GDP from 51% to 60%.

2.11 Agriculture represents a declining share of the economy, contributing 11% of GDP in 1980 and only 7% in 1990. This sector has many structural problems - in the North, it is characterised by small, inefficient farms while the South and Centre have larger scale farming which is more mechanised and internationally competitive. The CAP has led to the development of intensive cereal and animal production but a neglect of vegetable and fruit production (where Portuguese comparative advantages lie).

2.12 Industry did not enjoyed strong development in the 1980s. It declined as a proportion of GDP from 38% to only 33% although it maintains roughly the same share in employment (28% of total employment). This sector is characterised by mature, labour intensive production. Low productivity is a dominant feature. So-called high tech sectors (fine chemicals, equipment goods, office equipment, electronics, transport machinery and precision equipment) did not expand as a share of GDP over the 1980s and only represented 14% of total output and 15% of employment in 1988.

2.13 Portuguese industry has become regionally specialised over the years. Textiles, footwear and forestry products are located in the North. Cork is found south of Oporto and south of Lisbon. Ceramics, plastic mouldings and part of the chemicals industry is found in the coastal centre. Equipment goods and machines tools industries are located in Oporto itself. Lisbon is a services-based economy, although part of the chemicals sector is located in the southern part of the greater metropolitan area.

2.14 Foreign direct investment (FDI) is seen more and more as a key to Portuguese diversification. Generally, FDI has been concentrated into the services sector - banking, tourism, distribution and property. Spain has taken a strong interest in investing in Portugal; it was the first destination country for its FDI and is the third largest investor in Portugal.

Trade

2.15 Portuguese exports were valued at 27% of GDP in 1990, whereas imports were valued at 42%. The strongest export sectors are textiles (27% of all exports), equipment goods (12%), shoes (8%) and pulp (6%). Key imports are equipment goods (23% of imports), transportation goods and materials (13%), food products (10%) and energy products (9%).

2.16 Leading export sectors developed in the 1960s through the attraction of low wages and these companies developed as processing centres or subcontractors. As a result, these industrialists never developed real understanding of or control over the markets. These sectors are currently at risk because (1) they cannot adapt as quickly as the Northern economies to the rapidly segmenting global markets and (2) other developing countries are able to offer lower cost production and have greater access to the EC markets. As a result, substantially more entrepreneurs are interested investing in the former colonies than in Europe.

2.17 Exchange rate policy is determined through Portugal's participation in the EMS. Although maintaining parity with other EC currencies has positive impacts for local economy (price stability, cheaper imports) it provides another challenge for exporters, which in the past were previously kept competitive through a devaluation process. In fact, these tough conditions may encourage exporters to move to higher value products and technological modernisation.

Structural funds - the PEDIP programme

2.18 PEDIP was the largest of the programmes financed by the Community at 2.35 billion ECU.[2] Disbursed over five years (1988-1992), its objectives were to:

- revitalise the existing industrial base
- create and develop new industries of greater technological potential
- to diminish and eliminate comparative structural disadvantages.

2.19 PEDIP was a wide ranging programme, the effects of which will now be scrutinized through a formal evaluation. Impressions are that PEDIP has had limited impact on the modernization of traditional sectors and has failed to stimulate significant investment in diversification. However, there have been actions within the programme which have been well received and are considered to be successful. The technology transfer centres established under PEDIP are an example of localised success.

2.20 At the time of writing, the PEDIP II programme has been approved and is now being worked out by the Ministry of Industry and Energy and other interested agencies. The focus of PEDIP II will be to address development of technological infrastructure, human resources, natural resources, and special actions to support industrial clusters as well as the development of market niches in precision mechanics, optoelectronics, IT, and eco-industry.

Porter Report

2.21 The philosophy of PEDIP II has been informed by the study currently being conducted by the Monitor Group, also known as the Porter Report. This 1.6 million ECU study currently being completed will suggest an economic strategy for Portugal. Early indications are that the Report will encourage further development and support of existing clusters of strength, such as textiles, cork, leather goods and automotive components.

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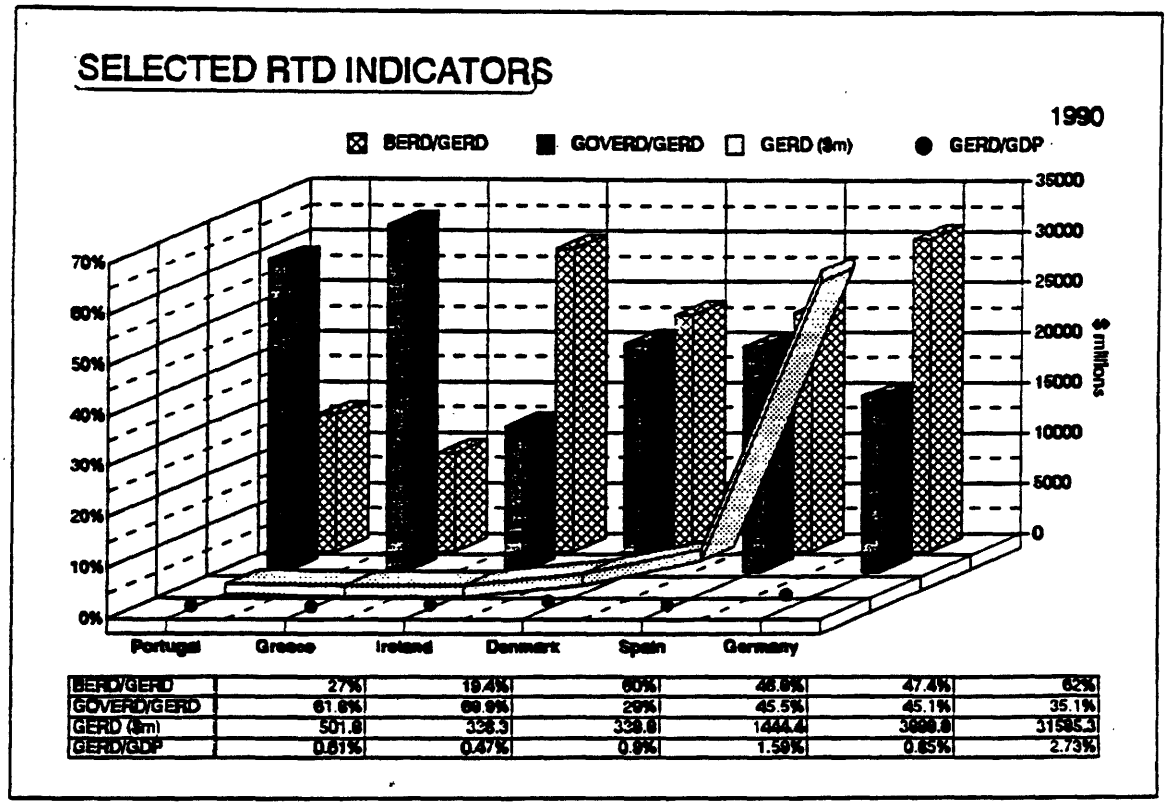
[2] 1988 constant prices.

Characteristics of RTD in Portugal

2.22 Portugal is one of the weakest countries in Europe in the area of research, technology and development. Less than one percent of GDP (.6% in 1990) is spent on RTD, compared to 2.73% in Germany and 1.59% in Denmark. (see figure 2) The Community average of number of research workers is four times as high as the Portuguese average. The statistics for citations and the technology balance of payments also describe a weak RTD capacity in Portugal

2.23 However, there has been a great deal of progress made since Portugal's entry into the EC, and within Portugal there are several centres of excellence which are internationally recognised. Through the national funding programmes, significant investment in the supply side of RTD has been made. GERD rose from 62.5 million ECU in 1984 to 287.5 million ECU in 1990. The number of research workers rose from 9,267 in 1984 to 12,042 in 1990.

Figure 2



BERD/GERD	27%	19.4%	60%	48.6%	47.4%	62%
GOVERD/GERD	61.6%	69.9%	29%	45.5%	45.1%	35.1%
GERD ($m)	501.8	336.3	338.8	1444.4	3888.8	31585.3
GERD/GDP	0.61%	0.47%	0.9%	1.59%	0.65%	2.73%

RTD policy in Portugal

2.24 Science and technology policy falls under the political responsibility of the Secretary of State for Science and Technology (Secretaria de Estado da Ciencia e Tecnologia) which is part of the Ministry of Planning and Regional Development. Policy advice is provided by the Supreme Council for Science and Technology (Conseiho Superior de Ciencia e Tecnologia), created in 1986, which recommends S&T strategy and innovation support infrastructure.

2.25 The Junta Nacional de Investigação Científica e Tecnológica (JNICT) coordinates and implements the policy of the Secretary of State for Science and Technology. JNICT, which was recently restructured and strengthened, has a range of responsibilities including:

- approval and finance of collaborative R&D projects
- funding of large R&D infrastructure projects
- administration of Community programmes for RTD development in Portugal
- post graduate training in the technology and engineering fields.

2.26 JNICT is the major agency for funding research. It funds basic, applied and development R&D but only to the pre-competitive stage of exploitation. It had a budget of 116 million ECU in 1992, or roughly 40% of the government budget for S&T (298.3 million ECU in 1992).

2.27 The Ministry of Industry also has some responsibilities for innovation support. A Standing Committeee for the Evaluation of the Technological Plan has been set up under the Ministry of Industry. Through its agency, the Instituto de Apoio às Pequenas e Médias Empresas e ao Investimento (IAPMEI), it provides innovation support to SMEs, often funding projects for the commercialisation of R&D. IAPMEI has also been involved in the delivery of the PEDIP programme. The Ministry of Industry also has responsibility for a number of R&D institutes, most notably the Instituto Nacional de Engenharia e Tecnologia Industrial (INETI) which is the largest state laboratory and which has an international reputation for research and development of industrial technologies.

2.28 The Ministry of Education plays a key role in RTD training as well as in providing core funding for the higher education institutions. There is also a Council for Higher Education/Enterprises (CSEE) to improve relations between universities and industry.

2.29 There have been several programmes to further develop the RTD system in Portugal since 1982. Most recently, these have included: CIENCIA, STRIDE, PEDIP and PRODEP.

CIENCIA

2.30 The CIENCIA programme, Creation of National Infrastructure for Science, Research and Development, focused entirely on developing the RTD system during its implementation (1990-1993). Its total funding was 253 million ECU, and its objectives were to:

- reinforce the S&T potential of Portugal
- improve the institutional structure of the RTD system
- reduce the regional disparities in S&T.

2.31 CIENCIA had three action lines: infrastructure financing, integrated research programmes, and human resource training. Two science park developments, TagusParque and the Porto Science Park, were initiated under CIENCIA but then transferred to the STRIDE programme. There has been some criticism that infrastructure was financed through CIENCIA without regard to the maintenance and running costs, and there is concern that some of these projects will quickly become white elephants. CIENCIA was implemented by JNICT, a task which at times overwhelmed this small agency. The new programme, Praxis 21, has recently been approved by the Commission.

2.32 Whereas the Ciencia programme developed the means to carry out research (infrastructure), Praxis 21 will be developing the soft infrastructure to improve the exploitation of research. Praxis 21 was still under discussion when the fieldwork for this study was carried out. However, the indications are that the programme will place more resources in developing links with industry through means such as joint research projects. Training and fellowships will also be an important feature.

STRIDE

2.33 The STRIDE programme was implemented over three years (1991-1993) and was managed by JNICT. It had a budget of 71 million ECU to assist access to EC research programmes, spread RTD capacity and develop collaboration with industry in research. Two science parks, TagusParque (Lisbon) and the Porto Science Park, have been funded under STRIDE.

PEDIP

2.34 The PEDIP programme included several actions which supported the development of the RTD system in Portugal: basic and technological infrastructures, vocational training, incentives for productive investment, financial engineering, productivity drives, and industrial quality and design. In addition, PEDIP funded two sectoral strategic programmes: one in information technology and electronics (which will continue under PEDIP II) and the second for the development of the capital goods industry.

2.35 Under PEDIP, five business incubators were financially supported and one science park was funded (Lispolis). In addition, seven technology transfer centres were established to assist firms in both the traditional sectors and developing sectors.

PRODEP

2.36 This programme, which was 54% funded by the Community, provided funds of 950 million ECUs[3] to develop and extend the education system in Portugal. A feature of this programme was to develop higher education institutions and in particular polytechnics, especially in the non-costal regions. As a result, 35,000 new student places were created and many of these were in polytechnics and for engineering sciences.

RTD Structure in Portugal

2.37 There are three levels to the RTD base in Portugal: research laboratories and universities, interface organisations and firms. There are several state laboratories which are associated with the different Ministries (Industry and Energy, Agriculture, Civil Works, Health and Education).

2.38 Higher education has undergone an unprecedented phase of restructuring and expansion. New universities and polytechnics have been created around the country. Nevertheless, the old universities still conduct the bulk of training and research for this sector. Some of these institutions have high international reputations, such as the Instituto Superior Tecnico (IST) of the Universidade Tecnico de Lisboa (UTL) in the field of engineering and the Universidade Nova de Lisboa in robotics.

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[3] 1989 prices.

2.39 Together, state laboratories and higher education institutions represent over two-thirds of the R&D conducted in Portugal. The state laboratories are largely concerned with applied research (53% of their RTD activity) and experimental development (40%), whereas higher education devotes significant effort to basic research (46%) as well as applied research (41%).

2.40 The rule of exclusivity[4] in HEIs and other restrictive regulations led to the development of interface organisations [IOs] in the 1980s, which are owned by the universities and are in practice their commercialization mechanisms. These IOs have a private non profit status and are far more flexible than the HEIs from which they derive. In practice, the staff of both institutions include many of the same people. Most of the interface organisations were established after 1987, although INESC led the movement in 1980. IOs represent about 8% of the RTD activity in Portugal, but it is a fast growing proportion.

2.41 Like HEIs, the interface organisations undertake much basic research (29% of their activity), but they more involved in applied research (47%) and experimental development (24%) than their parent organisations.

2.42 Business expenditure in R&D (BERD) is relatively low in Portugal (24% of total GERD and 9.5% of GEMP). In 1988, 173 firms claimed that they conducted R&D at a total expense of 58.5 million ECU.[5] Of these 173, four companies represented over one-third of the total expenditure. The biggest spenders were in electronics, fine chemicals, pulp, business services, communications and energy production. As in other countries, in 1988 nearly three-quarters of the R&D was related to experimental development, 27% in applied research and about 1% in basic research.

2.43 Most Portuguese firms buy research and technology in its final form as a product or service. The small cluster of new technology-based firms being generated through spin out from the HEI/RI sector or from foreign high tech companies are the exceptions to this pattern of technology dependance. Currently, there are no research labs of foreign multinationals in Portugal.

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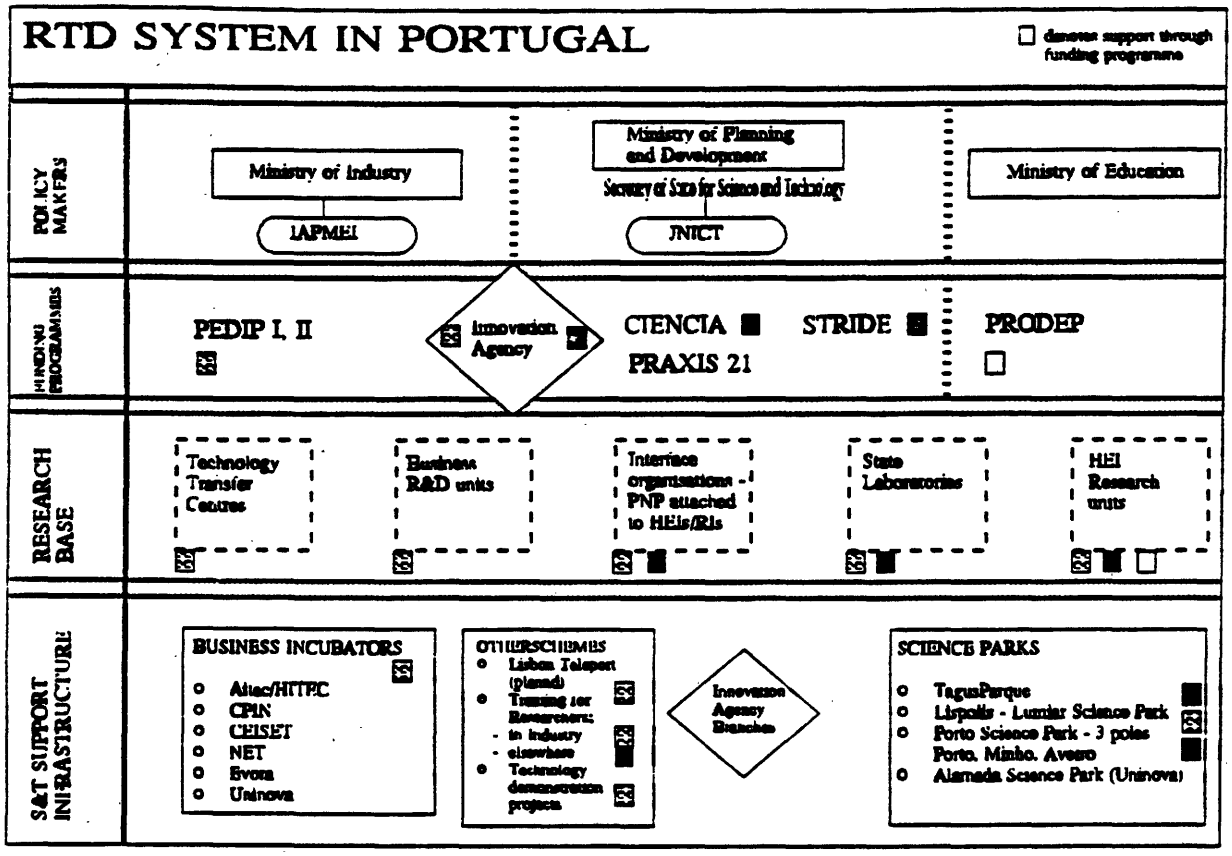
[4] The rule of exclusivity prohibits higher education staff from undertaking other economic activity which may be in conflict with his or her responsibilities at the university.

[5] 1991 prices.

Figure 3



Priorities for future RTD development

2.44 Key priorities for the future of RTD development in Portugal are:

- **To shift the balance of R&D expenditure.** Basic and especially applied research dominate the RTD activity in Portugal. Most developed economies reveal a very different proportion of research activity: 28:15:57 (Sweden), 25:10:65 (US), 36:29:35 (Netherlands), 20:32:48 (France).

- **To raise the proportion of BERD.** The low participation of industry in R&D is a concern for future economic growth. To date, growth in BERD has been sluggish and even declining at points.

- **To redress the "weakness of links and synergies between funding and performing of R&D"**[6] Government is not funding research in industry; industry funds are not supporting research in government laboratories or HEIs. The exception to this pattern are the interface organisations, which receive up to 25% of their funding from industry.

- **To establish a stable and strong local base of R&D funding** Portugal suffers from a heavy dependance upon EC funds to support research. Anecdotal evidence indicates that some research organisations in Portugal receive funds directly (research contracts) or indirectly (via structural funds) from the Community which represent the majority of their budgets. Furthermore, there is evidence that EC funds for the RTD system are merely displacing government investment rather than leveraging additional investment.

- **To spread RTD activity more effectively across Portugal** The recent PEDIP and CIENCIA programmes made some headway in reducing the dominance of the coastal regions in conducting R&D, but more needs to be done. Lisbon and Oporto account for roughly 82% of GERD, and Lisbon alone accounts for roughly 2/3 of all RTD activity.

- **To extend training and human resource development** There is a lack of technicians. While the number of researchers has escalated dramatically since 1982 (an increase of 96% was recorded in 1990), there has only been a rise of 40% in the number of technical staff trained.

- **To collaborative research activity amongst public and private research establishments.** A high degree of fragmentation exists among the research groups in Portugal. In some cases, these groups include only three to five individuals and are working in isolation. Collaboration through joint research projects may help Portugal to achieve a critical mass of research quantity and quality.

- **To strengthen international linkages.** Portuguese firms and researchers still have a relatively poor awareness of their foreign counterparts. To be able to compete successfully in the Community, Portugal needs to be more aware of and linked to other Community members.

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[6] OECD, p. 31.

Support infrastructure for RTD and innovation

2.45 In general, Portugal is constrained by a lack of people trained in public policy. In particular, formal training in science and technology policy is not a feature. No university in Portugal offers training in this field. Thus, there still remain many challenges in further developing support infrastructure for RTD and innovation.

Technology transfer

2.46 Over recent years, the science base has developed and expanded. While competent at winning research projects from the Commission, the science base has not fared well at transferring technology and skills to Portuguese industry. While the Commission provides relatively lucrative opportunities to carry out basic and applied research which is interesting to these researchers, they have less incentive to devote their talents to seeking out the more mundane and conservative requests from local industry. However, it must be emphasized that there is a large gap between what Portuguese research can provide and what Portuguese business feels it needs.

2.47 There has been no established culture within universities to work with companies. Furthermore, firms themselves are critical of the ability of universities, state laboratories and even interface organisations to meet their needs. This situation is particularly relevant to SMEs and less so to the blue chip companies which may occasionally place work.

2.48 Industry liaison officers and the technology transfer centres established under PEDIP were seen as measures to help bridge this gap. However, their impact has been limited. Collaborative research projects involving public and private sector researchers are considered to be fundamental to efforts to improve technology transfer in the future. Lessons from previous experience indicate that to improve chances of commercialisation, projects should be of core interest to the company which should pay for part of the study and take leadership.

2.49 The roles of an innovation agency and business innovation centres were designed to help facilitate this process of technology transfer and support innovation in SMEs in Portugal by developing more skilled intermediaries at a local level.

Agencia da Inovacao

2.50 The Innovation Agency is owned 50:50 by JNICT and IAPMEI. It was established in 1993 and has made limited progress to date. The development of this Agency will depend on the role and responsibilities defined by its sponsoring agencies and thus the resources it is given to deliver from the national funding programmes.

2.51 The Agency has offices in Lisbon and Porto and is a member of the Association for Technology Implementation in Europe. It is also the Value Relay Centre for Portugal and a member of TII. The Agency was established to facilitate technology transfer and to encourage innovation in industry. International cooperation is a key objective at this early stage.

Business Innovation Centres

2.52 Business innovation centres, which in Portugal are incubators as well as innovation support centres, have been a relatively successful development. Although the impact has been small relative to the country's needs, BICs have played a very important role in the progress of innovation and industrial RTD. At present, there are nine existing BICs and a further three in planning. The movement in Portugal began with Aitec/Hitec, which is an incubator developed by INESC and IPE to assist in supporting spin outs from INESC. Individuals from INESC and IPE had learned from experiences in the US and Europe and were able to visit incubators in advance of the establishment of Aitec. At a later stage, the PEDIP programme as well as the EuroBIC programme financed by DG XVI led to the establishment of several other BICs in Portugal.

2.53 Incubators are recognized a loss making activities by those organisations currently involved in sponsoring them. Thus, a key issue in the expansion of incubators across Portugal is how to finance them long term. The BICs have developed a national association and have initiated a programme of regular dialogue and cooperation. As a national association, they intend to negotiate with the Ministry of Industry for the establishment of a seed capital fund to be delivered through business incubators and capitalised under PEDIP II.

Role of science parks

2.54 Science parks are a new economic development tool for Portugal. Taking shape in 1989, the focus of science parks in Portugal is to be a technology transfer mechanism. There is some controversy about how the flow of projects was initiated, but it was clearly a push from the science base (in particular, INESC - one of the largest interface organisations - and INETI - the largest state laboratory) in response to science park movements elsewhere in Europe and abroad.

2.55 At present, there are four planned science parks which are at various stages in their development. At the time of writing, only one science park has reached a stage in its construction in which firms - especially SMEs - are able to locate on the park. These planned science parks have been orientated more to the RTD strengths of their associated research organisations rather than to the needs and characteristics of local industry. In part, this is a feature of the national strategy to "invent" local high tech industry through technology transfer from the more developed and resourced research community.

2.56 Progress in establishing science parks has been very slow and difficult. An important difficulty has been the hiatus in funding caused by the one year gap in Community funds which meant that very little money was available in 1993. As a result, some of these projects have lost momentum. Difficulties have also arisen through a lack of consensus at the national and local level about the appropriate composition and location of the science park and its role in local economic development. Some of these parks are joint public and private sector ventures.

2.57 There are divisions amongst the community supporting science parks in Portugal which can be traced back to the sponsors of these parks. The Ministry of Industry established the Lispolis Science Park under the PEDIP programme. The Minitry for Planning - through the Secretary of State for Science and Technology and its implementation arm JNICT - have sponsored TagusParque (Lisbon) and the Porto Science Park under the Ciencia and STRIDE initiatives. The fourth, the Almada Science Park, has been promoted by the Universidade Nova de Lisboa and its interface organisation Uninova and hopes to receive financing through PEDIP II (Ministry of Industry) and possibly Praxis 21 (Ministry of Planning).

Telematics

Current Structure

2.58 Three PTTs have been operating in Portugal: Telefones de Lisboa e Porto (TLP) which has provided telecommunications in Lisbon and Porto (TLP), Telecom Portugal which has provided telecommunications in other regions and CPRM Marconi which has controlled telecommunications abroad. The latter is a 51:49 joint venture between the public and private sector. In February 1994, an agreement has been made to rationalize the three PTTs into one organisation. The process will begin with a combining of TLP and TP. At this stage, no dramatic changes are planned in terms of the provision of advanced telematic services and their costs.

2.59 Portugal has benefitted greatly from the massive investment in telecommunications infrastructure provided through the STAR and TELEMATIQUE programmes, although there have been some elements of those programmes which have not had the impact intended. Telephone lines throughout the country have been extended and improved; in many cases, fibreoptic cabling has been used (3,972 km pairs in Lisbon and Porto in 1992). The number of telephone connections grew by 8% in Lisbon and Porto from 1991 to 1992 to 1.4 million. In 1988, the telephone density was 28 connections per 100 inhabitants in Lisbon and Porto; in 1992, the figure was 40 connections. While customers welcome the improved basic telecommunications provision, the costs of telecommunication relative to other EC countries is still high, especially with respect to international communications and leased lines.

2.60 In practice, the PTTs in Portugal are three monopolies, and full deregulation is not anticipated until 2003. All three are overstaffed - particularly TLP and TP - and there is an urgent need to reduce costs. TLP alone employed over 10,000 workers in 1992. These PTTs have been little more than service companies; they have delegated their research and development in telecommunication provision and services to INESC, which is 50% owned by the PTTs. Over the past few years, the PTTs have recognized the need to become more customer orientated. Of the three, TLP has made the most progress in this respect and the new amalgamated PTT will rely heavily on TLP's experience.

2.61 The current challenges facing the PTTs are the full introduction of ISDN and the development of two Metropolitan Area Networks of 140 Mbps in Lisbon and Porto connected by a spur. The MAN is currently at the pilot stage with 10 users who are testing the system. These users have access to broadband communications free of charge at present, but the PTT will introduce charges in the next phase. Of the 10 users, most are research institutes related to big science (particle physics institutes including one connected to CERN) or telematics (INESC). Digital and IBM are also part of the trial, as is BCP which is the largest private bank in Portugal. A notable absence from the MAN pilot is INETI.

Advanced telematic services

2.62 A number of advanced telematic services have been developed by the PTTs, often with financial assistance of the TELEMATIQUE programme. Customers can lease lines, although this is no longer of great interest to PTTs like TLP who see their role as providing a public network that can offer not only high quality transmission by also effective value added services. An appropriate analogy would be that they not only want to provide an effective railway system but also the train services to run on the system. Fundamental strategy is the SME market in Portugal, which is a very large growth market for communications services and dependant upon user-friendly value added services.

2.63 The most notable success in advanced telematic services in Portugal has been the multibanking system, which is an ATM system based on the X.25 public network, TELEPAC. The advantage in this system is that all of the Portuguese banks are part of the same system. Fax and cellular phones are common business facilities. Audiotex is reputed to also have been a successful service developed with Community funding. In practice, file transfer facilities and leased lines are used by multibranch companies to connect their internal communications.

2.64 The provision of ISDN is the biggest challenge the PTTs now face. They have had technical difficulties in combining technology from two suppliers: Alcatel and Siemens. While these difficulties are being resolved by the suppliers, the PTTs are also waiting on final government approval on tariffs and conditions. The PTTs plan to make ISDN costs attractive and roughly in balance with other European countries. At present, it is possible to get an ISDN line in Lisbon but the monthly rental cost is twice that of a regular phone line and the cost of the call is the same. Furthermore, if the connection requires only a conversion of an existing line, the installation is relatively quick and cheap. However, if the connection requires a new line, the wait for installation is excessive and the costs quite high. More improvements to the ISDN service will have to be made before it is widely taken up. INESC are currently developing the value added services for the ISDN network.

2.65 The PTTs recognize that the need to develop the market for ISDN as for other advanced telematic services. Recently, TLP commissioned McKinseys to conduct a demand study for advanced telematic services; this study indicated that the prospects for ISDN take-up would be very high provided that appropriate value added services were available and costs were reasonable. TLP and TP currently have ISDN demonstration displays in their high street shops, but they are not aggressively marketing until the technical difficulties and other details have been worked out.

Existing telematic networks

2.66 There are several telematic networks operating in Portugal. TELEPAC is the PTTs X.25 public network. It does not have a very good reputation for value for money and reliability. In fact, many customers were lost two or three years ago when the network was undergoing serious difficulties. COMNEXO, which is owned by British Telecom, is its main rival and has been successful in winning over many customers. Charges are roughly two-thirds those of TELEPAC and it is also involved in telecommunication resales. COMNEXO has an advantage in that it is not constrained to the tariffs established by government. VIASAT, owned by Marconi, is the third commercial network operating in Portugal. Again, it is less expensive than TELEPAC. Although traffic figures for these three networks were not made available, the indication is that the number of customers is small but growing. The Portuguese banks make up the largest share of TELEPAC users.

2.67 RCCN is the X.25 academic network for academics and researchers which is managed by FCCN and is based at LNEC. The network is part of EuropaNET and has a gateway into the INTERNET. E.mail is the most often used feature of this network - 97% of E.mail activity takes place in HEIs. Purely commercial traffic is not allowed on the network, but in practice it is very difficult to control network traffic. There is also an EARN network. The academic network is essential in the development of demand of advanced telematic services in Portugal. While at university or polytechnic, the next generation of businessmen are developing the skills and familiarity in using these services that they will carry into the workplace.

2.68 Developing demand for advanced telematic services in Portugal will be easier than other countries for one important reason - Portuguese are technophiles. They are very open to new technologies if their benefits are effectively demonstrated. It is notable that the take-up of advanced telematic services such as ATM banking, faxes and cellular phones has been very rapid and crosses all age barriers. Nevertheless, the Portuguese firms are still not big users of advanced telematics relative to other countries in Europe, and the importance of demonstration and training in the use of advanced telematics is paramount. At this stage, any small companies using advanced telematic communications are generally using E.mail and file transfer, whereas large, multisite companies are using more advanced and specially designed value added services including CAD/CAM and EDI. TLP has already received requests from multinational companies in Portugal for Asynchronous Transfer Mode communications.

2.69 TLP has recognized the importance of science parks in their strategy for developing demand for advanced telematic services because they perceive science parks as a site for the most technologically advanced and successful Portuguese companies. They hope to be able to use science parks as a demonstration centre as well as a pilot site for new technologies. There is currently a telematics strategy for Tagusparque proposed by TLP. TagusParque will be provided with a fibreoptic network and a digital exchange. It will be a node on the MAN and will have broadband communications for voice, data and images. Provision to the start-ups and SMEs of these advanced telematic services (including ISDN) is being suggested as a means for TLP to develop demand and demonstrate the value of these services to other companies. TLP is currently considering extending the same provision to Porto Science Park, but it has no plans for the other two science parks. The reason for the choice of TagusParque and the Porto Science Park is that TLP is a sponsor of these two parks. More specifically, part of the TLP company will be based on TagusParque as well as the data centres of two of the largest banks and the multibanking system company. One can argue that the benefits of advanced telematic services to the other companies which will locate on the park, especially the smaller companies, are a positive externality generated by the level of advanced telematic services required by the TLP division, the banks and the multibanking system.

2.70 The PTTs have also considered support for other local economic development mechanisms such as EXPO 98 and teleports. TLP is in charge of the telematic infrastructures for EXPO 98 and this will be an opportunity to develop demand and provision of advanced telematic services further. Although in other countries PTTs have been main sponsors of teleports, this has not been possible in Portugal at this stage. Because the division of communications rights between CPRM Marconi, TLP and TP, any sponsorship would have to be a joint effort and this has not developed. TLP was not aware of the Lisbon Teleport development, which may be supported by CPRM Marconi and BT.

Chapter Three

LISBON

Regional overview

3.1 Lisbon is the capital of Portugal and, as a metropolitan area, it has 2.1 million inhabitants. The Lisbon economy is largely based on services, which made up over 65% of the local GDP in 1992. Unemployment (5.8%) is slightly higher than the national average and may be on the increase.

3.2 Two-thirds of RTD activity takes place within the Lisbon metropolitan area. This is largely due to the concentration of public R&D bodies in Lisbon, which have over 80% of their R&D resources located within the region.

3.3 Lisbon is characterised by fragmentation and a lack of connectivity amongst the government agencies, research organisations and higher education institutions which absorb much of the city. There are two reasons underlying this lack of connectivity: 1) the space constraints of the city over time have frustrated clustering and 2) the clannish behaviour of different Ministries of government trickles down to all levels.

3.4 In higher education, departments are spread across the city and this isolation frustrates cross-curricular cooperation and research, which is recognised as the source of many of the most important discoveries of recent decades. It also limits interaction with industry, which cannot decipher the structure of the research base. Nevertheless, the universities have shown a strong resistance to move out of the city, and relocation efforts in the past have had little success (eg Universidade Nova de Lisboa). There now may be a change of heart taking place as some research organisations would like to have the advantages of a campus setting and are eager to create one.

3.5 Local government in Portugal is made up primarily of municipalities and Regional Coordinating Commissions (CCR). In Lisbon, the Regional Coordinating Commission is mainly responsible for the physical development of the metropolitan area. It has had little involvement with the three planned science parks other than to be aware of and approve the physical development plans. The CCR may be developing more interest in economic development in the future. It has financially supported the BIC for Almada, CEISET, and it has developed a small financing scheme for SMEs which will be delivered in cooperation with the Portuguese Industrial Associations (AIP) for Lisbon.

3.6 AIP is a nationwide organisation of the industrial associations of each region. AIP is the voice of industry in Southern Portugal and it has been more active in the development of science parks and business innovation centres across the country. AIP (South) is located in Lisbon and has recently undergone a restructuring process. In addition to its lobbying and policy making roles, AIP provides services to Portuguese companies. It is a European Information Centre and a BC-NET operator. In the near future, they hope to be able to deliver relevant EC information to companies via the Audiotex network. AIP and AIPortuense (the Porto body) have joined together recently to form a national umbrella body, Confederação de Indústria Portuguesa.

3.7 In practice, the municipality governments have been the most significant local partner involved in the development of science parks in Lisbon. The municipality of Oeiras has been notable in its lobbying action at a top national level for the development of TagusParque. The municipality of Almada has also been very pro-active in acquiring the land needed for the Almada Science Park. The municipality of Lisbon is working to help facilitate the building programme of Lispolis.

Lispolis

3.8 Lispolis will be the first science park in Portugal in operation. In the first half of 1994, the business incubator on the park has been opened as well as the Management building and the Portuguese Design Centre. Lispolis is unique in Portugal because it is a science park attached to a state laboratory, in this case the largest state laboratory - INETI. Founders of Lispolis include INETI, the Centre for Technological Development and Innovation (CEDINTEC), AIP, Investment and Business Participation (IPE)[7], Lisbon City Council (the municipality), JNICT, IAPMEI, Mining Development Enterprise (EDM), IST and Technological Institute for the European Community (ITEC).

3.9 Lispolis lies within the INETI compound, which was first built for INETI in the 1980s and is based on 12 hectares. Lispolis will expand to 22 hectares over two phases. In the first phase currently being completed, the business incubator, the management building and a training centre are all purpose built. There is serviced land available for other companies. There has been a delay in completing construction (begun in 1991) caused by municipality bureaucracy and slow progress in completing the road infrastructures (which were initiated after the construction of the buildings). Lispolis is located very near the international airport which will enhance its appeal.

3.10 The objective of Lispolis is to promote linkages between industry and research and to provide a site for advanced training for industry (an important element in the PEDIP programmes). Twenty percent of the science park land is dedicated to training, and there will be two technical schools on site. Portuguese industry is the primary target for this development. The Board of Lispolis has decided that firms locating on the park must be technology-based, involved in clean technologies and not in mass production. Lispolis companies will reflect the research strengths of INETI -advanced materials, biotechnology, energy, electronics and IT.

3.11 INETI will play the most significant role in the development of Lispolis. A laboratory with annual contracts worth 38.7 million ECU in 1993, it is largely involved in applied research as well as some experimental development. INETI is more related to industry than the higher education institutions in Lisbon. Around 150 contracts totalling over 8.3 million ECU were from industry in 1993. INETI has largely been working for the large Portuguese companies, but it would like to develop the SME market. To date, INETI has found Portuguese SMEs to have very short term strategies which discount R&D substantially and therefore difficult to interest in services INETI can provide.

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[7] IPE has been responsible for the management of state ownership and capital investment in private sector entities.

3.12 The Instituto Superior Tecnico (IST) will also be associated with Lispolis. ITEC, one of IST's interface organisations, will move to Lispolis in 1994, including ITEC's Institute of New Technology. Although Lispolis is of secondary interest to IST now (TagusParque is its main investment), there is potential to develop synergies between the research strengths of ITEC and INETI. The decision to locate ITEC on Lispolis was taken years ago and was a political decision that has now lost some favour with the Board of IST.

3.13 The management company of Lispolis is a private non-profit agency which is technically separate from INETI but there is significant crossover in staff and interests. The management company recognises its role as one of innovation support for companies on-site, technology transfer and development of spin-outs from INETI. The management team includes an incubator manager, who is already preparing himself and the centre for the early stage companies expected to move in mid-1994.

3.14 Lispolis firms will have access to the IT Centre (which will have ISDN links and potentially access to the broadband MAN) as well as the Medical Centre. Both of these Centres are part of INETI. In the Incubator, there will also be secretarial support, IT facilities and an X.25 connection. The incubator will be a node on the INETI FDDI. At this stage, INETI and thus Lispolis do not have a link on the Lisbon MAN. It is likely that TLP will include INETI at the next phase of the MAN's development, but this needs to be assured so that INETI and Lispolis have access to broadband facilities. The lack of these facilities may put Lispolis at a disadvantage relative to other Lisbon science parks and the Lisbon teleport.

3.15 Another important facility offered by INETI is its Information Service, which has a protocol with the British Library. They hope to have on-line soon INFONETI, a telematic information service for patent searches, technical data and business information. The system has been taken off-line temporarily because of hardware difficulties, the need to upgrade equipment and a lack of finance. The Information Service has access to public and commercial database providers, such as Dialog, DataStar, Predicasts, ECHO and several specialist scientific databases, and they are the IMPACT node for Portugal. The Service has been trying to develop its customer base by going beyond INETI and other research organisations to private companies. Unfortunately, they find it difficult to compete with one or two information services which have been subsidised by the government. Nevertheless, they are organising seminars to demonstrate the value of on-line information through the AIPs throughout the country. The Information Service also offers a Masters degree programme in Information Science jointly with Sheffield University.

3.16 To date, they have had over 70 companies voice an interest in Lispolis, including an intent to locate from the largest R&D company in Portugal - EID Electronics - which is related to the telecommunications industry. There are currently three SMEs on site in a makeshift incubator. The views of two of these SMEs are reviewed together with other Lisbon firms in a subsequent section of this chapter.

3.17 The Lispolis management team are active members of Arc Atlantique together with Almada Science Park, Porto Science Park and the Madeira Science Park. The Atlantis sub-group of the Arc are currently developing a database of companies on site. They have not been actively involved in IASP at this stage. During the feasibility stage of Lispolis, members of the management team visited science parks in the UK and France, and they have maintained these contacts. They also have strong personal contacts at Valencia and Bari, but they see a strong need to become more involved with other European science parks to learn from their experience and to help find European partners for their companies.

CPIN

3.18 CPIN, the incubator of ITEC and the EuroBIC for Lisbon, may eventually locate on Lispolis and take responsibility for the incubator centre. A decision about this role has been delayed because of the issue of long term financing for the incubator, which some see as a profitable activity and others (particularly the CPIN management) recognize as a loss-making activity.

3.19 CPIN was founded by ITEC in 1989 and has been in operation as a EuroBIC since February of 1991. It is affiliated to IST and INETI. In total, CPIN has supported over 30 companies, 25 of which took up space in the incubator. Of these 30, six have been spin outs from IST and eight have spun out from other research organisations. In addition to business support, CPIN provides default finance insofar as it will allow companies in a difficult phase to drop rent payments for a while. Companies use CPIN's connections to IST and ITEC to great advantage, making use of the resources and research provided by these two research organisations.

3.20 There is only a handful of staff to support 10 companies presently located at CPIN. The incubator is full and they are are oversubscribed. A location on a science park would provide them with additional space and a more appropriate design. The current building is not suitable in that it has poor connectivity (from a telematics perspective) and awkward room shapes. CPIN provides a LAN for tenants which interconnects with the ITEC LAN. Tenants also have access to a modem. CPIN management hope to be connected to the EBN network in the future.

3.21 The CPIN manager coordinates on a local basis with IST, ITEC and INETI as well as with the other Portuguese BICs, particularly those in Lisbon. EBN holds good potential for CPIN in developing links with other incubators across Europe. He has found TII and BC-NET to be less useful linkages, but this is primarily due to the lack of interest of CPIN companies in finding international partners. The manager sees it as a key challenge for CPIN to get its companies into the European markets and he feels this will only be achieved when he can arrange for CPIN companies to meet their European counterparts. On occasion, the manager has considered Europartenariat, but it is too expensive.

TagusParque

3.22 TagusParque is the largest science park planned for Portugal. When complete, the park will include over 200 hectares of developed space in the Oeiras, Sintra and Cascais municipalities of the greater Lisbon area. The project has brought together a wide range of partners, with no one sponsor taking the lead in its development. Founders include JNICT, IAPMEI, UTL, IST, INESC, Oeiras and Cascais municipalities, Electricity of Portugal, Telecom Portugal, TLP, SIBS Inter-Banking Services Society (multibanking service), CGD General Service Bank, Banco de Fomento e Exterior, Banco Comercial Português, Banco Português de Investimento, Banco Fonsecas & Burnay and Gestifer. AIP and FLAD, the Portuguese-American Development Foundation, have been particularly active supporters of TagusParque.

3.23 An S&T Board for the Park has been established to monitor the development of the park and sets its strategy as a site for innovation and high technology. The objectives of TagusParque are:

- to improve linkages between the research base and the entreprenuerial community in Lisbon
- to create an environment to support innovation
- to promote the creation of new technology-based firms
- to attract national and foreign high tech companies.

3.24 Original plans for a Lisbon science park were promoted by INESC, which lobbied for a technopolis 40 miles to the northeast of Lisbon, complete with housing, education, leisure facilities and amenities. TagusParque will incorporate much of this original plan albeit on a much smaller scale. Informal linkages will be an important element of TagusParque through the provision of a gym, a golf course, shops and housing on site. The park is based on a "European town centre" as opposed to the suburban models followed elsewhere. At the centre of the park will be a multifunctional building which will house the Park Management company. There will also be multiuse laboratories, an SME incubator as well as next stage space. Tenants are expected to set up on the Park in late 1994/1995.

3.25 The Management company is a private company established in July 1992 and its primary responsibilities are to implement the strategy for the park, support the provision of R&D and technology diffusion services, establish a strong link with IASP and manage the facilities. The Management company is a member of TII as well as IASP, which they find to be very helpful. They have attended IASP conferences and find them information and useful for making new contacts. In the future, they would like to have a IASP Network which would provide a forum to discuss practical issues, partners for tenant companies and databases for technology transfer. Individuals in the company have visited several science parks around Europe and have established personal linkages with Heriot Watt Science Park, the Manchester Science Park and the planned Alcalá Science Park.

3.26 INESC and IST will provide the research cornerstone of TagusParque. INESC has plans to move all of its activities to TagusParque. INESC, which has over 500 clients, earns 20% of its research contracts from the PTTs and a further 15% in working with industry (supported by government grants). For many years, INESC has been interested in establishing a campus environment for itself and for IST. Directors of INESC believe that this will encourage more linkages and potentially more collaborative work between INESC, IST, TLP and other companies on the park. Their decision to move to TagusParque is linked to IST's decision to move the area of its teaching most relevant to INESC, electrical and computer engineering, to TagusParque. This decision is not cast in stone at this stage, but there is some commitment. In practice, IST may be holding its final decision as a means to leverage more influence over the development of the park. If IST carries out its decision, 250 teaching staff and 3,000 students will be moved to the TagusParque site. IST perceives many benefits of moving this area of its teaching to the park, including more industrial contracts for its teaching and research staff, more opportunities for its students to conduct their final year research project with industry and a possibility of extending its teaching programme to new areas. IBET, the leading research institution for biotechnology, is also located at Oeiras and will be linked to TagusParque.

3.27 TLP, SIBS and some of the founder banks will provide the commercial cornerstone of the park. An extensive telematics strategy has been proposed by TLP for the Park as mentioned before, and this is likely to be implemented. Because of these cornerstone companies and the high demand for telematics that they provide, all firms on TagusParque will have state-of-the-art advanced telematic services at their disposal, such as E.mail, file transfer, bulletin boards, access to commercial and scientific databases, interactive working and video conferencing. The Management company suggest that TLP will provide most of the demonstration and training activities for encouraging use of these services, and if INESC is on the park, it would be most suited for this role.

3.28 The Innovation Agency is also to take up space on TagusParque, although no firm plans have been made as yet. This is in part due to the uncertainty surrounding the role of the Innovation Agency in the future, but there is an obvious conflict of activity that has not been resolved between the Innovation Agency and the Management Company. These two organisations will have to coordinate closely to provide clear and effective support for innovation on site.

3.29 The target of inward investment is most developed at TagusParque and is less of a feature of the other two Lisbon science parks. The Management team hopes to attract mobile R&D projects from international and national large companies. At present, they have already received 70 enquiries about the Park. With respect to Portuguese companies and in particular SMEs, the Management team also appreciates that in the first stage of the development of TagusParque it will be necessary to house not only technology-based firms carrying out R&D but also firms with a real potential to develop R&D.

3.30 There is a concern that TagusParque is becoming "no-one's project", as there are too many conflicting views and no project champion has come forward. IST feels that the research focus of the science park is giving way to commercial necessity too soon. Without the participation of IST and INESC, the park will lose is research base. The Management company has no real strategy for how it will interrelate with research organisations and companies off-site, despite the fact that wider linkages between TagusParque and the Lisbon science base will be essential to its success. Furthermore, the Management company has not made much progress in establishing linkages with the other two science parks in Lisbon although it does communicate with the Porto Science Park.

Aitec/Hitec

3.31 Aitec/Hitec may locate on TagusParque in order to maintain the close linkages already developed with INESC. It may be proposed that Aitec/Hitec take responsibility for all of the incubator activities on the Park, but no such decision has been taken as yet. Aitec/Hitec is best described as either a full service incubator (Hitec) or a very hands-on seed capital investor (Aitec). Aitec/Hitec selects embryo companies to support through capital, management guidance and facilities. Roughly half of all supported companies have been spin outs from INESC.

3.32 The seed capital scheme was managed by Aitec using equity from IPE and INESC (which sold out its equity stake in 1993). A minority equity share is taken, and these shares are sold on after an average of five years to the companies themselves or another venture capitalist. A novel aspect to this programme is that INESC employees can - and do - invest in the seed capital programme. The average size of investments is around 40,000 ECU, reflecting an equity stake of 5 to 50% of equity. Altogether, there is approximately 1.3 million ECU invested. Besides providing a needed financial instrument[8], gains from selling shares in companies has enabled Aitec/Hitec to cover the costs of supporting an incubator.

3.33 Hitec can provide high quality physical space if necessary in one of the INESC buildings. In practice, space is limited and many of the supported companies are within a radius of one mile from the Aitec/Hitec centre. However, all of the supported companies (at present they are supporting 25 companies and have holdings in 17) can use the shared facilities and have special access to INESC and its services, which includes access to the academic network. A consolidated turnover of Aitec/Hitec and its supported companies was 20 million ECU in 1992, employing roughly 350 people. Of these, 5 are employed at Aitec/Hitec itself.

3.34 Aitec/Hitec cannot be called a EuroBIC because it has received no money from DG XVI. However, they are members of the EBN, ADT, and NBIA and the manager frequently attends and has participated as a speaker at NBIA conferences. Aitec is a full member of EBN, but there has been in the past a perception that the organisation gave preference to EuroBICs. The manager has many international contacts of his own that he has developed over the years; he often shares experience and ideas with contacts at organisations such as ADT in Germany and the IC^2 Institute in the US.

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[8] Venture capital in Portugal is very limited and almost non-existent for SMEs.

3.35 The main focus for international linkages should lie with the companies and even the venture capitalists supporting these companies. There is good potential for joint product development and joint marketing initiatives involving incubator and science park firms across Europe that should be stimulated. At present, there are no effective means of getting these firms to meet, and particularly in the case of Portuguese SMEs, there is a reluctance to look beyond the local market.

Almada Science Park

3.36 The Almada Science Park is unique for Portugal in that it is the project of a university, the Faculty of Science and Technology (FCT) of the Universidade Nova de Lisboa, and its interface organisation, UNINOVA. The project has been much delayed and is still at a very early stage of development (behind both Lispolis and TagusParque). Only recently has the pace of development of the project quickened with the establishment of a Steering Committee involving the University, the Department of Engineering, UNINOVA and the municipality. This is a very "locally owned" project.

3.37 The Almada Science Park is one part of a larger strategy for further developing the campus which will take place over four phases to be completed in five to seven years. The Steering Committee has decided to follow the model of science park associated with the UK (smaller size development owned by an HEI and located on campus). The criteria for tenant companies will be exactly the same as those used at Lispolis and TagusParque. Although they recognize the need for a designated manager for the project, one has not been selected as yet and the Director of UNINOVA is keeping the process moving. However, much of the project has not yet been defined.

3.38 The Almada Science Park will contain an incubator and a fibreoptic network around the campus. They currently have a two megabit line and are connected to RCCN, and they have plans to be a node on the MAN. They foresee a LAN for the science park which will interconnect with the FCT/UNINOVA LAN.

3.39 The project has its origins in the relocation plans for the Universidade Nova de Lisboa, which was given financial support to move the University to a campus of 80 hectares in Almada. In fact, only the Faculty of Science and Technology and its interface organisation, UNINOVA, are located on this campus.

3.40 UNINOVA is the research organisation for new and emerging technologies. It has research strengths in computer science, mechanical engineering, robotics and environmental science. It has 200 staff, half of which are also staff at FCT. UNINOVA is an industrially sponsored research organisation, although industrial contributions are only token gestures. A change in the sponsorship rules is expected very soon, with an increase in membership fees and the introduction of proportional voting on research programmes. At present, UNINOVA has 30 members, the majority of which are large and even multinational companies (IBM, Digital, Unisys, Marconi). A centre of excellence in robotics and new materials and a UNINOVA teaching centre have since been developed. UNINOVA operates an ad hoc incubator for early stage firms and start ups launched by FCT and UNINOVA staff as well as from outside. There is no formal space or services offered, but empty rooms are made available and access to technical equipment and IT is negotiated.

3.41 The Almada Science Park is a registered member of IASP, but there is not much benefit of this network at this stage. Until a dedicated management team has been appointed, there is no one to really develop these linkages. The Director of UNINOVA has been critical in keeping the momentum of the project going and in identifying new sources of funding (PEDIP II, PRAXIS 21), but the day to day management of the project will become overwhelming. Furthermore, there appears to be no real strategy for the role of a science park management company. Unless there is a commitment at this stage to bring wider innovation support to tenant companies, this role is likely to develop as one of property management and the park will become little more than a business park within a research complex.

Mutela Technological Park

3.42 The Mutela Technological Park has developed from the establishment of a business park with a BIC on site in a reclaimed area which has suffered from the decline in naval industry. CINTEC (Centre for the Incubation of Companies) has received funds from IAPMEI and the Commission (RENAVAL) to establish an incubator and technological park in the Almada region. The Park is still under development and does not have tenants as yet.

3.43 Most of those consulted had very little awareness of this project other than one of the BIC managers who knew the BIC and thus was aware of the project. It was this manager's opinion as well as IAPMEI that it was not really a science park, but that it was intended for technology-based business.

3.44 The lack of awareness of the Mutela Technological Park was even more striking it has been promoted by Naval Industry Association (AIN), the municipality of Almada, the Faculty of Science and Technology of the Universidade Nova de Lisboa, UNINOVA, IST, the Institute of Quality and Standards (ISQ) and others.

Lisbon Teleport

3.45 The Lisbon Teleport is a current proposal sponsored by the World Trade Association of Lisbon. Depending upon government support (PEDIP II) and significant investment by the private sector, the Teleport may be on track to open in 1998, coinciding with EXPO 98. The World Trade Association - Lisbon (WTA-L) has 27 full time employees and nearly 300 free lance trainers and consultants. It is an association for local businesses which also provides a number of services, including courses in business, management consultancy and incubator space (in declining order of share in the WTA-L's activity). The incubator is quite limited with little space and support from the management. Only the WTA-L management have an ISDN line which they use exclusively. The WTA-L did sponsor a demonstration of video conferencing in 1993, but it was not a big success due to technical difficulties.

3.46 The Lisbon Teleport is to be full feature development, including high specification office space, a training centre for business development, shopping malls, a business incubator, leisure facilities, apart-hotels and appropriate landscaping. Physically, it will be well-networked into the Lisbon community; the site which has been chosen is convenient to the major ring roads as well as train connections.

3.47 Telematically, the Teleport is planned for full interconnectivity. The site will have broad band communications (64 kb), including ISDN lines integrated into the buildings. Part of the space will be to serve as a "computer hotel". The Teleport will be a node on the Lisbon MAN. The WTA-L plans to develop value added services to offer on the Teleport LAN. Video conferencing will also be a feature.

3.48 The impetus for the Lisbon Teleport was the global teleport movement actively encouraged by the World Trade Association, of which the World Teleport Association is a subgroup. Within these international associations, there is a European association. It is through this European Teleport Association that the WTA-L has received assistance in developing this project. Both France Telecom and British Telecom (members of the EuroWTA) have given advice and assistance. BT may become an investor in the Lisbon Teleport.

3.49 Essentially, the Lisbon Teleport is a planned high specification business park with an incubator. There will be business training and advice available on the Teleport (provided by the WTA-L and a Management Institute), but it will be of a general business nature and will not focus specifically on innovation. It is also a commercial venture that is likely to proceed with or without public support, as there is great interest in high quality space with good telematics, convenient parking and full amenities (shopping and leisure facilities nearby).

Lisbon companies

3.50 Because none of the science parks are occupied as yet, consultations were held with companies from some of the business innovation centres as well as two of the companies occupying temporary space at Lispolis. These companies are the target tenants for the science parks and the most likely users of any innovation support or shared advanced telematic services.

3.51 **SFM (Software, Training & Multimedia)** is located in temporary accomodation on Lispolis. They are the TX software distributor for Portugal, which is used for multimedia presentations, workstations with CAD and robotics. The company has four partners and two employees; before launching the company, the partners were working with Sun Systems before the branch closed in 1992.

3.52 At present, the market for software processing is very bad with margins of only three to five percent. Furthermore, there is a strong cyclical trend in purchasing patterns which affects their cashflow badly. One of the biggest barriers in their development is finance. Banks are not extending loans to small businesses; instead, owners are taking out personal loans at 24% interest and using their homes as collateral. SFM hopes that Lispolis will be able to help them access grants and loans more effectively.

3.53 They import software from the US, UK and other European countries and hardware from the US. They are not exporting at this stage, but they hope to develop an export product in the future. SFM would also like to identify other suppliers elsewhere in Europe to help broaden their businesss. In their view, the science park manager could play a role in identifying suppliers from other parks in Europe.

3.54 They would like to have access to more business information; currently, what they get is out of date and inappropriate from information service companies, INFOCAMA and Dun&Bradstreet Portugal. They are looking forward to being able to use more advanced telematic services on Lispolis, but they are concerned about the cost of these services. Even telephone and fax rentals are disproportionately high (nearly as high at their rent costs); ISDN Group 4 fax could help lower these costs.

3.55 JLL is a small high tech company involved in three projects: laser card systems, advanced scanning equipment (fingerprint recognition) and data recovery. It is one of the three located in temporary accomodation on Lispolis. This company is developing products that will need large company backing or venture capital to launch; these are not consumer products but technology systems. The partners of the company have a research or industrial technology background and are interested in developing a fast growth company with a strong export performance. At present, they are paying a consultant in Spain and France to look out for market opportunities.

3.56 In order to develop their data recovery centre, they will need powerful computing and communications hardware which would cost tens of millions of pounds. However, they have an option to purchase refurbished equipment from an IBM broker at a fraction of the cost. JLL has firm commitments from several companies in the use of this data recovery centre, but they need seed capital to purchase the hardware. Unfortunately, seed capital is virtually non-existent in Portugal. According to JLL, it is not worth applying to the IAPMEI Seed Capital Fund because it is undercapitalised and oversubscribed. JLL hope that the science park will help them in accessing seed capital not only in Portugal but abroad.

3.57 JLL will need sophisticated telematics facilities to carry out their data recovery centre activities. They have negotiated their requirements with Lispolis and will pay for a specific ISDN line or the like when the centre is established. They would also like to extend their human network. JLL staff have attended the CEBIT fairs, which they find too large and cumbersome to be of much use. In their view, the science park association is a means to assist them in finding strategic partners elsewhere in Europe.

3.58 **Women at Work** is a IT service company located at the World Trade Centre. It was established in 1992 by a former sales manager of a multinational pharmaceutical company who lost her job when the branch closed two years ago. She employs two other individuals to assist her in setting up computer systems for Lisbon area companies. The company would like to develop a telematics service for information on clinical trials of pharmaceuticals which would be used by doctors and hospitals in Portugal. In order to develop this project, they attended the Telecoms Fair and met representatives from INESC, which the Director believes could help them to develop their business idea. They have done some initial market testing, but they have not through all of the telematics requirements at this stage. The company only uses telephone and fax at this stage, although the Director is familiar with the use of advanced telematics through her previous employment.

3.59 The Director received some business training through the WTA-Lisbon and has contacted the Innovation Agency, which only provided a contact name at INESC and an application form for finance. This company needs more fundamental assistance, but it is unable to identify where it can get this support. Women at Work also needs new and more appropriate premises. The Director had heard something about Lispolis, but was not clear what Lispolis could provide nor the costs of locating there.

3.60 **Hidromod** is one of the companies supported by CPIN and located in the incubator. It is a spin out from the IST which provides a physical geographical modelling service for government, the EC (through research projects) and the construction industry. The company was established in 1992 by two PhDs faced with the choice of working for a less technologically advanced industry or instead creating their own high tech business.

3.61 They are familiar with their foreign competitors, notably Delft Hydraulics, and they do not have any direct competitors in Portugal at this stage. They are collaborating with a French company on a European research project, and they have collaborated in the past with a German company, Hydromorph. Hidromod have found their partners through the Commission research programme and through IST. They are now starting to develop exports, but it is usually in collaboration with IST or with a larger Portuguese companies as part of a bigger project.

3.62 Their biggest barrier at this stage is communications; Hidromod need better and direct access to the IST computing network so that they can download their models directly from their offices. While they recognise that the CPIN LAN is very good, it is only internal and is therefore not of much use to them.

3.63 This company is dependant upon IST for research assistance and computing facilities; neither of these resources is formally charged for at this stage of the company's development. As a result, if the IST department they are collaborating with moves to TagusParque, Hidromod will also move to TagusParque or near to it (depending upon the cost of locating on the park). This company saw CPIN as a space provider rather than a business support provider, nor were they aware of the Innovation Agency. At present, their business advice comes from IST and the big companies they work with.

3.64 TecMic has been in operation for five years and was a spin out from INESC. It was one of the first companies supported by Aitec/Hitec in the field of ASICs design. TecMic has completed designs for 15 different ASICs, but Portugal was not a sufficiently big market for these products. They have diversified their activity into all system development and they represent several software houses (including CADENCE and XYLOS [in-house programmable ASICs]). They do not actually bring the ASICs into actualisation but rather send it to a company in France for manufacture. TecMic are the only company operating in ASICs design in Portugal. The company now employs 11 people (nine of which are technically trained staff and six are from INESC).

3.65 INESC is also one of TecMic's biggest customers. They also have linkages with other research organisations and higher education institutions through sales of the software. Their market is strictly national and largely outside of Lisbon, and they do not have plans to develop export markets in the near future. European research programmes such as ESPRIT represent nearly one-third of their turnover. TecMic may become involved in assisting INETI in commercialising their products in this field.

3.66 TecMic currently have access to all telematic facilities available through INESC at a subsidised rate. They use E.mail and the INTERNET, although it is still cheaper to send an electromagnetic tape with the ASICs design by post to France. They have on-line access to the large institutions they supply, but the smaller companies they supply are not even connected to E.mail nor have a modem.

3.67 Science parks look attractive to TecMic because of the traffic congestion in Lisbon and because of the good potential for linkages in a nice environment. They have a very close relationship with INESC and they hope to extend these to other companies and organisations on TagusParque. In the past, they had not had much help in the beginning from Aitec in terms of business support, but they have been getting more attention over the past couple of years. They would be interested to know what similar companies (ASICs) are doing elsewhere in Europe and potential lines for collaboration.

Key issues for Lisbon

3.68 A number of issues emerged from this study, and issues pertinent to all of Portugal are included in the final chapter. Key points particular to Lisbon are identified below:

- In general, there is the absence of a developed innovation support infrastructure. Linkages between different organisations are very weak in many cases. Portuguese firms are not presented with a comprehensive portfolio of innovation support mechanisms (space, information, advice, funding) and agencies and this will lead to confusion over the different roles of science parks, technological parks and teleports.

- There is no coordination between the science parks developing in Lisbon. Acting in isolation rules out the benefits of sharing experience, of developing a powerful lobby, and of sharing resources for a more efficient end. Science park managers underline their differences in philosophy of the role of science parks; the axes of support split between Tagues Parque and Lispolis/Almada Science Parks. The latter two are active members of Arc Atlantique; TagusParque is largely involved in IASP and sees its science park partners at a more international level.

- The local lack of coordination is an inheritance from the national problem of fragmentation and lack of connectivity which must also be addressed at top levels.

- The three science parks as well as the Teleport will come into operation at roughly the same time, which is likely to create a situation of oversupply relative to the size of local demand. This situation will encourage fierce competition for tenants which may be damaging to all three science parks - but particularly the smaller developments of Almada Science Park and Lispolis - in the absence of cooperation and coordination.

- All science parks should be connected to the Lisbon MAN, and negotiations with TLP should begin immediately.

- National priorities have been at the basis of definition of the three science parks. These priorities also hold for Lisbon, and so planned roles for these parks are appropriate. Likewise, the difficulties in meeting these goals are more national in character than regional (and thus will be discussed in Chapter Five).

Chapter Four

PORTO

Regional overview

4.1 Porto is a city of 1.7 million people and is the second largest urban centre of Portugal. It is the dominant industrial city of Portugal, based primarily on industry equipment goods and machine tools as well as in trade in the traditional sectors common to the region, such as textiles, cork, wood products as well as port wine. The Northern region is dominated by three large sectors (textiles and clothing, footwear and leather and furniture). The Oporto region provides 21% of the gross domestic output of Portugal and 25% of total employment, compared with Lisbon's 21% regional contribution of GDP and only 17% of total employment.

4.2 Nearly two-thirds of the gross value added of the region is in the three large sectors already mentioned. Penetration of imports is growing at an alarming rate, and these sectors have been slow to develop their export markets. A production orientation rather than a market orientation persists in these industries. Modernisation of the sectors as well as diversification into new economic areas is a priority for the North. There has been very little foreign direct investment in the North, as FDI has generally been in services and therefore in the South.

4.3 The North provides 18.5% of the gross expenditure on R&D in Portugal (1990), which is significantly less than Lisbon (63.5%) but higher than the central coastal region (14.5 % of GERD).

4.4 Because of the tendency for most funding and projects to locate in Lisbon, the North is made up of powerful lobbies which frequently join together in challenging their common enemy - Lisbon. The Regional Coordinating Commission for the North is much more active in issues of economic development than its counterpart in the South. The AIP (Portuense) is also a very active economic development agency for the region. The area is best described as a region of tribes which feud over local issues and combine effective forces in fighting for regional rights. To some extent, similarities can be drawn to the development of the Italian Northern League.

Porto Science Park

4.5 The Porto Science Park has been developed as a major instrument in the economic development policy to reshape industry in the North. The Regional Coordinating Commission for the North (CCRN) is a representative on the Park Board and considers the Park to be a key part of their regeneration strategy for modernising traditional industry and encouraging economic diversification. Big industry is backing the project through the AIP and it has political support. However, there have been excessive delays in getting the park underway because of the difficulties is establishing a local consensus about the park's structure. The objectives of the Park are similar to those set out for the TagusParque initiative, although there is less emphasis on high tech inward investment which is considered less likely in Porto.

4.6 The Porto Science Park will have three poles: in Porto itself, in the north and in the south of the region. To some extent, this situation was needed to satisfy local pressures for participation in the project, but it also matches the local development of the research base. In all, five universities, one polytechnic and two research organisations will be connected to the Porto Science Park. As in Lisbon, other founding members include the relevant municipalities, AIP, the CCR for the North, TLP, CPRM Marconi, Banco Português Atlantico, IPE as well as five large manufacturing companies.[9] AIP's involvement in the Park has been shaken because of a disagreement about the management plans for the Park as well as the establishment of the southern pole near AIP's Europarque development which will be discussed shortly, but this is seen as a temporary difficulty.

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[9] Barbosa e Almeida (bottle manufacturers), Quintas e Quintas (ropes and aluminium conductors), Sogrape (wine and other alcoholic beverages), Sonae (Portuguese conglomerate), RAR (sugar, chocolate, coffee manufacture) and Vicaima (integrated wood processing).

4.7 The Park will have a Board which will set the strategy and development plans for the Park. A private non profit company will be established to take over the operational responsibilities for the three poles. In the budget, 17 employees are dedicated to the management team, where five individuals will be responsible for each pole. The management team will have responsibility not only for the development of the Park but also the mechanisms for technology diffusion and innovation support. From the outset, a collaborative working relationship with the Innovation Agency has been envisaged.

4.8 The first pole to be built will be Maia, with the other two poles following thereafter. There have been some enquiries from companies already, but they do not want to advertise too far in advance of the actual opening of the poles. The Park has no strategy as yet as to how it will attract foreign mobile R&D projects. The Association sees a need to allow manufacturing on the poles, but they plan to be selective and include only those companies that are technology-based and fit their tenant profiles.

4.9 Networking the three poles will be of fundamental importance to the success of this project, and appropriate telematics investment will be made. Both TLP and TP are involved in the project, and at the very least, the Maia pole will be connected to the Porto MAN. Views from INESC, which is involved closely with PTTs and industry, believes that at the most telematics provision should include an effective LAN, ISDN links and videoconferencing facilities.

4.10 Linkages will also be fostered between the three poles and their associated research and commercial communities; this will be a primary responsibility of the management team. Currently, there is cooperation between the universities of the North. They meet regularly to discuss issues relevant to the development of higher education and to set up lobbying campaigns.

4.11 The Association for the Porto Science Park is a member of Arc Atlantique. In fact, they have not found the Arc to be a very useful because of a tendency of that assocation to become "talking shops" rather than relevant training and experience sharing venues. Training activities that have been undertaken are superfluous or inappropriate at the level of the participant. The Director of the Association would like to develop more productive linkages with other science parks in Europe, and in particular with Zamudio, the Bilbao Science Park, because of the common regional economic conditions and problems they share and because the two Directors are very compatible. The Association Director is also very interested in how German science parks operate as she perceives them as more practical and industrially focused. They are not currently members of IASP although they intend to submit their application soon.

Maia (the Porto pole)

4.12 This pole is the most likely to go ahead and to be completed first. A site and design for the park have already been selected. Maia is located near to the airport and in a fast growing industrial northern section of Porto. It is the most industrially diversified of the three poles and is likely to attract a wide range of companies. AIP has given some priority to this pole because of the importance of the University of Porto in the region, the facility in acquiring the land and the strong support of the municipality to the pole.

4.13 Affiliated to the Maia site are the largest number of research organisations: the University of Porto, the Catholic University of Porto (together with its Biotechnology School), the Polytechnic of Porto, INESC (its Porto branch), INEGI[10] and INETI (its Porto branch). The Catholic University of Porto through its Biotechnology School is planning to develop a Management and Industrial School to provide training at the higher degree level (lower than a university or polytechnic degree).

4.14 The University of Porto which is the largest of all Portuguese universities (20,000 students) has two initiatives planned for the Maia pole: 1) to develop a continuing education institution and 2) the Institute for Environmental Studies. There may be scope to improve technology transfer to industry in key areas through its interface organisations INESC and INEGI. such as environmental science. A conflicting development is the current construction of a new site for the Faculty of Engineering and the Faculty of Economics, which will be close to the Maia pole. This site will house the University's incubator which is a joint project of the University and the BIC in Porto. NET. This site is being completed with PEDIP money and will open well in advance of the Maia pole.

4.15 While it is an advantage that an important part of the University of Porto will be near to the Maia pole, it is not as advantageous as if the university site were part of the Maia pole. INESC must be near to the Engineering Department of the University of Porto, and thus the investment of the University of Porto on the Maia pole is crucial in developing a critical mass of research organisations on site. Aitec in Porto (which is currently incubating three companies) would move with INESC, which also hopes to set up some polytechnic level training on the Maia site.

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10 An interface organisation set up in 1986 by the University of Porto and a number of industrial assocations in mechanical engineering.

Taipas (Minho)

4.16 The Northern pole of Taipas will be affiliated to the University of Minho and potentially the University of Tras-os-Montes, which is more dedicated to agricultural research and training. Both the municipality and the local industrial association are very involved in the project. The University has put together a task force of three people to assist the development of the pole, which highlights the recognised importance of the science park to this region. The area is characterised by low tech, micro firms in traditional sectors of textiles and footwear. Alumni students are an important part of the entrepreneurial culture locally.

4.17 TecMinho is the interface organisation set up by the University of Minho. It is very involved in issues of technology transfer and business incubation. It plans to locate on the pole its incubator which is a branch of NET (NETMINHO), the technology transfer centre as well as a continuing education centre. It is quite possible that the technology transfer centre of TecMinho will become a branch of the Innovation Agency as the technology transfer officer has personal contacts at the Agency.

4.18 Through their work, the technology transfer centre of TecMinho have found local companies to be lacking in areas of quality assurance and design improvement. They have little access to business and technical information and thus poor understanding of export markets. In their opinion, it is insufficient to provide these companies the raw data; they need assistance in interpreting the data.

4.19 The University itself is involved in several European networks, including BRITE/EURAM, SPRINT Regional Technology Advisory Centres (RTAC) network, TII and COMETT.

Feira (Aveiro)

4.20 Feira has the heaviest industrial density in the southern region of Oporto. The site has good access to the motorway and its proximity to the AIP's Europarque facilities. Feira lies 40 kilometers away from Aveiro, and according to researchers at the University it is an acceptable distance to travel and an appropriate location to assist the University in developing its linkages with Coimbra and Porto because of its convenient motorway access.

4.21 The main partners in the southern pole are the University of Aveiro, Centro de Estudos de Telecommunicaçoes (CET, which is Telecom Portugal's centre for telecoms research), Centro Tecnologico do Calçado (research centre of the footwear industry), Centro Tecnologico da Cortiça (research centre of the cork industry), AIP and the municipality. There is also the potential to bring into association the Centro Tecnologico de Moldes (castings). All of these research centres were initiated under the PEDIP programme.

4.22 Industry in the area is involved in cork transformation, footwear, ceramics, metal products, machinery and transport equipment. Aveiro itself is a fast growing town, and this pole is intended to encourage this development.

4.23 The University of Aveiro has key research strengths in environmental science, ceramics and electronics (particularly in telecommunications). It is also an associate of INESC since 1987. The University is interested in participating in the science park because they realise the importance of developing closer linkages with research in order to align their activities more accurately to the needs of Portuguese industry. The University of Aveiro, like Minho, is a new university and is therefore more flexible in structure and less crippled by tradition. In the last two years, an adjunct post to the Rector was created by the University to assist the development and strengthening of industrial linkages.

4.24 AIP's **Europarque** project includes a 7000 m^2 exhibition centre, a business and cultural centre, a restaurant, a business centre which includes an incubator as well as a communication and imaging centre which is similar to the "Futuroscope" in Poitiers. The Europarque will be completed in 1997.

4.25 IDIT, the interface organisation established by the University of Porto, INETI and AIP, has been located on the Europarque, outside of the science park pole as first envisaged. The decision was taken to build IDIT on the Europarque because the PEDIP money needed to be spent, and the science park pole was not yet determined. Part of Aveiro University will also be located on the Europarque.

4.26 While a large industrial area second only to Porto, this pole seems the most unlikely to develop in the near future if at all. The science park pole is being designed to fit the progress of Europarque, but this is not considered altogether acceptable to the other partners and it is risking the development of this pole. Some partners feel that the existence of the Europarque undermines the rationale for a pole in that area because Europarque will itself provide sufficient business space and access to the research base.

NET BIC (and Aitec)

4.27 As in Lisbon, the Porto Science Park may seek to include the existing BIC, NET, to develop its incubator facilities on the three poles. There is already scope to do this at the Northern pole, where TecMinho plans to set up NETMinho.

4.28 NET has been operation for six years, and it currently represents all Portuguese BICs at EBN. They are a share owned company with 27 public and private shareholders. In 1993, they were funded 45% and were 55% self-funded. They hope to improve this proportion to become 75% self-funding, but they do not foresee being able to cover 100% of their costs from rental income.

4.29 It has two incubator centres in Porto itself, one in town and one on the INETI campus. Between the two centres, NET has the capacity for 24 companies. At present, they support 19 companies. A further five companies have moved from the incubator but still receive support. Over the years, they have supported over 40 companies in Porto. Some of these have been spin outs from the universities (5), one from a research institution and three others from multinational high tech companies.

4.30 Second stage space for companies leaving incubators is not available at the quality and size needed. NET's manager also believes that these firms still need some level of support services, albeit less so than in the incubator itself. Cost of rental property is relatively high in Porto, and there is a concern that the science park poles may set too high a price. In the future, they are uncertain whether they will take up space on the new campus being built by the University of Porto or locate on the Maia pole of the science park.

4.31 Advanced telematics are not necessary for their tenant companies at this stage. The costs would far outweigh the benefits to these companies. For the most part, the companies make use of telephone and fax and they have access to IT facilities in the incubator.

4.32 EBN is not a perfect network, but it has made good progress thus far. However, there is a concern that EBN is overstepping its brief and not concentrating sufficiently on Community issues. There is also some tension in the Network to focus on issues of importance to BICs in the North as well as the South. The EBN network has had some difficulties; some BICs are not interested in communicating in this fashion. However, barriers are being broken down by the continued use of delivering routine notices via E.mail. EBN is a network of personalities, and thus the meetings are essential to establish contacts. Once initiated, telematics can facilitate the development of these linkages.

4.33 Europartenariat has not been as successful for NET and its tenant companies. Again, Portuguese companies are not in the tradition of exporting nor operating in foreign markets. NET is also a member of TII and they find the Technology Request Network to be a good service. Unfortunately, it is useful to only 5% of their companies at this stage of Portugal's push into high technology.

Porto companies

4.34 Because none of the science park poles have been built, consultations were held with companies from NET BIC, which are possible tenants for and potentially the greatest beneficiaries of the science park poles. In general, they were aware of the science park plans but felt they were too far in the future to pose any real solutions for their present needs.

4.35 **GISIA** is a service company providing GIS (geographical information systems) and employing five people. The company, which was established in 1992, has negotiated an agreement to distribute Canadian GIS software across Europe. These contacts with Canadian firms have been established by the company's managing director, who has lived in Canada for several years. The company was founded using owner capital and has been growing on retained earnings because of the difficult banking conditions.

4.36 The managing director is skeptical of the benefits of science parks in improving commercialisation from the research base. In the field of GIS, GISIA faces unfair competition from state laboratories and interface organisations which are financially supported by government and which directly compete for their business. They hope to win an important contract from the Porto wine growing industry, for which they have helped in securing a grant of 5 million Canadian dollars from the Canadian government.

4.37 They are actively looking for partners in Europe, but they have not found the appropriate channels as yet. Business and technical information acquired in Porto is also of poor quality and too late to be of use to GISIA. They are sensitive to both cost and timing with respect to information services, but they perceive it as a necessity in finding market opportunities. GISIA use the telematic facilities of the University of Porto where one of the partners is a staff member. At this stage, they are only using E.mail but they would like to be able to download new GIS software telematically in the future.

4.38 AUTSI has been operating for less than one year and it employs five people. The company carries out contract design and system development in automation on behalf of industry and power plants. Since establishment, they have encountered a few problems in their operation.

4.39 Autsi has difficulties with the representatives of its suppliers, most of which are in Germany, Japan, the US and Switzerland. The representatives are not technically skilled and they cannot get the information that they need. A telematic link with suppliers would assist them greatly, but this is partially a problem with the supplying companies who prefer to delegate customer support to their local agents.

4.40 Another important barrier to Autsi's development is the lack of business and technical information available to entrepreneurs in Porto and Portugal more generally. In many cases, the information is just not accessible in Portugal; where it is accessible, there is always a long delay in receiving the information in Porto. The company is interested in investigating foreign markets, but is unsure how to begin a market analysis nor how to set up strategic alliances with foreign companies.

4.41 Autsi has a close working relationshp with the University of Porto and INESC, both of which have strengths in automation. They have no such links with other companies operating in this field, although they are aware of several in Porto and throughout Portugal.

4.42 The company uses modems within the Porto region as some of their staff prefer to work at home. They would like to develop an on-line service for their customers eventually, but they are not convinced of the need for an ISDN line.

Key issues for Porto

4.43 Key points particular to Porto are identified below:

- The Porto Science Park is in danger of becoming three separate science parks and of these, Maia would be the strongest development. The loss in momentum has dulled the interest in the Porto Science Park, and the pace has to be renewed and commitment to the project made clear. Otherwise, the Europarque and University of Porto development will carry on without consideration of the Park and alter fundamentally the innovation landscape.

- Porto continues to be poorly served in terms of business resources, research and financial support relative to Lisbon. For a true rebalancing of the national economy, many people argue that more resources need to be devoted to the North.

- The BIC development, largely based on NET, is growing in strength and importance in the North. Already a wider network of integrated BICs is helping to support develop high tech small firms which are likely tenants for the planned science park poles.

- The Porto Science Park has been designed in part with the needs of local industry in mind. This is particularly true of the Northern pole which will be situated in the heart of the textiles industry. Insofar as these science parks can assist the modernization of traditional industries as well as the diversification into higher value production (through new technology based firms and technology transfer to existing firms), the Porto Science Park will be meeting the needs of the Oporto region.

Chapter Five

CONCLUSIONS AND RECOMMENDATIONS

5.1 The science park movement is at a very early stage in Portugal and has suffered many delays. As such, this is a very influential phase of development and a number of issues should be addressed in considering ways forward.

Objectives of science parks

5.2 Science parks in Portugal are developing with very local objectives. Only one is really interested in attracting inward investment from foreign multinationals. Most are addressing the local circumstances and hoping to build R&D companies. In the long term, this is likely to be a successful objective but there are several difficulties foreseen in the short to medium term. Portuguese industry is still very much a low level R&D user, and demand for science park space (as opposed to high quality, high profile space) may be limited. The development of spin outs - although in evidence and occurring at a higher rate than in other countries - is not likely to fill up more than the incubators on site. In practice, the burden will be on science park managers to identify real R&D potential and encourage its development in the face of a weakening economy, an unhelpful banking sector and a confused system of innovation support. Pressures to make these schemes a financial success may detract from the original objectives of the parks.

5.3 Manufacturing should be allowed on the science parks of Portugal. Many science park schemes have indicated that they would not be allowing manufacturing to take place on the park. In the North, this is a common criterion for science parks (nb UKSPA). However, this strategy is in clear conflict with Portugal's economic trump card - its low cost production base within the European Union - which will be the basis of attraction for most multinational companies. This restrictive criterion also negates a large and valuable part of the innovation process, the application of R&D to production processes.

5.4 Other innovation support agencies and national schemes must be drawn upon to assist the science parks in meeting their objectives.

Human network requirements

5.5 Local networks are poor because the innovation support infrastructure in Portugal is underdeveloped. Organisations with similar objectives are not collaborating on important issues. The result is an apparently fragmented and confusing system which is not supporting innovative Portuguese firms. This fragmentation begins at the top level of government and trickles down.

5.6 Science parks in Portugal are developing in isolation from one another. This stands in marked contrast with the BIC development, which have been on balance more effective at developing linkages with one another, although there are some exceptions.

5.7 BICs can play an important feeder role for science parks. Spin outs occur at greater frequency than northern countries, in part because of the greater absence of high tech industry in the local economy. There should be a formal cooperation between BICs and science parks in Portugal - an innovation network of support - which will bring in other agencies (the Innovation Agency) and relevant bodies (industry liaison officers from universities) to improve the innovation infrastructure in Portugal.

5.8 Porto Science Park is considered an objective player in the science park movement in Portugal. Its Association could play a pivotal role in bringing together the Portoguese Science Parks into a national association. However, it may be too small and too comparable (all at the same stage in development) a group to provide for a valuable experience sharing exercise. There may be some merit in considering the value of an Iberian Science Park Association.

5.9 All science parks voiced an interest in developing more links with science parks across Europe. These managers were more interested in these networks for practical information and support than for lobbying activity. This is most likely a function of their stage of development. The requests for more linkages and assistance in developing linkages were strongest from those projects which had long since lost any SPRINT science park consultancy support.

5.10 More information on other science parks is needed as a first level support for networking. Such a directory would detail not only basic information, but also regional characteristics and challenges, objectives of the park and unique services and facilities. A meaningful exchange of management staff between science parks to develop solutions for problems they face would be welcomed by the science parks of Portugal. In addition, managers believe that their companies must also have an opportunity to meet potential partners based on other science parks. This could be achieved by the development of interest group areas (based on technology or industry sector) which would arrange exchanges at existing Commission events such as EuroAlliances, EuroBusiness Days and EuroPartenariat. However, public support for attending these meetings would be needed by some of the Portuguese firms.

Telematic network needs

5.11 TLP plans to develop Metropolitan Area Networks for Lisbon and Porto, which happen to be the sites for all of the science parks planned for Portugal. TLP has also indicated its interest in using science parks as mechanisms to develop local demand for advanced telematic services. All science parks should negotiate with TLP to have access to the MAN when possible. At present, only two seem likely to have access.

5.12 Most firms consulted during this study were not using advanced telematics. At most, they were using E.mail and file transfer. The key issues for developing the usage of telematics will be:

- appropriate demonstration of benefits and training
- assistance in assessing the firm's communication needs
- the development of good value added services
- reasonable costs.

Support for local firms

5.13 Portuguese firms show a remarkable lack of interest in exporting or operating in foreign markets. In part, this lack of interest is the product of fear of risk and ignorance about markets elsewhere in Europe and a general lack in self-confidence. It must be a priority of innovation intermediaries to assist these firms to break into foreign markets and to set up strategic alliances with foreign firms.

5.14 Firms evidence a great need for business and technical information, which could be delivered on the MAN, and potentially the need for assistance in interpreting the data. One of the INETI Information Service managers reviewed local demand for business and technical information for her PhD; her conclusions were that businesses in Portugal felt very isolated and were unsure of where to get information. Marketing and awareness raising campaigns will be essential in developing the demand.

5.15 None of the science park management teams have considered how they can or will support companies off site. BICs, on the other hand, are generally supporting a number of companies off-site. This may be a function of time - it is too early in science park development in Portugal to recognize a need for this.

Portugal

LIST OF CONSULTATIONS

1 NATIONAL LEVEL - POLICY

- Junta Nacional de Investigaçao Científica e Tecnológica [JNICT]
  Luisa Henriques, Directora de Serviços

- Instituto de Apoio as Pequenas e Médias Empresas e ao Investimento [IAPMEI]
  Maria Rita Varandas, Chefe de Departamento de Projectos Especiais

- Telefones de Lisboa e Porto, S.A.
  Teresa Abecassis, Grandes Clientes - Serviços Especiais, Directora de Serviços

- Agência de Inovação, S.A.
  José Manuel da Graça Martins, Director Geral
  Francisco Manuel André de Oliveira, Administrador

OTHER EXPERTS

- Manuela d'Oliveira
  Science Counselor, British Council

2 LISBON AREA CLUSTER

Science Parks

2.1 TagusParque

Park management

Fernando Gonçalves, Administrador Executivo
Vasco Varela, Marketing Director

Associated HEI/RIs

- Instituto Superior Tecnico
  Diamantino Freitas Gomes Durão, Presidente (Professor Catedrático)

- Instituto de Engenharia de Sistemas e Computadores (INESC)
  Professor Dr João C R Lourenço Fernandes, Director

2.2 Lumiar Science Park (LISPOLIS)

Park management

Francisco Alberto Jarro, Administrado Executivo
Aurélio de Sousa, Director Administrativo e Financiero
José Paulo Pinto Lobo, Direcção Administrativa e Financiera

Associated HEI/RIs

- Instituto Nacional de Engenharia e Tecnologia Industrial (INETI)

  Mário Mánuel Pereira Gomes de Abreu, Vice-Presidente *Also member of park management team*
  Maria Da Graça Carvalho Fernandes Proença, Chefe da Divisão de Informação
  Maria Joaquina Candeias Carvalho Barrulas, Investigadora

Tenants

- JTL LDA
  Sr Naro Leal

- Software, Formaçâo e Multimedia, LDA.
  Cristiana Moreira, Directora Geral

2.3 Uninova - Alamada Technology Park

- Professor Steiger Garção
  Director, Uninova

BICs

2.4 Centro Promotor de inovação e negócios - CPIN

José Carlos Amaral, Director Geral

Tenants

- Hidromod, LDA
  Adélio J R Silva, Director

2.5 Aitec

Francisco P Soares, Presidente do Conselho de Administração

Tenants

- Tecnologias de Microelectrónica [TECMIC]
  Gabriel Saragoça

Local organisations

2.6 Comissão de Coordenação da Região de Lisboa e Vale de Tejo
João Biencard Cruz, Vice-Présidente

2.7 Associação Industrial Portuguesa
Cristina Pescada, Apoio Técnico as Empresas

Technology Demonstration Centres

2.8 Lisbon Teleport

Pedro Salazar Leite
World Trade Centre - Lisboa *Centre currently has an incubator*

Tenant

- Women at Work
  Isabel Lacerda Alçada Monteiro, Director

2.9 Centro de Comunicaçoes em Ambientes Empresariais
INESC
Cândido Manso, Coordenador de Centro

3 PORTO AREA CLUSTER

Science Parks

3.1 Porto Science Park

Associação para o Parque de Ciência e Tecnologia do Porto
Cândida Leal de Loureiro, Director Executivo

Associated HEIs/RIs

- INESC
  Pedro Guedes de Oliveira, Director

- Universidade do Porto
  José Novais Barbosa

- Universidade do Minho
  TecMinho - Associação Universidade/Empresa para do Desenvolvimento
  Jaime C L Feirreirà da Silva, Director Delegado
  Ana Paula Amorim, Coordenadora de Projectos, Dept Transferência de Tecnologia

- Universidade do Aveiro
  Assistant to Prof Tomás da Fonseca

BICs

3.2 Novas Empresas Technologias (NET), S.A.

Eng Jorge Monteiro, Director

Tenants

- GISIA, LDA
  Teresa Maria Moutinho Periera, Manager

- Automação, Sistemas de Informação e Engenharia (AUTSI) LDA
  Pedro Malafaya, Director Geral
  Luiz Malafaia, Project Manager
  António Teixeira, Research

Local organisations

3.3 Associaçao Industrial Portuense

Roberto Guedes, Conselho Executivo
Vítor Carvalho

3.4 Comissão Coordenação Região Norte

Prof Álvaro Cunha (via Candida Leal de Loureiro)

LITERATURE REVIEWED

A significant amount of literature from the science parks, government agencies, companies and others consulted has been reviewed. Acknowledgement must be made of the following documents:

Prof J M Gago et al. "Portugal: Shaping Factors", The European Challenges Post-1992, ed Alexis
Jacquemin and David Wright. Edward Elgar: Cambridge 1993, pp 377-399.

OECD Reviews of National Science and Technology Policy - Portugal 1992. OECD: Paris, 1993.

Circa Group (Dublin) and Challenge (Lisbon). "Evaluation of Community Support Frameworks for
Research and Technology Development - Portugal", November 1992, unpublished report.

Segal Quince Wicksteed. "Porto Science Park - Viability study", 1991. unpublished report.

Segal Quince Wicksteed. "Lisbon Science Park - Viability study", 1991. unpublished report.

GLOSSARY

BERD	-	Business expenditure on R&D
Ciencia	-	RTD development programme supported by the Commission and the Portuguese government (1989-1993)
GERD	-	Gross Expenditure on R&D
IAPMEI	-	Agency for small and medium enterprise
IPE	-	public organisation which managed public holdings in private companies and in new projects funded by foreign capital.
JNICT	-	Agency implementing S&T policy and the primary state funding body for research
NBIA	-	US National Business Incubator Association
Praxis 21	-	Follow-on RTD development programme (1994-1999)
PEDIP	-	Industrial development programme supported by the Commission and the Portuguese government (1989-1992)
PEDIP II	-	Follow-on industrial development programme (1994-1999)

SPAIN

PROSPECTS FOR SPNET

IN

CATALUÑA

April 1994

Fred Bennetts

INDEX

1. INTRODUCTION

In the course of a visit to Barcelona of 2.5 days, interviews were conducted with, amongst others, the Director of the Valles Technology Park - who is also directly responsible for the Centro de Empresas de Nuevas Tecnologias (a BIC) located on the Park. Within the City of Barcelona, the consultant interviewed the Director of Barcelona Activa, which is also a BIC.

As regards the Generalitat (regional government), discussions were held with the person responsible for industrial and technological promotion. Within the Universities, contacts were made with the Fundacion Empresa y Ciencia (of the Universidad Autónoma) and the Universidad Politécnica. Finally, 6 companies were visited, one of them a venture capital company located in Barcelona, others in the BIC, and yet others on their own premises in the Park.

2. ECONOMIC BACKGROUND

Cataluña is a Comunidad Autonoma (region) comprising 4 Provinces: Barcelona, Tarragona, Lerida, and Gerona, with a total population of some 6 million. The capital of the regional government, known as the Generalitat, is Barcelona. Parts of Cataluña are classified as Objective II.

Cataluña is, by most measures, the leading industrial region in Spain and one of the most dynamic, contributing almost 25% of total industrial production. Its structure is well diversified between the principal subsectors - metal products and machinery; textiles, shoes, and leather; chemical products; food and beverages; and energy. Most of these account for about 10% of total regional production and none for more than 20%.

In relation to the pattern of production and employment, Cataluña sees its industrial structure as being similar to that of North Westphalia, Baden-Wurttemberg, Nord Pas de Calais, Yorkshire-Humberside, and the North/East Midlands.

As regards size of companies, only some 100 employ more than 500. In total such companies account for only 15.9% of employment - which is well below the EU average (54.3% in the case of the U.K.). Companies with less than 100 employees account for 57.9% of the total - well above the EU average. Geographically, industry and business activity generally is very heavily concentrated in and around the capital, Barcelona.

Foreign investment in Cataluña increased very significantly between 1985 and 1989, by over 55%. It now represents some 25% of the national total, with chemicals and metals showing particular strength. EU countries account for over 50%. Factors of attraction probably include: existing industrial fabric, proximity to Europe, qualified work-force, and good transport infrastuctures. As regards exports from Cataluña, their pattern has, roughly, followed that of Spain as a whole; notable export industries have been machinery, fuel, cars, and chemicals.

3. INDUSTRIAL AND TECHNOLOGICAL POLICY

The Generalitat believes that the role of government in ensuring the competitivity of industry lies in the creation of a suitable environment in which the key factors are macroeconomic and structural. Since the former are largely the responsibility of the central government - as they relate to fiscal policy, exchange rates, interest rates, labour law etc - the Generalitat has concentrated on the latter. Major achievements have been: the improvements in transport infrastructures and the provision of industrial land, training, energy infrastructures, and technological infrastructures.

Given this philosophy, the Generalitat - which is declaredly non-intervenionist - has developed some programs for the period 1993-'96 in the form of a Plan for the Stimulation of Competitivity. Some key features refer to the promotion and financing of:

- Internationalisation:
  - . Promotion
  - . Training
  - . International collaboration

- Services to Companies:
  - . Creation of Business Centres
  - . Promotion of handicrafts
  - . Industrial safety measures
  - . Competitivity audits
  - . Business data bases
  - . Support for business start-ups
  - . Standardisation and certification

- Research and Development:
  - . Creation of the IDIADA car-industry centre
  - . Further develop the testing, technical service, and research centres of the region
  - . Equip the recently-completed Laboratorio General de Ensayos e Investigación (LGAI)
  - . Training in New Technologies
  - . Technology Advisory Services

As regards r.& d., the key Regional Government Departments are the Dirección General de Industria (DGI) and the Centro de Información y Desarrollo Empresarial (CIDEM). The DGI's review of r.& d. in Cataluña includes the following:

- overall a low level of r.& d., measured both in terms of technological trade balance and as a % of GDP (0.67% in 1990)

- culture of Catalan companies: a low level of r.& d.(other than in some pharmeceutical and chemicals companies - and in some multinationals); little awareness of the importance of cooperative projects and internationalisation

- limited control by the regional government over some publicly-owned research centres (the 13 CSIC centres located in Cataluña but owned by the central government)

- a substantial part of r.& d. financing is controlled by the central government, notably the Plan Nacional de I.+ D. and the CDTI funds

- incomplete range of publicly-supported technical service centres

- a significant improvement has been achieved in University/company relationships; in 1991 the value of contracts and collaborative research projects of the 3 major Barcelona Universities amounted to approximately 51 million ECUs

The other key body within the Generalitat, related to research in a wider context, is the Comisión Interdepartamental de Investigación e Innovación Tecnológica (CIRIT). This inter-departmental body has responsibilities for co-ordination as well as defining priority areas for the region. In its Plan de Investigación 1993-'96, priority areas for research include:

- Agro-industries
- Fine Chemicals
- Health and Quality of Life
- Environment

This is the first Plan of its kind. It should be noted that the Generalitat has not been in the forefront of Spanish regions in developing and carrying out a consistent r.& d. policy. The criticism can also be made that the infrastructure, while impressive, has not been developed in accordance with any clear pattern or sense of priorities (viz the syncrotron, below).

The current situation of r.& d. in Cataluña is, in some respects, a cause for concern to Pere Escorsa and Jaume Valls in their recent report on Research and Technology for the DGI. They point out that, despite the dynamism of Catalan industry, there has been no "explosion of high technology" in the region. The process has been one of adaptation and incorporation of technology rather than creation. In some segments Cataluña has been catching up on more advanced countries but in others its backwardness appears irremediable; they suggest that this is so in the case of the electronics industry - which is now entirely in the hands of foreign capital.

In other respects, however, the same authors find the the situation more encouraging. Thus a Monitor Fast study in 1991 classified Cataluña as a region with high receptivity to innovation (this took into account not just r.& d. but all the other factors that make innovation possible: University system,

business structures, services available etc.). Moreover they suggest that Cataluña leads Spain in r.& d. expenditure. The statistics suggest otherwise, with Madrid accounting for 42% v. Cataluña's 20%, but they believe these figures may be distorted by the high concentration of research centres and company headquarters in Madrid (some of whose r.& d. is conducted in other regions). They point out, moreover, that the proportion of research carried out by companies in Cataluña is higher than the national average and that Catalan companies are the source for almost 40% of the "technology development" projects financed by CDTI.

4. TECHNOLOGY INFRASTRUCTURE

The technology infrastructure of Cataluña promoted by the Generalitat consists of a loose network of laboratories and centres for research and technical services, some publicly owned, others joint ventures. They include:

Laboratorio General de Ensayos e Investigación (LGAI)

The LGAI, located close to the Vallès SP, is based on an old institution. It has, however, been extensively modernised and expanded in recent years at a total cost of some 81 million ECUs. Over the next 4 years an additional investment, in equipment, of 9 million ECUs is planned. It comprises 15 centres specialising in areas such as polymers, electronics, construcion, metallurgy, and fine chemicals (a fine chemicals pilot plant has recently been built). Primary activity is testing of products and materials. However, it offers a wide variety of services, including contract research. Annual income 6 million ECUs - which covers operating costs. Forms part of EUROLAB and participates in SPRINT, CTS-2, CTS-2BIS, REWARD, COMMET II, HERMES.

Instituto de Investigación Aplicada del Automovil (IDIADA)

Again, an old institution which has been incorporated into the Generalitat's network and is a platform for University/industry collaboration. Offers standardisation services, testing, and contract research. A new laboratory complex now being built includes a test track of 4.5 kms - one of the 3 best in Europe. Total investment 32 million ECUs, partly FEDER-financed. Location offers easy access from other car-industry regions (Aragon and Valencia).

Centro de Supercomputación de Cataluña

Supercomputer centre. Founded 1991. Offers to users in the public and private sectors hardware, software, and consultancy services. Connections to major international research centre such as CERN, Cornell, CNUSC. Also offers access to academic-scientific networks such as EARN, EASINET, IXI, NSF.

Syncrotron

The decision was taken earlier this year by the Generalitat to build a 2.5 GeV syncrotron (linear accelerator) in the Vallès, close to the SP. It will be built entirely in Cataluña over a period of 10 years. Total cost 69 million ECUs. The Generalitat anticipates that the central government and the European Commission will contribute.

Other elements of the technology infrastructure include, in addition to the Universities:

- the Instituto de Investigacion y Tecnologia Agroalimentaria (IRTA), an exceptionally active centre related to the food industry which has spun off some small companies

- various associations which provide research, technical, and training services for specific industries; notable amongst them is the Asociacion Catalana de Empresas Constructoras de Moldes y Matrices (ASCAMM), controlled by 200 companies in the mould and matrix industry and supported by the University and Generalitat; located on the SP

- the 13 CSIC institutes - including the Centro Nacional de Microelectronica - which, although owned by the State, are being incorporated, in some degree, into the Catalan system

The creation of NTBFs is not a primary objective of this network: given the characteristics of the Catalan economy this is seen by the Generalitat as being largely a spontaneous process, aided by instruments such as the Science Park, BICs, and other Centres de Empresas (some 30 in all).

The principal aim of the network is to help in strengthening and consolidating technology-based companies which have grown to employment levels of 30-100 and a minimum turnover of about 6 million ECUs. It is believed that this constituency consists of about 1000 companies ; they can benefit from the use of external technological resources and need guidance to access support programmes (CDTI, Plan Nacional, EU etc.). In addition, the network is available for larger companies - some 250-300 - who are already engaged in r.& d. activities (most of them with r.& d. budgets of some 300.000/600.000 ECUs p.a.).

5. BARCELONA ACTIVA (BIC)

Barcelona Activa is one of 3 major initiatives developed by the Ayuntamiento (local authority) of Barcelona for the promotion of new business activities (amongst other objectives). The others elements in this loose network are:

- Catalana de Iniciativas S.A.
- Barcelona Tecnologia S.A.

The former, a venture capital company, is the result of a recent merger between the interests of the Ayuntamiento and the Generalitat in this field. The latter (in which the 3 Universities, a Bank, and various companies are also shareholders), was conceived as a venture capital company specialising in University spin-offs. It now has a portfolio of 17 such companies but its core activities have changed, both because of limitations on the size of their fund and because of difficulties in the management of the companies (continuing "cultural gap" problems between Universities and the business world). Its staff of 16 are now engaged primarily in technology transfer activities - acting as intermediaries or as leaders/participants in various European programmes - DRIVE, SAVE, BRITE-EURAM, EUREKA.

As regards Barcelona Activa (BA), it forms part of the EBN network but its management recognise that it is atypical and that some problems have arisen in this respect. They appear to attribute them to the fact that they are not unduly concerned about projecting their image as a BIC - in addition to some procedural difficulties. They appreciate the EBN seminars (although of rather variable quality) and Bulletins. As regards use of EBN consultation facilities by incubator companies, they have sometimes found it useful to ask for help from BICs in other countries in searching for allies, clients etc..

The two main lines of activity of BA are: creation of micro-companies and training (of the unemployed and of company staff). Their main building in central Barcelona measures 4.000 m² and includes an incubator which houses 78 companies. Two buildings in other parts of the city house, between them, 35 companies more. In addition, in each of 6 small offices scattered around the city, teams of 3 provide counselling services. Total staff 80, of whom 22 are incubator-related; includes 10 advisors (business plans etc.), 3 consultants, and 5 administrative staff (servicing the companies).

BA's company creation activities are self-financing - i.e. it covers operating costs, of 880.000 ECUs. Income from incubator rentals amount to 690.000 ECUs and the balance is made up from fees for business consultancy services provided to external clients.

BA is about to undertake a major new project, FORUM, which will require an investment of 6.3 million ECUs. This will be provided, on a matching funds basis, by FEDER and the Ayuntamiento. The project will provide 2.500 m² of additional space and will comprise: an exhibition hall for technologically innovative products, a training centre for new technologies, and an incubator specialising in NTBFs. Additional business services and some multi-use equipment will be made available from the new building.

In addition, BA is launching a pilot project, with the support of RETEX (the EU fund for the conversion of textile industries) for the creation of a new form of venture capital

fund. The total value of the Fund at the pilot project stage will be approximately 480.000 ECUs and it will provide up to 40% financing for new investments of, on average, 80.000 ECUs. The system is based on ceding the use of funds through private contracts, rather than on share-holdings. The need for this Fund arises from the fact that other venture capital funds and the reciprocal guarantee funds are aimed at a different segment of the market, investments starting at about 1.3 million ECUs.

As regards telematics equipment, the incubators provide communal fax and modem facilities. Few of the current tenants of the incubators use the modems. BA management, however, believe that FORUM project tenants are more likely to do so, for communications, access to data bases etc.. A network of Science Parks which included BICs would be of interest to the management of BIC primarily as a means of facilitating access to information about EC programmes and possibly to international sources of venture capital.

6. PARC TECNOLOGIC DEL VALLES

The Parc Tecnologic del Valles (PTV) was the first Science /Technology Park in Spain: first tenants in 1989. Its site is 12 kms. from Barcelona and within a radius of 3 kms. are located the Universidad Autonoma, the Laboratorio General de Ensayos, and 3 of the CSIC research centres. Also close by is a Business Park, housing some major companies.

The project has been promoted by the Generalitat (through CIDEM) and by the Ayuntamiento (through CZF - the Free Port Zone Authority). At present they are equal shareholders in the Park management company (PTVSA), with over 49% each. Other (token) sharcholders include the 3 public Universities, 2 private business schools, some research centres and Institutes, some financial institutions, and local authorities. The Centro de Empresas de Nuevas Tecnologías (BIC), located on the Park, was at an earlier stage the responsibility of a separate company, which has since been absorbed into PTVSA. Sources of finance for the project have been the Ayuntamiento, the Generalitat, and FEDER (2.5 million ECUs in infrastructures and 2.5 million ECUs in the BIC). The Park is now financially self-supporting, with income derived primarily from the sale of land.

The Park occupies 58.5 has. of which 185.000 $m^2$is classified as industrial land. 70% is now occupied and a further 10% has been bought. In a second phase, now under consideration (although the property market is weak), the space available could be quadruplicated, bringing the outer limits of the Park up against the University campus. Space is available under a wide variety of formulae including purchase or rental of plots or buildings

PTV management see their primary objective as being the creation of NTBFs, followed by the attraction of inward investment in a general sense and the promotion of collaborative activities. Criteria for evaluating applicants include: companies

should be assigning not less than 4% of their turnover to r.& d. and should be prepared to carry out in the medium term some part of this activity (not specified) on the Park. PTV management claim that objectives and criteria have remained unchanged since the beginning of the project but imply that the rigour with which they were applied may have varied over time.

Total number of companies located on the PTV are 69, of whom approximately 39 are in the incubator. Of the total some 40% are active in computer technology, software, and telecommunications. 13% in electronics, 9% in biotechnology; other areas represented are: design engineering, business services, consultancy, and contract research. There are two major multinationals on the Park - Alcatel and Olivetti - and one large Spanish company- Telesincro. For the most part, however, tenants are SMEs or - in the case of ASCAMM (already referred to) an Association of SMEs. In total some 1000 people are working on the PTV.

The project has, therefore, some significant achievements to its credit. Despite this, there is a widespread belief that, in large part, it has failed to meet its objectives. As an extreme but significant example a source in the Generalitat has expressed the opinion that the PTV is little more than an industrial estate ("poligono industrial"). This is undoubtedly an exagerration but it reflects concern at the fact that the synergies and inter-relationships characteristic of Science/Technology Parks are still at an early stage of development in the PTV. Moreover the relationship with Universities, while close in terms of contracting services, use of equipment, and student training programmes, falls short in other respects.

There does appear to have been a significant change in philosophy from the earliest days of the PTV, when due emphasis was placed on the development of such linkages and the creation of a "Technolgy Institute" was an integral part of the project. Since then pressures have built up on successive managers (turnover has been high) to achieve financial self-sufficiency as soon as possible and a large part of the management team's time has been spent on property promotion and facilities management. It is significant that the post of Technological Advisor ("Asesor Tecnológico") was apparently abolished and that the present 9-person team consists of a Director, Managers in charge of the BIC, Marketing, and Finance, secretaries, and maintenance staff.

The management of the Park is itself concerned about these issues and hopes in the future to promote technological development and collaboration more actively. A start has been made to this process: a catalogue of tenant companies has been prepared and an internal Bulletin is circulated; breakfast meetings of tenants and Open-Door Days are organised; information is distributed about commercial opportunities and European Programmes; business introductions are arranged. Most of these activities are re-active in nature and the Park management is taking few initiatives for the stimulation of collaborative

ventures (note, however, that an association of SP companies has undertaken some collaborative promotion - see below)

An underlying problem may lie in the pattern of ownership of PTVSA - which does not encourage wholehearted commitment by the promoters. The even distribution of share capital (and, therefore, of any credit for achievement) between two parties is perhaps not the best of formulas when those concerned are of different political complexions - as in the case of the Generalitat and the Ayuntamiento of Barcelona. Whatever the reason, the PTV is not now seen as a key ingredient in the Generalitat's industrial development strategy. There is no reference to it in either of the current Plans referred to above (Research and Stimulation of Competitivity). More explicitly, the Generalitat, while expressing satisfaction with what has been achieved, believes that new tools have become available and that the Park does not offer any major differentiating factors.

Relevant topics discussed in company interviews were:

Aplicaciones en Informatica Avanzada S.A (AIA)

Located in BIC. Staff of 21. Develop software with artificial intelligence techniques. Principal clients in electric utilities and banks. Good support from Park management re information about European programmes (ESPRIT and EUROLEADERS) but AIA does not have resources to follow up. Would welcome SPNET if it could provide support for proposals to European programmmes. Also could be useful for:

- search for technological/commercial allies in EU
- data bases, particularly on recent publications re artificial intelligence

Telesincro

European leaders in development and manufacture of electronic payment terminals. Shareholders include Bull and Inisel.150 staff of whom 30 are engaged in Development activities. Active participants in European and national collaborative r and d. projects, notably in ESPRIT and EUREKA. Describe the process as (1) joint project definition (2)individual project work (3) integration of results. Final stage requires massive data transfers, usually by couriered magnetic discs. The Park offers no alternative at present and present system is seen as reasonably satisfactory. However, they would welcome any initiative to improve existing systems.

Europroject

Engineering consultancy. Until recently they occupied a wing of the BIC. Now have their own building. 90 professionals in PTV plus 70 others in German and French affiliates. Specialists in transport engineering. Active

participants in European programmes, including EUREKA (2) and EUROMAR (including project in Biellorussia). Collaborate with Universidad Politecnica (including use of supercomputer). Very dissatisfied with telecom infrastructure of PTV. A switchboard for Ibercom (a Telefonica business network for voice and data) has been installed on the Park but without an X-25 (packet-switching) module - which would cost an additional 60.000 ECUs. Europroject is not prepared to pay this on their own and no other tenants appear interested. SPNET would be of interest to them primarily for commercial purposes: they could offer a wide range of engineering expertise to clients and possible collaborators on other Parks.

Dentaid

Leaders in the dental hygiene market in Spain. New 5.000 m² building on Park for r.& d. and manufacture. Staff of 50, of whom 8 engaged in r.& d.. No collaborative projects with other companies but work closely with Universidad Autonoma. Use phone/fax and modem (latter particularly for contacts with software support company in Sabadell). Attracted to Park in part by assumption that it was, or would become, a good information centre - re new markets, range of support services available, and European projects. Would welcome SPNET to the extent that it provided such information.

Aries

Located in BIC. Staff of 2.5. Designs and supplies equipment and software for automatic transmission of data through modems and PSTN. Clients are closed groups: companies (manufacturing/retail) with a large number of branches who require daily transfers of large amounts of data. Achieves cost advantage by using night-time rates on standard lines. Makes the point that X-25 and RDSI would be expensive solutions for such users even when available. Have received valuable help from PTV management: initial Business Plan (through BIC) and help in making business contacts. Also benefit from image. In addition, Aries formed part of a group of PTV companies that banded together some 6 months ago and, with financial support from Ministry Industry, hired a consultant for purpose of joint promotion - primarily by arranging meetings with major companies and institutions. Would be interested in SPNET for occasional consultation of data bases re international standards, identification of potential distributors etc..

The opinion of the Park Director in relation to the creation of a network of SPs was clearly stated. As regards inter-Park relationships, he has a poor opinion of existing networks - particularly the IASP: believes they are largely concerned with preserving the brand name and should take a more active role in formulating creative proposals for European Commission support.

To the extent that interchanges of management know-how between Parks can be of value (he gives them a relatively low rating), he acknowledges that a telematics network could represent an improvement.

However, he believes such a network can only be justified if it is of real utility to companies on the Park. On that issue he is profoundly sceptical. He recognises that it is potentially useful in terms of internationalising activities, providing specialised services and promoting commercial, financial, and technological collaboration. He believes however, that the frame of reference of companies on his Park (suppliers, clients, associates) is infinitely wider than that which is encompassed by companies on other Parks.

The Park Director is aware that some foreign Parks have extended their influence beyond their own boundaries - he cited the case of Montpelier (with which the PTV itself has a special relationship). However, in the case of the PTV and most Spanish Parks (with the Basque Country as an incipient exception) the SPs are not genuine regional networks of high technology.

Another cause of concern is the management aspect of the network: he believes there is a danger that a new bureaucracy might be created within the Park. If the network were extended beyond the Park, the problem would remain: logically, some government body would take management responsibility and functionaries are not ideal candidates.

Finally, as regards telecom infrastructures and services, he believes that new developments will soon make them available to everyone (in the case of Cataluña, in addition to Telefonica's plans, the Generalitat is investing 57 million ECUs in a regional network to be competed in 1996). The PTV already has in place most of the infrastructure which is required to link up by fiber optics rings with the University, the supercomputer centre, Telefonica's teleport, and many other facilities. They have not yet invested in the necessary interconnections largely because the level of demand by companies on the Park is so low.

APPENDIX
PERSONS INTERVIEWED: SPNET - CATALUÑA
21st - 23rd March 1994

1.	Parc Tecnològic del Vallès	Daniel Quer Director
2.	Generalitat de Cataluña Direccion General de Industria	Josep Montagut Jefe Servicio Promoción Industria y Tecnologia
3.	Fundación Empresa y Ciencia (Universidad Autonoma)	Josep Surís Director Gerente
4.	Universidad Politécnica	Pere Ecorsa Catedratico
5.	Barcelona Activa (CEEI)	Joan Oller, Director
6.	Barcelona Tecnología	Anna Llorente J. Promoción Tecnológica
7.	Telesincro	Joan Navarro D. Innovación Tecnológica Marcos Solé D. Recursos Humanos
8.	Aplicaciones en Informatica Avanzada	Marta Ysern Directora Comercial
9.	Aries Technologies	Jordi Moix Director
10.	Europrincipia	Javier Ruiz Director Gerente
11.	Dentaid	José Suner Subdirector

PROSPECTS FOR SPNET

IN

VALENCIA

March 1994

Fred Bennetts

INDEX

1. INTRODUCTION

Interviews were conducted over a 3 day period in the Comunidad Autonoma (region) of Valencia. The consultant visited the BICs - and some related organisations - in Alcoy, Elche, and the city of Valencia. Also in Valencia he visited the Acting Manager of the Science Park, the Director of the new SP management company (SEPIVA), the regional development agency (IMPIVA), the Universidad Politécnica, a business school, companies, and a research institute. A complete list of those contacted is attached to this report as Appendix I.

2. ECONOMIC BACKGROUND

The city of Valencia (population 1 million) is the capital of a region (of just under 4 million) which comprises 3 Provinces: Alicante, Castellón, and Valencia. It is the third largest city in Spain.

Gross Regional Product (GRP) is approximately 30.700 million ECUs. Services (primarily tourism) account for approximately 60% and Industry for 35%. Note, however, that while Agriculture contributes only 5% to GRP, Valencia is first amongst Spanish provinces in agricultural income and its sister provinces also rank high (in addition to citrus, the region produces a wide variety of early vegetable crops). The region is a major international trading centre and Valencia is one of Spain's busier ports. Links with the Mahgreb are strong, particularly as between Alicante and Algeria.

The structure of industry has undergone major changes in recent years, amongst them the closure of the integrated steel mills at Sagunto. There are a few large companies in the region - notable amongst them Ford, Industria Española de Aluminio, Petroleos del Mediterraneo, and Valenciana de Cementos. For the most part, however, the industrial sector is made up of companies of less than 50 workers. The region has had some success in starting up new companies and attracting foreign investment. The regeneration of Sagunto, on and around the site of the steel mill, was one of the major success stories of the '80s in Spanish industrial development.

The production of consumer goods is of particular importance and there is a high degree of specialisation in relation to geographic areas. Examples of this are tiles in Plana de Castellón, shoes in Elche and the Valle de Vinalopó, toys in Ibi, and textiles in Onteniente and Alcoy.

This feature of the region corresponds to a pattern of relative decentralisation. The city of Valencia does not dominate the economy and while some growth elsewhere in the region can be attributed to tourism, industry has also been a major stimulus. This is particularly the case in Alicante, whose economy has shown considerable dynamism.

The region's communications infrastructure has been much improved, overall, in recent years. The principal cities are linked by major highways to Barcelona and Madrid. There are international airports at Valencia and Alicante. Feasibility studies are now under way for a high-speed train line from Madrid to Valencia. As regards telecommunications, there appear to be no significant regional initiatives but the major cities are already benefitting from Telefonica's expansion of the ISDN network.

Communications are very much less developed in the hinterland and the situation is aggravated in some cases by mountainous topography. Towns of the importance of Alcoy are poorly served by existing road and telecommunications networks.

3. INDUSTRIAL AND TECHNOLOGICAL PLANNING

Regional development activities in the Comunidad Valenciana are largely centred on a number of entities created by the Consejeria de Industria, Comercio y Turismo of the Generalitat (regional government). They are: the Instituto de la Mediana y Pequeña Industria Valenciana (IMPIVA); Seguridad y Promoción Valenciana (SEPIVA); Instituto para la Promoción de las Energías Alternativas (IPEAE); Instituto Turístico Valenciano (ITVA); and Promociones Comerciales Valencianas (PROCOVA).

In the field of industrial development the key agency is IMPIVA. Its principal objective is to stimulate greater competitivity through innovation. This takes the form of modernisation of key areas of activity - notably information, training, design, interfirm cooperation and technology - and development of new activities.

IMPIVA has an annual budget of some 44 million ECUs and a staff of approximately 70. The full range of programmes which it controls or manages, some directly, some through intermediate organisations, includes:

- Information: particularly data bases for businesses
- Training: specialised, retraining, scholarships
- Technology: assessment, certification, testing, quality control, support for r.& d. and technology transfer

- Design: CAD/CAM services, information, assessment
- Internationalisation: trade fair visits, missions, business contacts
- Management: financial support and assessment, cooperative networks

EU and other international networks and organisations in which IMPIVA participates include:

- TII
- EFMD (business training)
- ICSID (design)
- BC-NET
- EBN
- Rutas de Altas Tecnologías de Europa del Sur

Technological Institutes associated with IMPIVA (see below) participate in various EU r.& d. programs, such as BRITE-EURAM, ESPRIT, SPRINT, and ECLAIR.

IMPIVA maintains "technical offices" in Bonn, New York, and Yokohama. It is, moreover, a proponent of creating a "Mediterranean Axis" and seeks international links for this purpose.

4. REGIONAL SCIENCE PARK PROGRAMME

4.1 General

The Valencia Science Park has formed part, until very recently, of a wider network, known as the Red Impiva. Its components were:

- the Science Park itself: València Parc Tecnològic S.A. (VPT), located close to the city of Valencia, in Paterna
- the 3 BICs or Centros Europeos de Empresas e Innovación (CEEIs) located in Valencia (on the Park), Alcoy, and Elche (in the Province of Alicante)
- the 12 Institutos Tecnológicos, widely dispersed around the region, including the Science Park

In recent weeks a new Consejero de Industria has been appointed in the regional government and there is also a new Director at IMPIVA. As a result, the responsibility for the VPT has been transferred from IMPIVA to SEPIVA, which will absorb the Park management company; the present manager of the Park will not continue in the organisation. Other changes in industrial

development policy and practice appear likely, as the new teams take over.

Other important developments related to the regional Science Park Programme (in its widest sense) include:

- construction has begun of a new CEEI to be located in Castellón

- the Universidad Politecnica is building a Ciudad Politécnica de Investigación - which they describe as a Technology Park - on their Campus in Valencia; the first Institutes are joint ventures with the CSIC (which already has a prestigious food research centre in Valencia)

- a Parque de Actividades Innovadoras is planned for a 100 has. site near Alicante, which will include a centre for r.& d. activities (see below)

The Valencia Science Park is described in greater detail in a separate section of this report. The Institutos Tecnológicos and the CEIs are referred to below.

4.2 Technological Institutes

The activities of the 12 Technological Institutes (TIs) are centred, in most cases, on a specific industry. Their headquarters are in areas of high concentration of those industries, with technical units sometimes being located elsewhere. Some of these units are on the Science Park, together with the headquarters of non-sectoral ("horizontal") Institutes. Appendix II shows the location of the TIs and provides some further detail.

In summary, the TIs and their areas of activity are as follows:

- AICE: Ceramics
- AIDICO: Construction Industry
- AIDO: Optometry
- AIDIMA: Furniture
- AIJU: Toys
- AIMME: Metal Mechanics
- AIMPLAS: Plastics
- AINIA: Food
- AITEX: Textiles
- IBV: Biomechanics
- INESCOP: Footwear
- ITENE: Packaging

These are, with one exception, relatively young organisations, most of them created within the legal framework of an Asociación de Investigación. The regional government and

organisations representing industrial companies are the principal promoters. Some 2000 companies are associated with the Institutes and, in some cases, represented on their Boards.

The TIs' staff number some 350 and their total annual budget is of approximately 12 million ECUs. At present IMPIVA covers approximately 40% of their operating costs, the balance coming from research and technical service contracts. The objective (already achieved by some) is that they should be self-financing, in terms of operating budgets.

The services provided by the Institutes include: contract research, technical services related to materials, processes, products, design, automation, IT etc., testing and certification, training, and access to technical and business information. The Institutes also participate in collaborative research projects.

TIs interviewed in the course of this study were:

AITEX

The Instituto Tecnológico Textil (AITEX) is headquartered in Alcoy, with technical units in Crevillente and Onteniente; a third unit is planned for location on the VTP. Founded by textile companies' association and IMPIVA. Employ 46. Over 200 companies in the association (mostly 10/20 workers, maximum 120) and some 500 client companies. Traditional industry, much promotion required. Areas of activity: services and research related to quality control, standards, design, improvements and problem solving related to equipment, processes, finished products.

International relationships include network of design centres in U.K., Portugal, Italy; CIRCEA (European Association of Clothing Industry Research Centres). Also act as consultants to EU Commission re network of textile centres in Greece. EU programs in which they participate include: FORCE (training materials), CRAFT, SPRINT (technology transfer with Portuguese and Italian partners, CITER and CIFER).

Relationship with other TIs based on occasional meetings, personal contacts, IMPIVA monthly bulletin. Some project collaboration, e.g. with Optics Institute on Quality Control, with Footwear Institute on numerical control systems. AITEX consider their own "horizontal" area of expertise to be CAD/CAM.

Telematics infrastructure in Alcoy limited: no ISDN. Other features:

- LAN within Aitex but little used (lack of awareness of researchers)

- X-25 packet switching, through modems, to IMPIVA offices; access to IMPIVA external data bases and to IMPI (Madrid) commercial data (little used)
- indirect access to Internet email through Institute of Ceramics and University
- hope to implement an ARCO project in '94, providing specific information services and transmitting test results to a few companies
- CAD/CAM telematics applications not much developed: problem solving and file tranfers to 3 client companies

IBV

The Instituto de Biomecanica de Valencia (IBV) is a dynamic organisation. Their work is concerned with the application of mechanics to biological systems and is, therefore, related to medical science, electronics, and IT as well as mechanics. Fields of application include work environments and sport. Product developments include special footwear, furniture (for the disabled and elderly), track surfaces, implants, and instrumentation.

Unlike most of the other TIs, it is a University Institute - but has a special status which gives it significant autonomy and permits IMPIVA to share control with the Universidad Politécnica. 45 full-time staff, plus 25-30 post-grad students and contract staff. Created 1986, located on VPT since 1989. Self-financing. Sources of income include royalties on products developed under contract for company clients.

IBV projects have been the basis for the creation of several companies (7-10) and have stimulated the growth of several others. IBV related companies on the CEI are Multitec and Biomatica; others, occupying a site of their own on the Park, are Surgival (osteosynthesis material), Comercial Envisa (electro-medical) and Ortoprono (orthopedic devices).

Participate in various EU projects: Human Capital (on rehabilitation), Euroforum, Erasmus, Telematic Initiatives for Disabled and Elderly (TIDE) - although they have reservations about EU-financed projects (because of multiple participants, problems of administration/management etc.), For this purpose need to keep in touch, on an international basis, with wide range of potential users and fellow professionals: industrial designers, bio-medical specialists, health service specialists, and user groups.

For such external contacts they use fax, phone, letters, frequent trips and the Human Capital Program's information exchange. Would welcome SPNET as a means of making existing communications more agile through telematics (provided that the

system was well managed) and broadening their range of contacts in other Science Parks, particularly with those who are working in complementary fields.

They have in the past asked the management of the VPT to provide them with information about tenants of other Parks. This has not been forthcoming and they question whether the International SP Association is effective in this respect. IBV's relationship with the VPT's management is cordial but not close.

Overall, the management of IBV is not much concerned with the technical aspects of networking (they feel some scepticism about the timeliness and cost effectiveness of some advanced facilities, such as the video-conference centre on the Park). They are, however, very interested in establishing more effective links - institutional and personal - within the IMPIVA network of which they nominally form a part.

IBV feel that they get little benefit from being on the Park and would be just as well off on the University campus or on an industrial estate. IMPIVA provided them with the necessary resources but the relationship with other Institutes is, with a few exceptions, not effective - perhaps partly because there appear to be overlaps in the interests of the sectoral and the "horizontal" Institutes. There are 2/3 annual meetings between them, some interchange of information through bulletins, but little debate or discussion of policy issues.

As regards extensive use of SPNET by Valencian SMEs, the management of IBV is sceptical. In their opinion, few are in a position to benefit from the opportunities which it offers for internationalisation.

4.3 Centros Europeos de Empresas e Innovacion

CEEI - Alcoy

Alcoy has a population of 65.000. Textile town. companies undergoing reconversion, diversification. No HEIs but 2 middle-level Escuelas Técnicas - Telecom and Industrial Engineering.

CEEI founded 1989. Located in town centre, 3.200 m², of which 800 m² is an incubator. 12 companies in incubator and 16 CEEI-supported projects located elsewhere (e.g. diversification projects of existing companies). List attached as Appendix III. Cover an area with a population of 225.000, difficult topography, bad communications. On paper the CEEI has technical units in Ibi and Onteniente but, in fact, cannot staff them.

Lack of staff is critical problem. Believes they should have a professional staff of 4 minimum (Director, Comercial, Technical, Financial) but they only number 3 at present (and 2 until very recently). This restricts volume of work (they do not promote much) and range of activities (would not be able to make effective use of EBN for purpose of intercompany links etc. because this requires much expediting). Perhaps initial definition of CEEI role in relation to resource requirements was insufficiently clear.

As regards their participation in Red IMPIVA, they have little contact with the VPT (question its effectiveness in terms of attracting tenant companies), believe the TIs are doing a good job (but absorbing resources which should be more equitably distributed amongst the various components of the network). Suspect the TIs see the CEEIs only as incubators and are not aware of their role in providing business services. Believes CEEI should act within its area as a representative office of the entire IMPIVA network.

Data bases and other sources of information are crucial to needs of CEEI and their companies, particularly for purposes of preparing business plans: e.g. re competitive environments, prices, availability of technology, suppliers of equipment, import/export trends etc.. Current situation very confused because sources (various Government bodies, Chamber of Commerce etc.) are multiple, and the information is not standardised or adequately filtered. Information gathering for a business plan can take several days.

Limited telecom facilities. LAN within CEEI. Phone/fax, no modems. Within Alcoy, Star-backed project, initiated in 1990, to provide demonstration centres for advanced services (one of 12 towns) has not been a success. Limited to telex, fax, and (non-functioning) videotext. Equipment unused in municipal offices.

CEEI management believes first step in providing improved telecom facilities to local companies should be definition of their needs but assumes they would include modems and access to email. Some help in financing equipment available through Ministry Industry via industrial associations etc.. Multiple (12/13) sources of training - in telematics and other subjects.

Re financing of SMEs, recent developments include new venture capital Funds for start-ups (existing Funds were for growth phases), one backed by regional government, another by Alcoy companies and CEEI. In addition, hope to design specific financial products for specific needs: circulating capital, structural capital, equipment. There are also plans for a new reciprocal-guarantee fund for start-ups.

Incubator company interviewed: Korott Laboratorios S.L.. Staff of 4, graduates in Pharmaceuticals. Engaged in packaging and distributing imported natural products: medicinal plants, cosmetics etc.. Would like to process local plants and expand beyond national market. For communications use their own phone

and communal CEEI fax. Information collection is a major, time-consuming problem. Would welcome access to international data re regulatory/legal aspects of their business, commercial outlets, and product/technology availability.

CEEI - Elche

Elche is an industrial town (primarily footwear), some 25 kms. from the city of Alicante. CEEI's partners (who constitute the governing body) include IMPIVA, local authorities, University of Alicante, financial institutions, trades unions, employers' federation, Chamber of Commerce, industrial associations, technological institutes.

Occupy 1.800 m². 3 companies in incubator. 15-20 companies assisted p.a. - usually in preparation of business plans and related services: mostly new ventures by established companies, or new companies who locate off-site. Not all use or develop advanced technology but are innovative in wider sense. 2 of them participate in EU collaborative projects. Many local companies are associates of TIs or industrial bodies but few use their services regularly or participate in their activities.

Wide range of data bases can be accessed through IMPIVA but CEEI/IMPIVA connections are limited to phone and fax. In any case, lack of standardisation of data bases makes them difficult to consult. CEEI management receives much printed material, e.g. monthly Ministry Industry report on subsidies and material from TII and EBN. Would like to be connected to BC-Net.

Dynamic sub-region. European Commission's Patents Agency to be based in Alicante. In addition, there is a major project - supported by private and public sectors - to develop a master plan for "The Triangle": Alicante (services)/Elche (industry)/Santa Pola (tourism).

Within this area plans are advanced for a Park of Innovative Activities on a 1 million m² site. Will include an IMPIVA-backed Technology Institute specialised in biotechnology, a Polytechnic Institute (Engineering faculties for the University of Alicante), Trade Fair facilities, and a fiber optics ring. The CEI hopes to have an antenna, in due course, on this Park and another in the city of Alicante.

CEEI - Valencia

Founded 1987. Director, who has been a member of an EBN Executive Committee, founded, developed and (for a time) co-ordinated CEEI Programme in the region. Features include incentive systems for managers of CEEIs, measures including: degree of self-financing, number of projects, other assistance provided etc..

Professional staff of 4 plus 3 administrative assistants. 34 projects in 2 years of which 26 were for new companies, 8 for

diversifications (aim is 50%/50%). 217 jobs created. Principal areas: services 32%, construction/optics/instruments 32%, electronics 12%, glassware 9%. 16 companies located in incubator (4 have left).

Good relationship with University's OTRI: agreeement whereby final year students spend time working with CEEI's tenant companies. Also close ties to some TIs: e.g. Instituto Biomecanica asks their help in identifying companies who might commercialise results of their projects.

Some CEEI companies involved in EU projects, including Value, Esprit. OCT is participating in one of these projects related to traffic control systems.. Not much use of BC-Net and generally level of interest in internationalisation is low at this stage of their development.

Telematics links within Red IMPIVA very limited. Are discussing possibility of contracting development of a network from a company located on the CEEI, Tauroni Ingenieria de las Comunicaciones.

Tauroni is a spin-off from the Universidad Politécnica (but believes the CEEI is little known in the University). Core activities are: installation of telephone exchanges and development of computer networks. Also researching on voice recognition as related to phone answering systems. Are hoping for Esprit approval of a proposal presented jointly with the University. Created in 1993, they now employ 16 in Valencia, 2 in Barcelona, 1 in Madrid.

In addition, Tauroni offers clients access to Internet email, and the Bankinter data base. Are also linked to UPVNet, the University's network. Are discussing a possible contract to develop a telematics network for the Red IMPIVA. This would cover all TIs and CEEIs and might include companies associated with them.

They visualise a simple, X-25 packet switching system, using modems, PCs, phone, and software provided by Tauroni. Service would include access to Internet and a wide range of data bases. Tauroni would manage the system and facilitate administration and invoicing.

SPNET would form an attractive part of this service, as Tauroni sees it. They would also be interested in using SPNET themselves, looking for technological or commercial partners (new markets and new applications) for their voice recognition systems.

5.VALENCIA PARC TECNOLOGIC

1 million m² site, 8 kms. from Valencia. Inaugurated in 1990. Property owned by SEPES (central government agency). Development is currently the responsibility of a management company controlled by IMPIVA, Valencia Parc Tecnologic S.A.. As the result of recent political changes, already referred to, this company will shortly be absorbed into SEPIVA (which is engaged in the promotion of industrial property and in the provision of technical services of a municipal nature).

Arguments in favour of this move are that SEPIVA can offer a wider range of management resources to the Park and that it has the structure and culture of a company (in contrast to IMPIVA); moreover, the Director of SEPIVA was, at an earlier stage of his career, the first Manager of the Park. Reservations which might be expressed about the move would be related primarily to the fact that the Park, formally at least, would have no linkage to the Red IMPIVA other than at the level of the Consejero de Industria. Moreover, alternative means for participation in the activities of the Park would presumably have to be found for some of the Institutions which at present are represented in the Board of the VTP management company - notably the University, the unions, employers federation, and local authority.

Implicit in this change of direction appears to be the recognition that the Park has not developed as originally planned. This is, in any case, evident from the pattern of occupancy: there are only eight, relatively small, companies on the site (outside the incubator), and the dominant presence is that of the Technological Institutes, who also number 8. A list of tenants is attached as Appendix IV.

The main objectives of the Park are the industrial diversification of the region and the incorporation of new technology in existing industry. For this purpose, in addition to concentrating support infrastructures in the area (TIs and CEEI), it was hoped to attract a significant number of companies intensive in technology and engaged in r.& d.. Those that met these conditions would be allowed to engage in some production activities, provided they were non-pollutant.

That the Park has failed to achieve this particular objective is attributable in part to "property development" issues, amongst them its pricing policy, the competitive environment (alternative sites), the absence of any special financial incentives, and a limited choice of tenancy formulas (no rental). Public transport facilities are very limited and the service infrastructure is not outstanding. Although there are videoconference facilities and a fiber optics ring is in place, no telematic links between tenants have been developed. There is a teleport on the site but it is managed by Telefónica and not, at present, relevant to the business needs of the VPT.

Ultimately, however, the decisive factor is probably that there are no major technological inducements to overcome these disadvantages. There are relatively few inter-relationships and synergies as between between Park tenants. The creation of a "dynamisation unit" had been visualised within the VPT company but the management team is small (2 executives and 4 others) and has not been able to devote much time to the stimulation of technological development.

As regards relationships of VPT management with other Parks, they feel that the Associations of Science Park do an effective job and they are active participants: the Deputy Director of the VPT is the current President of the IASP (European Section). Nevertheless, they feel that SPNET could contribute greater agility to the relationship. The experience of other Parks in relation to marketing strategies is of particular interest to them, as is the creation of links betwen tenant companies and clients or distributors.

In the opinion of the VPT management, features of particular importance in SPNET would be subventions for the purchase of equipment, data bases for use by tenant companies (including easier access to EU Commission data), and training courses. They believe that the key needs of tenant companies are related to finding project partners and sources of technology, particularly on an international basis. They attach much importance to developing an appropriate management structure for SPNET and to providing assistance to companies in making effective use of the system.

The management of SEPIVA will be preparing over the next 4 months a plan for the "relaunch" of the VPT. Basic entry criteria will remain the same but there are likely to be changes in application. They hope also to create a higher profile and will seek to attract the public to special events on the Park.

6. UNIVERSIDAD POLITECNICA DE VALENCIA

This is one of only 3 Universidades Politécnicas in the country (the others being in Madrid and Barcelona) and is composed primarily of Engineering Departments. 27.000 students, 1400 professors and researchers, 17 degree courses.

Close relationship with industry and a high level of participation in collaborative projects. Total value of research contracts and collaborative projects: 17.6 million ECUs. The authorities feel, however, that they are reaching a saturation point within the framework of the University: the close inter-relationship between teaching and research functions is beginning to restrict the growth of the latter.

For this reason, the University has embarked on a project to build on its campus a Ciudad Politécnica de Investigación.

They see this as being a form of Technology Park, modelled on the Université Catholique de Louvain. Total investment will be 23.9 million ECUs and they expect to recieve a 60% grant from Feder funds. They have already received 2.5 million ECUs in Stride financing.

The site measures over 28.000 m². Two buildings, each of 7.000 m² built space, have been completed for future Institutes (joint ventures with the CSIC) of Tecnología Quimica and Biología Molecular y Celular de Plantas. A further two buildings will be constructed to house groups engaged in r.& d. in such fields as IT, industrial design, environmental technology, thermal macinery, and cartography. A fifth building, of 11.000 m², will house central services and shared equipment.

The intention is that all of these new ventures should be undertaken in conjunction with companies or institutions. They hope in this way both to tap new sources of funds and to integrate University r.& d. more closely with the needs of industry. Companies are also represented on the Patronatos (Boards) of the new Institutes. The University's OTRI is incorporated in a Centro de Transferencia de Tecnología, which has a staff of 5.

Other related programmes include "IDEAS", whereby the University, jointly with IMPIVA, provides financing (prototypes etc.) for new business ventures based on students' final-year projects. Successful initiatives then receive further support in order to locate on the CEEI.

The University's telecom infrastructures include double fiber optics rings on the campus and a LAN within the University. Investments of 2.2 million ECUs have recently been made in new telematics equipment. Researchers can access from their Departments or their homes, through a modem, information stored on CD-ROMs in the library. They can also access, for scientific calculations, several UNIXs within the University, the super-computer centre in Cataluña or (through RECITE) the Toulouse centre. The University is linked to the international IRIS scientific network and for email uses the x-500 Directory.

The University's telematics links to the Park - which is some 10 kms away - are by basic 64 kbs lines. Relationships between the two institutions were initially slow to develop (despite the University's presence on the Park's Board). They now appear to be particularly close in the case of the CEEI and some of the Institutes, such as the IBV. A connection to SPNET would be of considerable interest to the University: they are conscious that in many Parks there are high concentrations of potential partners for collaborative projects. Having identified such partners, however, they would visualise maintaining contact through personal visits (they have funds available for travel) or through their existing telematics systems.

7. SPNET PROSPECTS IN VALENCIA

In Spain as a whole, a "Science Park network" should not be seen as simply an extension of the term to include BICs, teleports, and demonstration centres. With few exceptions the Science Parks and similar organisations have been initiatives of public authorities (usually regional governments). They are invariably integral parts of wider development programmes which relate to the promotion of collaborative ventures in technological and related fields.

In the case of Valencia, the SPNET context is particularly wide - in terms of geographical spread and diversity of institutions. As regards the former, one of the basic premises of industrial development policy within the region is decentralisation and the accelerated growth of Alicante is likely to reaffirm this tendency. As for diversity, the Valencia Science Park is one amongst several instruments of regional policy -and is not outstanding amongst them at this stage of its development.

Complementary institutions include at present the 3 CEEIs (BICs) - soon to be 4 - and the 12 Technological Institutes. They will be joined by the new ventures to be located on the University's Ciudad Politécnica de Investigación in Valencia and the Parque de Actividades Innovadoras in Alicante. These are all, in some degree, collaborative ventures and the intention has been to encourage active participation by companies - incorporating them as shareholders or associates, offering them representation on Boards or advisory bodies, or seeking collaboration through joint projects or contract research.

While these organisations nominally constitute a series of networks, local and regional, the linkages are not strong. In the case of the Valencia Science Park, the presence of the Institutes is an important asset but the Park has not, in other respects, developed as planned. Although it has succeeded in one of its objectives - creating hybrid (public/private) technological institutes - it has largely failed to attract inward investment and is at an early stage in the development of NTBFs. The recent management changes are part of a drive to attract and develop more companies.

As regards the Institutes, the relationship with their approximately 2000 associated companies appears to be largely of a formal nature -although there are notable exceptions, such as the Instituto Biomecanica. Other linkages are also tenuous, for the most part. As between Institutes, they are based primarily on interchanges of information through conferences or bulletins. As regards international activities, most of these organisations are at a relatively early stage of development - although some participate in collaborative projects with foreign partners and IMPIVA is involved in a number of EU programmes.

In these circumstances, the fundamental issue would appear to be how to make the existing networks more effective instruments for collaboration. In the specific case of the Valencia Science Park, there is also a need to develop strategies to accelerate its growth. The emphasis would be on attracting tenant companies as distinct from institutions and on actively developing new organisations, particularly joint ventures. This would require, moreover, the development of new management skills within the Park management company - a need which has been explicitly recognised by the present managers, in relation to the marketing of the Park.

International experience would undoubtedly be of value in meeting these needs and could take the form of a Programme of Collaboration between European regions, with the Science Parks as a focal point. It might comprise training, the interchange of experiences, consultancy assistance, and the development of joint projects. Within this Programme networks could be developed on the basis of specific collaborative tasks which, as required, would involve the various organisations which participate in regional development: the development agencies, companies and their representative bodies, the Science Park, the CEEIs, the Technological Institutes, the University etc.. Initially the Programme would have a limited life span but could form the basis for continuing relationships and networks.

An interesting precedent in this respect is the AMBAR Programme, involving the Science Parks of Andalucia, Bari, and Montpelier. Another relevant initiative is that of the "Atlantic Arc" regions which seek to network their 19 Science Parks for, amongst other purposes, the training of SP managers and the interchange of information and ideas on issues such as venture capital and technology transfer.

Determining the scope of such regional collaboration and choosing suitable partners would be critical to the success of such a Programme in Valencia. A balance should be struck between ensuring that some centres of technological excellence and economic strength are incorporated in the network, wherever they are located, and recognising the importance of less tangible affinities which exist between regions. In this context, it should be noted that the Valencian regional authorities are determined to be active participants in the development of a "Mediterranean Axis".

Appropriate tools for use within the networks would probably include task forces, forums for discussion, promotion and diffusion of information, and the creation of appropriate data bases. Clearly telematics would be an important support of such networks. In addition, a significant number of companies or intermediate bodies, such as the CEEIs, would feel immmediate interest in gaining easy access to wider-ranging, better integrated data bases on topics such as: market trends, suppliers, regulatory requirements, subcontracting opportunities, and calls for bids.

In the case of some of the Technological Institutes and the University, there would also be significant immediate demand for telematic services which would assist them in identifying opportunities for collaborative r.& d. projects and in making initial contacts with potential partners. There is a widespread awareness of Science Parks as offering, at least in the wider European context, exceptional opportunities in this respect.

Valencian companies, however, are, with very few exceptions, at an early stage of technological development and internationalisation. SMEs in particular have a very limited range of contacts with foreign counterparts. They are not likely users in the short term of telematics networks for the purposes of creating technological or commercial alliances - or for joint project work.

The management aspects of developing, operating, and promoting the use of a telematics network is critical. There is a widespread belief amongst potential users that some qualified intermediaries would be required to make the system effective. To the extent that this is a technical and administrative function, the presence on the Valencia Park of Tauroni (the service company which may be asked to develop a telematics network for IMPIVA) is of importance: they would be likely candidates to provide the necessary support for a wider-ranging network.

In addition, however, some non-technical qualifications would also be required for the management of the network, based on an awareness of the technological and business objectives of users. The management of the Park could, in normal circumstances, be expected to play a role in this respect. In the case of Valencia, the management team does not in fact have appropriate experience - which, again, highlights the need to strengthen the Park management function.

APPENDIX I

PERSONS INTERVIEWED: SPNET-REGION OF VALENCIA

23rd - 25th February 1994

ALCOY:

1.	Centro de Empresas e Innovación	Sr. D. Jorge Segui Director
2.	Asociación De Investigación Textil (AITEX)	Sr. D. Javier Muñoz Subdirector
3.	Korott Laboratorios S.L.	Sr. D. Javier Blanes Director
		Sr. D. José A. Picó Director Técnico

ELCHE:

4.	Centro de Empresas e Innovación	Sr.D. Joaquin Alcazar Director

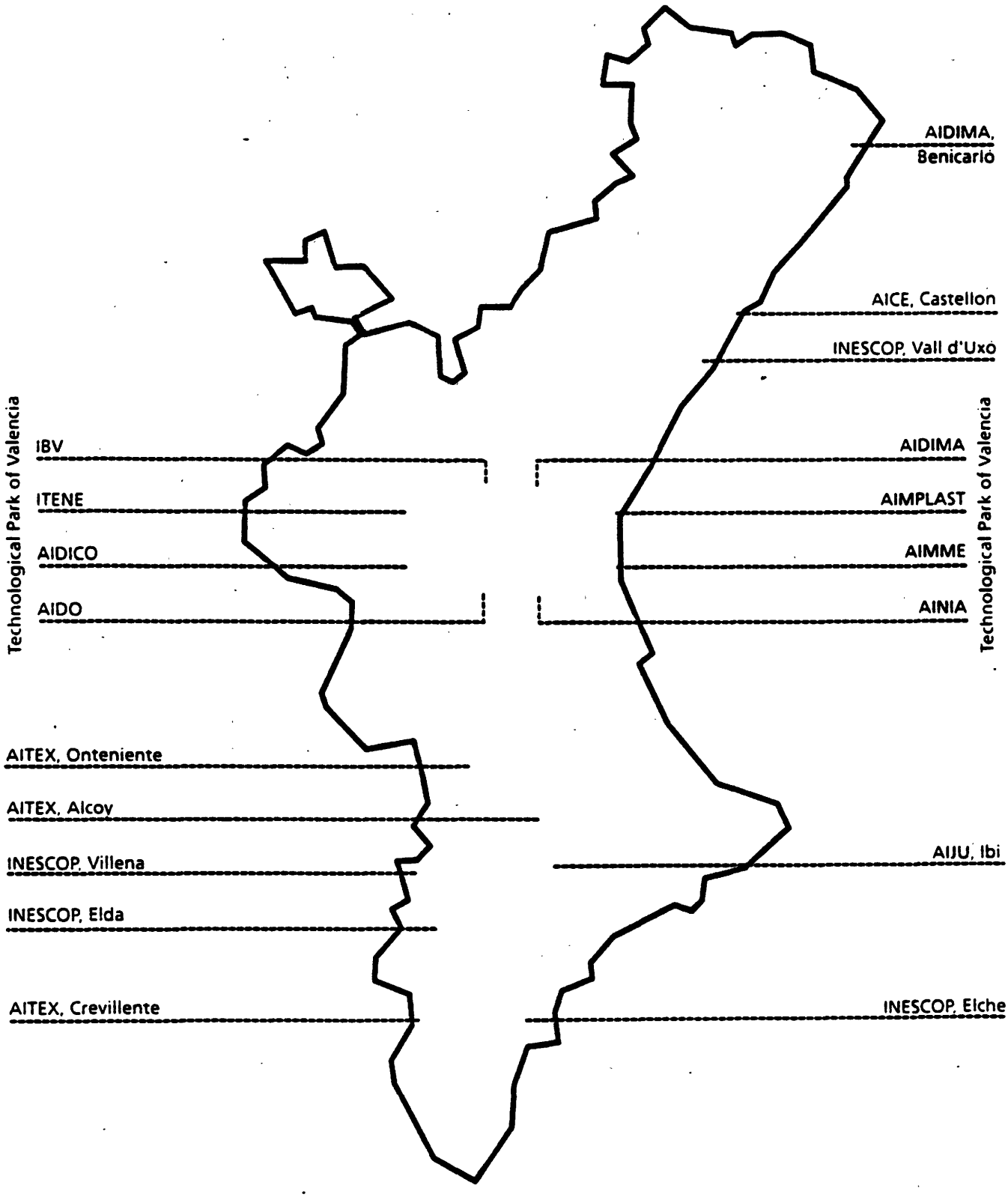
VALENCIA:

5.	Valencia Parc Tecnologic	Sr. D. Luis Sanz* Director Adjunto
6.	Seguridad y Promoción Industrial Valenciana S.A. (SEPIVA)	Sr. D. Miguel Mairena Director General
7.	Instituto de la Pequeña y Mediana Industria Valenciana (IMPIVA)	Sr. D. Andrés Moratal, Jefe, Relaciones Institucionales
8.	Universidad Politécnica de Valencia	Sr.D. Elías de los Reyes, Vicerector Inv. y Des. Tecnol.
9.	Centro de Empresas e Innovación	Sr.D. Jesus Casanovas Director
10.	Escuela Superior de Técnicas Empresariales Aplicadas (ESTEMA)	Sr. D. José A. Planas Director
11.	Tauroni, Ingenieria de las Comunicaciones	Sr. D. A. Tauroni Director Gerente
12.	Instituto de Biomecánica	Sr. Pedro Vera Director

* also current President of the International Association of Science Parks (European Section)

TECHNOLOGICAL INSTITUTES

SECTORIAL AND TERRITORIAL COVERAGE



EMPRESAS-CEEI

EMPRESAS PRESENTADAS EN 1.990

- ***Phonochart S.L.*** — *Ubicación: Alcoy. Empresa dedicada a la comercialización en régimen de alquiler de un programa de sotfware para el análisis de las variaciones de los valores cotizables en bolsa, cuya innovación consiste en la actualización diaria y posterior análisis vía modem a través de un ordenador compatible de la información de las distintas bolsas españolas sin necesidad de la presencia del usuario.*

- ***Acqua Lider S.L.*** — *Ubicación: Alcoy. Empresa dedicada a la elaboración y comercialización de un producto sintético retentor del agua que posibilita la lucha contra la desertización y contra los incendios forestales e industriales, resultando además un producto totalmente inocuo y biodegradable; innovador a nivel mundial en lo que respecta a la investigación sobre su utilidad.*

- ***Mongrafic S.L.*** — *Ubicación: Ibi. Empresa de servicios dedicada a la creación de la imagen corporativa de empresas, cuya diversificación consistió, en el momento de su creación, en la incorporación de la tecnología más avanzada para este fin, realizando el proceso completo (diseño gráfico, confección de cliches, impresión).*

- ***Infusiones de Mariola S.L.*** *Ubicación: CEEI-Alcoy. Empresa dedicada a la elaboración y comercialización de productos aromáticos y medicinales utilizando como materias primas especies de plantas y hierbas características de la Sierra de Mariola (entorno natural de Alcoy) y flores secas perfumadas para artículo de regalo y decoración, proponiéndose además su posterior cultivo mediante el sistema biológico.*

- ***Cárnicas Sanjosé*** *Ubicación: Alcoy. Empresa dedicada a la producción de embutidos frescos, conservados por medio de atmósfera modificada con una conservación en frigorífico con más tiempo que con métodos convencionales.*

- ***Alcoirotul C.B.*** *Ubicación: Alcoy. Empresa dedicada a la fabricación automatizada de rótulos y logotipos utilizando tecnologías avanzadas en informática (plotter de corte, conectado a ordenador de diseño gráfico, utilizando soportes de vinilo de gran adherencia).*

EMPRESAS PRESENTADAS EN 1.991

- ***José Carbonell*** *Ubicación: CEEI-Alcoy. Empresa dedicada al desarrollo de estudio, proyecto y diseño de piezas industriales. Sectores juguete, interiorismo, decoración y complementos. Necesidades del mercado industrial.*

- ***Duplival*** *Ubicación: Valencia. Realización de duplicaciones fonográficas a partir de un master en cintas de cassette, disco o compacto. Diversificación en nuestra comunidad.*

- ***Goico Quilts S.L.*** — *Ubicación: Alcoy. Fabricación y comercialización de patchworks (cubrecamas acolchados confeccionados con pequeños retales de tejidos). Incorporación de procesos tecnológicos rentabilizando el proceso. Implantar en el mercado un producto reservado actualmente a la confección casera propia o a coleccionistas.*

- ***Laboratorios Korott S.L.*** — *Ubicación: CEEI-Alcoy. Fabricación y comercialización de productos farmaceúticos con base de plantas medicinales en formato encapsulado. (Productos fitoterapeúticos). Producto nuevo en el sector.*

- ***Redsistemas S.L.*** — *Ubicación: CEEI-Alcoy. Empresa dedicada al desarrollo y aplicación de productos informáticos especializados en implantación de redes locales para tratamiento de la información en sistemas integrados de producción.*

EMPRESAS PRESENTADAS EN 1.992

- ***Paco Grau*** — *Ubicación: Alcoy. Empresa de servicio enfocada a cubrir la demanda de todo el proceso de edición de catálogos, trípticos y folletos ilustrativos en general, partiendo de la base de un plató de fotografía.*

:iversitat Jaume I
.mpus Universitario
:a. Borriol
304 CASTELLÓN
f · 96/ 424.06.22. Fax: 96/ 424.38.76

-RQUE TECNOLÓGICO
·do. 98. 46980 PATERNA
··f.: 131.82.78. Fax: 131.80.33

-RQUE TECNOLÓGICO
·do. 139. 46980 PATERNA
··f.: 131.80.51. Fax: 131.80.07

-RQUE TECNOLÓGICO
:do. 50. 46980 PATERNA
·f.: 131.80.01. Fax: 131.80.05

·:nnical Unit:
:NICARLÓ-VINAROZ
Vinaroz s/n (junto cauce Rio Seco)
:580 BENICARLÓ - CASTELLÓN
··f.: 96/ 446.01.68. Fax: 96/ 446.13.29

·da. de Industria s/n.
:440 IBI - ALICANTE
·if.: 96/ 555.44.75. Fax: 96/ 555.44.90

ARQUE TECNOLÓGICO
·do. 192. 46980 PATERNA
:if.: 131.85.59. Fax: 131.81.68

.oratory of Analysis
·d Contrast of Precious Metals,
·l. Ind. Fte. Jarro.
·da. Ciudad de Barcelona, 38
988 PATERNA
:if.: 132.08.62. Fax: 132.08.62

ARQUE TECNOLÓGICO
·do. 51. 46980 PATERNA
·elf.: 131.80.68. Fax: 131.80.13

AINIA
TECHNOLOGICAL INSTITUTE OF FOOD & PRODUCE
PARQUE TECNOLÓGICO
Apdo.103. 46980 PATERNA
Telf.: 131.80.34. Fax: 131.80.08

AITEX
TECHNOLOGICAL TEXTILE INSTITUTE
Pl. Emilio Sala, 1
03800 ALCOY - ALICANTE
Telf.: 96/ 554.22.00. Fax: 96/ 554.34.94

Technical Units:
ONTENIENTE
Pol. Ind. El Pla, 16
46870 ONTENIENTE - VALENCIA
Telf.: 291.22.62. Fax: 291.20.81

CREVILLENTE
C/ Jaime Balmes, 4
03330 CREVILLENTE - ALICANTE
Telf.: 96/ 668.06.59. Fax: 96/ 668.11.89

IBV
TECHNOLOGICAL INSTITUTE OF BIOMECHANICS
PARQUE TECNOLÓGICO
Apdo. 199. 46980 PATERNA
Telf.: 131.83.55. Fax: 131.80.16

INESCOP
TECHNOLOGICAL INSTITUTE OF FOOT WEAR
Polígono Industrial Campo Alto
Ctra. Elda-Monóvar
03600 ELDA - ALICANTE
Telf.: 96/ 538.00.62 - 539.52.13
538.70.48 DIREC. Fax: 96/ 538.10.45

Technical Units:
VILLENA
C/ San Francisco, 9
03400 VILLENA - ALICANTE
Telf.: 96/ 580.83.87

ELCHE
Ronda Vall d'Uxó
Pol. Ind. Carrús, 2
03291 ELCHE - ALICANTE
Telf.: 96/ 544.51.41. Fax: 96/ 666.11.43

VALL D'UXÓ
Ctra. Chilches s/n
12600 VALL D'UXÓ - CASTELLÓN
Telf.: 96/ 469.01.45. Fax: 469.01.45

ITENE
TECHNOLOGICAL INSTITUTE OF CONTAINERS AND PACKAGING
PARQUE TECNOLÓGICO
PATERNA

ALICER
TECHNOLOGICAL INSTITUTE OF CERAMIC DESIGN
Antonio Maura, 5
12001 CASTELLÓN
Telf.: 96/ 22.03.12. Fax: 96/ 23.04.14

- ***Exomel S.L.*** — *Ubicación: Onteniente. Empresa comercial que ha diseñado una serie de productos dermofarmaceúticos con base a la extracción de principios activos de plantas naturales.*

- ***Informatización de Servicios Innovadores S.L.*** — *Ubicación: Alcoy. Empresa de servicios dedicada al desarrollo y comercialización de aplicaciones informáticas basadas en la resolución lógica de problemas, tales como la optimización del desplazamiento en redes planas.*

- ***Selección Vitícola Valenciana S.A.T. nº 8.877*** — *Ubicación: Onteniente. Sociedad Agraria de Transformación constituida como vivero seleccionador para la multiplicación "IN VITRO" de patrones y plantones de vid para su posterior comercialización.*

EMPRESAS PRESENTADAS EN 1.993

- ***Resinas Marve S.L.*** — *Ubicación: Alcoy. Empresa dedicada a la fabricación de cliches de resina fotosensible para impresión en envases y embalajes.*

- ***Portamatic Electronics S.L.*** *Ubicación: CEEI-Alcoy. Empresa dedicada a la fabricación y comercialización de automatismos para puertas.*

- ***Thermyp Kraal S.L.*** *Ubicación: Alcoy. Empresa dedicada a la fabricación de termoconformados plásticos.*

- ***Dr. Vinyl*** *Ubicación: Alcoy. Empresa dedicada a la reparación de elementos plásticos y cuero con base de resina, otorgada en franquicia.*

- ***Index Producciones*** *Ubicación: Alcoy. Empresa dedicada a la producción de animación y video interactivo para las empresas productoras de videos comerciales y publicitarios.*

- ***A.I.T.A.*** *Ubicación: CEEI-Alcoy. Empresa dedicada a la consultoria de innovación tecnológica, producmática y robótica.*

EMPRESAS TUTELADAS EN 1.993 Y PENDIENTES DE PRESENTACION

- ***CAVIFES S.L.*** *Empresa dedicada a la construcción de maquinaria para la fabricación de cajas de cartón ondulado, en proceso de investigación y desarrollo de un nuevo sistema computerizado para la automatización de cambio de formato en el proceso de fabricación. (Teléfono de contacto: 552.23.50)*

- ***ARA LABORAL S.A.*** *Empresa de dicada a la fabricación de maquinaria vitícola con el desarrollo de un nuevo sistema de "escurridor estático autovaciante" para la extracción de mosto presentado en la última feria del sector en Zaragoza. (Teléfono de contacto 533.00.00)*

- ***RAYAS S.L.*** *Empresa de reciente puesta en marcha para la fabricación de papel estampado para su posterior transferencia a tejido, con ancho de 2'80 mtrs., y posibilidad de hasta 18 colores. (Teléfono de contacto 651.63.94)*

- ***LIVORNO S.L.*** *Empresa de reciente creación dentro del sector de géneros de punto de interior para la fabricación de prendas "sporthouse" para el mercado centroeuropeo. (Teléfono de contacto: 533.15.47)*

- ***BIOGESTION S.L.*** *Empresa de servicios para la consultoría, información y asesoramiento en temas medioambientales. (Teléfono de contacto: 554.16.66)*

APPENDIX IV

VALENCIA PARK TENANTS

STITUT DE BIOMECÀNICA DE VALÈNCIA (IBV)

c Tecnològic, s/n Ap. 199 Tel.: 96/131.83.55
80 PATERNA (VALÈNCIA)

SOCIACIÓ D'INVESTIGACIÓ DE LA INDÚSTRIA METALMECÀNICA, AFINS I CONNEXES • AIMME

c Tecnològic, s/n Ap. 192 Tel.: 96/131.85.64
80 PATERNA (VALÈNCIA)

SOCIACIÓ INDUSTRIAL D'ÒPTICA • AIDO

c Tecnològic, s/n Ap. 139 Tel.: 96/131.80.51
80 PATERNA (VALÈNCIA)

SOCIACIÓ D'INVESTIGACIÓ DE LA INDÚSTRIA AGROALIMENTÀRIA • AINIA

c Tecnològic, s/n Ap. 104 Tel.: 96/131.80.34
80 PATERNA (VALÈNCIA)

SOCIACIÓ D'INVESTIGACIÓ DE LES INDÚSTRIES DE LA CONSTRUCCIÓ • AIDICO

c Tecnològic, s/n Ap. 98 Tel.: 96/131.82.78
80 PATERNA (VALÈNCIA)

SOCIACIÓ D'INVESTIGACIÓ DE MATERIALS PLÀSTICS • AIMPLAS

c Tecnològic, s/n Ap. 51 Tel.: 96/131.80.68
80 PATERNA (VALÈNCIA)

NTRE EUROPEU D'EMPRESA I INNOVACIÓ (CEEI)

c Tecnològic, s/n Ap. 134 Tel.: 96/199.42.00
80 PATERNA (VALÈNCIA)

SOCIACIÓ D'INVESTIGACIÓ I DESENVOLUPAMENT EN LA INDÚSTRIA DEL MOBLE I AFINS • AIDIMA

c Tecnològic, s/n Ap. 50 Tel.: 96/131.80.01
80 PATERNA (VALÈNCIA)

EI - VALENCIA

SCUELA SUPERIOR DE TECNICAS EMPRESARIALES APLICADAS
RGIVAL (MATERIALES DE OSTEOSINTESIS
MERCIAL ENVISA (ELECTROMEDICINA)
TOPRONO (PROTESIS)
UPO IBER (TRANSFORMADOS METALICOS)
- IE ELECTROMATIC (APARAMENTA ELECTRONICA)
- JOMAR (ROBOTICA INDUSTRIAL)
- LOGICAL COMPUTER (SOFTWARE DE GESTION)
ATISAE (INGENIERIA MEDIO-AMBIENTAL)

DRAFT

PROSPECTS FOR SPNET

IN

THE BASQUE COUNTRY

January 1994

Fred Bennetts

INDEX

1. INTRODUCTION

The primary source of information for this report was a series of interviews conducted over a 3 day period in Zamudio, Bilbao and its environs, and San Sebastian. A list of those interviewed is attached as Appendix I. They represented 16 organisations and included: the managers or promoters of the 3 Basque Science Parks, the BIC, the Universidad del País Vasco, the Regional Development Agency, the 3 Research Centres located on the Zamudio Park, one of those located in San Sebastian, and the Association of which they form part, the regional telecomunications operator, the SPRITEL network, and 3 of the companies loçated on the Zamudio Park.

Written material which was consulted included the recently published "Plan de Tecnología Industrial 1993-1996" (Gobierno Vasco), "La Liberalización de las Telecomunicaciones en España" (Ministerio de Obras Publicas, Transportes y Medio Ambiente), "Centros Regionales de Apoyo a la Innovación" (Instituto de la Pequeña y Mediana Empresa Industrial), "Guia Delfos - Apoyo Publico a la Empresa Desde la Comunidad Autonoma del País Vasco" (SPRI).

In organising his programme of interviews, the consultant received valuable help from Mr. Antonio Aranxabe, President of the management company of the Zamudio Park.

2. ECONOMIC BACKGROUND

The Basque country is one of the 17 Autonomous Regions of Spain and comprises 3 Territories or Provinces: Alava (its capital, Vitoria, is also the home of the Basque Government), Guipuzcoa (capital, San sebastian), and Vizcaya (capital, Bilbao). It has a population of some 2.1 million and its GDP is approximately 23.000 million ECUs. For European Union (EU) purposes, it is classified as an Objective II region.

The process of transferring political and administrative responsibilities from the central government to that of the Basque region - the Comunidad Autónoma del Pais Vasco (CAPV) - is well advanced. Moreover, at the level of Territorial Government, the Diputaciones Forales enjoy a significant degree of political and economic autonomy.

One of the richest areas of Spain until the 1970s, the heavily-industrialised Basque country then entered a period of economic stagnation, a process which was aggravated by political difficulties. New business activities, particularly the creation of knowledge-based companies, was at a low level. A significant recovery took place in the second half of the 1980s, largely as the result of reconversion programmes and major infrastructural improvements, allied to the promotion of innovation and the reorientation of business strategies to growth markets.

In more recent years the Basque economy has been seriously affected by the widespread recession and, in addition, has been hampered by the need for further reconversion of some key industries - particularly integrated steel. Its resource base for expansion has, however, been considerably strengthened by the measures already referred to and by continuing efforts to upgrade technology.

The current structure of Basque industry is still heavily weighted to base metals, metal products, and capital equipment - which account for over 60% of employment. Moreover, there is a predominance of small companies, lacking in critical mass. The objective of the Basque Government is to create an environmnet and support structure in which future growth of industries, and services directly related to industries, will be focused on:

. "clusters" which are considered to offer potential competitive advantages to the CAPV; these include machine tools, aeronautics, ancillary automotive, high value steel, and agro-industrial

. emergent industries which could have a major impact in the CAPV; these include professional electronics, telecommunications, informatics, and advanced materials

. other industries which, while not classifiable as "clusters", are of importance in the CAPV and can benefit from the development of joint sectoral strategies; these include capital goods and packaging

3. TECHNOLOGY POLICY

The CAPV is in the forefront of the Spanish regions as regards the promotion of technological development. In 1991 total expenditure in R.& D. was approx. 272 million ECUs. This represented 1.2% of the region's GDP - well below the EU average of 2.0% but significantly higher than that of Spain as a whole, 0.75%.

Also of significance is the fact that the proportion of private and public sector financing of R.& D. in the CAPV is, respectively, 64.8% and 30.6%. This compares with an EC average of 52.3% and 40.8%. The proportional contribution of the private sector to R.& D. expenditure in the CAPV exceeds the comparable figure for Spain as a whole by over 100%. 429 companies engage in some form of R.& D..

The regional government is particularly active in promoting technology and new business activity. It executes its programmes through various of its Departments and through its Development Agency, the Sociedad para la Reconversión y Promoción Industrial (SPRI). Other levels of government. however, also make significant contributions. Of particular importance within the CAPV is the role of the Diputaciones Forales. In addition to financing specific programmes in these fields, the Diputaciones have been important co-sponsors of the Science Park projects referred to below.

As regards the central government, active agencies include CDTI - which finances industrial R.& D. projects and promotes them through commercialisation - and the CICYT. The latter is an Interministerial Commission which formulates and monitors the National Plan for R.& D.; within the Secretariat of the Plan a network of offices, the OTRIs, has been created which has special responsibilities for building links between industry, Universities, and research centres.

In this context, an unique feature of the Basque scene is the existence of a network of contract research institutes, the Centros Tecnológicos Tutelados (CTTs), grouped together in an Association, EITE. Employing some 900 researchers and with an annual turnover of some 50 million ECUs, these 7 non-profit Institutes are autonomous organisations, which rely on industrial contracts and collaborative research for most of their income. They receive, however, substantial financing (some 30% of their budgets) for "generic" research projects from the Basque government, under whose tutelage they operate.

These centres, which form part of the European Association of Research Centres (EARC) are: Ceit, Gaiker, Ikerlan, Inasmet, Labein, Robotiker, and Tekniker. Their areas of activity include IT, Telecommunications, Materials, Design and Manufacturing Technologies, and Biotechnology.

Early government efforts to promote technology, in the period 1982-'92, were aimed primarily at increasing the level of R.& D. activity within companies by strengthening support structures. Instruments included financing of prototypes, demonstration centres, training, and quality control programmes. Particularly noteworthy was the IMI Programme for the incorporation of microelectronics to industry.

A new stage of development began in late 1993 with the publication of the Industrial Technology Plan 1993 - 1996. This was formulated by a co-ordinating body representing the public and private sectors. It states the policy objective as being the enhancement of corporate competitivity through the creation, development, and assimilation of technology. Key success factors include: linkages between R.& D. and market demands; strategic alliances and regional cooperation; and access to global markets.

The base strategy is defined as: technological cooperation between the agents for innovation. A new body, the Consejo Vasco de Tecnología (CVT), is created to achieve this and its executive arm will be the Unidad de Estratégia Tecnológica (UET) within SPRI. The principal agents for innovation (spanning supply and demand) are seen as being:

. the Universidad del Pais Vasco (UPV)

. the CTTs

. corporate R.& D. Departments

. sectoral research centres

. clusters of industries

The Plan covers, in addition to technological innovation of products and processes, those aspects of value-added which are closely related to technology such as design and training. The areas which have been identified as priorities for the CAPV are:

. INFORMATION TECHNOLOGIES
(Information, Telecom, Electronics, Automation)

. MANUFACTURING TECHNOLOGIES
(Manufacturing and Mechanical)

. MATERIALS TECHNOLOGIES
(Materials and their processes)

. ENVIRONMENTAL TECHNOLOGIES
(Environment and Recycling)

As regards the first of these, Information Technologies, the objective of the Plan is to provide a technology base whose use will give a competitive advantage to Basque companies and which will contribute to the further development of a Basque IT industry. It is proposed that the principal lines of activity within these areas should be:

- computer aided design, calculation, and manufacturing
- automation
- intercompany integration: electronic interchange of commercial and technical information
- product differentiation

Sources of finance for the Plan will include the Basque Government which is expected to make available 110 million ECUs for the period 1993 - 1996. It is hoped that this budget will act as a motor for total expenditure on R.& D. within the Plan of some 565 million ECUs during this period.

As regards Science Parks, the text of the Technology Plan does not make an explicit reference to them but their importance is recognised in the major projects referred to below, which are being undertaken with Basque Government backing.

4. REGIONAL SCIENCE PARK PROGRAMME

4.1 General

The first Science Park project in Spain was that of the Parque Tecnológico del País Vasco at Zamudio (Bilbao), initiated by the Basque Government in 1985. It now forms part of a planned network of 3 Science Parks whose other elements will be the Parque Tecnológico Miramón in San Sebastian and the Parque Tecnológico de Alava at Miaño Mayor (Vitoria) - both of which should be ready for occupancy in 1995. SPRI, on behalf of the Basque Government, will be the majority shareholder in all of them.

The 3 Parks will be complementary in some respects. Zamudio will have a special status and image, characterised by its high-quality (and costly) infrastructure. Vitoria will be able to offer very large industrial plots (not easily available elsewhere in the CAPV); the property is expected to sell relatively fast. San Sebastian will probably be slower to develop in property terms; it will be more selective, focusing on smaller companies, and exploiting its privileged location and surroundings. It may be developed in conjunction with a new industrial estate close to the city which will offer complementary features. As regards technologies or industries, however, it is not anticipated that there will be any significant areas of specialisation as between the 3 Parks: they will all be pursuing the priorities established for the CAPV as a whole.

In management terms, each Park will be autonomous for the purposes of achieving its financial targets but in other respects some degree of co-ordination or integration is planned. Moreover, SPRI is likely to maintain some form of executive presence in all of the Parks. In some functional areas a single person may be given responsibility for all 3 Parks. This will probably be the case in relation to some aspects of international relations and some aspects of technology development.

SPRI and the management of Zamudio feel that particular emphasis should be given in the future to creating more effective inter-company links - both within the Parks and within their hinterlands - and to strengthening relationships with the Universities. In this respect the growth of the Science Park network opens up new opportunities - and poses new challenges in terms of communication networks.

Other relevant centres of support to innovation within the CAPV are shown in Appendix II. They include the BIC centre in Bilbao (BEAZ) and a similar centre in Alava. In addition, some of the CTTs fulfil complementary functions: INASMET is opening up a prototyping workshop in Irun which will also act as an incubator for new companies.

The Zamudio Park is described in a separate section of this report. Details of other projects are shown below. The subject of a regional Science Park strategy for the CAPV was also examined in a 1993 report by a team sponsored by the Sprint "Plan for Consultancy Assistance to Science Parks".

4.2 Miramón Park

The Science Park will have a privileged site. Added to the exceptional attractions of San Sebastian itself, the Finca Marimón is a "Natural Park" located on a hill close to the city centre. The Science Park will comprise 110.000 m² of built space. It will be surrounded by 664.000 m² of verdant land and space will also be made available, as part of a related plan, for a residential development and a hotel - amongst other projects.

The Park's communication links are excellent. It is within a few minutes' away from an access to the network of European motorways. There is an national airport 20 minutes away and 2 international airports within an hour's drive. The terminal of the French TGV (high speed) train system is in Hendaye, 20 kms. distant. Telecommunication links are referred to below.

Within the city limits, 3 Universities have some form of presence: the public UPV (Information Sciences, Chemistry, and Engineering) and the private U. Navarra (Industrial Engineering) and U. Deusto (Business Administration). Various of the CTT contract research centres are located either in San Sebastian or in neighbouring areas of Guipuzcoa: they include INASMET (materials), IKERLAN (electronics; design and manufacturing technologies), CEIT (electronics, environment) and TEKNIKER (machine tools). Also noteworthy is the presence in San Sebastian of the Centro de Desarrollo de Empresas (CDE) which, amongst other training and consultancy functions, has been active in promoting the use of telematics.

The company responsible for the development and management of the Miramón Science Park was created in January 1994 and its Director - who has been actively involved in the project - has been appointed. 51% of the shares are held by SPRI and other shareholders are the Diputación Foral of Guipuzcoa, the Ayuntamiento of San Sebastian and the Caja de Ahorros (Savings Bank) of Guipuzcoa - which will finance the cost of infrastructure and of the buildings which will be rented out by the management company. Those buildings will comprise 3 blocks of 8.000 m^2 each, to be ready for occupancy in, respectively, 1995, 1998, and 2001.

Priority areas of technology for the Park are likely to include Electronics, IT, Materials, Control Systems, Environment, and Telecom. Focal points of development will include University/industry joint ventures, post-graduate training and provision of support services. It is hoped that the management team (which will number approximately 7 people) will act as a catalyst for technological co-operation and for the organisational development which this will require.

The Park plans to take advantage of the spirit of "associationalism" which is characteristic of Guipuzcoa. While jealous of their independence, businessmen have been traditionally open to various forms of co-operation. This is reflected in the existence of industrial and research Associations in many areas of activity. The management company hopes to make of the Park a "neutral" space in which this spirit of participation can flourish.

Associations which have already expressed interest in locating on the Park include AFM (machine tools), the Sociedad de Industrias Electrónicas del País Vasco and ADEGI (the employers' association). Other possible tenants include two of the CTTs: INASMET and some Departments of CEIT.

Irrespective of whether these organisations are physically located on the Park, it is of importance to the project that each is the focal point for a network of contacts within and outside the CAPV. Thus, INASMET, which has a staff of 120 and an annual budget of some 8 milliom ECUs, contracts work from some 700 companies p.a.. Moreover, its activities are becoming increasingly internationalised: it has clients in France and Germany, amongst other countries, and participates (as leader in some cases) in EU projects sponsored by BRITE, SPRINT, ESCS, COMETT and other programmes.

4.3 Alava Park

The origins of the Alava project are more recent. It is being managed at present from within SPRI and the future Director has not yet been appointed. Work on infrastructures will, however, begin in the near future and it is hoped that the first tenants will be on the site in 1995.

The Park will be located 12 kms. from the capital, Vitoria. This is a city which boasts a high quality of life, has a significant concentration of industrial companies, some University faculties, and a Centro de Empresas e Innovación (CEEI). The Park site is close to a national airport. It will enjoy easy access to a planned extension of the motorway system and is already well served by the existing road network.

Some 250.000 m^2 of built space will be made available on a site which measures approximately 1.200.000 m^2. Of this, 60.000m^2 will be space built by SPRI for rental. Another, relatively small, area will be sold in plots of 800 m^2 and the balance will be available for medium and large-sized plots.

The proportion of rented to sold space will, therefore, be of 25% to 75%. This is in contrast to Zamudio's 60% to 40% but is not intended to represent any lowering of standards. The development of other mechanisms is planned to safeguard the technology-intensive character of the project.

One of the major promotional features of the project is, as already indicated, the possibility of attracting the larger knowledge-based companies, given Alava's comparative advantage in terms of availability of sizeable plots. This could imply the location in the Park of corporate R.& D. Departments or ofvaried activities including manufacturing provided that these were technologically innovative and were non-contaminating.

At least one major tenant for the future Park has already been identified. This is a local company, Gamesa Aeronautica, which will design and manufacture components for a new aircraft together with parners in Brazil; an engineering staff of over 200 will be employed on the Park. There have also been (prior to the current recession) some indications of foreign investor interest in the Alava Park.

4.4 BEAZ

Founded in 1987, this was the first EC-sponsored BIC in Spain. Principal financial supporter is the Diputacion Foral; others include local businesses. Their first priority is the creation of new technology-based firms but they also provide advisory services, training, and other forms of assistance to established SMEs, including grants for employment of consultants. Staff of 16. Head office in Bilbao.

Incubator close by in Sondica. 8.900m² built space, 29 modules available. Recently opened, relatively low occupancy, 13 tenant companies. In addition, 83 BEAZ-sponsored companies are located in other premises. Principal industries represented: electronics, engineering design. Increasing number of University spin-offs.

Support services include development of prototypes, training, preparation of business plans, grants of 49.000 ECUs per project. No rental for space occupied but a charge is made for services. BEAZ can also provide access to the Diputacion's venture-capital company, Seed Capital de Vizcaya, but has difficulty in helping companies to find soft loans (the lower threshold for SPRI loans being comparatively high).

Linked by PCs/modems to SPRITEL services on the Zamudio Park (see below) and to data banks at Diputación in BIlbao. Business culture of incubator companies: technically quite sophisticated but dominated by the fact that they are undercapitalised, operating in high-risk businesses, and inexperienced. BEAZ management hope to do more in the future to widen their horizons, particularly in terms of internationalising, seeking technical and commercial alliances etc.

BEAZ participates in various networks: EBN, BCNET, Sprint, TII/TRN. They find EBN particularly useful. Europartenariat meeting to be held in Bilbao in November. Also belong to Comité Nacional de BICs, an Association of Spanish BICs. BEAZ has a good relationship with Zamudio but believes that, on the national level, there is some mistrust between BICs and Science Parks (particularly when the latter include incubators). There is a

need for a single Association to bring the two together - an attempt to create one, by the Instituto de la Pequeña y Mediana Empresa (IMPI), failed. It would be particularly useful in terms of jointly developing standards and criteria for project evaluation - which in turn might, it is hoped, facilitate access to project finance.

5. PARQUE TECNOLOGICO ZAMUDIO

5.1 General

The Zamudio Park is 12 kms. from Bilbao, which is a major industrial, financial, and commercial centre of some 400.000 inhabitants. An international airport is located at a distance of 4 kms. and there is easy access to motorways leading to the French frontier, Madrid, and Barcelona. The main campus of the public Universidad del País Vasco is located 6 kms. away and the private Universidad de Deusto is in Bilbao. The Park covers 660.000 m² and density (built space) is approximately 25%. It is virtually fully occupied and a new development phase, starting in 1994, will open up an additional 750.000 m².

The Park is being developed and managed by Parque Tecnológico S.A. (PTSA) whose shareholders are: SPRI (74.80%), Diputación Foral de Vizcaya (24.66%), and the Ayuntamiento (local authority) of Zamudio (0.54%). Space to be built and rented to companies by the PTSA accounts for 60% of the total; the remainder is available for sale to those companies who, meeting all the entry criteria of the Park, require more than 1.500 m². This policy is intended to guard against speculation and to preserve the standards of the Park.

The Park was created as an instrument for implementing the Basque Government's industrial and technological policy: the diversification of industry through the upgrading of traditional sectors and, more especially, through the promotion of high technology companies, drawing on the skills of industry, the Universities, and the Basque Technological Centres.

The strategic implications of this policy as applied to the Park are that virtually equal importance is to be given to the development of New Technology Based Firms and to the attraction of inward investment (both R.& D. and more general investments of which R.& D. forms an important part). Moreover, although the attraction of public sector research centres is not one of the explicit aims of the project, the existence in the CAPV of an

effective network of research centres (autonomous but under Basque Government tutelage) is considered to be a key strategic factor; it is hoped that some of them will relocate on the Park.

The purpose of the Park, therefore, is to stimulate business initiatives and investment through the creation of appropriate infrastructures. These should have the effect of generating new, innovative companies and activities and of stimulating the transfer of technology between companies, Universities, and research centres.

5.2 Characteristics

There are at present 44 organisations (companies and others) located on the Park, employing a total of almost 1.300 people. Over half of these organisations employ 10 or less. The largest company, which is active in Aeronautics, employs over 250. Approximately 35% of staff on the Park are directly involved in R.& D. and the industry segment which is most heavily represented (22% of the total) is Computers/Software/Telecommunications.

There is no incubator on the Park but there is a close relationship with BEAZ, the BIC, whose incubator is located 5 kms. away; they have a common shareholder (the Diputación) and BEAZ is represented on the Admissions Committee of the Park. Some BEAZ-nurtured companies have moved into the Park's "Nido" (Nest) building - which provides space to small, growth companies for a maximum period of 3 years.

Noteworthy non-corporate tenants include several CTTs:

. Robotiker. Specialised in automation of production processes. Also active in IT and Telecom. 57 sponsor companies.

. Gaiker. Specialised in Materials, Packaging, Industrial Biotechnology, Recycling. 65 sponsor companies. 700 clients.

. Labein. Headquartered in Bilbao, maintains in the Park a Telecom Lab, Quality Control Unit, and a Supercomputer Centre. The latter is equipped with a Convex-3820, the property of the Basque Government, made available through Labein to academic and business users (it is one of only 4 such service centres in Spain).

. EITE. The co-ordinating body for the CTTs on and off the Park site. It has been classified by the Plan Nacional de

Investigación as an Oficina de Transferencia de Tecnología (OTRI) which, together with the OTRI office in the University seeks to create linkages between companies and research centres.

As in the case of Inasmet, already referred to, each of these organisations is linked to various networks. For instance, Labein, on behalf of the Basque Government, is a participant in the RECITE regional network project - an initiative of the Conseil de Midi-Pyrenees which is seeking the support of Euroforum (DG XVI) for a training project which would bring together organisations in Valencia, Athens, Naples and Toulouse as well as the Basque country. At a later stage it is expected to involve the creation of a telematics link.

In addition, the European Software Institute will shortly locate its headquarters on the Park. A non-profit organisation, the Institute is being created as an European industry initiative by various sponsor companies. Its purpose is to improve the process of software development in Europe. Other important tenants, active in telecommunications, are SPRITEL and EUSKALTEL. Reference is made to them below.

5.3 Technology Development

The management and administration of the PTSA is the responsibility of a 10-person team. A large part of their time is taken up by the property development side of the business and there is some feeling that more resources should be made available for technology development activities within the Park. Nevertheless, the PTSA already appears to make quite a significant contribution to technology development in terms of advising individual companies, creating linkages between them, and developing a suitable environment within the Park. An important aspect of this consists in the screening of prospective tenants to ensure that they meet Park criteria, a task in which the PTSA managers are assisted by representatives of related institutions.

As regards other facets of technology development, there is within the team a part-time Technology Advisor who is available to assist companies in determining their needs for new technology and in identifying suitable sources within the University, Research Centres or elsewhere. In addition, the senior managers of the PTSA, including the President, also maintain close relationships with most of the Park tenants and frequently provide advice to them on issues of strategic importance to their companies. Recently, moreover, the PTSA has prepared a catalogue of tenant companies which includes brief descriptions of their activities; this is intended to facilitate contacts between organisations on and off the Park.

Other relevant activities undertaken within the Park include Congresses, conferences, and special training courses - organised in some cases by the PTSA. Meeting rooms, a social centre (including accomodation) and restaurant facilities are also available.

Video conference facilities are not available on the Park but the possibility of providing them has been under consideration by the PTSA for some years past. Most of those interviewed showed little interest in video conferencing but one of the CTTs, located in San Sebastian, had just installed the necessary equipment for the sake of a long-term contract with an American client. Some Chambers of Commerce offer these facilities but the quality is believed to be unreliable.

As regards the provision of other consultancy or advisory services or of costly equipment for shared use, the management of the PTSA sees its contribution as being limited to that of stimulating demand. It believes that new companies or value added services, preferably located on the Park, should be created to meet those needs. In some cases they may be private sector initiatives, in others it may be necessary for a research centre, such as Labein (in the case of the supercomputer service) or an Agency such as SPRITEL (in the case of telematic services) to play a role.

Some indications of the effectiveness of the interactions and synergies which take place on the Park are provided by the research centres. CTTs such as ROBOTIKER, GAIKER, and INASMET tend to consider the tenant companies of the Park as, qualitatively, one of their best markets: they see them as showing above-average permeability to new technology. They also consider them to be, in some cases, appropriate partners for collaborative research projects.

The extent to which the companies themselves take advantage of such opportunities varies considerably. It is noteworthy that the largest of them, ITP, has virtually no technological or commercial links to the Park. The smaller companies appear to be particularly interested in the potential benefits offered by the Park and two relevant cases are referred to below:

Integra Multimedia S.L.
This 6-person company, specialised in the development of interactive communications (CDi and CD-ROM), is located in the "Nido" building, having transferred from the BEAZ incubator. Integra has worked in collaboration with the UPV and other Spanish Universities. It has received help from the PTSA in preparing proposals (some unsuccessful, one still outstanding) for various EU programmes (Impact, Media, Lingua). The PTSA is itself a client of Integra and has also provided them with a marketing platform by

inviting them to participate in Park presentations. Their presence in the Park has in addition, been of value for reasons of image and because of their proximity to SPRITEL. Integra has not yet won any business from its fellow tenants but considers them as a good potential market, particularly for subcontracts.

Filosoft S.A.
This small company (9 employees), associated with a Madrid-based group, IPSA, develops and markets specialised software for communications and for scientific and technical purposes - particularly for laboratories engaged in research and quality control. Filosoft has carried out some projects in collaboration with University researchers. It has won business from a fellow tenant on the Park, SPRITEL (development of communications software), and hopes to win more from current contacts with two other tenant organisations. Filosoft also hopes to carry out a collaborative project with one of the Park-based research centres. In due course, it plans to make international contacts (particularly important for the development of new applications) through the management of the Park.

While the development of relationships between, and amongst, companies and research centres on the Park is seen as reasonably satisfactory (if slow), the linkages between Park and University appear to need strengthening. Some efforts have already been made in this direction. Both the OTRI and the Euskoiker (part of the Fundación Universidad -Empresa) are quite active in promoting contract research and collaborative projects with industrial companies and others: their total value in 1993 was approximately 3.3 million ECUs. Moreover,a review of University research projects for the purpose of identifying those with commercial potential is being carried out by the PTSA. Another interesting initiative is a programme which annually allows some 15 University researchers to acquire practical experience in companies on the Park.

Nevertheless - and while recognising the cultural and other constraints that exist in the business and academic communities - both the Vice-Rectorate for Research at the UPV and the Park management feel that more can be done to stimulate collaboration. Proposals which have been discussed recently include locating part of the University OTRI on the Park and finding a formula whereby the University can participate, possibly at Board level, in the management or policy-making of the Park.

5.4 External Relations

The PTSA also contributes to the creation of technological linkages through their contacts with other Science Parks, Regional Development Agencies and other institutions. The managers of the PTSA consider that their membership of the Spanish Association of Science Parks (APTE) is of particular value; they also participate in the International Association (IASP).

The Zamudio Park has particularly close links with the Bordeaux Technopolis. Reciprocal missions have been organised for Park managers and tenant companies and an office has been provided in Zamudio for visitors from Bordeaux.

Both of these Parks are active in Atlantic Arc, an association of Development Agencies from 5 countries of the "Atlantic Axis": Spain, Portugal, France,Eire and Britain. A programme, Atlantis, was presented in July 1993 to the European Commission by the association which proposes actions in 4 areas. In the case of one of these, technology transfer, two projects are visualised:

. the creation of a network of Science Parks

. the creation of a network for interactive, multimedia communications

As regards the first of these, the intention is to incorporate in the network the 19 Science Parks that are already operational in these regions (they are listed in Appendix III). Priority issues for the network (to be further defined by discussions within working groups) are:

. forums for venture capital and for company interchanges

. training, particularly of Science Park managers

. joint promotion and the development of a common image

The management of the PTSA is also discussing a project for the development of a trans-frontier educational institute. It would offer engineering courses, with a particular emphasis on new technologies. The project would involve partners in the 3 Spanish Basque Territories and in France, including the Helioparc in Pau.

In a related field, discussions are taking place regarding the creation, possibly on the Zamudio Park, of a new institution, Didaktiker. It would provide language courses (in Basque and English) for students in the CAPV through an inter-active telematics network

6. TELECOMMUNICATIONS ENVIRONMENT

6.1 National

There are 3 major public-service operators in Spain: Telefónica, Correos y Telégrafos (telex and telegrams) and Retevisión (transport of TV signals). In addition, Hispasat operates Spain's satellite infrastructure.

Telefónica is the principal operator of phone and other telecom networks. It is majority-owned by private shareholders and operates under a concession from the Government, which controls its activities through regulatory agencies. As regards service provision, numerous companies are active in this field, most of them small; amongst the most important is Telefónica Sistemas.

Since 1991 telecommunications have been regulated by the Ley de Ordenación de las Telecomunicaciones (LOT) and by the Plan Nacional de Telecomunicaciones (PNL). As from December 1993 Telefonica's monopoly of final services has been reduced to the basic phone service operated through its PST network.

In accordance with the EU Council of Telecom Ministers' decision of June 1993, the phone service in Spain will be liberalised not later than 2003 (possibly as early as 1998). Although no formal decisions have been made as regards the liberalisation of telecom infrastructures, the Spanish Government has indicated that the monopoly is likely to be ended within the same time frame.

The PSTN (basic telephone network) is used for voice and data and is 85% digitalised on national transit. The ISDN (Integrated Digital Services Network), after a slow start in Spain, has now reached most major cities and will be completed by 1995.

Fiber optics, intoduced only 6 years ago in Spain, has become the principal support medium for national transit and is also being used for subsciber connections. It is probable that the Hispasat satellite will be used to link some of the national circuits. Connections by radio communication have also undergone rapid expansion; they form a significant part of network infrastructures both in the case of microwave links and transatlantic satellite communications. International transmissions are supported to a large degree by co-owned cables and satellites (INTELSAT and EUTELSAT).

Data transmission services have recently been liberalised. However, at present the only services on offer are Telefonica's: by the PSTN, by IBERPAC packet switching or by point to point dedicated lines. IBERPAC offers two modes: X25 and the UNO network (for larger users: a virtual private packet switching network)

Business networks are supported by IBERPAC (data transmission), IBERCOM (voice and data) and IBERMIC (high speed data transmission, point to point). There has been a rapid development of Local Area Networks (LANs), which are interconnected by public networks (either rented lines or packet switching networks such as IBERPAC). In the case of metropolitan areas, Metropolitan Area Networks (MANs) have been developed, offering high-speed interconnections between LANs.

Electronic Data Interchange (EDI) has been implemented on a vertical basis for a few specific industries, notably the car industry, supermarket retailing, and electric utilities. It aims at substituting paper documents (orders, invoices etc.) with electronic communications.

As regards telephone tariffs, the Spanish situation is distorted, both in relation to the levels of other European countries and in relation to costs. Long distance and international calls subsidise urban calls and line connections. The EU average for national calls is 73% of Spanish tariffs and for European calls it is 84% of Spanish tariffs (see Appendix IV). A gradual process is planned for the adjustment of tariffs to costs. As a result, it is hoped that Spanish tariffs will be amongst the lowest in the EU within 7 years.

In the case of IBERPAC's packet switcing services, the complexity of the tariff structure makes comparisons more difficult. In summary, as regards volume of traffic, discounts make IBERPAC more costly than similar services in France and Germany for low volumes and less costly for high volumes. Comparative data is attached on monthly fees and charges for connections.

6.2 Regional

As a result of the new telecom legislation the Comunidades Autonomas (regional governments) are now free to develop telecom networks within their own territories for the use of their own Departments and Agencies and other public bodies. The regions which appear to be making best use of this opportunity are the Basque Country, Andalucia, Galicia, and the Balearics.

The Basque Government's plans in this respect appear to be particularly ambitious. It has created a new Agency, Euskalnet, whose purpose is to create and operate a telecommunications infrastructure to cover the entire CAPV. Euskalnet's headquarters are in the Zamudio Park. The responsibility for most of the existing Basque Government networks has been transferred to Euskalnet, as have been the regional radio and TV networks.

The principal physical support system will be a fibre optics network, which is being built at 3 levels to provide: linkages between the 3 Territorial capitals; access from smaller urban areas; and linkages within those areas. The first level will be completed by the end of 1994. In an interim phase Euskalnet is linking up major users by microwave.

For the time being, users of Euskalnet will be limited to the public sector, which will be interpreted to include Universities, Chambers of Commerce, and research centres. However, in anticipating total liberalisation of telecommunications in Spain, Euskalnet is already planning for the incorporation of business and other users into their network.

Euskalnet is also studying various possibilities as regards its future links to other Spanish and international networks. As regards the latter, one of the options is to resuscitate the project for the building of a Teleport in the Zamudio Park (an earlier initiative did not prosper - apparently for lack of interest by Telefónica). The future use of the Hispasat satellite is seen as being somewhat restrictive, in terms of tariffs and coverage, and links with privately-owned satellites will be considered, if this proves legally feasible.

Other possibilities might include link-ups with foreign operators in due course. One such possibility is British Telecom - which has recently allied itself with the Banco Santander Group to exploit telecom opportunities in Spain.

The logic behind this costly project is related, in part at least, to logistical and technical factors. As regards the former, the mountainous topography of the CAPV represents a

special challenge to communications. As for the latter, Euskalnet believes that the ISDN network would ultimately represent a growth constraint in terms of capacity, particularly for larger users.

6.3 Zamudio Park

All the tenant organisations of the Zamudio Park are linked by a recently completed fiber optics ring and constitute a Local Area Network. The telephone network will be upgraded to ISDN by March 1994. No charges are made for communications between Park tenants.

The Zamudio fiber optics ring will be linked up to that of the Universidad del País Vasco in Lejona (6 kms. away) shortly; in the meantime there is a microwave connection between them. Through the CTTs (research centres) on the Park there will also be (as from March 1994) microwave connections to off-Park CTTs, provided by Euskalnet.

Park tenants - using the SPRITEL programme (see below) - can, in addition, through the University, access the ARTIX academic-scientific network. ARTIX is a national network, operating through lines leased from Telefónica by the Plan Nacional de Investigación. It is linked to the European scientific network EUROPANET and to the global network INTERNET (see Appendix V). As such it forms part of the electronic mail (Email) system.

Within this telecommunications environment; the key telematics players on the Zamudio Park, in addition to the CTTs and Euskalnet (already referred to), are:

- Tenant companies

Of the 44 organisations located on the Park, 22 are companies engaged in computer technology, software, and telecommunications; 6 are engaged in electronics. Their fields of activity include:

. telecontrol of intelligent buildings
. design of printed circuits
. software development for scientific applications
. development of mobile communications systems
. automation of production processes
. development of interactive communications systems
. fiber optics engineering
. artificial vision technology
. installation and integration of multimedia systems

- SPRITEL

SPRITEL is a telematics programme set up by SPRI (the Regional Development Agency). It is intended to serve the dual purpose of developing and operating a service-supplier and user network and promoting telematics awareness.

SPRITEL has a staff of 16, distributed amongst its Head Office in Zamudio and commercial offices in the Basque capitals, Barcelona, and Madrid. It has some 1800 clients, connected through PCs and modems. The Telefónica substructure is used: telephone lines, switched data lines (X.25) and leased lines. Users dial the SPRITEL access point in the nearest city and, after identification, are routed through the X.25 network or leased lines. The system appears to be unique of its kind (at least on this scale) in Spain. Clients pay a relatively modest connection fee and a monthly charge. All other supplier charges are included in a single monthly invoice.

The system is used for accessing world-wide data bases and message interchange systems, in addition to a wide range of other applications. As regards the first of these, 80 % of international public data bases are available through SPRITEL and access to more specialised data bases can be provided, at special terms, on request. A list of some of the public data bases is attached as Appendix VI. EU data bases available include Rapid, Celex, Misep, Pabli, Cordis, Elise; in addition, SPRITEL acts as a road to BC-NET and other EU networks through the nearby BIC.

As regards message interchanges, SPRITEL provides connections for Email (through INTERNET, EUNET-USENET, EARN), file trasfers, and fax routing. It also offers transport services, routing calls to different data bases worldwide such as COMPUSERVE, EUROKOM, GREENNET, and NETWORK.

In its role as a demonstration centre, SPRITEL provides, on request, PCs with modems and communications software on a temporary loan basis. Training courses, seminars, and demonstrations are also available to users. A Help Desk assists users in resolving problems. As regards Service Providers, 8 small telematics services have been established locally with SPRITEL grants and several more are at the planning stage.

7. PROSPECTS FOR SPNET

The possibility of strengthening Science Park links and of creating telematics networks for this purpose aroused interest amongst all those interviewed in the Basque Country.

Such an initiative would represent a particularly important opportunity for organisations located on the Parks. However, the impact would be felt more widely: throughout the CAPV, by companies which have close links with the Parks (through SPRITEL, the CTT research centres, or tenant companies); outside the CAPV, by organisations which participate in other networks involving the Park.

It is of significance in this context that the Basque Science Park projects forms part of a clearly defined programme for regional development in which technology promotion plays an exceptionally important role. The Basque environment is, in many respects, propitious in terms of policies. institutions, and infrastructures:

. The Zamudio Park, though still at an early stage of development, is widely believed to be fulfilling its purpose in most respects

. The CTTs are an outstandingly important asset for technology development and transfer and are closely associated with the Park programme

. The telecommunications infrastructure, already quite highly developed, will receive further stimulus from the creation of Euskalnet

. The activities of SPRI and of SPRITEL have, over the years, made important contibutions to disseminating and upgrading technology in Basque industry , as have the relevant programmes of the Diputaciones Forales

. The BIC, in conjunction with other business centres and the Zamudio Park, has made an impact in terms of new business development and support services for SMEs

To the extent that there are serious institutional weaknesses, they often reflect nation-wide problems. As regards the University, there are still, throughout Spain, many barriers of an administrative and cultural nature to creating effective links with the business world. However, more specific to the Basque situation is the need to involve the Universidad del País Vasco (and possibly the private Universities) in the activities of the Park at various levels, including policy making.

Also a matter for concern is the widespread perception that the Basque business culture is still not fully conscious of the urgent need to incorporate new technology and be responsive to market changes. Although much has already been achieved (as the result of IMI and other programmes), the attitude of most small businessmen faced with a potentially valuable telematics tool is not yet "I have to have it" but rather "it would be good if..."

When companies do adopt new technology it is typically the decision of a single aware person rather than an element of corporate strategy. Similarly, there is still relatively little experience amongst businessmen in using external resources and engaging in collaborative projects (other than through Associations, in some cases). It is perhaps significant that business users of the supercomputer in Zamudio represent only 5% of the total (the research centres account for about 25% and University researchers for the balance).

Equally widespread, however, is the conviction amongst Basque policy makers that, while demand for telematic services by SMEs may be low at the start, it can be stimulated and the best way to do this is by demonstration. A Science Park network could play an important role in this respect. Moreover, it seems reasonable to assume that as the pressures of recession ease, SME managers will be more inclined to look beyond day to day cash flow problems.

Moreover, a distinction must be made between the generality of SMEs and those which are closely related to the Science Park and its associated networks. For many of the latter companies the synergies and interactions of the Science Park have already begun to work. They are attracted to the idea of a Science Park network partly because they want more of the same.

Beyond that, however, many of the companies interviewed showed an encouragingly creative approach to the subject of networking. They hope to find clients on other Science Parks but, in addition, they recognise the need for a new cooperative style of doing business, particularly in telematics.

They believe that, by drawing on the commercial and technical skills of others, a variety of opportunities are made available to companies who would otherwise be lacking in critical mass:

. export markets can be opened to existing products by allies who are technically and commercially competent (rather than simple sales agents)

. new applications can be developed and adaptations made to meet the specific needs of other markets

. subcontracts can be offered, or sought, for specialist tasks in the development and design stages of complex projects

. product ranges on domestic markets can be widened by importing and adapting technology and products

. partners can be found for collaborative ventures including EU-funded R.& D. projects

In the case of the CTT research centres, most of them already participate to a significant extent in international activities. However, the level of their interest in a Science Park network is equally high and their motivations quite similar to those of the companies interviewed. While often quite active in international collaborative programmes, their contract research work for foreign clients tends to be sporadic. They would, in many cases, like to develop such markets and believe that they are competitive in terms of quality and cost. Moreover, to some extent they see this as defensive measure since they are likely to face increased competition from imported contract research services.

A Science Park network would give the CTTs wider access to companies who - they already know from their experience in Zamudio - are particularly sensitive to technological issues. It would also extend the range of their contacts with potential partners in foreign research centres and Universities.

In the case of the Universidad del País Vasco, they participate in a number of international programmes and networks (Tempus and Human Capital and Mobility, amongst them), encourage researchers to attend international congresses (they finance some 300 attendances annually), and enjoy global connections through Email. Nevertheless, they feel that communcations limit their ability to make full use of the opportunities for international collaboration - especially in those cases where they would like to initiate a project, put together a team, and lead it, under EU auspices. They would very much welcome a network which would give them easier access to researchers in companies, Universities, and research centres associated with Science Park

All these varied organisations feel that a Science Park network could help to meet their needs but only if, in addition to providing access to an increased number of contacts, some means could be found to filter, interpret, and manage information. A simple catalogue or compilation of data would be of very limited value: they expect much more than a conventional data base. Whoever undertook this task, therefore, would need to have some knowledge of the activities of the companies concerned and some understanding of the dynamics of their industries or technologies. He would probably also need to make regular,

personal contacts with some of the key organisations in other Parks.

Clearly, in current circumstances, a strong candidate for this role could probably be found in the management team of the Zamudio Science Park, not least because their relationship with their tenant organisations is close and effective. This would, however, represent a widening of responsibilities which would apparently strain their resources, human and financial. An alternative solution might be for SPRI to treat this as a central information-management function for the 3 Parks. In that case, it could either be carried out by one of them on behalf of all or it could form the basis for a new value-added service.

For the management of the Zamudio Park, the network would be of interest not only for the sake of its tenants but because it would widen their own range of contacts with the managers of other Parks for the purposes of exchanging information, learning from each others' experience etc.. At present the only formal channels for these purposes are the national and international Science Park Associations.

In addition, the Science Park network could be of relevance to other projects in which the management of the Zamudio Park are involved such as the two already referred to:

. the trans-frontier educational institution, based on an interactive telematics network, now under discusssion with potential partners, including Science Parks, in France and the 3 Spanish Basque Territories

. the Atlantis programme, now under discussion within the Atlantic Arc association of Regional Development Agencies, for the creation of a technology transfer network between Science Parks

Consideration should be given to the possibility of combining or co-ordinating SPNET with the above projects, and with others such as the RECITE regional initiative also referred to elsewhere in this report.

As already indicated, the spontaneous reaction by most potential users to the SPNET initiative was to see it as a particularly promising means of identifying, and initiating contacts with, new partners, allies, and clients. Most of them assumed this would be a preliminary to a personal contact and to a relationship which would probably be conducted by alternative communication channels - which, they anticipated, would be adequate for such purposes. However, to the extent that such alternatives are public services provided at the usual tariffs, cost could be a factor for major users (given the likelihood that Spanish tariffs will remain above EU averages for some years).

APPENDIX I

PERSONS INTERVIEWED: SPNET - BASQUE COUNYTRY

17th - 19th January 1994

1. Sr. D. Antonio Aranzabe Melon	Presidente, Parque Tecnológico S.A. (Zamudio)
2. Sr. D. Roberto Baitia Bastida	Director, Programa Spritel
3. Sr. D. José Manuel Escajedo	Director de Informatica, Labein
4. Sr. D. José Antonio López Egaña	Director General, Robotiker
5. Sr. D. Iñaki Letona	Director General, Gaiker
6. Sr. D. Juan Ramón González Velasco	Vicerector Investigación Universidad del País Vasco
7. Sr. D. Manuel Cendoya	Director, Iramain S.A. (Parque Miramón)
8. Sr. D. José Manuel Giral Mañas	Director General, Inasmet (and Presidente -EITE)
9. Sr. D. Javier Maqueda Lafuente	Director Gerente, BEAZ (BIC)
10. Sr. D. Luís Zumárraga	Director, U.Estratégica Tecnológía, SPRI (responsible for S. Park Programme and Alava Park)
11. Sr. D. José Felix Menendez Villanueva	Director General, Euskalnet
12. Sr. D. Jesús Castillero	Director Gerente, Filosoft S.A.
13. Sr. D. Antonio José Ochoa	Director Gerente, BEMS S.A.
14. Sr. D. Ricardo Villar	Director, Integra S.A.

APPENDIX II

INNOVATION SUPPORT CENTRES - BASQUE COUNTRY

Source: Instituto de la Pequeña y Mediana Empresa Industrial (IMPI)

3.15. PAIS VASCO

3.15.1. ORGANISMOS DE COORDINACION I + D

Agrupación Vasca de Centros de Investigación Tecnológica (EITE)

PARQUE TECNOLOGICO
48016 ZAMUDIO (VIZCAYA)
Tlf. 94-420 94 87
Fax: 94-420 95 00
Contacto: D. JOSE MENDIA URQUIOLA

Ambito sectorial: Horizontal
N.° Empresas Asociadas: No tiene

Actividades principales:
Coordinación de lineas institucionales de investigación
Transferencia de Tecnologia

3.15.2. ORGANISMOS DE DESARROLLO

Departamento de Industria y Energía

DUQUE DE WELLINGTON 2
01011 VITORIA (ALAVA)
Tlf. 945-24 99 00
Fax: 945-24 47 08
Contacto: D. JOSEBA JAUREGUIZAR

Ambito sectorial: Horizontal
N.° Empresas Asociadas: No tiene

Actividades principales:
Ayudas de I+D
Convenios de Tutela de Centros Tecnológicos Vascos

3. Directorio de Centros

Asociación de Investigación Industrial de la Máquina-Herramienta (INVEMA)

AVDA. ZARAUZ, 82, 3°, EDIFICIO LOREA
20009 SAN SEBASTIAN (GUIPUZCOA)
Tlf. 943-21 96 78/21 90 11
Fax: 943-21 80 36
Contacto: D. FERNANDO BAILACH ALCAYA

Ambito sectorial: Máquina-Herramienta
N.° Empresas Asociadas: S. D.

Actividades principales:
Investigación Aplicada

Centro Tecnológico de Materiales-INASMET

CAMINO PORTUETXE 12, APTO 1689
20009 SAN SEBASTIAN. B° IGARA (GUIPUZCOA)
Tlf. 943-21 80 22
Fax: 943-21 75 60
Contacto: D. JOSE MANUEL GIRAL

Ambito sectorial: Mecánico
N.° Empresas Asociadas: 100

Actividades principales:
Asesoria Calidad
Asesoria Gestión Industrial
Investigación Aplicada

Centro de Estudios e Investigaciones Técnicas de Guipúzcoa (CEIT)

PASEO MANUEL LARDIZABAL 15
20009 SAN SEBASTIAN (GUIPUZCOA)
Tlf. 943-21 28 00
Fax: 943-21 30 76
Contacto: D. JOSE Mª BASTERO

Ambito sectorial: Horizontal
N.° Empresas Asociadas: S. D.

Actividades principales:
Formación
Investigación Aplicada
Investigación Básica

Sociedad para la Promoción y Reconversión Industrial, S. A. (SPRI)

GRAN VIA 35, 3°
48009 BILBAO (VIZCAYA)
Contacto: D. JAVIER RETEGUI
DIRECTOR GENERAL
Tlf. 94-415 82 88
Fax: 94-416 96 23

Ambito sectorial: Horizontal
N.° Empresas Asociadas: No tiene

Actividades principales:
Fomento Empresarial
Promoción Industrial
Promoción Tecnológica

Unidad de Desarrollo Regional de Iberdrola, S. A.

GARDOQUI 8, APARTADO 119
48080 BILBAO (VIZCAYA)
Tlf. 94-415 46 00
Fax: 94-416 28 09
Contacto: D. JOSE MANUEL ALONSO

Ambito sectorial: Horizontal
N.° Empresas Asociadas: No tiene
Actividades principales:
Apoyo como socio de nuevos proyectos
Asesoría Gestión Industrial
Asistencia Técnica
Creación de nuevas empresas
Formación

3.15.3. INSTITUTOS TECNOLOGICOS INDUSTRIALES

Asociación de Investigación Tecnológica-TEKNIKER

AVDA. OTAOLA 20
20600 EIBAR (GUIPUZCOA)
Tlf. 943-11 67 44
Fax: 943-11 27 57
Contacto: D. IÑAKI GONEAGA

Ambito sectorial: Máquina-Herramienta
N.° Empresas Asociadas: 90

Actividades principales:
Asesoría Calidad
Difusión Tecnológica
Formación
Información
Investigación Aplicada
Investigación Básica
Normalización y homologación

Centro de Investigación y Desarrollo del Mueble y complementos (CIDEMCO)

BARRIO LANDETA S/N
20730 AZPEITIA (GUIPUZCOA)
Tlf. 943-81 68 00
Fax: 943-81 60 74
Contacto: D. ANGEL LAFUENTE

RIBERA 1, 4º
48005 BILBAO (VIZCAYA)
Tlf. 94-415 21 44
Fax: 94-415 29 76
Contacto: D. JOSE MANUEL ECHEVARRIA

Ambito sectorial: Madera y mueble
N.º Empresas Asociadas: 65

Actividades principales:
Asesoría Tecnológica
Formación
Investigación Aplicada
Normalización y Homologación

Centro de Investigaciones Tecnológicas-IKERLAN

PASEO J.M. ARIZMENDIARRIETA 2
20500 MONDRAGON (GUIPUZCOA)
Tlf. 943-77 12 00
Fax: 943-79 69 44
Contacto: D. CARLOS REDONDO

Ambito sectorial: Horizontal
N.º Empresas Asociadas: 47

Actividades principales:
Formación
Investigación Aplicada

Grupo Fatronik

POLIGONO IBAITARTE S/N, APTO 160
20870 ELGOIBAR (GUIPUZCOA)
Tlf. 943-74 29 12/74 29 16
Fax: 943-74 34 92
Contacto: D. LUIS GOENAGA

Ambito sectorial: Máquina-Herramienta
N.º Empresas Asociadas: 17

Actividades principales:
Asesoría Tecnológica
Formación
Información
Investigación Aplicada

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3. Directorio de Centros

Centro de Transferencia Tecnológica-GAIKER

PARQUE TECNOLOGICO DE ZAMUDIO
EDIFICIO 202
48016 ZAMUDIO (VIZCAYA)
Tlf. 94-452 23 23
Fax: 94-452 22 36
Contacto: D. JUAN LUIS NUÑEZ

Ambito sectorial: Horizontal
N.º Empresas Asociadas: 53

Actividades principales:
Asesoria
Formación
Investigación Aplicada
Laboratorio de Análisis

Grupo de Transferencia Tecnológica-ROBOTIKER

PARQUE TECNOLOGICO DE ZAMUDIO
EDIFICIO 202
48016 ZAMUDIO (VIZCAYA)
Tlf. 94-452 22 66
Fax: 94-452 23 30
Contacto: D. JOSE ANTONIO LOPEZ EGAÑA

Ambito sectorial: Automóvil/Mueble/ Máquina-Herramienta/Electrónica/Informática
N.º Empresas Asociadas: 64

Actividades principales:
Consultoria
Formación
Investigación Aplicada

Centro Tecnológico Ideko

POL. INDUSTRIAL DE ARRIAGA. APTO 80
20870 ELGOIBAR (GUIPUZCOA)
Tlf. 943-74 25 54/74 25 58
Fax: 943-74 36 74
Contacto: D. PATXI ALDABALDETREKU

Ambito sectorial: Máquina-Herramienta
N.º Empresas Asociadas: 9

Actividades principales:
Asesoria Calidad
Asesoria Gestión Industrial
Asesoria Tecnológica
Formación
Investigación Aplicada
Normalización y Homologación

Laboratorio de ensayos e investigaciones industriales-LABEIN

CUESTA DE OLABEAGA 16
48013 BILBAO (VIZCAYA)
Tlf. 94-489 24 00
Fax: 94-441 17 49
Contacto: D. JOSE MENDIA URQUIOLA

Ambito sectorial: Horizontal
N.° Empresas Asociadas: S. D.

Actividades principales:
Asesoria Calidad
Investigación Aplicada
Asesoria Tecnológica
Asistencia Técnica
Normalización y Homologación

3.15.4. CENTROS DE SERVICIOS TECNOLOGICOS

Centro de Diseño Industrial (DZ)

SABINO ARANA 8
48013 BILBAO (VIZCAYA)
Tlf. 94-427 81 60
Fax: 94-427 80 05
Contacto: D. ION SOJO GARATE

Ambito sectorial: Horizontal
N.° Empresas Asociadas: S. D.

Actividades principales:
Auditoria y Asesoria de diseño
Formación

Diara

POLIGONO BASABE
20550 ARECHAVALETA (GUIPUZCOA)
Tlf. 943-77 10 15
Fax: 943-79 05 87
Contacto: D. IÑIGO AITOR VALLEJO

Ambito sectorial: Electrónica/ Máquina-Herramienta/Cerrajeria/Electrónica Industrial/Instalaciones/Mueble y Mobiliario de oficina/Equipos y Sistemas de Telecomunicaciones
N.° Empresas Asociadas: 27

Actividades principales:
Formación
Servicios a las empresas

Actividades Empresariales Experimentales (SAIOLAN) de la Eskola Politeknikoa, S.C.L.

LORAMENDI 4
20500 MONDRAGON (GUIPUZCOA)
Tlf. 943-77 05 00/79 02 11
Fax: 943-79 15 36
Contacto: D. ARMIN ISASTI ELIZARAN

Ambito sectorial: Horizontal
N.° Empresas Asociadas: No tiene

Actividades principales:
Asesoría Gestión Industrial
Formación
Promoción de la investigación aplicada

Centro de Desarrollo de Empresas (CDE)

GENERAL IZTUETA 1, ACCESORIO, APTO 1014
20012 SAN SEBASTIAN (GUIPUZCOA)
Tlf. 943-27 75 00
Fax: 943-27 53 56
Contacto: D. PEDRO PALOMO

Ambito sectorial: Horizontal
N.° Empresas Asociadas: S. D.

Actividades principales:
Asesoría Tecnológica
Formación
Información
Normalización

3.15.5. PARQUES TECNOLOGICOS

Parque Tecnológico Miramón, S. A.

PASEO DE SAN MIGUEL 43
20014 SAN SEBASTIAN (GUIPUZCOA)
Tlf. 943-45 58 00
Fax: 943-45 59 44
Contacto: D. MANUEL CENDOYA

Ambito sectorial: Horizontal
N.° Empresas Asociadas: No tiene

Actividades principales:
En proceso de creación del Parque Tecnológico

Parque Tecnológico-Tecnologi Elkartegia, S. A.

PARQUE TECNOLOGICO
48016 ZAMUDIO (VIZCAYA)
Tel. 94-420 94 87
Fax: 94-420 95 00
Contacto: D. ANTONIO ARANZABE MELON

Ambito sectorial: Horizontal
N.º Empresas Asociadas: No tiene

Actividades principales:
Asistencia Técnica
Formación
Infraestructura para implantación de empresas

3.15.6. *CENTROS DE PROMOCION DE EMPRESAS*

Centro de Empresas e Innovación de Alava, S. A. (CEEI-ALAVA)

ASTRO URDIALES, 10
01006 VITORIA (ALAVA)
Tel. 945-14 63 78
Fax: 945-14 67 52
Contacto: D. LUIS DEL TESO

Ambito sectorial: Horizontal
N.º Empresas Asociadas: S. D.

ACTIVIDADES PRINCIPALES
Promoción de empresas de innovación

Centro de Empresas e Innovación de Vizcaya, S. A. (BEAZ)

ALAMEDA RECALDE 18, 6º Planta
48009 BILBAO (VIZCAYA)
Tel. 94-423 92 27/423 92 28
Fax: 94-423 10 13
Contacto: D. JAVIER MAQUEDA

Ambito sectorial: Horizontal
N.º Empresas Asociadas: 9

Actividades principales:
Asesoria Gestión Industrial
Asesoria Tecnológica
Promoción de empresas
Formación

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3. Directorio de Centros

3.15.7. LABORATORIOS

Banco de Pruebas de Armas de Eibar

JUAN GUISASOLA 1
20600 EIBAR (GUIPUZCOA)
Tlf. 943-11 18 25
Fax: 943-11 11 31
Contacto: D. ANTONIO CABELLO OLIVA

Ambito sectorial: Fabricación de armas
N.° Empresas Asociadas: No tiene

Actividades principales:
Normalización y Homologación

Laboratorio de Ensayos Industriales de Alava (LEIA)

FLORIDA 56-58 BAJO
01005 VITORIA (ALAVA)
Tlf. 945-27 84 18
Fax: 945-25 50 78
Contacto: D. LUIS ALONSO

Ambito sectorial: Horizontal
N.° Empresas Asociadas: S. D.

Actividades principales:
Asesoramiento
Asistencia técnica
Normalización y homologación

SCIENCE PARKS IN THE "ATLANTIS" PRPGRAMME (ATLANTIC ARC REGIONS)

ATLANTIS

1. TECHNOLOGICAL PARK SOMERSET (TAUNTON - UK)
2. TECHNOPOLE DE CAEN NORMANDIE SYNERGIA (CAEN)
3. TREGOR TECHNOPOLE (LANNION)
4. TECHNOPOLE DE BREST IROISE (BREST)
5. POLE INNOVATION QUIMPER (QUIMPER)
6. RENNES ATALANTE (RENNES)
7. LORIENT TECHNOPOLE (LORIENT)
8. ANGERS TECHNOPOLE (ANGERS)
9. ATLANPOLE (NANTES)
10. ASSOCIATION DES CRITT DE POITOU - CHARENTES (POITIERS)
11. BORDEAUX TECHNOPOLIS (BORDEAUX)
12. HELIOPARC (PAU)
13. AGROPOLE (AGEN)
14. PARQUE TECNOLOGICO DEL PAIS VASCO (ZAMUDIO-VIZCAYA-ESPAÑA)
15. PARQUE TECNOLOGICO DE ASTURIAS (LLANERA-ASTURIAS-ESPAÑA)
16. PARQUE TECNOLOGICO DE GALICIA (OURENSE-ESPAÑA)
17. PARQUE DE CIENCIA E TECNOLOGIA DO PORTO (PORTO-PORTUGAL)
18. LISPOLIS (LISBOA-PORTUGAL)
19. CITMA (FUNCHAL-MADEIRA-PORTUGAL)

APPENDIX IV

COMPARATIVE TELECOM TARIFFS

Source: La liberalizaciòn de las Telecomunicaciones en España (M.O.P.T. 1993)

(Tariff study by Arthur Andersen Consulting)

TELEPHONE:

CONCEPTO	ESPAÑA	C.E.	MAYOR (ALE-FR-GB)	MENOR
Conexión	25.000	17.064	26.744 (GB)	4.770 (FR)
Abono Mensual	1.200	1.315	1.575 (ALE)	744 (FR)
Unidad Tarific.	4,16	11,80	17,53 (ALE)	8,06 (FR)
Coste 1 Min. Local	1,45	3,47	8,41 (GB)	2,33 (FR)
Idem Periférico	1,45	4,88	8,41 (GB)	2,9 (ALE)
Idem Provincial	25,65	16,74	17,90 (GB)	15,00 (FR)
Idem Regional	46,71	29,66	50,08 (ALE)	20,19 (GB)
Idem Nacional	46,71	33,98	50,08 (ALE)	25,20 (GB)
Idem a países C.E.	107,21	90,08	87,66 (ALE)	62,95 (GB)
Idem a resto Europa	130,80	105,30	124,69 (FR)	83,10 (GB)
Idem a América	195,22	173,90	150,13 (ALE)	91,54 (GB)

Fuente: Estudio de Arthur Andersen para Natel, Mayo 1993. Todas las cifras están expresadas en pesetas.
Los costes en función de la distancia se expresan en pts por minuto de conexión, en la tarifa horaria más cara, sin considerar «quantum» inicial ni cuotas atípicas.
Cuando existen costes diferentes a particulares o empresas, presentamos el valor medio aritmético de ambos.

Comparación de tarifas (pts por 3 minutos/horario comercial/jul 1993)

TIPO DE LLAMADA	ESPAÑA	ALEMANIA	FRANCIA	G. BRETAÑA	ITALIA
Urbana	8,72	18,3	14,3	25,8	32,3
Metrop.	8,72	18,3	28,7	25,8	43,1
Provincial	95,90	54,9	111,7	60,3	140,1
Nacional	161,30	164,9	157,6	86,0	183,2
CEE	357,50	274,8	258,0	189,4	291,0
América	621,50	476,3	115,8	296,8	656,0
Impuestos %	15	0	18,6	17,5	9 y 19 (neg.)
		Indices sobre llamada urbana			
Nacional	18,5	9,0	5,5	3,3	4,3
CEE	41,0	15,0	9,5	7,3	7,3
América	71,5	26,0	16,0	10,3	19,5

Las llamadas Urb. y Metrop. en el caso de G. Bretaña son para un periodo de 172,5 segundos.
Existen costes inferiores para llamadas de menor duración (tarifas en G. Bretaña y metropolitanas en Francia e Italia).
En Italia hay una tarifa más barata para llamadas en el ámbito de una misma central.
Cálculos con valores de divisas correspondientes al 28.7.93

COMPARACION DE LOS COSTES FIJOS DE IBERPAC-X25

PACKET SWITCHING:

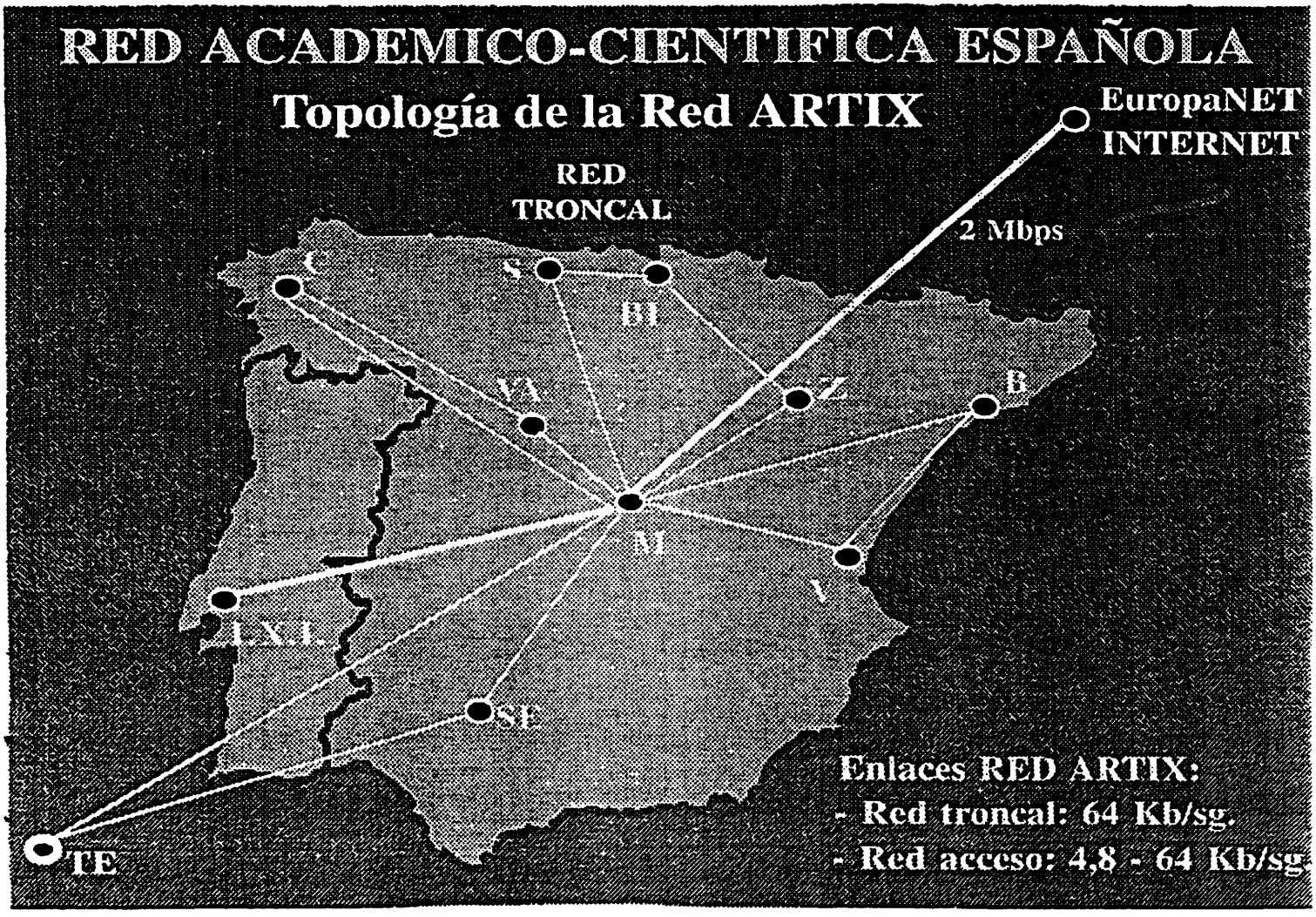
(DATOS EN PTS)	CONEXION BAJA VEL. (9.600 BPS)	CONEXION ALTA VEL.	CUOTA MENSUAL BAJA VEL. (9.600 BPS)	CUOTA MENSUA ALTA VEL. (64KBPS)
IBERPAC	52.057	261.535	50.653	104.600
FRANCIA	90.520	99.572	38.471	160.673
ALEMANIA	41.922	41.922	32.013	114.333
R. UNIDO	182.313	N.D.	62.370	N.D.
media CE	57.481	100.252	26.887	92.928
Iberpac/m.CE	-9,4%	+161%	+88%	+12,8%

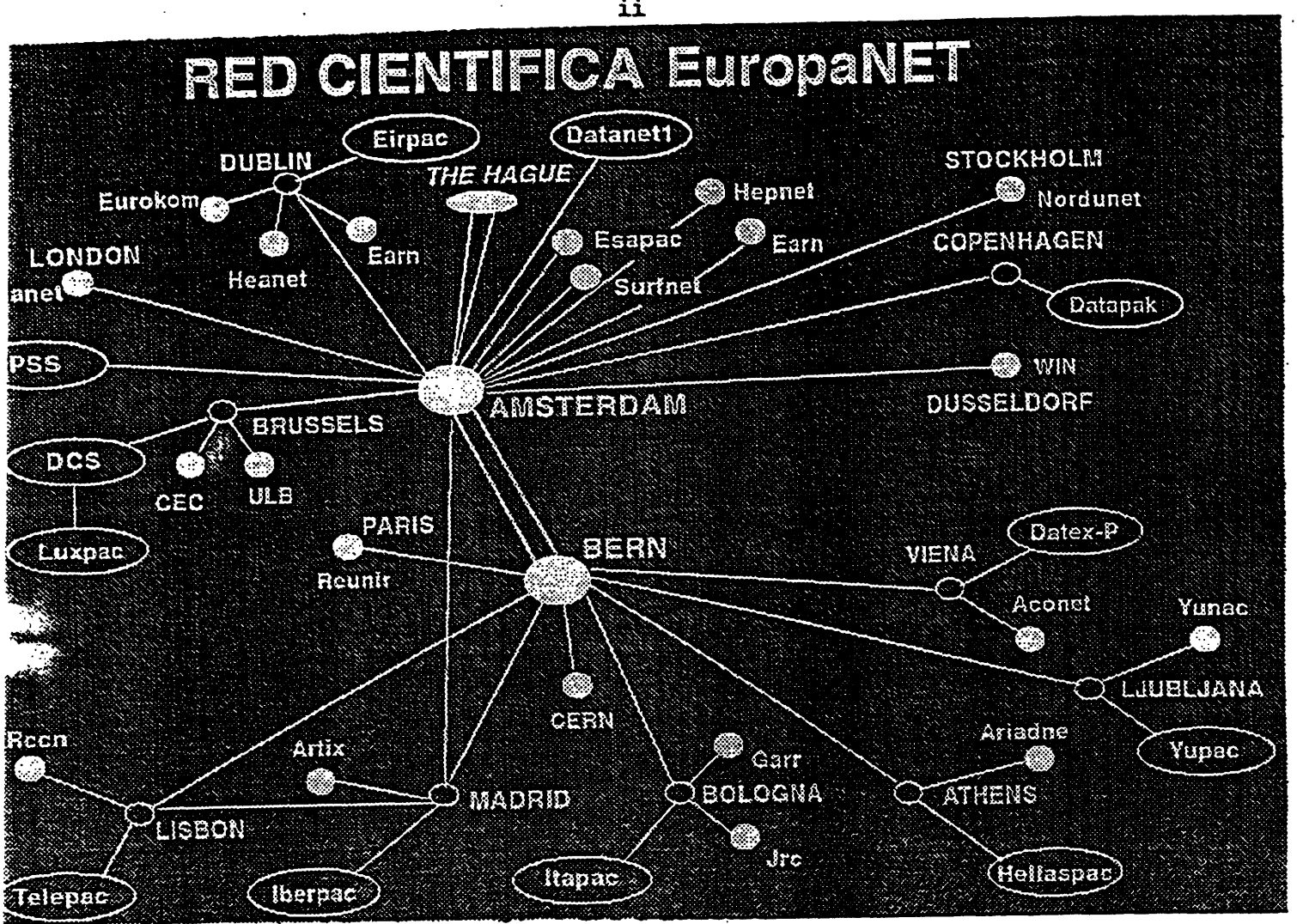
Fuente: Estudio de tarifas de 1994. Andersen Consulting

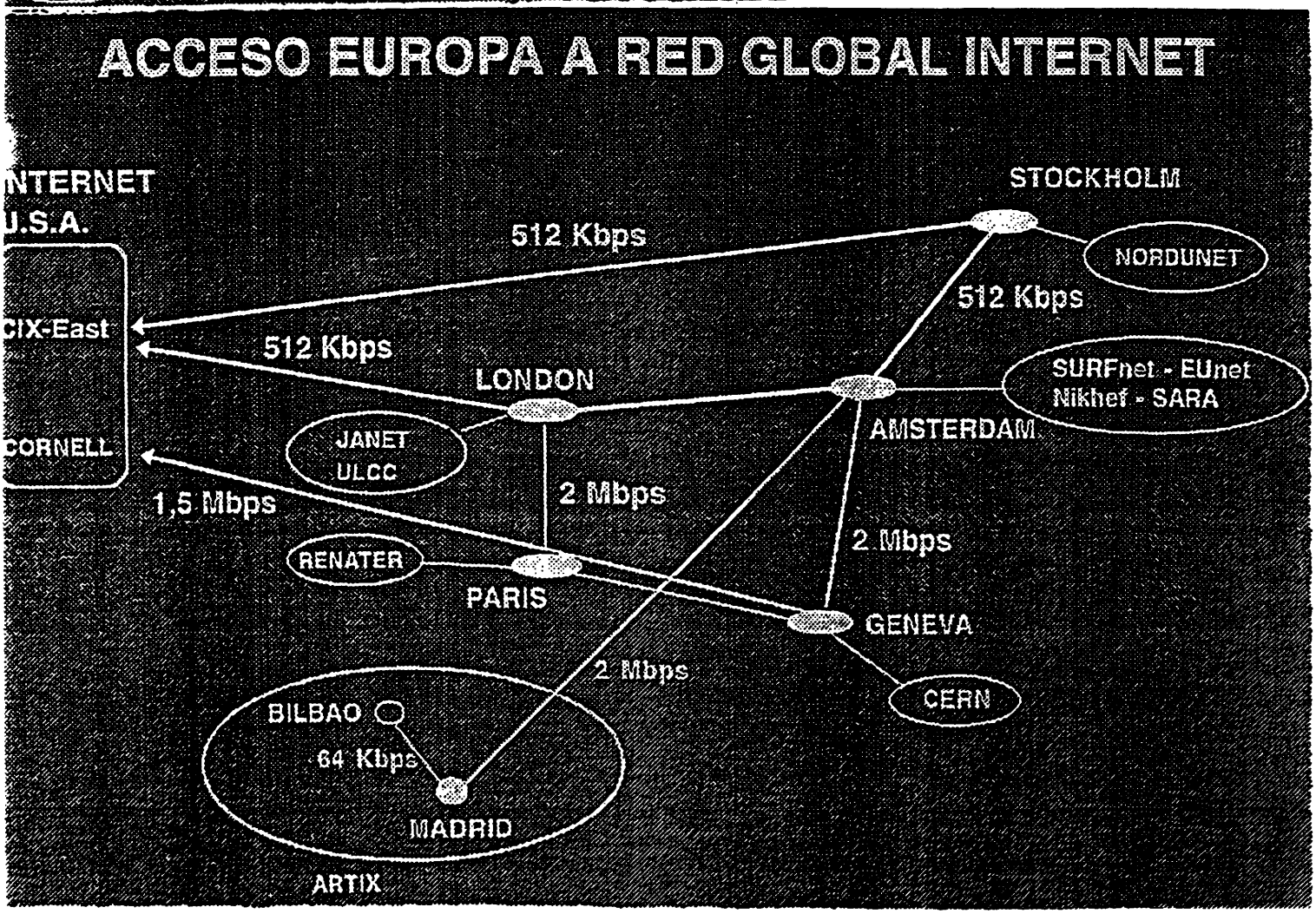
APPENDIX V

SCIENTIFIC TELECOM NETWORK

Source: LABEIN




RED CIENTIFICA EuropaNET
Eirpac
Datanet1
DUBLIN
THE HAGUE
STOCKHOLM
Eurokom
Hepnet
Nordunet
Heanet
Earn
Esapac
Earn
LONDON
COPENHAGEN
Surfnet
Datapak
PSS
WIN
AMSTERDAM
DUSSELDORF
BRUSSELS
DCS
CEC
ULB
Luxpac
PARIS
BERN
Datex-P
VIENA
Reunir
Aconet
Yunac
LJUBLJANA
CERN
Ariadne
Yupac
Rccn
Artix
Garr
MADRID
BOLOGNA
ATHENS
LISBON
Jrc
Telepac
Iberpac
Itapac
Hellaspac


ACCESO EUROPA A RED GLOBAL INTERNET
NTERNET
U.S.A.
STOCKHOLM
512 Kbps
NORDUNET
512 Kbps
CIX-East
512 Kbps
LONDON
SURFnet - EUnet
Nikhef - SARA
AMSTERDAM
JANET
ULCC
CORNELL
1,5 Mbps
2 Mbps
2 Mbps
RENATER
PARIS
GENEVA
2 Mbps
CERN
BILBAO
64 Kbps
MADRID
ARTIX

APPENDIX VI

SPRITEL DATA BASES

- AINTEX: Health and safety at work and environment.
- ARCHIE: Internet files search service.
- ARTTEL: National Bibliographic Service.
- BOLSABI: Spanish Stocks Exchange.
- BOPV: "Basque Government Gazette" and Government Biddings.
- BRS: Host containing a large number of databases on different matters.
- BTX: Gateway to the German Videotex Network.
- COLEXDATA: Spanish Law database.
- CORTTY: Teleshopping "El Corte Inglés" Department Stores.
- CSIC: Four databases from the Spanish Organisation for Scientific Research.
- DATA-STAR: Host containing business and economic information.
- DELFOS: It is a database containing all the grants and special loans offered to enterprises by the local Administration, Spanish Administration, and E.E.C.
- DELPHI: E-mail and databases (financial, news, etc.) from Delphi Miami.

- DIALOG: Host containing a large number of databases on different matters.
- DOCE: Education material database.
- ECHO: European Commission Host Organisation with its offer of databases.
- ECOPRENSA: Spanish economic press summary daily.
- EPOQUE: European Parliament database.
- ESA-IRS: Large number of databases from The European Space Agency.
- ESPAN: Spanish Statistical Production database.
- ESZ-CVS: R&D Supercomputer.
- EUROBASE: EEC databases (law, statistics, etc.).
- EUSKALTERM: Basque language dictionary, with cross translations to Spanish, French and English.
- EUSKOM: Electronic mail and electronic conference system provided by Spritel. E-mail is linked to Telex and Fax; and also to international e-mail networks (INTERNET, EUNET-USENET, EARN).
- GLOBAL REPORT: Quotes, financial news, Money Market, etc.
- GPAZ: Spanish "Blue Pages" telephone Directory.
- HOME BANKING: Six different services from six different banks.
- IBERCIC: Civil Works Database.
- IBERDUERO: Information service to the user form the Electric Company.
- ICEX: Export or Import Spanish Companies. Trade opportunities.
- INFOTAP: Intelligent Gateway to the main databases worldwide
- INFORMA: Commercial information of firms.
- INTEK: R&D Projects in the Basque Country.
- MINITEL: Gateway to the French Videotex Network (10.000 services).
- NORLINE: Spanish Market Stocks Quotes in real time.
- OAG: Flight information from the Official Airline Guide.
- P.A.E.: Spanish "Yellow Pages" telephone Directory.
- QUESTEL: Host containing a large number of databases on different matters.
- RAPID: European Commission Press communications.
- R.P.I.: Spanish Industrial Property Register.
- S.I.E.: Several databases from the SME Institute (Firms Directory, Exhibitions, Biddings, etc.).
- TED: Tenders Electronic Daily from the E.E.C.
- TRADSTAT: International trade information.
- TURISTEX: Hotel bookings in Spain.
- UPV/EHU: Connection to the Basque University Network.

DRAFT

PROSPECTS FOR SPNET

IN

ANDALUCIA

February 1994

Fred Bennetts

INDEX

1. INTRODUCTION

As a basis for this report, interviews were conducted over a 3 day period in Andalucia. The consultant interviewed those responsible (managers or promoters) for the existing Science Parks in Malaga and Sevilla, the BIC in Malaga, and the projects for a Centro de Empresas e Innovación in Cádiz and a Parque Empresarial y de Innovación Agro-industrial in Jerez. He was not able to interview the Manager of the BIC in San Juan Aznalfarache (Sevilla) because of scheduling problems.

The consultant also spoke to representatives of the Universities of Sevilla, Malaga, and Cádiz. In addition, 6 companies were contacted, as was the Employers Federation, CEA. As regards the regional government, the project was discussed with the Instituto de Fomento de Andalucia (IFA) and with the Consejería de Educación (in relation to the Plan Andaluz de Investigación).

In Madrid, the consultant met with the President of the Asociación para el Desarrollo del Proyecto de Cartuja '93. He also interviewed the Vice-President of the Consejo Superior de Investigaciones Científicas (CSIC) to discuss their project related to the Cartuja Park.

Earlier contacts had been made in Sevilla, in October 1993, at a seminar held to launch the Cartuja project, with representatives of the Institute for Prospective Technological Studies and of the World Teleport Association.

Published material which was consulted included the Plan Andaluz de Investigación and "Andalucia: an Emerging Regional Economy" by Keith Salmon (Junta de Andalucia)

A complete list of those contacted is attached to this report as Appendix I.

2. ECONOMIC BACKGROUND

Andalucia is the second largest region in Europe, occupying an area of some 87.000 kms². It has a population of approximately 7 million. The Regional Government is based in Sevilla and the Provinces which comprise the region are: Almeria, Cádiz, Cordoba, Granada, Huelva, Jaen, Jerez, Malaga, and Sevilla.

Andalucia is one of the least developed regions in Spain and its level of unemployment is several points above the national average. Its Gross Regional Product in 1991 was approximately 45.000 million ECUs. Its growth rate over the last few years, however, has been one of the fastest in Spain. There has been a marked increase in industrial production, due both to new investment and to increased productivity. Foreign investment has been high, Andalucia ranking third after Madrid and Barcelona.

Growth sectors have included aerospace, the auxiliary car industry, telecommunications equipment, and agro-industry. Services, which account for some two thirds of GRP, are showing growth at above the national average: they are, moreover, gradually shifting from a heavy dependence on tourism to industry-support activities.

The transport infrastructure of Andalucia has been significantly improved in recent years, partly in preparation for Expo '92, the World Fair. Spain's first high-speed train line runs from Madrid to Sevilla. In addition, a network of new highways covers most of the region. There are international airports at Sevilla and Malaga.

Structural characteristics of the Andalucian economy include:

- the small size of firms (below the national average) allied to a diversity of product lines with little specialisation

- a structure weighted towards first-stage processing, for the most part generating little value added

- lack of competitiveness: low productivity, mature technology acquired through patents

- regional market orientation: very limited penetration of international markets by industrial products

- lack of linkage between industries within the region: dependence on external sources for inputs

3. INDUSTRIAL AND TECHNOLOGICAL PLANNING

Economic planning is an important feature of regional government in Andalucia. In the current Plan Andaluz de Desarrollo Económico (PADE) 1991-1994, the objectives are to help well-established industries secure their competitive position (through rationalisation, product differentiation, new product devlopment etc.), to overcome technical and financial barriers by encouraging foreign investment, to create a support structure for the stimulation of SMEs etc.. There is also a geographic dimension to the planning that seeks to promote a broader distribution of industry.

R. & D. planning is the subject of the Plan Andaluz de Investigación (PAI) 1990-'93 (extended to April 1994, when a new, similar Plan will be initiated). The Plan budgetted, for the 4 year period, 19 million ECUs of regional government funds and estimated that a further 20 million ECUs would be received from national and EU programmes.

Priority areas within the PAI are:

- Food and Agro-industry
- Life Sciences
- Natural Resources
- Social and Humanistic Sciences
- Production Technologies
- Information Technolcgies

Within Production Technologies the following lines are included:

- Advanced Automation and Robotics
- New Materials
- Energy Use
- Standardisation and Metrology
- Effluent Treatment

Information Technologies include:

- Microelectronics
- Software Technology and Computer Architecture
- Radio-communications
- Space Technology.

In the field of regional infrastructural planning, a feature of particular importance is the Digital Communications Network of Andalucia. In the wake of deregulation (see separate report on the national "Telecommunications Environment"), Andalucia is one of the 4 regions which are well advanced in planning the development of their own telecom networks. Initially for use by regional government Departments, Agencies, and other public bodies (including the regional TV network), it is being designed on the assumption that, as deregulation continues, wider usage will be possible.

The regional network, which will be fully operational in 1997-'98, will cover 80% of the population. It is based on 5 fiber optics loops (with some radio connections), providing voice/data/image communications. Investment will be approximately 38 million ECUs and the regional government's principal partner in the operating company, Cia. Andaluza de Telecom (CAT), will be the electric utility, Cia. Sevillana de Electricidad.

Other CAT ventures include the trunking network for mobile phones, whose node is in the Malaga PTA, and, as a pilot project, an interactive cable network in Jerez. Packet switching services and satellite communications will, it is anticipated, be offered in the future.

4. REGIONAL SCIENCE PARK PROGRAMME

4.1 General

Projects for Science Parks and related ventures have been numerous and varied in Andalucia. They include:

- Parque Tecnológico de Andalucia in Malaga
- Cartuja '93 Science Park in Sevilla
- BIC Euronova located on the Malaga Park
- BIC Eurocei in San Juan Aznalfarache (Sevilla)
- Centro de Empresas in San Fernando (Cadiz) - contract for feasibility study recently signed with Sprint Programme
- Parque Empresarial y de Investigación Agroindustrial in Jerez (Cadiz) - preliminary agreement for feasibility study with Sprint Programme in 1992 but contract not finalised
- the Parque de Salud in Granada - project for a Park centred on Health-related Services, Research, and Industry, which will shortly be put out to tender

The Malaga Park (together with its BIC) and the Sevilla Park are the subject of separate sections of this report. The projects in San Fernando and Jerez are described below.

The development of these varied initiatives has not been effectively co-ordinated. In the case of Malaga and Sevilla in particular this has represented a major problem, now somewhat alleviated. The current AMBAR project - described elsewhere in this report - implies greater co-ordination between the two ventures. Moreover, forthcoming changes in the ownership of Cartuja '93 (also referred to below) will probably lead to some degree of integration in the management of the two Parks.

The wider issue, affecting the region as a whole, remains unresolved. It relates in part to the fact that the principal driving forces behind all of the above initiatives are government bodies whose inter-relationships form a complex, sometimes competitive, pattern of interests.

In some instances problems arise as between different levels of Government: central (who play a particularly important role as regards Cartuja '93), regional (involved in all the major projects) and provincial or local. However, even within one of these levels difficulties of communication can arise, for

instance, as between the Consejerias (regional Ministries) or between Departments of the same Consejeria. As an example, the significancc to the regional R.& D. programme of the new, important Parque Salud project (see Appendix VII) in Granada is not widely recognised within the regional government.

In the case of the Province of Sevilla, this problem is illustrated by the fact that the Diputación is promoting a project for a high-quality industrial estate, "Palmas Altas", located close to the capital, as being complementary to the research-only activities of Cartuja '93. It is hoped that suitable links will be created for this purpose - which would pose difficulties as regards the proposed complementary roles of Cartuja and the Malaga Park.

The Vicepresidente de Economia of the Diputación has also signed a framework agreement with Cartuja '93 to discuss possible telematic linkages between the Park and the newly- created Local Development Agencies. These form part of a Diputación programme to upgrade industry at the municipal level and much importance is given to incorporating new technology and improving access to sources of business information.

The need to co-ordinate the development of Science Parks and related ventures, while widely acknowledged, is sometimes discounted as simply a reflection of the size and diversity of Andalucia. As a result there appears to be a tendency to focus efforts on a few, major projects without adequately taking into account other initiatives.

In fact, Andalucian research resources are widely spread (the outstanding Science faculties at Granada University being an obvious example) as are its industrial and technological needs. Moreover, the current rapid development of a telecommunications infrastructure, and initiatives such as SPNET, represent a major opportunity to use these resources and meet these needs. A well-formulated, integrated programme for Science Park developments could achieve a wide impact at relatively low cost in Andalucia.

4.2 Centro de Empresas San Fernando

The project for this Innovation Centre is being promoted primarily by the Ayuntamiento (local authority) of the City of Cadiz - of which San Fernando forms part. The University of Cadiz is closely involved and the Ayuntamiento hopes for additional backing from the Chamber of Commerce, Free Port Authority, and local industry. Will also seek involvement of IFA (regional

government) and IMPI (central government). This venture is unrelated to (and apparently uncoordinated with) another project, promoted by the regional government, for the development of a 300.000 m² high-quality industrial estate in Cadiz.

A contract has recently been signed with the Sprint Programme for help under the terms of the "Science Park Consultancy Scheme". It is hoped that the Centre will be accepted into the EBN network in due course. At an earlier stage the promoters were given to understand that their status would be that of an "antenna" to the BIC in Sevilla but they would find this unacceptable if it implied that the projects were to be physically located in Sevilla (125 kms. away).

Cadiz (population 150.000, capital of a Province of some 1 million inhabitants) is one of the 2 or 3 largest industrial cities in Andalucia. Its activities are based largely on shipbuilding - which is undergoing extensive reconversion. The Ayuntamiento is seeking to relaunch the economy on the basis of creating new technology-intensive SMEs, upgrading existing industry, and attracting inward investment. As regards the latter, it has had some success: newcomers include Ford Electronics, a GM components subsidiary, and Unistore (manufacturers of hard discs).

Primary purpose of the BIC will be to provide technological support for SMEs and priority areas will be electronics, metal fabrication, and agro-industry. 30.000 m² site, providing incubator facilities and information services. The profile of other activities will depend on the results of the Sprint consultancy project. The promoters hope to draw on the experience of other European cities with similar problems. They already have particularly close relations with Brest, Taranto (near Bari) and Plymouth.

The intention is to draw heavily on the University's research and technical skills: the Project Director is the Professor of Chemical Engineering. The University of Cadiz is young and fast-growing (over 20.000 students). Its strengths include Materials, Marine Technologies, Chemistry, and - within the Escuela Politécnica (middle level) - Engineering. Neighbouring research centres include a CSIC Institute specialising in Aquaculture and the Marine Hydrographic Institute.

The promoters of the Park also hope to benefit (spin-outs, training etc.) from the presence in the area of some major companies. These include CASA (aeronautics) and E.N. Bazan (a shipbuilding company which has one of the largest electronics labs in the country).

Linkages to an SPNET would be very welcome. They consider themselves inadequately served by the present thrust of SP policy in Andalucia and would welcome the opportunity of strengthening their information, University, and intercompany linkages with other centres on a regional, national, and international basis. Are not in a position to be more specific about likely benefits at this stage.

4.3 Parque Empresarial y de Investigación de Jerez

Jerez (population 180.000) is located in the Province of Cadiz some 90 kms. from Sevilla, 35 kms. from the city of Cadiz. It is a major centre for tourism and for agro-industry: wine, sugar, cereals, vegetables and livestock. It has a national airport and is well connected by motorway and high-speed rail. An inter-modal transport centre will be built on a 120 has. site in the near future. As regards telecom, the town has a fiber optics network, will be linked into the regional telecom system now under development, and will be the first town in Andalucia to offer cable services (TV and interactive).

Promoters of the Parque Empresarial are the Gerencia de Desarrollo (GELDEMSA), a development company formed by the Ayuntamiento, the local savings bank and the Chamber of Commerce. They plan to develop an 80 has. site, of which 25 has. would be available for technology-intensive agro-industries and 1 ha. for research and training institutes. They hope to concentrate on this site a significant part of research and technical activities now taking place at the nearby University of Cadiz (the Sherry industry has close links to the Chemistry Faculty), Estación de Viticultura y Enología, Rancho de la Mejora Agrícola Ganadera etc.

The project was delayed for a time and the 1992 preselection for assistance by the Sprint SP Scheme was not pursued. However, the first major tenant, a flour company, has now commited itself to the occupation of 15.000m² and GELDEMSA has just put out to tender a contract for part of the Park's infrastructure. Total investment is estimated at 14.6 million ECUs over a 4 year period. They hope for EU structural funds support for the project which, they anticipate, will be included in the 1994-'99 Regional Plan (second tier - local authority projects).

The promoters view SPNET as potentially very important to them. Although they expect regional government support for their project, they feel discriminated against by the tendency to concentrate research activities in areas of specialisation - Cordoba, in the case of agro-industries. SPNET would represent an important instrument both for communications and networking.

5. PARQUE TECNOLOGICO DE ANDALUCIA (MALAGA)

5.1 General

The earliest of the Science Park projects in Andalucia. its first tenant located on the site at the end of 1992. It now houses close to 30 companies or other organisations. 22 of these are in the BIC but major companies installed or firmly committed include:

- Hughes Microelectronics (part of GM; engaged in automotive markets, radiofrequency identification, and microelectronic integrated solutions)

- Alcatel: centre for DEC Standard

- Air Liquide: production and distribution of special gases and environmental research

Other notable tenants include 6 research institutes which will share premises to be constructed shortly by the regional government (these are described in a later section of this report) and the Quality Control Institute for Construction Material.

Companies which are already operational have created 300 jobs; firm commitments for 1000 more. Total land area 168 has., giving 50 has. of built space. Infrastructure in place for 35 has. and construction for the remaining area will begin February 1994. Expansion to neighbouring area planned. Land sold in plots of minimum 1.500 m^2 at 117 ECUs/m^2 built space (no takers for 75 year leases at 5 ECUs/m^2 p.a.).

Financial and fiscal credits for tenants include:

- possibility of grants for up to 50% of investments
- interest rate subsidies of 2 - 3 points
- tax credits up to 45% on R.& D. investments
- training grants up to 100%
- low interest CDTI loans for up to 70% of R.& D. projects
- accelerated depreciation of fixed asset investments

The project got off to a weak start - attributable both to the situation of apparent rivalry with Cartuja '93 and to the depressed state of industry and the property market. It seems to have picked up significantly: SP managers claim 60% of total available space has been reserved (with deposit). Are revising their property development targets from 10 years down to 5.

Management of the Park is the responsibility of a 7 - person team which covers property development, administration,

operations, and technology development. Extensive use of subcontractors, for maintenance, security, installations. Latter includes the development of the telecom network - which has been contracted to IngeniA - a company located in the BIC (see below).

As regards technology development, this includes some assistance in promoting collaborative projects. PTA management works in close conjunction with the Asociación de Empresarios of the Park, which meets monthly (headed by President of Hughes) So far, relatively little diffusion of technology to companies off the Park but management sees this as an important objective in the longer term.

PTA forms part of Spanish and International SP Associations. See them as forums for useful contacts but few concrete results. Believe SPNET could be of importance (as AMBAR has been) to developing close South-South relationships between Science Parks (this refers to cultural affinities and stage of economic development rather than geographic location).

In this connection, considerations of compatibility,, easier communications, non-threatening relationships, opportunities to exert influence are seen as more important than the potential advantages of associating with more developed areas. A conference for South-South Science Parks (including China and Brasil) will be held in Malaga later this year. PTA management also hopes to assist Parks in Mahgreb (Casablanca and Tunis).

PTA management believe SPNET would, in addition, be of benefit to Park tenants, primarily as a basis for extending their range of commercial and collaborative contacts. As to development and management of the system, suggest subcontracting to IngeniA. It would be relatively easy to incorporate SPNET into the package of basic or optional services offered by PTA to tenants (see below).

The Ambar project is seen as having some relevance to SPNET. PTA management describe it as having 3 facets within an overall objective of providing co-ordination between SPs and BICs in Andalucia, Bari, and Montpelier:

- the development of a telecom network
- linking companies with similar interests in joint projects (e.g. CETECOM in the PTA with a microelectronics company in Bari)
- upgrading technology in traditional sectors (tourism and construction in the case of Andalucia) through joint projects: the creation of the Quality Control Institute of the Construction Industry is, in part, the result of this collaboration.

5.2 PTA Telecom Network

One of the principal features of the Park's telecom infrastructure is the recently-completed fiber optics ring. Within a few weeks networks will be further enhanced by connection to the national ISDN system. The Park is also the site of a service centre for mobile phones.

Total cost of installation of the Park's telecom infrastructure was approximately 2 million ECUs, of which some 790.000 ECUs was financed by FEDER. The key elements of the Park's digital system are:

- an exchange providing basic phone service and low speed data transmissions

- ISDN services

- a transmission node gateway directing Park systems to the exterior

-superimposed systems of metallic cable and fiber optics

-an integrated telecom office with two LANs to each site: Ethernet and FDDI

- video conference room using ISDN

Advanced services are offered through this network by IngeniA, working on behalf of the PTA management, on a package basis (basic package and options). They include:

- X 400 electronic mail

- Park Videotex

- Access to Park data bases

- Access to Internet

Details are attached as Appendix II to this report.

5.3 Universidad de Malaga

Relatively new University but has grown fast. 34.000 students. Technology-related faculties only founded some 5/6 years ago. In the regional context, Malaga is considered to be the leading University as regards Telecom Engineering.

Current links between PTA and University include:

- some PTA company staff (e.g. IngeniA) also teach at the University

- a scholarship Programme, funded by regional Government, enables a substantial number of last-year students to spend 3/4 months acquiring practical experience at such companies as CETECOM and Hughes

- the Director of the PTA is a member of the University's Consejo Social

- there has been some interchange of specialist training courses

- the University has carried out some technical service contracts (problem-solving) for PTA companies

As part of the plans for closer links in the future, the regional government is constructing (for completion in March '95) a 5.500 m² building to house 6 new University Research Institutes and Centres, as follows:

- Centre for Documentation on Standards
- Institute for Automation and Robotics
- Institute for Image Processing
- Institute for Millimetric Waves
- Institute for Software Quality
- Institute for Logical Control of Computation

The Junta will provide facilities for shared use and sees this building as a form of "incubator for institutes"- a reflection of the fact that the University is at an early stage of development in these fields. Relatively little thought has been given to the future organisational structure of the Institutes, particularly their relationship with the business world.

The University, for its part, is planning to locate on the PTA a 2.200 m² building. This would house the offices of the Oficina de Transferencia de los Resultados de la Investigación (OTRI), together with conference facilities, rooms for specialist training courses, and exhibition space.

Also of major importance in this context is the current move by virtually all the Faculties and Departments to a new campus, some 5 minutes from the PTA. The University authorities would like to take the opportunity to instal an advanced telecom infrastructure. At present they are connected, by an X 25 (packet switching) system, to the Consejería de Educación in Sevilla and, through them, to other Universities and to the Centro Informatica

de la Comunidad Andaluza (CICA). This gives them access to a Convex super-computer. For international communications they depend primarily on electronic mail - particularly for file transfers - and fax.

The University looks to the PTA as providing a model for the telecom infrastructure of the new campus and hopes to link the two systems. SPNET would be of particular interest to them in terms of strengthening links to the business community - most of their current collaborative projects are with other Universities - and to widening their range of international contacts. The University is already quite active internationally. It has strong links with the U.S. (Carnegie Mellon), Italy, France, Germany, and other countries. As regards EU Programmes, it is particularly active (5/6 projects) in Human Capital and Mobility.

The University's OTRI office has a staff of 6 and is financed from STRIDE funds. Located at present in the Rectorate, they would like to create 2 other offices in the future - in the PTA and in Central Services (which would seek to encourage inter-disciplinary activities). Their work is at an early stage of development and is focused on providing information (regarding collaborative projects etc.) to University Departments, and building up data on Departments' resources. Little active promotion. Few contacts with industry - which they see as being the primary responsibility of the Fundaciones Universidad-Empresa (not yet established in Malaga). Total income from contracts and collaborative research approx 3 million ECUs p.a. (mostly for technical services). A list of contracts and research projects undertaken in 1992 is attached as Appendix III.

OTRI management see SPNET as being potentially of particular interest in terms of providing access to data banks (unspecified), information on collaborative research contracts, and closer linkages to industry.

5.4 BIC Euronova

Founded end-'92. Shareholders:

- IFA (regional government)	30%
- Promalaga (Ayuntamiento)	30%
- IMPI (central government)	30%
- UNICAJA (savings bank)	10%

Total space available 4.500 m², in modules of 20 - 160 m². 70% occupancy at present, with 22 companies, employing 120. 40 companies within 3 months. Expansion planned. This impressive record attributed in part to its integration within PTA, in part

to absence of any alternative sites for innovative SMEs in Malaga.

A full list of BIC tenants is attached as Appendix IV. One University spin-off: TCC (cartography). A relatively small proportion, perhaps 20% (mostly engaged in IT), are thought to be "outgoing" - interested in collaborative projects, internationalisation etc.. Others tend to be engaged in assembly or production of components for major clients.

BIC management consists of 8 full-time staff and 4 consultants. Provide advice to prospective tenants (Business Plans etc.) and support at later stages - in marketing, administration (handle book-keeping for 40% of them). Very focused on in-house activities and lack resources to build up an off-site network of SME contacts.

As regards financial support and advice to tenant companies, BIC management do not themselves control any funds but can channel requests for venture capital (up to approx 320.000 ECUs) to Promalaga or M-Capital (funded by some major local companies). Other sources of capital (investment or loan) as already referred to (ICO, Unicaja, and IFA). The major problem for SMEs is meeting loan guarantee requirements (which do not take into account the value of the project itself but only business and personal assets).

SMEs on the BIC do not appear to make any significant use of BC-NET, or of the EBN and Sprint services available to them. As regards SPNET, BIC management believe that the short-term market would be limited but that it would make a valuable contibution, nonetheless. They feel that the AMBAR project, in which they have been closely involved, is significant in this respect. It has, even in its current first phase, stimulated intercompany collaboration, including some interchange of executives. It has also led to the identification of 4/5 specific projects (in areas such as aquaculture and audiovisual systems) which, it is hoped, will form the basis of projects in later phases of the programme.

5.5 Selected Tenant Companies

5.5.1 Procedimientos-Uno

Located in BIC. Founded 4 years ago. Staff of 16 (expect to be 30 within 5 years). Base activity: software for architectural and civil engineering applications. Speciality: seismology research. Some 3000 clients.

Collaborative research and international alliances essential to their business (e.g. currently looking for partners for a

venture related to shock absorbers for buildings). Work closely with Universities of Malaga, Cadiz, and Granada. International contacts include ISPRA research centres, Berkeley University, and researchers in Japan. Primary communications link Compuserve (Internet) through basic phone line, PC, and modem.

No involvement in European programmes at present and one of their problems is information. Recently learned of an opportunity through contacts in Bari. Very interested in SPNET. See it as a means both of widening their range of contacts and learning of EU project opportunities

5.5.2. Centro de Tecnologia de las Comunicaciones (CETECOM)

Created 1991, occupies its own premises on PTA. Joint venture between IFA (regional government), Asociación al Servicio de la Investigación y las Tecnologías (ASIT), and Rheinisch-Westfalischer Technischer Überwachungsverein e.V. (RWTÜV). Infrastructure financed by Star, Stride, and Prisma programmes.

Engaged in testing, consulting, and training related to standards and software development for Information Technology, telecom terminals, and related fields including electro-medicine. Their work is closely aligned to EU standards on Compatibility, Functionality, Safety, Quality. Exceptionally well equipped and serve international markets.

Official accreditations from Ministry of Industry, D.G. Telecomunicaciones, RELE (Red Española de Laboratorios de Ensayo). Participate actively in various national and international associations including ADLNB (Association of Designated Laboratories and Notified Bodies), ANIEL, and AENOR.

Value their presence in PTA. Much "cross-fertilisation" with other tenants including Hughes, IngeniA, Alcatel, and with University. AMBAR has been useful to them: are developing a relationship with the Microelectronics Division of the Novus Ortus Tecnopolis. They work in complementary fields, Bari in microelectronics and Cetecom in electromagnetics. Have prepared dossiers on respective strengths and are planning joint promotion.

Will use PTA network for international communications in future. At present,for a specific project are using email facilities provided by the Sema consultancy group (Madrid). Would welcome SPNET primarily as a means of widening, on a national/international basis, business and technology contacts which have already proved useful. However, believe linkages should be selective - not all Parks are of interest to them.

5.5.3 Ingeniería e Integración Avanzadas S.A. (INGENIA)

Provides advisory services in communications and IT, systems integration, software development, and training courses. Shareholders are Fujitsu 40%, IFA (regional development agency) 40%, and Promalaga (Ayuntamiento) 20%.

IngeniA are working under contract as advisors to the PTA management company in the development of the Park's telecom infrastructure and telematics network (which is not yet operative). They will manage and administer the system in due course.

Attracted to Park by subventions and by prospect of developing business within it. Business relationships already developed include: CETECOM (training and project collaboration, including EU projects), Telefónica (cabling subcontract and joint services promotion), Hughes (outsourcing), BIC management (technical support on IT). Close links with the University. 7 members of the staff teach there. In addition, IngeniA is participating in Ambar project at two levels: PTA and BIC.

IngeniA actively promote video-conference services on behalf of PTA: they plan 2 meetings per month. 60% of companies who attended a recent meeting in Malaga expressed interest. One major local company (cement) installed its own facilities. Current video-conference facilities in PTA are costly and inconvenient to use. Improved system, using two RDSI lines, will be installed shortly.

As regards telematics demonstration centres and training, primary official sources are IFA, Consejería de Trabajo (regional government), Ministry of Industry and D.G. Telecomunicaciones (central government). Support services include some subventions for equipment.

Would welcome SPNET as direct users - primarily to expand their commercial/technical contacts. Also would hope for better information on opportunities for EU project participation. Suggest it could, in addition, act as instrument for disseminating information on, and promoting, Malaga (and specific Malagueño companies) as a centre of expertise for tourism and other services.

Believe they could play a role in administering SPNET within the PTA and in filtering/managing appropriate information flows (as suggested by PTA management). SPNET could be included as an option in the package of services offered to tenants on a fee basis and could use the same interactive terminal equipped with a special SPNET icon. Consider themselves well qualified in terms of knowledge of networking and information needs of SMEs on and off the Park: have carried out IT audits for many of them.

6 CARTUJA '93 PARK

6.1 General

Of unique characteristics, this project is based on the site of the Expo '92 World Fair, which took place in Sevilla. The total site covers an area of approx. 100 has. (450.000 m² of built space). An early plan -the PINTA project - proposed that all of it should be used as a Science Park. In the face of recession, this was limited to its present dimensions: approx. 75 has. This includes many of the Expo pavilions (total area 165.000 m²) and unbuilt land. The balance will be used for a theme Park and for University facilities.

The shareholders in Cartuja '93 are the central government (through AGESA) 51%, the Junta (through EPSA) 44%, and the Ayuntamiento 5%. Its fundamental objective has been to reutilise and, to the extent possible, capitalise the investment made in the Expo site. The value of these investments, variously estimated, is probably of the order of 4.140 million ECUs.

Legal problems which hindered the sale of land and buildings (leasing being the favoured solution) now appear to have been overcome. However, difficulties continue in that sales mechanisms have not been co-ordinated and prospective buyers have a choice of dealing with two land-owners, AGESA or EPSA.

For this and other reasons, agreement has recently been reached whereby the regional government (Junta) takes 51% ownership, leaving AGESA with 34%, the Ayuntamiento with 10%, and the Diputación Provincial with 5%. A new management phase also begins for the company, in which major issues of a fiscal and legal nature give way to those more appropriate to a SP management company, including an increased emphasis on technology development.

As already indicated, this change in ownership patterns is likely to lead to a closer management relationship between Cartuja '93 and the PTA in Malaga. The possibility has been discussed of creating a Foundation, involving both organisations, which would be involved primarily with the technological development aspects of their activities. The two projects are in many ways complementary. However, the suggestion (frequently made) that there is a dichotomy Malaga/Industry and Sevilla/Services would seem to be an over-simplification.

Some considerable success has been achieved in attracting tenant companies and other organisations. Not all of these would appear to meet the strictest criteria as regards innovation intensive-activities and it is notable that the private sector is not yet strongly represented. Some scepticism about the future of the project is still widely expressed for this reason.

Nevertheless, some noteworthy commitments have been made to the Park. A list is attached as Appendix V. 3 of the most important, referred to below, are: the research institutes of the Consejo Superior de Investigaciones Cientificas (CSIC), the Engineering Departments of the University, and the Institute for Prospective Technological Studies (an EU Joint Research Centre).

Other likely tenants are:

- A branch of the Centro Nacional de Microelectronica (CNM). This research centre is very active internationally, participating in 4 ESPRIT projects amongst others. It also works closely with at least one Cartuja tenant, Tecnológica S.A. (quality assurance for aerospace components)

- the Centro Nacional de Aceleradores: a 6 MeW accelerator, to which a cyclotron may be added, which will act initially as a service centre for research by Universities and companies (again, Tecnológica S.A. will be a client of the project)

As regards other current tenants, organisations classified as being active in "advanced technologies" account for 428 jobs (out of a total of 1.158). They include companies such as:

- AYESA (engineering in water technologies)

- Siemens (training and r & d. in IT, Energy, Environment),

- Tecnológica S.A. (already referred to)

- Fundación ONCE (research on systems and equipment for the blind and other disabled)

Also on the site are the offices of the Confederación de Empresarios de Andalucia (CEA), the regional Employers Federation. It operates a centre for business services, offering assistance, information, and training on a wide reange of business topics. It is a potentially important link between Cartuja and SMEs on and off the Park and played an active role in the AMBAR project.

There is no BIC within the Park but there is one at San Juan Aznalfarache, some 465 kms away. There appear to be no close links between this BIC and the Cartuja Park.

Priority research areas for the Park, as identified by its promoters, are in large part related to the natural resources of the region, to the traditional bases of its economy - agriculture and tourism - and to environmental concerns. They include:

- Biotechnology applied to agriculture
- Food Technology
- Water Technology
- Environmental Technologies
- New Materials
- Information Technology
- Research on Training and Recycling in New Technologies
- Prospective Technology and Evaluation of Technology Transfer

The process of "organisational development" required to integrate existing skills and achieve synergies within the framework of the Park has largely been the responsibility of the Asociación para el Desarrollo del Proyecto de Cartuja '93 (ADP). This has been formed by over 20 companies and other organisations including Alcatel, Telefónica, Siemens, IBM, and Philips and its purpose is to promote the Cartuja project. Its members hope that a role will be found for them within the new management structure of Cartuja '93, perhaps within an Advisory Committee.

The principal achievement of ADP to date has been the creation of the Centro Tecnológico del Agua (CENTA), a research group composed of various companies (AYESA, Siemens, EGMASA amongst them) and Government bodies (notably the Ministerio de Obras Públicas) with complementary interests in fields related to the use of water. These include treatment processes, equipment, territorial planning, and the integration of all these. Immediate projects are related to the development of a pilot plant for water purification, the modelling of a watershed, and the management of irrigation. A similar initiative, for the creation of a multi-disciplinary research group, is planned in the Energy sector.

The telecom infrastructure of Cartuja is of exceptional quality. Already in 1992 the site was linked to the ISDN network and 7 fiber optics rings were laid down. A wide range of services is provided, as shown in Appendix VI. These include video-conferencing (this service is also provided to the PTA in Malaga from Cartuja). There is, in addition, a teleport on the Cartuja site but it is owned and managed by Telefónica. The extent to which it will be integrated into the Cartuja project, in terms of meeting the specific needs of tenants or the Park management, is not yet clear.

Those interviewed showed considerable interest in the potential of SPNET. However, for the most part, their ideas are not yet clearly defined as regards specific benefits - understandably, given the characteristics of the Park and its early stage of development. Some likely benefits which can be cited:

- the Park's new management team could benefit very significantly from close links with more experienced SP managers (not least because they do not form part of the national or international Science Park associations)

- those responsible for the ADP's efforts to form new interdisciplinary research groups within Cartuja would benefit from being able to identify and call on skills and resources from other Parks on an international basis

- the Fundación Once, which has not yet embarked on its ambitious plans for research and technology transfer related to the disabled would benefit from contacting research centers and Universities working in related fields in other Parks and from achieving easier access to information about EU-financed (particularly Social Fund) projects

4.2 Consejo Superior de Investigaciones Cientificas (CSIC)

State-controlled group of 90 research institutes. Employ some 8000 nationally, of which 2,600 are researchers. Annual budget of approx. 300 million ECUs, of which some 35% from contract and collaborative research projects (private and public sources). The CSIC distinguishes itself from the Centros Técnológicos (mostly regional in nature) in that it claims to be engaged exclusively in research, not in technical services.

CSIC management co-ordinates and guides activities of the Institutes and represents them internationally (close links to CNRs in France, Max Planck Institute etc.). 71 Institutes are wholly-owned, 17 are joint ventures with Universities or regional governments, and 2 - the Centro Nacional Microelectronica and the Centro Nacional Biotecnologia -have a special status, being governed by a Patronato on which diverse bodies are represented.

No dedicated telecom network between Institutes. CSIC Institutes will, it is anticipated, be integrated operationally into the Research Plans of appropriate regional governments, starting with that of the Generalitat de Cataluña.

CSIC is commited to the Cartuja '93 project. Work has started on rehabilitating and extending a building on the site which will provide 11.000 m² to house, as from early 1995, some 300 researchers in:

- Instituto de Ciencias Materiales: 1 of 4 such within CSIC (others in Madrid, Barcelona, Zaragoza)
- Instituto de Bioquimica Vegetal
- Instituto de Quimica

The first two are joint ventures with the University of Sevilla.

In addition, the UE's Institute for Prospective Technological Studies - a Joint Research Centre which will relocate from ISPRA later in the year - will be housed in the same building. The CSIC hopes to work closely with them, creating a Department which would focus on Spanish needs for such studies.

The Centro Nacional de Microelectrónica (CNM) may also, in due course, move one of its units to Cartuja. The other CNM locations are Madrid (soon to move to the Tres Cantos Science Park) and Barcelona (close to the Vallès Science Park). The CNM is very active internationally - e.g. it has 4 new Esprit projects (leads one of them) and works under contract for French, German, and Swiss companies amongst others. It hopes to spin-off some joint venture companies, primarily as a means of raising additional private sector financing.

The move to Cartuja appeals to CSIC management primarily because it offers better accomodation. They see some of the additional attractions of being on a Science Park, and recognise the potential of SPNET, but will probably be slow to take full advantage of them.

6.3 Universidad de Sevilla

Plans are firm for the transfer to Cartuja in October 1995 of the University's Engineering Schools (Escuelas Superiores de Ingenieria Industrial). At later stages, some of the Science Departments may also move there.

The Engineering Schools will move to an existing building, offering 55.000 m² of space, to which 15.000 m² of workshops will be added. This complex will house 5.000 students and some 280 professors and researchers. Areas of research and technical service activity will include: electronics, automation, mechanical industries, aeronautics, and electrical engineering. The same building will also provide space for some new institutes to be created by the Plan Andaluz de Investigación which will work in the fields of Robotics, Metrology, and Renewable Energies.

The University's Engineering Schools date back some 30 years. They are the oldest in Andalucia and claim to be the regional leaders in all areas except possibly Telecommunications (in which Malaga is strong). 8-10 of their research groups are said to be of outstanding quality. The value of the Schools' contracts (research and services for industry and collaborative projects) is approximately 3.5 million ECUs p.a.. Most of these are channeled through the Asociación de Investigación y Cooperación Industrial (AICIA), a non-profit organisation.

The University forms part of the regional Centro de Información Científica Andaluza (CICA). Students and researchers have access, through work stations, to University computers and, within CICA, to a Convex super-computer. The Engineering Schools are active participants in various EU programmes - JOULE II, ARCO, CECA, ESPRIT and others - and have other extensive international links. Communications primarily by email.

The move to Cartuja is seen in a positive light but there is some scepticism as regards the interest of private sector companies in locating on the Park. The Engineering Schools are anxious to build a closer relationship with industry and feel they can help Andaluz businessmen in adapting to a more collaborative, international style of work.

SPNET is of interest to them as a tool for widening their range of contacts with industry. In addition, it is seen as being a potential support for the technology documentation centre which the Schools have been developing (EU standards etc.) and which they hope to install in a separate 1.500 m² building.

6.4 Institute for Prospective Technological Studies

The Institute is one of the 8 Joint Research Centres operated by the European Commission as a direct action within the Framework Programme.. Its move, scheduled for end-1994, from its present location in ISPRA (Italy) to Sevilla is seen as being of great significance to the Cartuja project.

Founded in 1989, the PROMPT Institute is an observatory for technological developments and socio-economic trends on an international scale. It also provides related services - specific studies and training - tailored to the needs of companies, research centres. and other users. Priority topics include Energy, Environment, and Transport.

PROMPT is actively seeking clients for its services in Spain and other EU countries. As regards companies, it believes that its studies can be particularly valuable as an input to the formulation of corporate strategies.

In addition, PROMPT is considering the possibility of launching new activities. One such possibility, considered in the course of the AMBAR study, would be the creation of an Observatory to analyse the "supply and demand" of industrial applied research: it would seek to identify industrial needs and contrast them with lines of research which are being undertaken in Universities and research centres.

PROMPT's marketing initiatives include the creation of an European Economic Interest Association together with Grupo Tecnológico INI in Spain, the Centre for Science and Technology (CEST) in Britain, and an organisation in Bari. In these circumstances it sees SPNET as being of great interest in terms of expanding its network of contacts.

7. THE AMBAR PROJECT

Reference has been made in earlier sections of this report to AMBAR as seen by some of its participants. The project is summarised below, within the limitations imposed by the incomplete information available to the consultant.

AMBAR is a pilot project for co-operation between Science Parks in Andalusia, Montpelier, and Bari, launched in 1991. Its objectives include:

- Helping to make of Andalucia a Southern European pole for technical competence and economic development. The project proposes to draw on existing assets: the development strengths of the region, the tools for business promotion, and two major support projects (the PTA in Malaga and Cartuja in Sevilla). The objective is to enhance current efforts and achieve a multiplier effect within Andalucia. It is also hoped to create new links with the Mahgreb states based on the transfer of technological and business skills

- Developing active partnerships between the 3 sites. Facets will include: scientific (as between Universities/ research centres) and economic and technical (as between business enterprises). For this purpose full use will be made of EU programmes in particular and specific opportunities for co-operation will be sought. In addition the dissemination of technology to business enterprises within and outside the Parks will constitute a major objective.

The work programme was grouped into:

- actions for co-operation between Science Parks (whose participants were the managers of the Science Parks)

- actions for the dissemination of innovation (whose participants were the managers of the BICs and of the employers' federation - CEA)

- actions of common interest to both of the above

In order to facilitate linkages between participants in these actions, effective use was made of telecommunications, including email, video-conferencing, and fax.

Various companies and other tenants of the BICs and Parks have been involved in these actions. In some cases - 4/5 within the PTA alone - opportunities for cooperation have been identified (see CETECOM and Procedimientos-Uno above) and there has been some interchange of executives. In addition, contacts between construction industry associations in the 3 regions has led to the development of joint projects.

In Sevilla, the CEA has been particularly active in the AMBAR project. It has played an important dissemination role in relation to its member companies. It has also reached an agreement with its opposite number in Montpelier related to information on public EU contracts - which represent a major export opportunity for Andalucian construction companies.

The current phase of this project is now coming to an end. As regards the preliminary conclusions (subject to further discussion) of the working group on Science Parks, it is understood that they recognise the complementary nature of the two Parks but refer to the lack of co-ordination in the development of their strategies. They recommend that a common position should be adopted for the purposes of external promotion.

The creation of a co-ordinating committee which would draw up a Charter for Technological Development in Andalucia is proposed. One of its objectives would be to define more precisely the priorities of each Park, assuming - as a rough guideline - that Malaga's activities were focused primarily on industry and Sevilla's on services. Within the committee 4 workshops would discuss Markets, Networks, Services, and Training.

As regards telematics, it is understood that the conclusions of the AMBAR working group stress their potential importance in terms of improving the competitivity of Andalucian companies and other entities. They recognise the existence of Cartuja's telecommunications infrastructure as being a major asset but note that a business communications network has yet to be built upon it.

It is proposed that AMBAR should act as a demonstration project for regional intercommunication by telematics. The primary purpose would be to look beyond the immediate needs of companies and demonstrate the usefulness of advanced equipment and systems. The conclusions stress the importance of building business services on wide-band rather than other networks.

Recommendations of the working group include the formulation of a master plan for telecommunications in Cartuja and, together with IFA, of a master plan for a regional telecom business network. The latter would serve as an input to Telefonica's PHOTON (national fiber optics) Plan.

At some earlier stages, sceptical reactions to AMBAR were, apparently, quite widespread. However, on balance, current attitudes amongst those interviewed were positive. Questions about its future role include, in the view of some participants:

- should its scope be extended to include other regions?

- should it be involved in the implementation of some of its recommendations and seek a budget for this purpose?

- how should it be managed - possibly by a mixed Commission representing regions and Directorate Generals?

Participants in AMBAR see the prospect of a SPNET as being valuable in itself and as complementary to the likely future actions of the project, as outlined above. AMBAR is also of significance to SPNET as indicating that many opportunities exist for collaborative actions involving various agents: Parks, BICs, companies, regional governments, employers' federations, and others.

APPENDIX I

PERSONS INTERVIEWED: SPNET - ANDALUCIA

9th - 14th February 1994

Malaga:

1. Parque Tecnclógico de Andalucia	Felipe Romera Consejero Delegado Cristobal López D. Operaciones
2. Ingenieria e Integración Avanzadas S.A. (IngeniA)	José Blanco Director General Manuel Alvarez D. Técnico Carlos Bentabol D. Comercial
3. Universidad de Malaga - Vice-Rectorado de Programación e Inversiones	Carlos Camacho* Vice-Rector
4. Universidad de Malaga - Oficina de Transferencia de los Resultados de la Investigación (OTRI)	Armando Reyes Director
5. BIC Euronova S.A.	José Manuel Zurera Director General
6. Procedimientos - Uno	Manuel Melero Gerente Peter Hodgson Depto. I.+ D.
7. Centro de Tecnologia de las Comunicacioones S.A. (CETECOM)	Luis F. Martinez D. Técnico

* also associated with the Instituto de Ondas Milimétricas project - to be located on the Parque Tecnológico

Sevilla:

8. Instituto de Fomento de Andalucia (IFA) División de Innovación y Tecnología (Consejería de Economía, J. Andalucia)	Francisco Mencia Director
9. Fundación Organización Nacional de Ciegos (ONCE)	Felix Hernandez Director
10. Plan Andaluz de Investigación (Consejeria de Educación, Junta de Andalucia)	José Luis Huertas Director
	Francisco M. Solís Jefe Servicio de Investigación
11. Universidad de Sevilla - Escuela Superior de Ingeniero Industriales	José Dominguez Abascal, Director
12. Confederación de Empresarios de Andalucia (CEA)	Juan Andrés Haurie D. Formación, Rel. Internacionales
	Mercedes Leon, R. Internacionales
13. Cartuja '93	J.Antonio Barragan D. Financiero

Cadiz:

14. Ayuntamiento de Cadiz Dirección de Fomento Económico	Fernando García Director
	Manuel Galán * BIC Project Mgr.

Jerez:

15. Ayuntamiento de Jerez Gerencia de Desarrollo	Miguel Ballesteros Director Gerente

* also Catedrático de Ingeniería Quimica, Universidad de Cadiz

APPENDIX II

PTA TELEMATICS SERVICES

1. INTRODUCCION

En el Parque Tecnológico de Andalucía (PTA) se han creado un conjunto de infraestructuras avanzadas de Telecomunicación con el objetivo de prestar servicios a las empresas e instituciones que se instalen el Parque, poniendo a disposición de éstas un paquete de herramientas telemáticas y medidas de seguridad que permitan mejorar la gestión de las empresas, modernizar sus procedimientos e incrementar su seguridad.

El acceso a los servicios Telemáticos del Parque se realiza a través de la red de fibra óptica del Parque que recorre el subsuelo del recinto (anillo FDDI). Las conexiones a la Red del Parque pueden establecerse de dos formas: Conexión Estándar (Ethernet a 10 Mbps) o Conexión Avanzada (FDDI/SAS a 100 Mbps)

Las empresas pertenecientes a la Entidad Urbanistica de Conservación del Parque Tecnológico de Andalucía (Comunidad de Propietarios), son las beneficiarias de un conjunto de Servicios Avanzados incluidos en el denominado Paquete Básico de Servicios (PBS).

2. SERVICIOS PRESTADOS POR EL PARQUE TECNOLOGICO DE ANDALUCIA

El Parque Tecnológico de Andalucía prestará a partir del día 15 de abril de 1.994 el conjunto de Servicios que se describen a continuación.

Con el ánimo de difundir el mayor número de servicios al menor precio posible, se ha considerado la conveniencia de definir el Paquete Básico de Servicios (PBS).

El PBS tiene el tratamiento de "bono" anual, con unos cupos de uso para cada uno de los servicios que incluye. Si su empresa agota el cupo anual asignado a alguno de los servicios, puede contratar individualmente la ampliación de cupos a la tarifa vigente.

La mayor parte de los servicios incluidos en el PBS son accesibles desde la Red del Parque. Además de éstos el Parque Tecnológico de Andalucía ofrece otros servicios avanzados a las empresas.

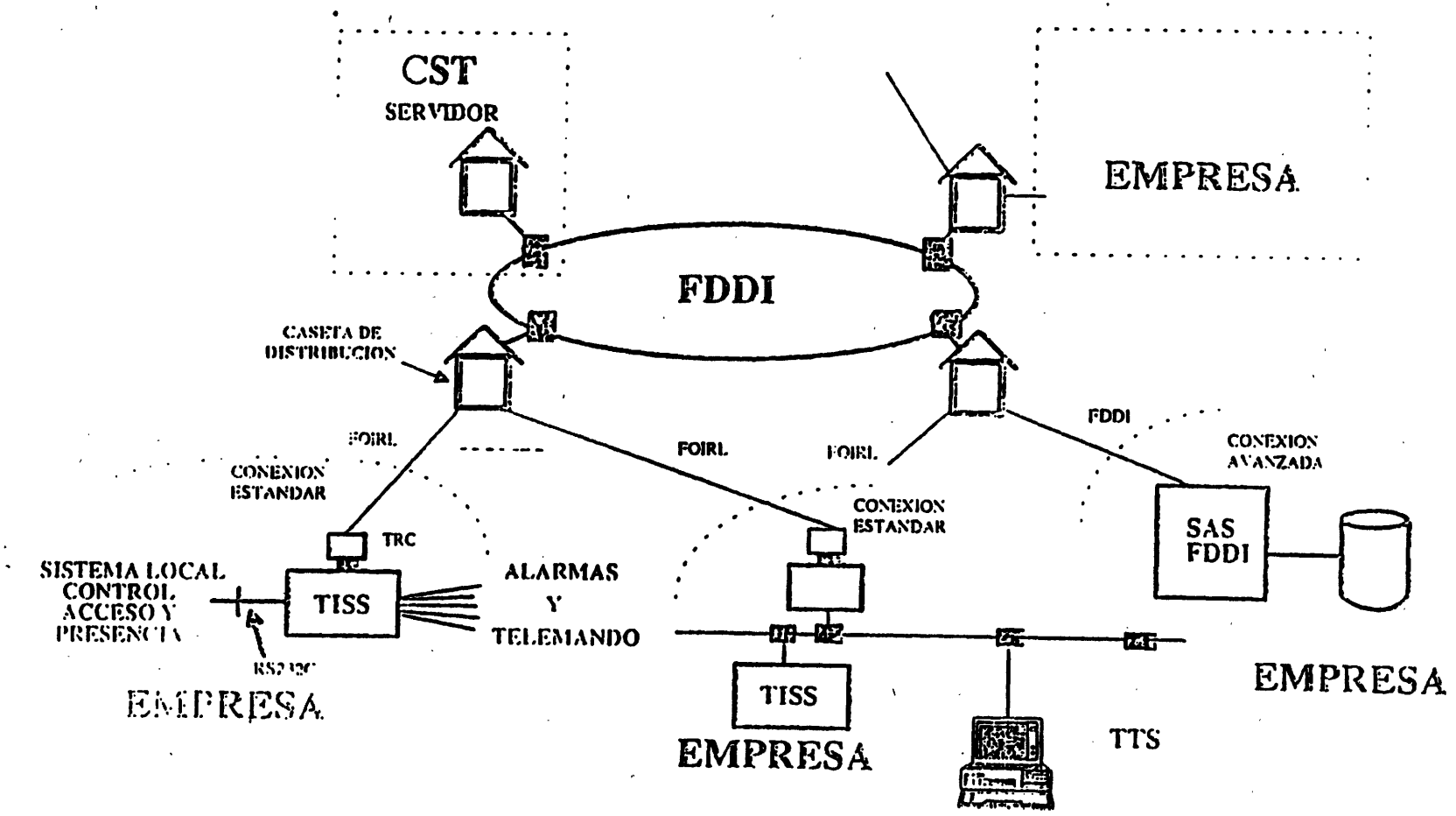
2.1. Servicios incluidos en el PBS.

- CCTV para videovigilancia del recinto y de los accesos al Parque
- Sistema de Control de Accesos al Parque
- Conexión Estándar a la Red PTA (Ethernet)
- Monitorización de alarmas empresas
- Telemando dispositivos remotos empresas
- Correo Electrónico X.400
- Servicio Videotex del Parque
- Conectividad e interconexión de Redes Locales.
- Acceso a Bases de Datos del Parque
- Pasarela a redes públicas X.25 y Servicio PAD
- Gestión Programada de Visitas
- Espacio Telemático para las empresas del Parque
- Sala de Videoconferencia

2.2. Servicios no incluidos en el PBS.

- Conexión Avanzada a la Red PTA (FDDI)
- Administración redes locales
- Puerta de acceso a Internet
- Auditorio con Medios Audiovisuales
- Estudio de Videoproducción
- Salas de Reuniones equipadas
- Punto de Información Interactivo

INTEGRACION DE SISTEMAS



PTA

IngeniA

APPENDIX III

UNIVERSITY OF MALAGA CONTRACTS

Relación de contratos y convenios de colaboración suscritos con empresas públicas y privadas vigentes a 1 de enero de 1992:

INVESTIGACION

Junta del Puerto de Málaga
Seguimiento y estudio de las aguas del Puerto de Málaga desde el punto de vista de los niveles de contaminación química y tasa de renovación e intercambio con las aguas exteriores de la bahía de Málaga

Alcatel Standard Eléctrica, S.A.
Desarrollo de un sistema de comunicaciones para interiores en ondas milimetricas

Instituto para la Conservación de la Naturaleza (ICONA)
Realización de un estudio titulado "Elaboración, Cuantificación y Análisis del Mapa de Pendientes de las Cuencas del Ebro y Pirineo Oriental"

Ministerio de Cultura (Dirección General de Bellas Artes y Archivos)
Consejería de Cultura y Medio Ambiente Junta de Andalucía
Obispado de Málaga
Realizacion de un Inventario General de Bienes Muebles de interes artistico, historico, paleontológico, arqueológico, etnografico, cientifico y tecnico de la provincia de Málaga, situados en inmuebles de la Iglesia Católica

TERMIA
Estudio y mejora del proceso productivo relativo al panel solar térmico modelo CAROL I y de las características térmicas de dicho panel

Comunidad Europea del Carbón y del Acero y Universidad de Alicante
Desarrollo de un Proyecto de I+D denominado "Activated carbon from spanish subbituminous coals", dentro del programa CECA

Laboratorios J. Uriach & Cía. S.A.
Realización de un estudio sobre el efecto del trifusal en la interacción plaqueta-pared vascular

Comisión de las Comunidades Europeas. I.R.F.A.T.A.
Realización del proyecto titulado: "Tecniche di progettazione di sistemi experti", dentro del programa COMETT.

Alcatel Citesa S.A.
Desarrollo y puesta en funcionamiento de un laboratorio de medidas automáticas para terminales telefónicos y radio

Alcatel Citesa S.A.
Desarrollo hardware radio y software de aplicación de un terminal telefónico inalámbrico con contestador en estado sólido

Informática Educativa S.A..
Diseño y construcción de placas de control para ordenadores personales

Instituto Nacional de Empleo
Realización de un estudio sectorial de hostelería y turismo

Fundación para la Investigación Agraria en la Provincia de Almería (FIAPA)
Desarrollo de un proyecto de investigación titulado: "Control Adaptativo informatizado de invernaderos alimentados con energía solar fotovoltaica. Diseño, realización y pruebas de prototipo".

Consejería de Hacienda y Planificación de la Junta de Andalucía
Realización de un estudio sobre "Estimación de las Rentas Comarcales en Andalucía"

Asociación de Abastecimientos de Agua y Saneamiento de Andalucía (ASA)
Realización de trabajos de colaboracion en el proyecto para la creación de un servicio de información sobre cartografía y redes de infraestructura en la Comunidad Andaluza: Informatización de cartografía y redes en los servicios de aguas de Andalucía

Consorzio Pisa Ricerche
Colaboración para el desarrollo del proyecto "European Textual Reference Corpora", patrocinado por la Comisión de las Comunidades Europeas

Pharma-Mar S.A.
Realización de un estudio sobre el efecto de la Didemnina B y Deshidrodidemnina B sobre la Ornitina descarboxilasa y el crecimiento tumoral

Instituto de Estadística de Andalucía
Realización de un estudio sobre "Dirección y coordinación para la elaboración de las tablas input-output de Andalucía año 1990"

Consejería de Economía y Hacienda Junta de Andalucía
Realización de un estudio sobre "El Plan Andaluz de Desarrollo Económico 1991-1994: Entorno en la economía andaluza"

Patronato de la Cueva de Nerja (Málaga)
Realización de investigaciones geológicas y microambientales en el entorno de la Cueva de Nerja

Organización Mundial de la Salud
Realización de un proyecto de investigación titulado "Comparison of methods for the isolation of Salmonella from natural waters"

Osborne y Cía S.A.
Realización de un estudio consistente en el análisis y mejora genética de la levadura de flor en las bodegas de Osborne y Cía S.A.

Boehringer Ingelheim S.A.
Realización de un estudio sobre la relación tiempo-efecto de la acción del dipiridamol asociado a ácido acetilsalicílico sobre las alteraciones vasculares retinianas en un modelo de diabetes experimental.

ASESORIA CIENTIFICO TÉCNICA Y APOYO TECNOLOGICO

Local Examinations Sindicate de la Universidad de Cambridge
Organización y realización anual de exámenes de inglés

Centro de Estudios Clínicos
Realización de estudios clínicos

Ayuntamiento de Cañete la Real
Impartir clases teórico-prácticas de Historia y Arqueología Medieval a alumnos de la Escuela Taller Canit y asesoramiento al equipo encargado de la restauración del Castillo de Cañete la Real

Ayuntamiento de Málaga
Realización de un estudio que dote al Ayuntamiento de Málaga de los medios de localización cartográfica de las zonas de riesgos en las inundaciones y de la incidencia que éstas pueden tener en los distintos sectores de la ciudad de Málaga.

Clínica A. Huescar S.A.
Realización de análisis genéticos cromosómicos

Ministerio de Economía y Hacienda (Secretaría de Estado de Comercio)
Actividades analíticas relativas a estudios técnicos y de apoyo en el Laboratorio del Centro de Inspección de Comercio Exterior de Málaga

Cooperativa Agraria Malaca
Análisis de plaguicidas en cítricos producidos por la Cooperativa Agraria Malaca

Consejo de Seguridad Nuclear
Desarrollo de un programa de vigilancia radiológica ambiental

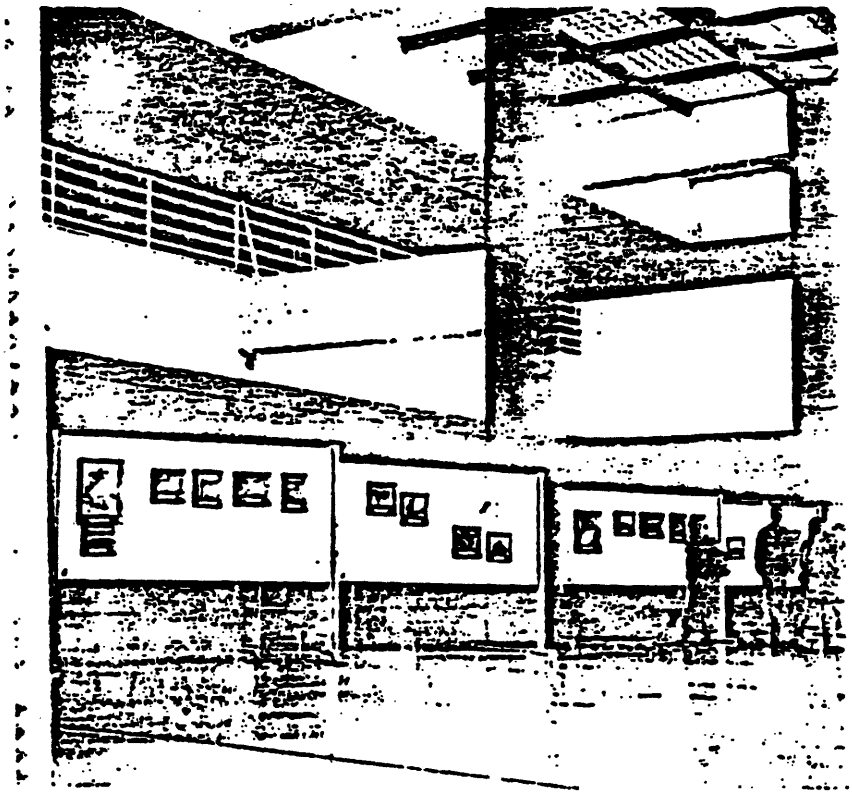
Instituto Nacional de Técnica Aeroespacial (INTA)
Instalación y manejo de una estación de calibrado y seguimiento del satélite ERS-1 de la Agencia Espacial Europea y de su equipo informático

ACCION FORMATIVA

Instituto para la Conservación de la Naturaleza -ICONA- (Proyecto LUCDEME)
Realización de prácticas de alumnos

Secretaría General de Pesca Marítima
Impartición de Curso de Introducción a la economía de la acuicultura

Siemens Matsushita Components S.A.
Formación de estudiantes de últimos cursos, mediante prácticas en empresas



Alcatel Citesa, S.A.
Becas estudiantes de último curso o de proyecto fin de carrera

CONVENIOS DE COLABORACION

Universidad Politécnica de Wolverhampton
Convenio Cooperación Interuniversitaria

Centro Antidroga de la Diputación Provincial de Málaga
Convenio Formación Práctica de Alumnos

Facultad de Maschinenbau de la Hochschule Bremen (Alemania)
Estudios conjuntos e intercambio de estudiantes

Universidad de Passau
Convenio-Marco Interuniversitario

Universidad del Ulster
Convenio de colaboracion

Fundación "Presidente Salvador Allende"
Convenio Marco de Colaboracion Cultural

Consejo de Seguridad Nuclear
Convenio Marco de colaboración en el Campo de la seguridad nuclear y de la protección radiológica

Instituto español de Oceanografía
Convenio Marco de cooperacion

Universidad de Puerto Rico
Convenio de intercambio de profesores y alumnos

Ecole Practique des Hautes Etudes en Paris
Cooperación e intercambio universitario

Universidad de Angers (Francia)
Convenio de cooperación interuniversitaria

Universidad Austral de Chile
Convenio de colaboración académica

Colegio Oficial de Doctores y Licenciados en Filosofía y Letras, y en Ciencias
Convenio de colaboración en actividades formativas

Consejería de Educación y Ciencia J.A.
Convenio de colaboración académica

Siemens-Componentes S.Á.
Convenio Marco para becas de formacion de estudiantes

Gabinete de Estudios Ambientales, S.A. de Sevilla GEA
Convenio de Asesoramiento y colaboración en temas medioambientales

Fondo de Promoción de Empleo
Colaboración en actividades de investigación, divulgación y enseñanza de las nuevas tecnologías

Consejería de Hacienda y Planificación de la Junta de Andalucía
Protocolo de cooperación entre la Consejería de Hacienda y Planificación y la Universidad de Málaga, para la realización de actividades de investigación, formación y difusión económica y financiera

Universidad Católica de Lovaina
Convenio de colaboración académica

Asociación de Jóvenes Empresarios Malagueños (AJEMA)
Acuerdo Marco de colaboración

Centro de Investigaciones Energéticas Medioambientales (CIEMAT)
Convenio Marco de colaboracion

Osborne y Cía S.A.
Colaboración en actividades científicas de investigación y desarrollo tecnológico, intercambio de expertos y formación de personal.

Universidad de Provence (Aix Marseille I, Francia)
Cooperación interuniversitaria

Universidad Técnica Eslovaca de Bratislava
Cooperación interuniversitaria

Asociación de Abastecimientos de Agua y Saneamiento de Andalucía (ASA)
Convenio Marco de colaboración

Centro Andaluz de Teatro
Convenio colaboración para potenciar las actividades teatrales

California State University, Chico
Acuerdo colaboración para el desarrollo de proyectos conjuntos

Consejería de Cultura y Medio Ambiente de la Junta de Andalucía
Desarrollo de proyectos y actividades relativas a bienes culturales, a través del Instituto Andaluz del Patrimonio Histórico

EURONOVA BIC TENANTS

EMPRESAS INSTALADAS EN BIC EURONOVA

Parque Tecnológico de Andalucia, C/ Juan López Peñalver, s/n 29590 CAMPANILLAS (MALAGA)

[] **Ingenia**: Gerente: Jose Blanco. Tlf.: 95-2619124.
Asesoramiento en comunicaciones e informática, integración de sistemas, desarrollo de software y cursos de formación.

[] **Fundación Forja XXI**: Director: Tomás Muruaga. Tlf.: 95-2626300. Ext. 322.
Formación y preparación de jóvenes licenciados en economía y derecho para el asesoramiento a las PYMES.

[] **Teletrunk Andalucía**: Gerente: Jose C. Serrano. Tlf.: 95-2626300. Ext. 217.
Explotación de servicios de telecomunicación avanzada y telefonía móvil.

[] **A.S.I.T.**: Presidente: Jose Pérez Palmis. Tlf.: 95-2619130. Ext. 337
Impulsar, orientar, desarrollar y difundir la investigación y la tecnología.

[] **Astrosur**: Gerente: Concepción Urrutia. Tlf.: 95-2626300. Ext. 340
Investigación de desarrollo de prototipos. Maquinaria para envasado de líquidos.

[] **Analight**: Gerente: Antonio Criado. Tlf.: 95-2626300. Ext. 214/221
Aplicaciones de los estudios sobre la polarización de la luz y sus efectos dicroicos.

[] **T.C.C.**: Gerente: Alfonso Anselmo. Tlf.: 95-2619133
Servicios de consultoría, comunicación y proyectos informativos.

[] **Suragua**: Gerente: Fernando Sola. Tlf.: 95-2626300. Ext. 333
Ingeniería de aguas y detección de fugas.

BIC EURONOVA S.A.

[] **Consorcio de poligonos**: Presidente: Julio Gutierrez. Tlf.: 95-2626300. Ext. 336/313
Desarrollo y producción de alarmas inteligentes.

[] **Procedimientos Uno**: Gerente: Jose Salas. Tlf.: 95-2626363
Software de arquitectura e ingeniería. Elaboración de software educativo y proyecto de un nuevo producto de transmisión de datos vía telefónica.

[] **Novart-Tesign**: Gerente: Jose Mª Guadamuro. Tlf.: 95-2626300. Ext. 222
Agencia de publicidad de servicios plenos, así como estudio dediseño especializado en nuevas tecnologías.

[] **Andaluza de Técnicas Multimedia**: Gerente: Angel Rodriguez Dominguez. Tlf.: 95-2626300. Ext. 334
Estudio, investigación, desarrollo y comercialización de servicios avanzados en nuevas tecnologías de la información.

[] **Instituto Andaluz de la mujer**: Directora: Carmen Olmedo Checha. Tlf.: 95- 2626300. Ext. 211
Administración Pública. Progama VIVEM

[] **N.C.N. Producciones**: Gerente: Pedro J. del Castillo Martínez. Tlf.: 95- 2626300. Ext. 332
Producción y comercialización de cualquier tipo de imágenes filmadas y alquiler de equipos de video.

[] **E.E.E.E.A.**: Gerente: Ernesto Pérez-Bryan. Tlf.: 95-2626300. Ext.: 339/340. Master en Dirección de empresa.

[] **Novasoft**: Gerente: Juan Fajardo Navarro. Tlf.: 95-2626300. Ext.: 213/223. Desarrollo, análisis, instalación y mantenimiento de equipos informáticos

[] **Instituto Andaluz de Tecnología**: Gerente: Javier Iglesias Rodriguez. Tlf.: 95-2626300. Promover y realizar programas y proyectos tecnológicos.

[] **Datecna**: Gerente: Alberto Suárez Gutierrez. Tlf.: 2626300. Ext.: 319 y 320. Desarrollo y aplicaciones de tecnologías avanzadas, en todos los campos de la ingeniería alimentaria

[] **Apliforesta**: Gerente: Augusto Torres de Navarra. Tlf.: 2626300 Ext.: 345. Investigación, difusión y promoción de las tecnologías para la regeneración y optimización de suelos áridos.

[] **E W REACON EY**: Gerente: D. Juan Dominguez. Tlf.: 2626300. Servicios de comunicación, imagen, publicidad y diseño gráfico

[] **Technology and Production Center Málaga**: Gerente: D. Bern Jung. Tlf.: 2626300. Investigación y desarrollo en el sector del medio ambiente, asi como en la tecnología aeronáutica y energética y ... comercio con los productos de estos sectores.

[] **Retelsur**: Gerente: D. Idelfonso Puigmitja. Tlf.: 2626300. Explotación económica del negocio de fabricación, reparación, importación, exportación, montaje, instalación y comercialización al mayor y/o menor de toda clase de productos, materiales y equipos eléctricos y electrónicos.

[] **Egmasa**: Gerente: D. Rafael Santo-Rosa. Tlf.: 2626300. Gestión medioambiental.

APPENDIX V

CARTUJA TENANTS

PROYECTO CARTUJA93

EMPRESAS Y EMPLEOS LOCALIZADOS EN LA ISLA DE LA CARTUJA

DATOS A FEBRERO DE 1994
PREVISION: FINALES DE 1994

ZONAS/EMPRESAS	EMPLEOS ACTUALES	EMPLEOS PREVISION'94
PARQUE CIENTIFICO Y TECNOLOGICO	1158	2499
TECNOLOGIAS AVANZADAS	428	1204
AYESA	105	105
CSIC (Grupo de Centros: 1ª Fase)		200
COLEGIO DE ARQUITECTOS		6
CONSEJERIA EDUCACION-FUJITSU	6	10
CONTROLBAN	80	110
C.E.A.	49	50
EGMASA (Grupo de Empresas)	47	50
GESNATUR (EGMASA)		8
BIOSUR (EGMASA)	4	5
SYSTEM (EGMASA)		7
GUADALTEL (EGMASA)		12
ESTACION DE ECOLOGIA ACUATICA	6	6
EUROINGES		10
IFA (Grupo de Empresas)		200
INSTITUTO DE PROSP. TECNOLOGICA		15
INTERNATIONAL CREATIV. P. T.		18
MINER. ESCUELA ORG. INDUSTRIAL		100
MOPTMA. CEDEX		20
MOPTMA. CORREOS		10
ONCE	4	30
PLAN ANDALUZ DE INVESTIGACION		100
SIEMENS	38	38
TECNOLOGICA	50	55
TELEFONICA	39	39
BANDA DE SERVICIOS	148	523
AGESA	127	127
POLICIA LOCAL Y DELEG. DE TRAF.		300
IBM	7	7
SAMU-ABENGOA	14	29
DIALPA		60
ADMINISTRATIVO	582	772
ANDALUCIA ECONOMICA, S. A.	7	8
AROAL	4	4
ASESORIA FISCAL A. MOYA	2	2
ASOCIACION DE JOVENES EMPRESARIOS	3	3
BANCO BILBAO-VIZCAYA	3	3
CENTRO INTERNACIONAL DE PRENSA-GRUPO MAURA	6	8
CHARABAN CAFETERIA	11	11
CIA. ANDALUZA DE TELECOMUNICACIONES	13	16
C. I. MERIDIONALES	5	7
DIEGO JIMENEZ LLERA, S.L.	6	6
DOW ELANCO IBERICA. S.L.	4	4
EDIF.MAURA (Prev. incremto. adicion. para1994)		29
FCO. DE ASIS JIMENEZ, S.L.	4	4
FELIX RIVAS Y ASOCIADOS, S. L.	3	3
FERNANDO PRIETO, S.L.	3	3
FISONS	1	1
GABINETE DE PRENSA WTC	2	2
GAESA, S.L.	3	3

GERARD'S INTER. BUSINESS	2	2
G.M.U.	360	360
IB-10 SERVICES, S.L.	4	7
INTERADVANCE	3	3
INTERN. CONSORCIO DE ALIMENTACION., S.L.	2	2
I.C.X. SISTEMAS, S.A.	15	15
I.W.S. INGENIEROS, S.L.	5	5
MAGIC RADIOM INTERNATIONAL	3	5
M.R.W.	1	1
OFISERVICE, S.A.	6	6
PUBLIESPAÑA	5	5
REDESA	34	38
SADIEL-CEDIAN	8	8
SOCIEDAD ESTATAL CARTUJA93, S.A.	22	22
SUR ESPAÑA PROMOTIONS, S.L.	2	2
TRADUINTER, S.L.	2	2
TRANSPORTE AEREOS DEL SUR	11	17
VICTORIO	3	3
WORLD TRADE CENTER SEVILLA	14	14
W.T.C. (Previsión de incremento adicional para 1994)		138

PARQUE TEMATICO	1569	1750

PARTECSA (más Contratas y Concesionarios)	1470	1644
- Animación Espectáculos	100	
- Concesionarios	350	
- Mantenimiento Edificios	384	
- Mantenimiento Espacios Públicos	200	
- Otros servicios de apoyo	150	
- Pabellones Atracciones	100	
- PARTECSA	56	
- Transportes y Accesos	130	
PROYECTOS Y OCIO, S.A.(Grupo CruzCampo)	76	80
- Napy Restaurantes	25	
- Oficinas	4	
- Pabellón CruzCampo	45	
- Restauración	2	
POSEIDON	13	16
RETEVISION	10	10

HOTELERO Y RESTAURACION	103	115

DEPORTIVO	23	25

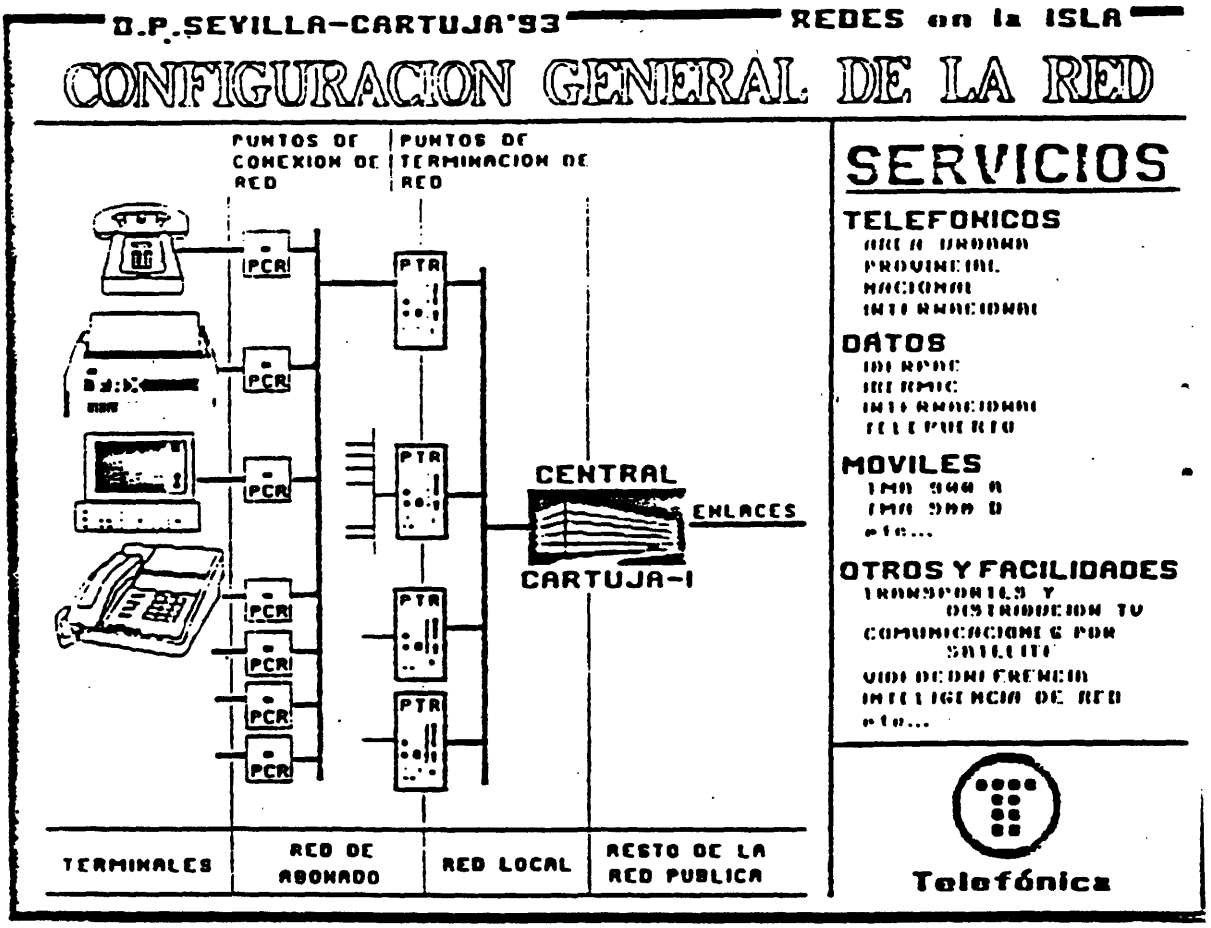
PARQUE DEL ALAMILLO	26	30

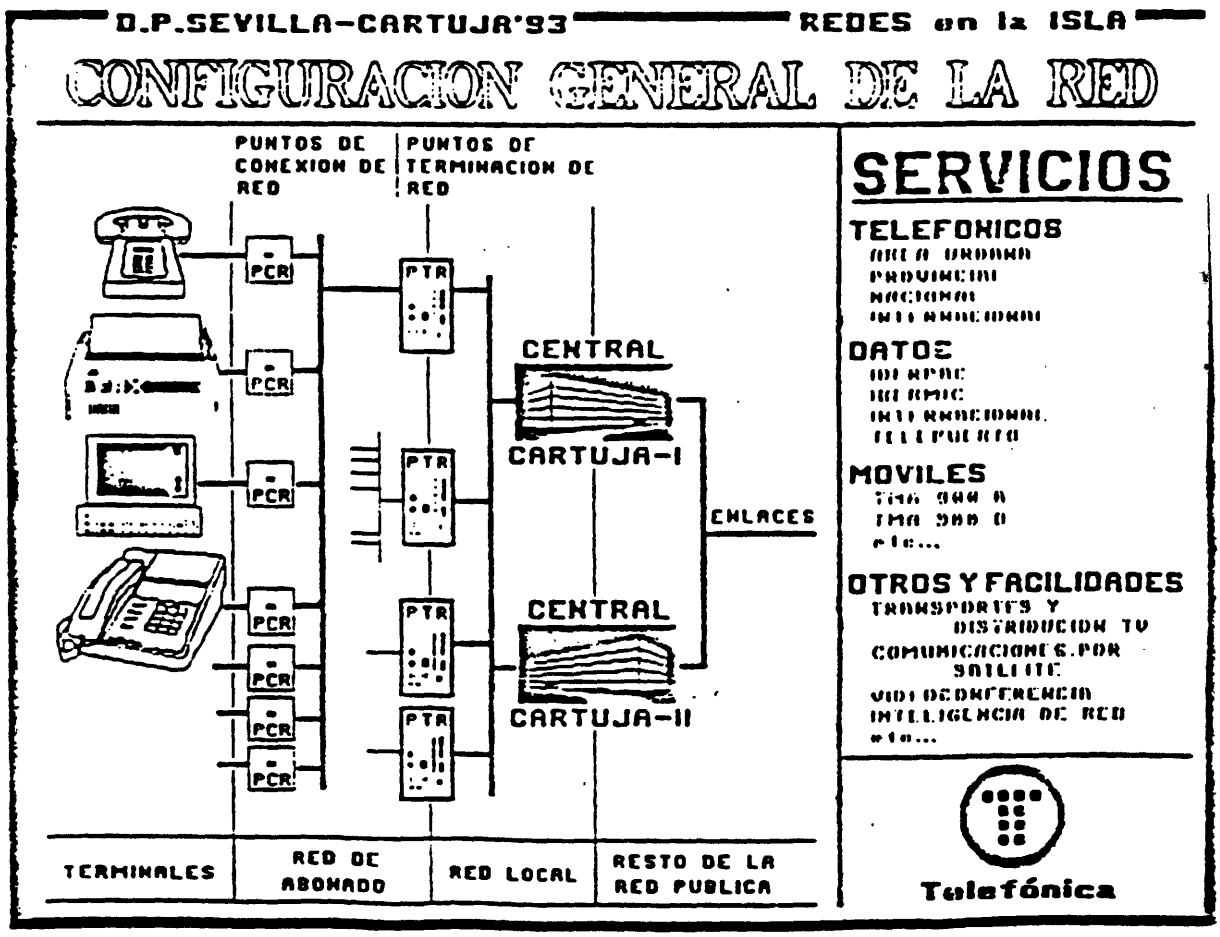
RTVE		180

MONASTERIO DE LA CARTUJA	60	72

VARIOS	5	17
- Guardería de la Cartuja	4	15
- Gasolinera GALP	1	2

TOTAL EMPLEOS	2944	4688


D.P.SEVILLA-CARTUJA'93
REDES en la ISLA
CONFIGURACION GENERAL DE LA RED
PUNTOS DE CONEXION DE RED
PUNTOS DE TERMINACION DE RED
PCR
PTR
CENTRAL
CARTUJA-I
ENLACES
TERMINALES
RED DE ABONADO
RED LOCAL
RESTO DE LA RED PUBLICA
SERVICIOS
TELEFONICOS
DATOS
MOVILES
OTROS Y FACILIDADES
TRANSPORTES Y DISTRIBUCION TV
COMUNICACIONES POR SATELITE
VIDEOCONFERENCIA
INTELIGENCIA DE RED
etc...
Telefónica


D.P.SEVILLA-CARTUJA'93
REDES en la ISLA
CONFIGURACION GENERAL DE LA RED
PUNTOS DE CONEXION DE RED
PUNTOS DE TERMINACION DE RED
PCR
PTR
CENTRAL
CARTUJA-I
CENTRAL
CARTUJA-II
ENLACES
TERMINALES
RED DE ABONADO
RED LOCAL
RESTO DE LA RED PUBLICA
SERVICIOS
TELEFONICOS
DATOS
MOVILES
OTROS Y FACILIDADES
TRANSPORTES Y DISTRIBUCION TV
COMUNICACIONES POR SATELITE
VIDEOCONFERENCIA
INTELIGENCIA DE RED
etc...
Telefónica

APPENDIX VII

University of Granada: Health Sciences Campus

The project, sponsored by the Consejerías de Salud y de Educación of the Junta de Andalucia, was sparked off by the need to build a new University hospital - which led them to think of a more ambitious project which would "optimise all the resources available, creating a University Campus which would integrate all of the University of Granada's teaching activities in the Biosanitary field together with new support facilities in a centre which will become an international reference point for higher education, research and health services".

Elsewhere, the text makes a reference to the fact that "the Campus should include an industrial complex related to biosanitary technology and biotechnology (pharmaceuticals, food, and othopedic devices) which will recieve the results of research generated by the University and provide the basis of an industrial fabric for Granada". This is, however, the sole reference to the subject.

Total built space would be: for the hospital 90.000 m^2 (on 20/25 has.) for 700/800 beds; other buildings 60.000 m^2. Approx 11.500 students, 100 teaching staff, 800 researchers, 500 services staff, 2.500 sanitary staff. No estimate of cost in the official documentation but the Press speaks of 25.000 million ptas budget (approx. 120 million pounds).

The site would be divided up into the following zones:

- Hospital and Dental Clinic
- Teaching Area
- Offices and Labs of teaching and research staff
- Services, including Administration, Library, Canteens, and possibly some Univesrity residences
- Sports Facilities

The Hospital would be the first "green" hospital in Spain - particular attention to energy usage, waste disposal. green areas etc.. Curricula would probably include (changes in Degree Courses are planned - may form part of this Competition): Medicine, Odontology, Nursing, Physiotherapy, Pharmacy, Psychology, Food Sciences and Technology, Optics and Optometry, Biochemistry, Podology, Occupational Therapy. Research Institutes to be remodelled or created new: Nutrition, Neurosciences, Toxicology, Biotechnology, Parasitology, Oncology

PROSPECTS FOR SPNET

IN

CASTILLA Y LEON

March 1994

Fred Bennetts

INDEX

1. INTRODUCTION

Interviews were concentrated on Valladolid and León, the two cities in which there are projects directly relevant to this study based on Science Parks or similar organisations. A full list of those contacted is attached as Appendix I. In Valladolid, visits were made to the specific Park and interviews were conducted with the Director of the Park, the Technology Director of the C.E.E.I. (BIC) - designated by the Director General - the Managers of two companies (within the C.E.E.I). and of two research and technical service centres. Also in Valladolid, contacts were made with the University (the Vice-Rector of Research and the Director of the Fundación Universidad-Empresa) and with the Regional Government (the person responsible for RETECAL - the regional Technology Network).

In León the consultant interviewed the Acting Director of the C.E.E.I. and the Director of the O.T.R.I. (Technology Transfer Centre) in the University. He also spoke to those responsible for the "Science and Technology Park" project which is being promoted by the Diputación Provincial (provincial authority) and for the "Technology Park"project which is being promoted by the Ayuntamiento (local authority)

2. ECONOMIC BACKGROUND

The Comunidad Autónoma (region) of Castilla y León is the largest region in Europe, covering over 94.000 kms.^{2} in the N-W interior of Spain; to the West it borders on Portugal. It comprises the Provinces of Avila, Burgos, León, Palencia, Salamanca, Segovia, Soria, Valladolid, and Zamora (a map is attached as Appendix II). Total population is just over 2.5 million, giving a density - of 27.1 inhabitants/km.^{2} - well below the national average. Gross Regional Product is approximately 19.800 milliom ECUs. Castilla y León is an Objective I region.

Sectoral contribution to GRP is approximately: 53.2% services, 27.1% industry, 10.5% construction and 9.2% agriculture. In Agriculture the principal problem is that most of the region's production is of crops that are in surplus within the EU and it is aggravated by difficult climatic conditions. In Services growth has been slow and non-traditional services are not a significant element; some interesting opportunities are opening up in Tourism. Infrastructures - including transport, industrial land, and distribution systems - are, in many respects, deficient, the size of the region and the dispersion of the population contributing to the problem.

Industrial activities are located primarily in Valladolid and Burgos, with secondary centres in León and Palencia. They are concentrated on: Energy Products, Transport Equipment, Food and Beverages. Noteworthy amongst these are the production of electricity (20% of the national total), and the auto industry (again, some 20% of national production). There is a significant presence of multinationals, Renault and Michelin amongst them.

Predominant in the industrial structure of the region are, however, the small companies working in traditional fields and at a low level of technology. There is considerable concern about the need to improve competitivity, diversify industry, find new sources of finance, and stimulate the transfer and development of technology.

The assets of the region include, in addition to those already referred to, some important natural resources (including coal and uranium) and well qualified manpower. As regards higher education, there are three public Universities (León, Salamanca, and Valladolid) and one private (Pontificia de Salamanca).

3. INDUSTRIAL AND TECHNOLOGICAL POLICY

A Plan de Desarrollo Regional (PDR) 1994-'99, the framework for regional development, has been prepared by the Junta (regional government) and is awaiting Parliamentary approval. One of its key features is the proposed creation of a Regional Development Agency(RDA).

The responsibilities of the RDA will include the supervision or management of the Junta's shareholdings in various companies which are engaged in economic promotion. These include:

- Parque Tecnológico de Boecillo S.A.

- SODICAL: a development corporation(venture capital etc.)

- CEICALSA: the promoter of the CEEIs

- INTICALSA: microelectronics training/demonstration and subventions for telematics equipment

- SITECALSA: telecom services including Servicio and Centro de Información Empresarial and access to Minitel

Other RDA responsibilities include:

- expediting applications for subventions - available for new investments (up to 50%)/ new technology development

- creation of industrial design centres, including one on the Boecillo Park

As regards the Junta's technology policy, it is based on a Law of December 1992 which provides for:

- the creation of a technology infrastructure in the form of a network (RETECAL) comprising Centros Tecnológicos Asociados (CTAs)

- the creation of an organisational structure which, in due course, will allow the Junta to develop and implement a technology policy - involving a Consejo Rector of CTAs, a Centro de Gestion para el Desarrollo Tecnologico, and a Comisión Asesora

The technology policy will provide subventions and soft credits for design improvements, prototypes and pilot plants and equipment whose purpose is to improve products and processes. It will also provide various forms of financial support for r.& d. within companies.

As regards telecommunications policy, the RDA does not provide significant insights. There is widespread dissatisfaction with the present Telefonica network and a feeling that the regional authorities should be planning beyond the introduction of ISDN (by 1995 to major urban centres).It is understood that a regional White Paper on the subject is pending. In the meantime, however, a project for a regional, wide-band network has been prepared by the School of Telecommunications Engineering of Valladolid University and is apparently under consideration by the Junta. Its proposed architecture is shown graphically in Appendix III.

Principal features of the proposed network are:

- a fiber optics ring connecting the 9 provincial capitals
- urban fiber optics rings in the 4 principal towns
- additional rings in "strategic centres", including Science Parks and Universities
- a VSAT satellite communications network to cover other areas
- a Teleport to provide external links (e.g. via Northern Telecom, in Norway, to Eastern Europe)

In a first phase this network would serve government bodies and related institutions. Following full deregulation (sometime between 1998 and 2003), users would include companies and private subscribers. A consortium would be created, as betwen the Universities and the Junta, to operate the network.

4. R.& D. INFRASTRUCTURE

Within the RETECAL, the CTAs, now numbering 18, include existing and new centres. Their range of activities spans contract research, collaborative r.& d. projects, technical services, training, and tests for quality control, certification, and standardisation. The financial contribution of RETECAL to these centres relates to fixed assets (buildings and equipment) and derives from STRIDE funds in large part. Total value in 1993: 16.3 million ECUs. For 1994 the Junta has provided an additional 2.8 million ECUs and substantial STRIDE funds are expected for the period 1994-'99.

The management companies of the Science Parks in the region will not themselves form part of RETECAL but some of the institutions located on them will benefit from it. In the case of Boecillo these centres are, at present:

- Centro de Investigación y Desarrollo en Automoción (CIDAUT)
- Centro de Tecnología Laser (CTL)

In León the following RETECAL-financed Institutes will be located on the La Granja Park which is being promoted by the Diputación:

- Asociación de Investigación Energètica y Minera (ENERMITEC)
- Asociación de Investigación de Biotecnología (INBIOTEC)
- Asociación de Investigación de Toxicología (INTOXCAL)
- Asociación de Acuicultura
- Asociación de Automatica y Fabricación

Other León Institutes, which have applied for RETECAL financing and which may locate on the Park, will be active in: Environment and Natural Resources, Food Sciences and Livestock

One of the principal objectives of these new projects is to bring together industrial companies and research centres. In some cases companies participate as shareholders or partners. In others this is not possible for legal reasons (notably in the case of University Institutes) but companies can be represented on governing or advisory bodies.

The Universities of Valladolid and León are potentially important resources for the development of their respective Science Parks. Even within their existing Departmental structure, a significant amount of contract and collaborative research is being conducted, some support being provided by the OTRIs. In addition, in the case of Valladolid, the Fundación Universidad-Empresa is active, particularly in training projects (through COMETT and other programmes) and forms part of two European networks: AUEF (training) and CAR (cooperation between car-industry regions).

There is a move within the Universities to develop new structures enjoying a high degree of autonomy. These are intended to encourage inter-disciplinary work, tap additional sources of finance, facilitate administration (contracting procedures, hiring staff etc.) and create more effective links with the business world. Researchers within these new structures, while continuing to draw on some University resources, will no longer be restricted to working on a project-by-project basis and will be able to develop long-term, integrated plans.

Within this framework, there are alternative forms of organisation. The most common, already referred to, are the Asociaciónes de Investigación - in which partners may include companies, public authorities and others - and the Institutos Universitarios. In the case of Valladolid University, Institutes of particular importance have been, or will shortly be, created in the following fields: Electronics; Robotics, Automation, and

Telecommunications; Opthalmics; Sugar Industry; Environmental Management.

It is unlikely that any of these Institutes will locate on the Boecillo Park - most of the researchers are, or would be, University staff working part-time and Boecillo's location - 16 kms. from the town - would apparently be a disincentive. Valladolid University has, however, participated in the sponsorship of the three centres located on the Park, CADE, CIDAUT and CTL, and is particularly active in the latter. It is also actively seeking to promote, together with PBSA (the management company of the Park), a joint venture in the biomedical field and claims to have the support of a U.S. company for this venture and to have received expressions of interest from various European companies and two local venture capital funds.

Other possibilities for the Universities include the creation of joint venture companies with industry, for research or commercial purposes or both. It is significant in this respect that the University of Valladolid, having registered patents with commercial potential (which are costly to maintain) and having failed to find existing companies willing to exploit them, is now participating, as a minority shareholder, in the creation of new companies. The first of these, Aborgan (engaged in commercialising, for agricultural purposes, new products derived from waste treatment), has recently been formed.

5. REGIONAL SCIENCE PARK PROGRAMME

5.1 León Projects

León is a Province located in the N-W of the region and has a population of some 530.000. Important elements in the economy are coal mining, electricity production, agro-industry, pharmaceuticals, and construction. Overall, industry is at a relatively early stage of development and, with a few exceptions, is fragmented and technologically backward.

The University of León, of recent creation, has over 12.000 students and a staff of some 600. Principal research groups are: Livestock, Biotechnology, Environment, and Food Technology. The University is already active in international projects. Most recently they have been designated as the Junta's representative for participation in a EU biotechnology project sponsored by the Atlantic Arc network (of regional development agencies). Other participants are from Spain (Asturias and the Basque Country), France, and Portugal. The University would be very interested in participating in a Science Park network in order to widen its international links - currently largely dependent on personal contacts.

Government bodies which are particularly active in stimulating economic development in León are, in addition to the Junta, the Diputación Provincial (acting through IPELSA amongst

other agencies) and, at the local level, the Ayuntamiento. As regards Science Parks and similar organisations, there are at present 3 projects under way: the CEEI (sponsored by the Junta as an "antenna" of the CEEI in Boecillo), the Science and Technology Park sponsored by the Diputación, and the Technology Park sponsored by the Ayuntamiento.

There has been virtually no co-ordination in the development of the 3 projects - a fact not unrelated to differences in political complexion as between the levels of government involved. They are located on 3 different sites. All those interviewed considered that a network of Science Parks could be an important instrument for the integration of these projects at the local level, in addition to more specific benefits (access to potential allies, data bases etc.). The projects are described below.

5.1.1 Parque Científico-Tecnológico (Diputación)

The initiative to create this Park was taken by the Diputación and the University and the Junta has expressed its support in principle. The project has received consultancy assistance from SPRINT (the final report has been submitted and is awaiting approval). Its primary purpose is to develop, adapt, and disseminate new technology in order to enhance the competitiveness of existing business and to develop new business activities in León, both by attracting inward investment and by promoting local projects.

The promoters have adopted a phased approach. In the first phase the emphasis will be on strengthening current business activities in the Province and creating new institutes to exploit existing r.& d. resources (primarily in the University). This would enhance Leon's credibility and would serve as the basis for a more ambitious second phase.

The property to be developed for the first stage of the project will be the Parque La Granja, a 2.3 ha. site close to the centre of León and to the University. Total built space would be 11.500 m^2 and it would be available for occupancy by the 5 Asociaciones referred to above, some additional Asociaciones, a multi-use workshop or laboratory, and a central services building. As regards the latter, it is intended that it should house the Park authority, offices for the provision of business services, and short-term rental offices for SMEs. It is also hoped that the r.and d. Department of a multinational, active in veterinary pharmaceuticals, may locate on the La Granja Park.

The second phase of development would be based on a 20 has. site in Villaquilambre, 5 kms. from León. Part of the space would be available for extensions of Phase I activities (research associations and related business services), and the rest for industrial and service companies: agroindustrail and pharmaceutical companies would be amongst the primary targets for location on the Park.

This project has not yet crystallised in terms of creating a Park Management company and some significant aspects are awaiting clarification. The extent of the Junta's support needs to be defined (although it has already included various of the Park's Asociaciones in RETECAL). In addition, the University is reconsidering the nature of its involvement. Nevertheless, the first stage of development is already in hand - the Diputacion has prepared infrastructures and buildings on the site and some Asociaciones are already in occupancy - and has made some financial commitments.

5.1.2. Parque Tecnologico (Ayuntamiento)

The origins of the Ayuntamiento's project lie in a planned investment by Biomedica, a U.S. industrial group. Although public information about the group is sparse (and this has led to some political and media controversy), the project has been favorably evaluated by the Junta - which is providing a 40% subvention. The Ayuntamiento will contribute the land required for the new plants free of charge. The decision was made, late in 1992, to use this investment as the nucleus for the development of a "Technology Park".

The Park is well located, close to Armunia, 4 kms. from the city centre, on a by-pass road and close to the railway. Total area being developed in a first phase is 30.6 has. and an additional 4.5 has. are available. The Biomedica Group will occupy 12.0 has.. Work on infrastructures has begun.

Biomedica is developing 2 projects on the site and planning a third:

- Manufacture of small, high performance motors for medical use (dentists' lathes etc.) and other purposes, including aeronautics. Total investment 20.7 million ECUs. 307 jobs will be created.

- Absorbent Technologies S.A.: manufacture of absorbent products for medical uses - first application of a new technology developed in Tennessee University. Investment of 14.1 million ECUs. 136 jobs.

- At the planning stage: a pharmaceuticals company. Investment approximately 28.3 million ECUs. 167 jobs.

In the first of these projects staff will include 60 engineers, many engaged in design work for special applications. In the second project, 18 people will be engaged in r.& d..

In addition, the Junta has recently granted a subvention for another major foreign investment, by Imagine, an Israeli/British company manufacturing products related to the digitalisation of images. Planned investment 28.3 million ECUs. 406 jobs (of which 180 in development activities). Area to be occupied 1.7 has.

The rest of the Park will be made available to industrial and service companies in advanced technology sectors. The Ayuntamiento's preferences are: Biotechnology and Pharmaceuticals, Telematics, and Environment. Some joint administrative facilities will be made available for smaller companies. The Ayuntamiento will, in addition, encourage collaboration between companies and the University. The University authorities have reacted positively to this project and see it as being, in some ways, complementary to that of the Diputación (at least as it relates to the Asociaciones located on the Parque La Granja).

It is arguable that this project falls short of the more usual definitions of a Technology Park: the role of the promoters will be limited as regards technology development activities and, by the Ayuntamiento's own admission, it may not be rigorous in the application of entry criteria for tenants. However, the project does have the merit of housing some important new investments which could help to stimulate technolgical development in this economically backward area.

5.1.3. CEEI León

Operational as from early '94. Attractive new centre located on a 2 has. plot on the industrial estate of Onzonilla, some 5kms. from León (the estate has very few tenants and is being "relaunched" after several years of stagnation). The first Director has recently resigned and the project is at present being managed by the Director Administrativo Financiero. It is an antenna of the Valladolid CEEI and there is a single management team for both organisations. There is a staff of 5 in León.

Activities focused primarily on EUROFORM (innovative projects) and NOW (women's projects) and currently waiting for a new call for proposals. These programmes provide subventions for up to 37.000 ECUs plus 3.700 ECUs for each job created. Financing for micro-companies from other sources is a major problem, particularly as regards banks' requirements for assets-based guarantees. There is one tenant company in the incubator - engaged in distributing local produce and developing a León quality image. 5/6 other projects under discussion. CEEI management have also participated in training aspects of EURFORM - visit to Southern France re rural tourism projects.

At present only phone/fax/modem links. No access to data bases. External contacts relatively weak with Chamber of Commerce and FELE (industrial association), stronger with IPELSA and with University. Project under way with the University's Business School to develop a financial model suitable for the CEEIs' activities in relation to preparing Business Plans and providing training.

3.2 Parque Tecnologico de Boecillo

General

The Boecillo project has had a chequered history. It got off to a slow start, the planning stage having begun some 5 years ago. The original promoter was a private sector company but it was bought out by the Junta (regional government). Moreover, in the early stages of development the University of Valladolid was not closely involved in the project (other than through some of its individual members). The image of Boecillo also suffered as the result of the financial difficulties in which its first major tenant, Crystaloid, was involved. The project became - and, to some extent, still is - politically controversial. As regards the site, it is attractive in itself (set in 400 has. of pines), but is widely seen as being isolated and quite distant (16 kms.) from the City and University.

A new stage of development began, however, in 1991 when a Sprint consultancy team carried out a feasibility study of the project. Subsequently the Park received substantial FEDER financing and it has been operational since April 1992. The land on which it is located is owned by Gesturcal (a property company controlled by the Junta) and the Park is managed by Parque Tecnologico de Boecillo S.A. (PBSA) -wholly owned by the Junta (although the local authority is also represented on the Board). PBSA will become the responsibility of the Regional Development Agency when it is created later this year. The management team consists of the Director Gerente, 3 executives - in charge of Installations, Finance, and External Relations - and 2 secretaries.

The principal objectives of the Park are to stimulate the diversification of industry and to act as a platform for University/company collaboration. The management of PBSA believe that they are meeting these objectives - despite difficult economic conditions. A multi-use central building has been completed - housing the PBSA, rental space and other facilities - as has been a 5.500 m^2 CEEI (BIC). 16 companies (or other business entities) have located on the Park. 11 of these are in the CEEI, most of them very small. They hope for 3 more tenants in the course of 1994.

The larger companies are:

- Crystaloid: liquid crystal displays for cars, 60 staff
- Improgesa: robotics, 30 staff
- Grupelec Electronica: hybrid circuits, 40 staff

Other tenants include 3 joint ventures, in which industry, the University, and PBSA are shareholders: CIDAUT and CTL (described below) and CADE (energy conservation and research). PBSA hopes to promote new joint ventures in the field of Biomedical products and (later on) industrial design. One of the novel features of the current stage of development of Boecillo is the close involvement of the University in the project.

...ark tenants interviewed in the course of this study:

...1. CEEI (Valladolid)

Founded 1989, moved to Boecillo Park approximately 1 year ago. Principal promoters - who have contributed total assets of ... million ECUs - include DG XVI, the Ministry of Industry (IMPI), the Junta (regional government), the 2 public Universities, Chambers of Commerce, Ayuntamientos, financial institutions, and an unusually large number of companies.

The Valladolid CEEI has management responsibility for the CEEI in León and hopes, in due course, to establish a third CEEI in Burgos. Their 5.500 building on Boecillo offers incubator space in the form of work-shops and offices. 11 companies in occupancy at present, some of which are described below. Most are engaged in the provision of technological services. Total number of projects at the end of 1992 (latest information readily available) was:

- Business Plans prepared	139
- Companies created/modernised	75
- Total investment	14.7 million ECUS
- Jobs created	294

As in the case of León, the CEEI relies heavily on the EUROFORM Programme to stimulate applications for help, accounting for some 60% of the total. Applications related to the following fields: Industry 23%, Business Services 18%, Technological Services 15%, Social Services 38%. New trends include an increase of projects related to rural tourism.

As regards telecom, there is considerable traffic with the León CEEI, but the connection is by modem using PSTN lines, and this is slow for their purposes. No email within their own offices but they sometimes use J.J. Soft's facilities (see below). As regards data bases, the CEEI acts as gateway for requests for information, principally from IMPI (Ministry of Industry) and ICEX (foreign commerce). Quite costly: 0.62 ECUs per item registered.

Provide support to CEEI companies looking for external support or partners, as and when requested (not frequent). In one case helped a company engaged in genetic engineering (agro-industrial applications) in establishing contact with the Montpelier Technopole.

Mixed feelings about effectiveness of EBN in responding to company requests for help: recognise it can be useful simply to put the company in touch with a CEEI in another area but would like to do more. Moreover, would like to see EBN taking a more active role in promoting cooperative ventures - particularly since the idea of interfirm cooperation is still quite alien in this region. Would also like a more constant flow of technical/commercial information for companies from EBN, with more reliance on telematics (not just Bulletins). Would welcome SPNET to the extent that it could help to meet these needs.

... Centro de Investigación y Desarrollo en Automoción (CIDAUT)

Intended to be a flagship project, for provision of technical services and contract research for the auto industry. Initiated by the University because their researchers are active in such fields as Materials, Motors, Dynamics and because Valladolid is an important centre for autos and related industries.

CIDAUT is a non-profit Association. Partners include Michelin, Renault, Iberdrola (electric utility), 2 savings banks, FASA, Ayuntamiento and various other companies. Each contributes some 54.000 ECUs over 3 years at the end of which time it is hoped that CIDAUT will be self-financing (covering Operating costs). Fixed assets financed by RETECAL (primarily STRIDE) - approx. 3 million ECUs - and Ministry of Industry - approx. 1 million ECUs.

At present they occupy office space in the Boecillo Park and are putting up a new building (2.400) equipped for tests, development of prototypes, research etc. in fields which include noise and vibration. Staff of 3 and will build up gradually, using contract staff for most project work. Given their current stage of development they are not actively seeking business yet but anticipate principal sources will be their associated companies (prototypes, testing etc.) and collaborative projects. As regards the latter, they have already identified an opportunity as a result of the Bourdeaux/Louvain Programme (referred to below).

Hope to develop a national market and have made some preliminary contacts in Cataluña. Would also hope to penetrate some foreign markets in due course, through their multinational associate companies. Not aware of EU Programmes specific to the car industry. No very specific interest in SPNET other than a wish to access data bases. They use phone and fax at present.

It is believed that the market for such services is substantial within the region. Market conditions in other regions, however, are likely to be difficult. The competitive project in Cataluña (see separate report) is a major new initiative by the Generalitat (regional government). It is well-funded, well-equipped (including a test track), and strategically located for the car industry in Valencia and Zaragoza as well as Cataluña. As regards the local market, some knowledgeable sources in Valladolid are sceptical about the future of the auxiliary car industry in the region.

5.2.4. Centro de Tecnologia Laser (CTL)

Non-profit Association. Located on the CEEI. Operational since April '93. Promoted amongst others, by 15 industrial organisations (mostly Associations or SMEs), the University, and the Junta (through the Park management company). Fixed assets financed through RETECAL (STRIDE funds). Staff of 6, 2 others paid for by University, and 5 post-graduates on temporary contracts.

Derived from University research. At present principal activity is metal processing by lasers (cutting, welding, surface treatment) but this is seen, in part, as a hook for r.& d.-related activities. Participate in Brite-Euram projects and Human Mobility Programme (staff interchange). European projects include cleaning of historic buildings with lasers. Collaborate with Aachen Laser Institute.

CTL appears to be a dynamic organisation but is still building up momentum. Will be actively looking for EU collaborative projects within the next year. Very interested in SPNET as a means of finding suitable partners for this purpose. Also because they will soon be involved in a major project which requires much data transfer. email would be best solution but they can only access from the University.

5.2.5. J.J. Soft Comunicaciones

Located on the CEEI. Founded October '93. 5 partners, 1 of whom works from an office in Asturias. Received help from CEEI (preparation of Business Plan), a small grant (6000 ECUs) from the Ayuntamiento and have applied for a grant from the Junta to expand their commercial network. Attracted to CEEI primarily by easy availability of (PSTN) phone lines.

They offer design of data bases and communications interconnections. As regards the former, their principal markets at present are professional bodies - e.g. College of Architects - with large memberships, working in dispersed locations, who want to access through modems central data bases and equipment (such as plotters). Hope to expand into new markets, such as multi-branch companies, and into new areas (beyond Castilla-León and Asturias).

The interconnection service comprises a communications software package and the possibility of accessing through modems an email network through J.J.Soft's offices in Boecillo and Asturias. These offices provide batch connections to a British Telecom X-400 node in Barcelona. (They understand BT also has nodes in Madrid and Bilbao and is planning to expand the system)

J.J. Soft has associates in Miami and Barcelona. The software for their multi-task communications platform was developed in Miami and translated into Spanish in Barcelona. J.J. Soft develops the client applications. The 3 associate

organisations collaborate in marketing and in joint development of new applications - which involves transfer of files and consulting data bases.

No involvement in EU projects and little information about them. Receive some information from CEEI management about standards, project opportunities etc.. Are also in touch with CDTI in Madrid and hope to participate in collaborative projects with Universities through them.

Attracted to concept of SPNET. Independent of whether their existing system could form part of it, they feel they could provide technical support, including help to SP companies in structuring and interpreting information about possible allies or commercial/technological contacts in other parks.

5.2.6. San Cayetano Division Internacional S.A.

Located on the CEI as from 1 year ago. Have shelved plans for a building of their own. 3-man organisation, subsidiary of the San Cayetano packaging Group. Most of their work is related to development and design of new applications for corrugated cardboard, seeking to replace plastic and other materials. Also provide quality control services.

Use phone/fax/PC and (very occasionally) modem. SPNET would be very attractive to them. They have difficulties in accessing data re packaging, client sectors (notably the food industry), and suppliers of material. Also want to identify, and build up a network of contacts with, specialist organisations for purposes of consultation and collaboration. Have had preliminary contacts with Engineering School of Valladolid University and Technological Institutes in Valencia Science Park (food and packaging). Would like to internationalise and are looking for allies in similar fields who could commercialise results of some of their projects.

Receive information re EU Programmes, new standards etc. from CDTI in Madrid and from CEEI mangement. Put forward a project once, unsuccessfully, for CRAFT assistance. Few synergies with companies on Park - some consultations with FASESA (didactic equipment).

6. BOECILLO NETWORKS

On the initiative of the European Commission (DG XVI), a Programme of Collaboration began in 1993 between the Boecillo Park, the Bordeaux Technopolis, and the Universite Catholique de Louvain - as a means of stimulating innovation and internationalisation of companies in Castilla y Leon. Its primary objective is to put into effect specific collaborative activities between companies and/or research centres - particularly those which can be presented for support by EU Programmes.

Features of the Programme include:

- the staff of the 3 Parks should get to know each other and training should be provided to Boecillo staff
- collaboration between agencies at the regional level should be prepared and existing networks encouraged, especially between companies, Universities, research centres (public and private)
- finance should be provided for pilot actions and for the promotion of collaboration
- technical assistance should be provided in support of collaborative actions

The actions proposed for these purposes include:

- creating a task force consisting of the managers of the 3 Parks, a representative of the EU Commission and, possibly, a consultant - which will meet monthly
- defining specific actions to be undertaken
- organising a seminar and at the same time a press conference and an event open to the public
- synthesising the experience of all the Parks for the purpose of defining best practice and making the Parks effective tools for regional development (consultancy task)
- creating a common mechanism for disseminating information about the economic environment and new EU initiatives related to r.& d., innovation, and regional policy
- assistance in presenting company and University proposals to the COMETT Programme

In each Park a post-graduate has been commissioned to undertake tasks related to this Programme. In the case of Boecillo, it is hoped that this person will become, in due course, the Technical Director of the Park. His principal activity at present is to identify needs of companies on, or related to, the 3 Parks and match them with services which other Park-related companies can provide. An example given was of a robotics company, specialised in materials classification, who was looking for expertise in artificial vision. Apparently no formal mechanisms have yet been created for these purposes and it was acknowledged that an information system such as SPNET might develop could be of interest.

The opportunity for collaboration which is furthest advanced relates to CIDAUT: a project is being developed for research on new material for car bumpers, in response to more stringent safety standards. It will involve CIDAUT, some French companies, and the Parks of Bordeaux and Louvain. Additional projects which are still in the negotiating stage involve CTL. Other initiatives include the organisation of a seminar in Louvain to open up channels between Boecillo and Eastern Europe.

As regards the financing of pilot actions and of promotion, the intention is that the Programme should make an initial investment in such activities and that subsequently they should be financed by the parties involved or by other EU Programmes, principally SPRINT, COMETT, ERASMUS and those related to research. Such financing would be used, amongst other things, to learn more about specific forms of technology transfer employed in Bordeaux and Louvain. It would also be used to finance the preparation of proposals for joint projects, including the costs of travel for businessmen and University staff.

The attitude of PBSA management to the network is very positive. The possibility that SPNET might strengthen or add to the network also appeared of interest to them. It emerged that the selectiuon of Bordeaux and Louvain as partners for Boecillo had been made by the Commission. PBSA management, while not questioning the choice, commented that there are some other European Parks with which Boecillo feels a special affinity, notably Rennes Atalante: similarities of industrial structure and other characteristics led them to include an expert from Rennes in the Sprint team.

This would appear to raise the possibility of "networking the networks" in various directions:

- Louvain is already linked to Rennes as well as to Warwick and Karlsruhe through the Sprint interfirm network (note, moreover, that Warwick has an indirect link, through the University, to car-industry research)

- Rennes forms part of Atlantic Arc which, through its Atlantis Programme, is seeking to link the 19 Science Parks of member regions - see report on Basque Country (the Junta already belongs to Atlantic Arc, through a development corporation, but has not seen fit to include Boecillo in Atlantis). Note also that Boecillo and Bordeaux form part of Atlantis and have a particularly close inter-relationship

The interest of PBSA management in SPNET is centred on its potential value in strengthening links between SP managers (particularly important to them since they feel that the IASP is not an effective instrument for this purpose). Areas of collaboration of particular interest to them include the financing of SP companies - a problem of "spectacular" proportions, particularly in relation to risk capital for the smaller companies. Existing Junta-supported venture capital

companies - INCRIS and SODICAL - are very small and their products are not aligned to market needs.

No strong views from PBSA management as to likely demand from tenant companies for telematic services. Assuming that such services would require a significant management effort, they would think in terms of subcontracting (possibly to J.J.Soft). There are plans to install video-conferencing facilities.
At present the Park's telecom resources are minimal: phone/fax/modem through PSTN lines (and email connections through J.J.Soft). They are expecting to be linked up shortly to Telefonica's ISDN and there also appear to be possibilities of a fiber optics link to the nearby Valladolid/Madrid line.

APPENDIX I

PERSONS INTERVIEWED: SPNET - CASTILLA-LEON

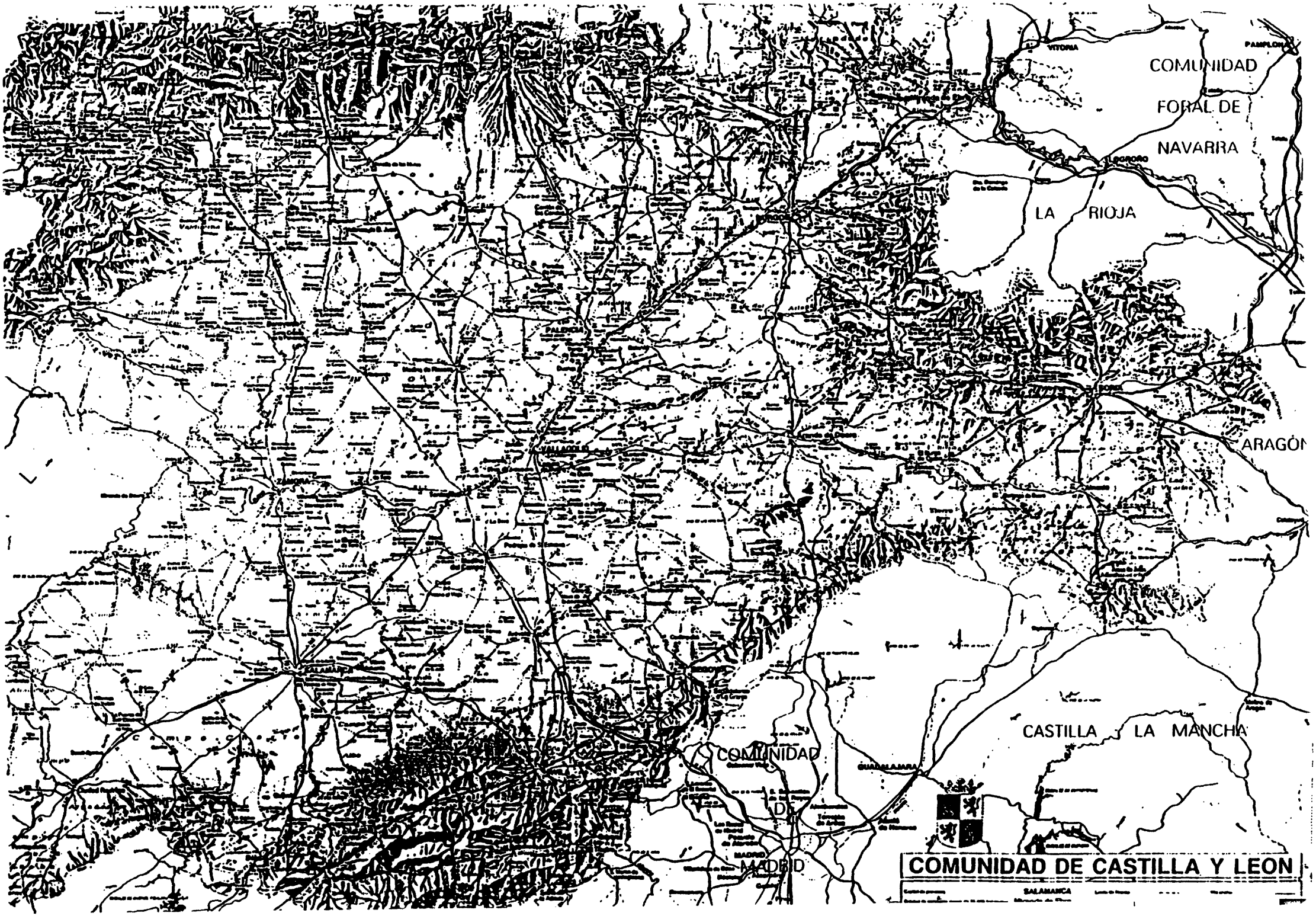
9th-10th March / 16th March / 29th March

Valladolid:

1. Junta de Castilla y Leòn	Felipe Garcia Cordero Consejeria Economia
2. Universidad de Valladolid	F.J. Alvarez Guisasola V-Rector Investigación
3. Industrias San Cayetano	Juan Bachiller Jefe Comercia Exterior
4. J.J. Soft Comunicaciones	Julian San Leon Director Gerente
5. C.E.E.I.	Carlos Saso Director Tecnológico
6. Fundacion Universidad-Empresa	Angel Alvarez-Taladriz Director Gerente
7. Parque Tecnológico de Boecillo	J.Antonio Menendez Director
8. Centro de Investigación y Desarrollo en Automoción (CIDAUT)	Jesús Arraiza Director
9. Centro de Tecnología Laser	Angel de Frutos Director Científico

León:

10 Diputación de León	J.Antonio Alvarez-Canal Director del proyecto del Parque C-Tecnológico
11 Ayuntamiento de León	David Lopez Director del proyecto del Parque Tecnológico
12 C.E.E.I.	Francisco Baredo Director Financiero
13 Universidad de León	Paulino de Paz Director de la O.T.R.I.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PAMPLONA
COMUNIDAD
FORAL DE
NAVARRA
LOGROÑO
LA RIOJA
ARAGÓN
CASTILLA Y LA MANCHA
COMUNIDAD
DE
MADRID
GUADALAJARA
COMUNIDAD DE CASTILLA Y LEON
SALAMANCA

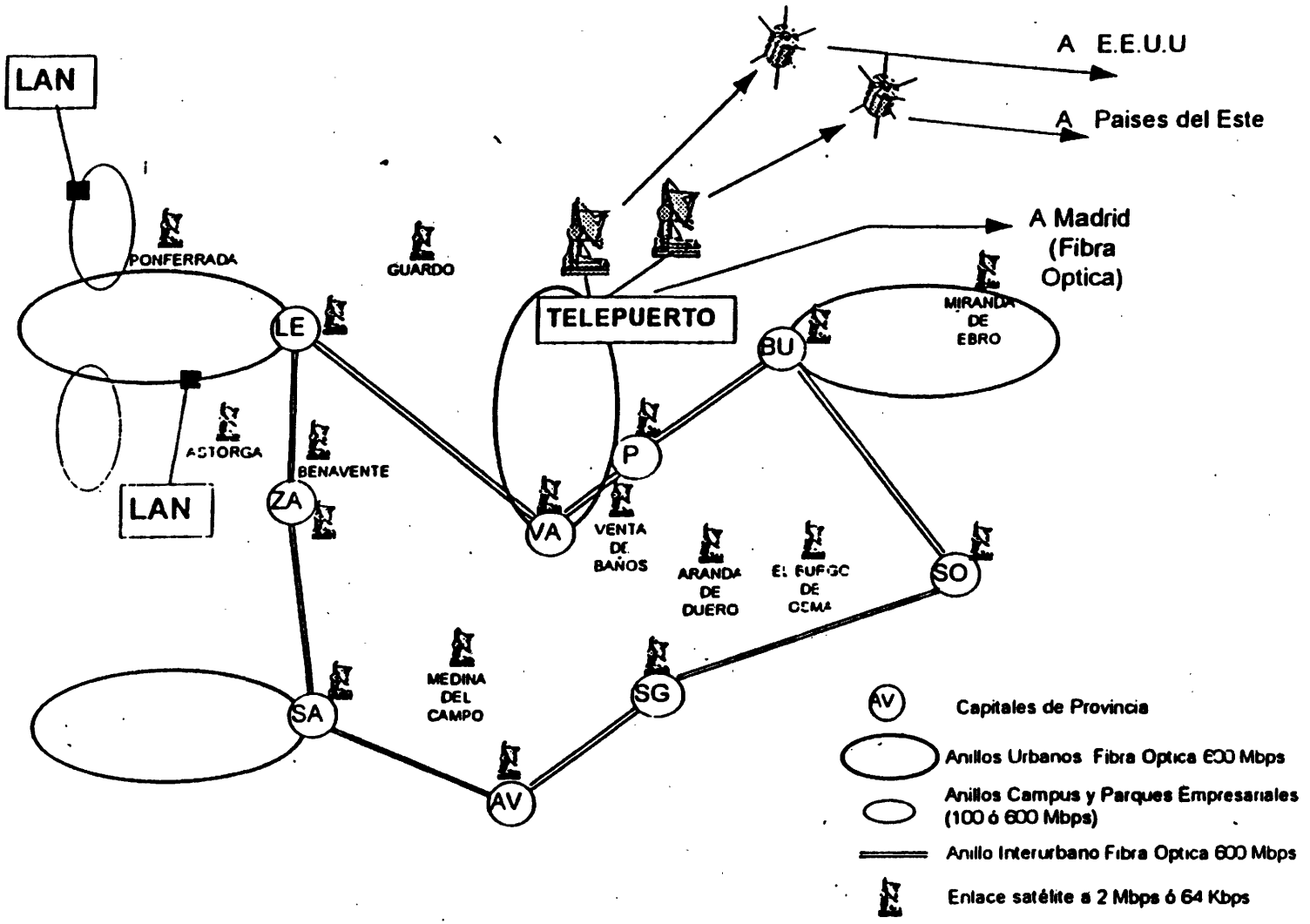

Figura 1: Ejemplo de diseño para la Red de Comunicaciones Universitarias y Regionales de Castilla y León

UNITED KINGDOM

Chapter 1

COUNTRY BACKGROUND

Population and employment

1.1 The UK has a population of some 55 million people with an average GDP per head in 1989 of 13,684 Ecu compared with an EC average of 13,551 Ecu. There is a work force of some 25m, 86% of which are employees in employment, while the remainder are self employed, in the armed forces or in work related government training. In 1993 some 20% of employment was in manufacturing industry, 73% in services and 6.6% in other occupations such as agriculture, the proportion in manufacturing having declined slowly over many years.

Industry

1.2 During the 1970s and 1980s the manufacturing base of the economy was reduced in scale as a result of the decline in heavy industries such as iron and steel production and shipbuilding and the lack of competitiveness of industries such as car manufacture and machine tools. The British economy has significant regional disparities with higher unemployment in the North (11.8%) and North West (10.3%) than the national average of 9.2%. Some areas such as Merseyside and Northern Ireland have suffered serious industrial decline and have been designated Objective 1 areas. However, there are several other areas facing serious economic problems due to the decline of traditional industries including the West Midlands, the North East and parts of Scotland.

1.3 During the 1980s there was a major expansion of service industries, particularly financial services. In recent years, the competitiveness of the manufacturing sector has improved mainly due to better management practice and several manufacturing sectors such as car manufacture have undergone a resurgence. Other important manufacturing sectors include chemicals, pharmaceuticals, biotechnology, food, engineering and IT.

Universities

1.4 During the 1980s and early 1990s there was a major expansion of the university sector with a dramatic increase in the number of students in universities and polytechnics. In the early 1990s all the polytechnics became universities and, as a result, many cities in the UK are now the location of two, three or four universities. Networking between universities was developed during the 1980s by the provision of the Janet system by the central university funding body (UFC, and subsequently HEFC). This provided E.Mail links between all universities and has recently been extended to provide broad band multi-media links between several of the major universities. During the 1980s many universities in the UK developed science park initiatives mainly as additional sources of revenue.

Regional economies

1.5 The UK has a decentralised approach to regional development with a wide variety of bodies and agencies involved in economic initiatives including city authorities, regional technology centres, Training and Enterprise Councils and regional offices of the DTI. In the last two or three years there have been various initiatives to improve the coherence of regional or local economic actors for example through the City Challenge initiatives and the Businesslink initiative. Because of the decline in traditional manufacturing industries, a number of initiatives were undertaken during the 1970s and 1980s to capitalise on the UK's strengths in scientific research, to develop new industries and to encourage economic regeneration. These included the development of science parks.

Science park development

1.6 The first Science Parks were developed in the early 1970s at Cambridge and Edinburgh. These were entirely funded by the universities concerned, (Trinity College Cambridge and Heriot Watt University) using their own resources. During the subsequent years there was an expansion in the number of science parks and, by the early 1980s, 16 science parks had been developed including Aston Science Park, Warwick Science Park and Manchester Science Park. These science parks were generally promoted by a consortium which involved a range of partners such as the university, the City Council and other leading economic bodies or major firms. Their focus was usually more closely oriented towards encouraging new industry and economic regeneration. Almost all these British science parks are single site, property based initiatives, owing more to the American science park model than to the multisite approach adopted in parts of France and Italy. Some of the new science parks were greenfield site developments with room for growth while others were based in urban areas where the regeneration of old industrial areas was the main priority.

1.7 The number of science parks continued to grow during the 1980s and reached 42 in 1992 with several further proposed parks being planned. The total investment in science parks by 1992 reached £542m with 508,000 square metres of accommodation and 1092 tenant companies employing 16,587 people.

Science park companies

1.8 The majority of firms on science parks are small. Some 45% of companies employed fewer than 5 people and 74% employed fewer than 15 people. About a quarter of firms on science parks were estimated to have 'spun out' from the associated university. Although a number of science parks have significant employment levels, eg over 1000 on Warwick Science Park, their economic significance within the broader region in which they operate is relatively modest since there are usually many other large employers in the area and many other initiatives aimed at economic regeneration with a more immediate economic impact.

The changing role of science parks

1.8 The role of science parks has often been to provide a focus for innovative high tech firms and a framework to support their development. Science parks also contribute to the image of an area providing an example of the successful development of new industries to encourage inward investment. During the 1990s science parks have been affected by a number of factors:

- the growth in the number of science parks and other similar initiatives such as Research Parks, Business Parks offering similar facilities
- the rapid expansion of the number of universities and of the size of individual universities
- the development of new universities within the catchment area of a science park, for example some cities now have three or four universities
- the recession which affected demand for property
- new initiatives at a regional level such as Businesslinks and City Challenge aimed at enhancing local and regional economies development

Recent science park developments

1.9 Most science parks did not suffer as badly as other property related bodies during the recession maintaining occupancy rates of 92% compared, for example, with less than 75% for Business Parks.

1.10 Currently, at a time when the worst of the economic recession seems to have past and economic prospects are improving, many UK science parks are examining their role within the broader regional context and seeking to establish networks with other actors to assist their broader development. In addition, many science parks are seeking ways to assist tenant firms and companies in taking advantage of opportunities within the Single European Market. However, the role of science parks within their local and. regional economy is strongly related to their ownership, objectives and historical development. Their ability to forge new productive linkages and establish networks of benefit to their tenant companies and to the wider economy is examined in the following four regional case studies.

Telematics

1.11 The UK was the first major country in Europe to privatise the telephone system and to introduce competition. As a consequence there are now two major telephone companies, BT and Mercury, together with a larger member of cellular phone operators some of which operate analogue and some digital cellular services. There has been a large scale investment in digital exchanges by BT and Mercury and ISDN is available almost universally.

1.12 The main growth areas for ISDN has been in the graphics, advertising, printing and packaging industries, but there is also growing usage of other media such as radio and television. The use of private leased lines for business communication has grown considerably both for voice telephony and data communications. The introduction of Cable Television during the early 1980s was slow at first, but over a number of years the Cable TV network has grown and has a significant presence in many major cities and towns. A change in regulations allowed Cable TV companies to provide telephony as well as entertainment services, although BT remain debarred from entering the broad cast television market and are therefore developing video on demand services.

1.13 A further major development during the 1980s was the investment in the academic research network 'Janet' which links universities and research institutes with electronic mail and data interchange facilities. A more recent development includes the provision of a new broad based data network to allow multi-media transmission over the new 'Super Janet' system. The Super Janet broad based system will link nodes based in university centres in major cities but is unlikely to be extended to all the institutions in a particular city or to the universities in smaller cities. In some cities proposals are being developed to invest in a broadbased Metropolitan Area Network to link all the relevant bodies such as universities and research institutes to the Super Janet system.

1.14 Although private sector organisations are permitted to join the Janet network their use of the network is restricted to research activities and commercial traffic is not allowed. As a consequence very few companies are linked to Janet. The use of Janet by academics is extensive and a very large proportion of academics have their own 'E.Mail' address. The Janet system is linked to many other networks including Europanet in Europe and NSFNET in the US. Very few science park companies are linked into the Janet System.

Chapter 2

ASTON SCIENCE PARK

Regional Background

2.1 The West Midlands economy has traditionally been based on the engineering and metal forming industries with a strong automotive manufacturing and components sector. During the 1970s and early 80s there was a decline in these traditional industries throughout the West Midlands including Birmingham. The regional economy did not have a strong base in the newer industries such as electronics, software etc and consequently this led to the need for an initiative to encourage the development of SMEs in these new industries and to attract high tech companies to locate in Birmingham. The development of the Aston Science Park was an initiative which opened in 1983 to help achieve this.

2.2 Birmingham is the second largest city in England and has three universities (Birmingham, Aston and University of West of England). The Science park has links with all three universities, but was originally founded by Aston University and the Birmingham City Council. Some of the major economic actors in the area include:

- Birmingham City Council which, through its Economic Development Department, supports a wide range of economic initiatives such as a new Advanced Manufacturing Centre located on a business park in the city and provides a demonstration centre in best practise advanced manufacturing. The City Council is represented on the Board of the science park.

- The DTI West Midlands which, in addition to a wide range of business support, has initiated one of the first Business Link centres in the UK to provide an integrated centre of support for business linking the DTI, Birmingham TEC, Birmingham City Council and Birmingham Chamber of Commerce and Industry

- The Birmingham Chamber of Commerce and Industry which carries out surveys of business opinion as well as providing a wide range of services to members. BCCI is the host location for the Business Link

- WEMTEC is the Regional Technology Centre for the West Midlands is located on the outskirts of Birmingham at Alvechurch

2.3 Traditional major employers in the city include Rover Group, Lucas, GKN and Dunlop. However, in recent years the City Council has sought not only to attract new high tech companies but also to widen the economic base in the services sector by developing the National Exhibition Centre, the Birmingham Convention Centre and by improving transportation and other services.

The Aston Science Park

2.4 The Aston Science Park was founded by the University of Aston, the City of Birmingham and Lloyds Bank. The site is owned by the City Council and includes a former factory and office block which have been completely refurbished together with a range of new buildings. The site occupies 22 acres of which 11 have been developed. The science park has received ERDF funding for development purposes. The site includes areas of former derelict land with contaminated soil which is being restored. There is a range of accommodation on site all of which is on short term leases including:

- a business and innovation centre of 6875 sq ft providing very flexible small units on short leases with many common services such as reception, switchboard etc

- a range of new purpose built premises which are designed to allow firms graduating from the innovation centre to grow as well as providing sites for inward investment

2.5 The science park provides a range of services to tenants including secretarial back up, payroll operation, post, fax and conference facilities which are charged to tenants as part of the service charges. The science park site was originally a factory surrounded by derelict land provided by the City Council. The original site was not originally attractive and a great deal of investment has been put into improving the physical environment to make the Science Park attractive and to integrate it further with the University campus The objectives of the science park were to encourage economic regeneration through:

- encouraging start up businesses in the incubator centre

- attracting mobile companies with complementary technologies or products

- encouraging the inter-action of companies on the science park for example on product development, problem solving and DTI schemes. A survey by the Aston Business school indicated that 60% of firms were inter-acting with each other

- extending networking activity with Aston University. The Science park has a dedicated telephone line into the University switchboard and is also linked by E.Mail. However, the science park is not currently linked to Janet (Joint Academic Network) and estimates are being prepared for the cost of installing Janet access points in the park.

2.6 The science park has four operational arms:

- Birmingham Technology Ltd which manages the science park as a whole
- Birmingham Technology Property which manages the property and buildings
- Birmingham Technology Venture Capital which provides venture capital funds to companies on the science park and in the city of Birmingham
- Birmingham Technology Services which provides revenue generating services

2.7 The science park management currently employs 16 people. In addition, the science park is a member of EMN and works to provide assistance to innovative companies mainly on the park. Aston Science Park is linked to EBN through the E.Mail system but the value of the EBN services is currently being considered.

2.8 The science park has an objective of creating clusters of companies in a technology or market field such as environmental technology who provide complementary products and services and can gain greater exposure and resources through a corporate umbrella organisations. Such a consortium, based on the science park would allow other relevant companies outside the park to join and would establish a joint office and personnel. The consortium would seek support from the City Council, DTI and the EC and would be in a position to manage the 1995 European Environmental show on an adjacent site.

2.9 The science park also seeks to attract companies from outside Birmingham to locate on the park by demonstrating the pool of skilled labour which now exists in new technology areas.

2.10 The science park is located on a site immediately adjacent to the University of Aston. Environmental investment in landscaping and construction has created a pleasant physical environment which complements the University campus.

Science Park Management Networking Activity

2.11 The science park is well connected to the Birmingham City Council who are concerned with strategic and development policy and sit on the Board of the science park.

2.12 Links between the park and the University are encouraged through use of university facilities as well as student placements, joint research projects and joint academic appointments. About 15% of companies have been generated from within the University. The Universities government grant during the 1980s was limited and this is thought to have encouraged academics to leave the university to set up companies. There are currently 80 companies employing 1000 people on the science park.

Links with Local Agents

2.13 The Science Park engages in a range of local networking activities including hosting meetings of the Business Link Group. This is a group of 50 agencies and other bodies which provide business advice and assistance through the Business Link. This provides a wide network of networks in the local area.

Other Networks

2.14 The science park is a member of UKSPA whose head quarters is based in the Innovation Centre. The science park is also a number of EBN, TII, UKSPA, IASP, BVCA, EVCA and AURRP. It is not a member of BCNET and is not involved in any SPRINT networking schemes. Although the science park management has modems it does not access on EC Databases or make use of facilities such as Manchester Host.

2.15 The science park management recognises the need for informative on markets, potential licenses, technology partners in the UK and more widely in Europe and throughout the world. However, the complexity of the range of possible networks and databases has led to a requirement for a specialised person who would provide an information service to the science park by accessing these sources. The person would need to understand:

- how the various databases and E.Mail systems operate
- what information and contacts are available and whether databases are up to date
- the requirements of the business sectors on the park eg environment, pharmaceutical etc

2.16 An information specialist could be located on the Science park in a unit open to other companies both on and off the science park. However there is currently insufficient funds to provide such a facility and this concept would require funding from the EC. A pan European scheme to assist in the setting up of such centres would provide the added advantage of detailed feedback on how the user interface to allow the value of the various systems to be improved and harmonised.

Telematics/Provision

2.17 The science park provides a range of shared services in the Innovation Centre including fax with an E.Mail system linked to the University. There is no ISDN link into the management of the science park and no video conferencing. Aston University has a £4m Local Area Network which is the largest in Europe which allows both data and video communication within the campus. However, the Aston University wide area network does not extend to the science park, but this might be possible in the future.

EBN

2.18 Birmingham Technology is a member of EBN. There is a subscription of £1000 p.a to join and the main value is thought to be the networking provided by EBN rather than the services provided. There are 9 BICs in the UK many of which are struggling to survive. The value of the information obtained from EBN could be enhanced through a dedicated information support centre.

2.19 The Science Park has been in existence for over 10 years and has developed extensive links with science parks and BICs in other countries. During the recent recession the focus has been on developing activities locally to the detriment of European links. However the European market is important for a large proportion of the firms on the science park and networking with other European bodies is likely to grow in importance.

UKSPA Membership

2.20 The science park is a member of UKSPA but the management does not have a direct link to the UKSPANET service, although the UKSPA office is in the same building. UKSPA provides quarterly meetings with talks and discussion of specific issues and opportunities for networking. Meetings are hosted at different science parks. The possibility of extending the UKSPA survey to provide a Benchmarking scheme relevant to Science parks throughout Europe would be valuable.

Venture Capital

2.21 The science park has its own venture capital fund 'Birmingham Technology Venture Capital'. This is a £2m fund which is used to finance companies on the science park or within the city of Birmingham. The fund provides equity, loans and preference shares and was set up by Lloyds Bank and the City Council.

Companies on the Science Park

2.22 Companies on the science park had requirements for improved networking and information within Europe in order to find customers, agents and partners. Some companies were using modems to provide customer support for software they had produced and to download upgrades and diagnose faults. These systems linked the customers computer to a dedicated computer in the company via modems. Neither a host computer nor ISDN were required. Other companies were linked to their customers' systems through the AT&T easylink system.

2.23 The advantages of location on the science park included a convenient location and a landlord who provided better more flexible terms suitable to their needs. The main assistance required from any potential science park network was a database or information facility which would allow firms to identify suitable customers, agents or partners in European countries. Facilities such as E.Mail and video conferencing were not used and did not seem to be of particular significance.

The UKSPA organisation

2.24 The UKSPA administrative office is located on the science park. It carries out a number of functions for member organisations including:

- a database of all companies on member science parks coded by technology and area of interest
- the UKSPANET E.Mail system which is managed by the Manchester HOST
- book sales
- subscriptions
- financial reports
- organising quarterly meetings
- newsletter

2.25 Conferences used to be arranged but in the present economic climate are considered a risk.

2.26 The UKSPA database of company information provides opportunities to search for complementary companies when requests are received. However, the codes used to define company technology etc are becoming out of date in a number of areas and are not the same as those used by other organisations eg EBN or TII. The European Commission could assist technology transfer by developing a harmonised coding system. Demand for searches on the database system is about two per month. The possibility of making the database available through the E.Mail system to allow text based searches is being considered.

2.27 At present the UKSPANET has only about seven or eight science parks attached to the network despite the fact that costs are low and the system is relatively simple to use. However, all science parks have fax and the use of a PC based fax card is intended to allow a fax to be sent to 40 different locations at the same time without paper at the UKSPA office. This will save time and telephone charges, but at present technical problems have hindered this development. The main benefit of the UKSPA activities however was seen to be the opportunities provided for human networking and the training/learning opportunities from the quarterly meetings.

Mercia Systems

2.28 Mercia Systems develop software for inventory control and distribution requirements planning. The company is about 9 years old. The company sells its products directly in the UK and in Europe both directly and through agents.

2.29 The company has made little used of existing databases or networking systems such as TII or Wemtec and believes that the greatest benefit from the SPNET project would be the development of assistance in finding agents in other countries. Assistance in finding out what information is already available would be valuable. The company does not use E.Mail, ISDN or video conferencing.

Fame Computers

2.30 Fame Computers operate in three main areas:

- application systems for insurance brokers
- bespoke micro computer systems, support and development
- formlink which is a windows based toolkit for transaction processing using business forms

2.31 The company has grown on the Aston Science Park and now has a dedicated building of its own. One of the issues facing Fame is how to develop the European market. This would require a dedicated agent and considerable investment. Currently the company does not sell into European markets. The company is linked telematically to large insurance companies.

Wemtech

2.32 Wemtech is the regional technology centre for the West Midlands and is situated about eight miles south of Birmingham. Its location outside any of the major cities avoids the territorial problems associated with being closely associated with one particular city. It was previously located on the Birmingham Science park.

2.33 Wemtech has an extensive database of 400 experts in a range of technology areas which has taken 2.5 years to develop. Each expert has been interviewed by Wemtech to develop a full understanding of the scope of their expertise.

2.34 Wemtech operates by acting as an intermediary between the many thousands of SMEs in the region and the technology experts. Consequently there is also a database of 17,000 companies who are potential customers for Wemtech services.

2.35 Wemtech operates at three main levels:

- developing solutions to every day technical problems
- legislation management for example in relation to health and safety, environment of electro magnetic compatibility, technical audits and management support
- missionary activities such as training and awareness

2.36 Wemtech receives funds from a range of customers including DTI, TECs, Birmingham Businesslink, Patent Office, Comett, EC, Link directorate and EPA. Wemtech also operates the Technical Action Line for DTI and has a contract with Birmingham Businesslink to supply technology services to SMEs.

2.37 Wemtech have telematic links using PSS to access X25 nodes in order to access a range of databases such as Kompass. They also use a fax modem to market their services directly to potential customers. This is followed up by telephone marketing. The majority of firms can receive fax but very few have E.Mail facilities or ISDN and therefore fax is used. The objective of the marketing exercise is to identify the small sub set of companies that are interested in technology transfer.

2.38 Wemtech's approach to telematics is to start with the strategic value of information rather than starting with the technology.

2.39 Wemtech have utilised Eurokom but ceased to subscribe because of lack of value. They continue to subscribe to ECHO but find it is little used and have recently joined BCNET. The use of BCNET will be organised as a self funding project in the expectation that the business derived from BCNET will pay the costs.

2.40 Wemtech is not part of the Sprint interfirm network but is involved in RTAC, the European network of Regional Technology Advisory Centres which is currently defining its role.

2.41 Wemtech had not heard of EBN or TII although they have had dealings with Barnsley BIC. They have had no contact with the Value Relay Centres in the UK.

2.42 Wemtech recently discovered through a newsletter that they were a contact point for the Craft programme for companies wishing to find partners. They had not known about this previously.

2.43 Wemtech have considerable networking links with the universities in the region including Aston, Warwick and Coventry and will be cooperating with Aston University on video training materials. However, they are not linked to Janet and believe that the greatest value comes from human networking.

2.44 Wemtech utilise PSS which is a digital network with error correction to access nodes for communication purposes. PSS is cheaper than ISDN (£30/quarter). However, there is interest in Wemtech becoming a demonstration site for ISDN.

2.45 The main value of better networking might be the provision of information to SMEs to establish import substitution. The example of the Asian sources catalogue was described as an excellent system to enable SMEs to market efficiency on a world scale. Networking could also provide an improved mechanism to link companies for technology transfer purposes.

2.46 Wemtech would like to be in a position to assist clusters of companies through the provision of infrastructure of support for example in materials, testing or marketing. The main opportunities were seen as being those which put companies together for commercial purposes such as the network infrastructure created by Asian sources of Hong Kong.

Potential for Improving Networking

2.47 The following conclusions about the potential for improving networking emerged from the discussions:

- Assistance for providing an information specialist and an open information centre would be very valuable. This would allow special interest groups to develop throughout Europe on areas such as environment etc. As a consequence, better information would allow clusters of complementary companies (and university courses to support companies) to be developed. These could gain synergy through E.Mail networking, bulletin boards etc

- The concept of developing longer term relationships between managers of established science parks and newer science parks through a non executive director scheme would have a lot of potential

- A network feasibility scheme to identify suitable network partners and networking methodologies would be valuable

- The concept of a demonstration centre in advanced telematics would need to show how companies could benefit from newer technologies. The science park management incur considerable telecommunications costs and the concept of a (subsidised) audit of telecommunications usage to provide case study material was supported. A company on the science park provided systems for telephone monitoring and management

- Harmonising the codes used by bodies such as UKSPA, EBN and TII when trying to match companies through databases or networks would assist the technology transfer process and improve general networking.

Those interviewed include:

Mr D Harris	Chief Executive, Aston Science Park
Mr G Mills	Finance Director, Aston Science Park
Mr B Websden	Mercia Software
Mrs S Cook	UKSPA
Mr A Renold	Fame Computers
Mr G Murray	DTI West Midlands
Mr R Fenley	DTI West Midlands
Mr D Sandercock	WEMTEC

Chapter 3

WARWICK SCIENCE PARK

Regional Background

3.1 The University of Warwick Science Park is situated in Coventry, an area of traditional manufacturing industry. The motor industry, (Jaguar, Peugeot, Rover) and other engineering sectors such as machine tools, components and sub contract machining are major employers in the area. A wide variety of other manufacturing sectors are also located in the Coventry area.

3.2 During the 1980's there was a serious decline in the motor manufacturing and components sector with a rationalisation and concentration of plants. Over more recent years the automotive sector has seen a resurgence both in the car manufacture and components industry, but not yet to their former level. Industries such as machine tool manufacture have undergone considerable decline.

3.3 Coventry has two universities, Coventry University (the former polytechnic) and the University of Warwick. The science park is located on land adjacent to the University of Warwick and has linkages with Warwick university. Linkages with Coventry University are small apart from some recent linkages concerned with student projects.

3.4 The Science Park was formed in 1983 by a consortium consisting of University of Warwick, Coventry City Council, Warwickshire County Council and West Midlands Enterprise Board. Although Coventry is a separate city, its economy is closely linked to wider West Midlands economy around Birmingham as well as with the East Midlands and the engineering industries around Oxfordshire. The West Midlands region has a number of other universities including Birmingham University and Aston University with science parks at Aston and Birmingham. There is a regional technology centre WEMTEC at Birmingham about thirty miles away.

3.5 The University of Warwick has developed very strong links with the manufacturing sector in the region particularly in the field of automation, computer aided design and advanced manufacturing technologies. These include joint research projects and graduate development programmes with companies such as Rover and Jaguar. The Science Park is also a focus for linkages between companies located on the park and university research. In addition, the Science Park has established a range of linkages with other companies in the area.

Warwick Science Park

3.6 The Warwick Science Park has grown since it was started in 1983 and now has sixty three companies employing 1112 people. There is a strong concentration on electronics, IT, automation and systems engineering within the Science Park.

3.7 Accommodation on the science park includes:

- units in Barclays Innovation Centre suitable for very small firms where a range of common services such as reception, switchboard and other services are provide
- a range of buildings occupied by several firms where each has separate entrances and reception areas
- larger self contained buildings for major companies such as computer vision and Sun Microsystems
- The Science Park has had a number of EC grants for the development of buildings through the ERDF and STRIDE

3.8 The strategic objectives of the Science Park include the establishment of new technology based firms, the attraction of mobile private sector R&D investment and inward investment more generally. About forty companies on the science park have under ten employees, but many of these were existing small companies which came to the Science Park from the surrounding economy. Relatively few are new companies set up from within the University of Warwick. This is thought to be due to the continued fast expansion of the University which created career opportunities for university staff and did not encourage them to leave to form their own companies. Small companies are able to set up in the Innovation Centre within the Science Park with minimal accommodation but gain a high profile and credibility with customers. In addition they can move to larger accommodation on the park without a change of address.

3.9 Science Park companies in the automation and computer aided design field have strong interactions with the University and with the surrounding engineering and manufacturing industries. In addition the Science Park management has established a number of mechanisms to facilitate linkages with companies in the region. These include contacts with companies related to the Sprint Interfirm network for technology transfer, work experience for students and student projects within firms. The forthcoming Chambernet telematic network organised by the Chamber of Commerce will provide an additional link with local companies

3.10 The Science Park has links through the SPRINT Interfirm network to the Science Parks at Karlsruhe, Louvain and Rennes. This network functions through the exchange of profiles by fax. Each month Warwick Science Park sends one profile to each of the other Science Parks. When it receives profiles, there is an established process for generating a match with companies on the science park or in the surrounding economy. Personal Networking between the Science Parks in the SPRINT network is seen as being very important and the possibility of establishing video conferencing to enhance contacts is of considerable interest. The Science Park has also recently gained support through the ERDF (Section 6) for the development of a Business Angels network.

Current Networking Activities

3.11 The Science Park provides switchboard and fax services for tenants of the Barclays Innovation Centre. It has also established telematic links to BCNET through modem and software although this has only recently been installed. The Science Park is linked via modem and (different) software to the UKSPA network based on the Manchester HOST. This involves a local call to a server computer at Leamington Spa rather than a call to Manchester. The UKSPA network currently has only about seven science parks connected and consequently the number of E.Mail messages transmitted is relatively small.

3.12 The Science Park is a member of the Coventry Chamber of Commerce and plans to join the Chambernet system via modem and software when this becomes available. This would provide access to all the other businesses in the area as well as access to databases. A telematic link between the Innovation Centre and the University was originally installed but more recently the connection has ceased due to lack of use.

3.13 The development of these networks is part of the developing strategy of the Science Park to extend its contacts and develop for itself a series of useful networking opportunities. These include BCNET, UKSPANET, Chambernet, IASPFAX (fax based monthly network), TRN (paperbased network). The Science Park would be interested in joining EBN but is currently inhibited by the cost.

3.14 Companies on the Science Park are involved in a wide variety of telematic networking ranging from the relatively simple to the most advanced.

3.15 Several smaller companies are involved in telematic links with customers through modems and software. These linkages with remote customers are often used for the transmission of drawings, product information and software. The drawings and data transmitted via modem were said to be cleaner and safer than those transmitted by fax. In some cases, companies have installed equipment and software in their customers' plants. The science park company uses dial-up modem facilities to access this equipment for diagnosis and transfer of data and programmes and to provide customer support. In many cases such telematic links were more prevalent with companies in the UK and USA than with companies in Europe. Data was also transmitted to and from suppliers to these smaller firms. Issues related to the transmission of drawings and data include:

- problem related to standardisation of CAD packages
- the time taken for transmission which is often 10-15 minutes but can be as much as 45 minutes for computer drawings

3.16 In all cases these small companies were using the standard telephone line and had not investigated the use of ISDN. In general, small companies used telematic links for a single dedicated purpose eg transfer of drawings, and did not use the same linkage for other services such as E.Mail, bulletin boards etc. Very few companies used modems to access databases and were, in general, unaware of the wide range of databases available. In general small companies do not have the management time to investigate possible benefits when other priorities are more urgent.

3.17 Small companies using modems for telematic purposes also made extensive use of fax and telephone for communications with customers and suppliers. This relates to the fact that only a small number of customers and suppliers are linked to E.Mail systems whilst all customers and suppliers use fax and phone.

3.18 The possibility that telecommunication costs could be reduced and more advanced services made available through ISDN was discussed, but detailed data and costings would need to be developed through a telecommunications audit to demonstrate this. In general, small companies felt that a demonstration centre on the Science Park would be of benefit. This could provide a range of services and provide familiarisation and training. The possibility of using a demonstration centre to access remote databases through a central facility would be of interest to companies seeking agents in other European countries as well as those seeking technology cooperation.

3.19 The possibility of encouraging the local Cable Company 'Coventry Cable' to extend its network to the Science Park has also been discussed, but there would be insufficient demand from residential properties to make this viable.

Future Networking Options

3.20 The Science Park is actually extending its networking role. The possibility of creating a networking demonstration centre on the site was discussed. If a demonstration centre were established it would need to offer a range of services to companies on the Park as well as to companies more widely.

Pan European Network

3.21 There would be considerable advantage if a Pan-European network linking all science parks in Europe could be set up. At present the UKSPANET has only seven members and this makes usage sub optimal. The EC could play an important role in developing a Europe wide dial up network which was cheap and simple to use. Such a network would need to provide access to local nodes or provide facilities for local telephone charges to be incurred rather than international charges. It would be particularly important to provide a very user-friendly front end to the system so that users could easily send E.Mail to other locations and access relevant databases easily. It would be very desirable to bring together all the existing networks (including EBN) and give them a common user interact. This would enable a critical mass of users to be established much more quickly. Ideally the network should include all those organisations involved in the business of innovation, business staff ups company formation, technology transfer and business advice.

SPRINT Networking scheme

3.22 The possibility of extending SPRINT to provide assistance for the development of networks should be examined. The scheme would provide assistance for a group of Science Parks or an individual Science Park to establish the optimal network Advice and assistance would also be given in the telematic aspects.

Non Executive Director/Mentor

3.23 The possibility of establishing a long term linkage between a manager of an established Science Park and a newly developing Science Park and a newly developing Science Park, might be examined. Such a scheme would assist the travel and the costs of attending the meeting of the management board of the newly established Science Park. The scheme could provide for either one single mentor/director to join the board or for a pair of Directors/mentors, one from the South and one from the North.

Demonstration Centre

3.24 A demonstration centre providing services such as low cost desktop video conferencing would be a very valuable method of enhancing networking.

3.25 Such as system based for example on ISDN lines and Sun workstations would need to ensure that compatible equipment (conforming to international standards) was available in other Science parks. There are possibilities that companies would wish to facilitate the development of such a centre. However, the demonstration centre would need to be supported by facilitators from the Science Park to provide guidance to the users in each country and to provide advice on issues such as technology transfer as well as frustration facilities.

3.26 The benefits of such an approach are that:

- real models or prototypes could be displayed and discussed in real time
- drawings could be examined and discussed
- firms could establish closer links and mutual understanding

3.27 The demonstration centre could also offer services to companies in the area such as:

- transmission of drawings/data etc more quickly, safely and cheaply via ISDN
- audits of companies' telecommunications costs to determine whether better solutions are available

3.28 Larger companies on the Science Park were using advanced telematic applications regularly. In addition they supplied systems to industry and universities which had capabilities for the transmission of data and drawings as well as desktop video conferencing facilities.

Sun Microsystems

3.29 Sun was established (in the US) ten years ago and employs 23 at Warwick. The company has 13 offices in the UK including warwick. The company sells workstations into markets such as CAD/CAM and financial trading desks. Research is carried out in Dublin and manufacture near Edinburgh. The company is currently building ISDN capabilities into the majority of its workstations. This is limited by the time and cost of gaining BABT approval which can take 6 months.

3.30 The company has some ISDN connections but also has kilostream and megastream leased lines. ISDN has real benefits because it provides reasonable bandwidth and the customer pays only for the usage incurred. However, it is only of value if the receiver at the other end has ISDN.

3.31 Modems are frequently used at present for data transfer, but these must be compatible. The development of ISDN is likely to develop through organisations that need to transfer large amounts of data such as financial institutions. ISDN is limited to 2 X 64 k bits/sec. For higher bandwidth applications, ATM provides 155 Mbits/sec and is scalable up to 9500 M/bits/sec requiring optical cable.

3.32 Large customers are already using video conferencing through Megastream at 2 Mbits/sec and FDDI at 100 mbits/sec which requires fibre optics.

3.33 The ability to transmit video conferencing with a shared application and a white board can be achieved using ISDN and data compression. The quality of the video image would depend on the bandwidth available and compression techniques used.

3.34 Sun currently have cards and software available for the workstations to provide video conferencing for £1500. The minimum workstation required to accept this card would cost an additional £9000.

3.35 The company is a very extensive user of E.Mail through its own network and transmits about one million messages each day within its network of 12,500 employees worldwide. The company is also connected to Janet paying an annual subscription and is also linked to SuperJanet. This allows it to communicate with academics and researchers worldwide. In addition the company is connected to other networks such as BT Gold and Internet.

3.36 There is prima facie evidence that companies are wasting money on telecommunications for example paying for X25 and kilostream lines that are little used. It would be useful to carry out an in depth survey of companies needs and telecom costs for example in a sample of companies to demonstrate the possibilities for more effective methods.

3.37 A demonstration facility for ISDN and teleconferencing would be valuable. The company would be likely to be interested in participating such a facility. The company has provided equipment to the University for the Advanced Technology Centre.

3.38 A demonstration Centre could also provide a range of services such as data transfer. There are still standards problems in transferring drawings however and some detail is lost in the transfer process.

Paradigm

3.39 Paradigm produce computer systems for the control of process industries (paper, food, beverages) and carries out software development to solve customer problems. About 25% of turnover has recently been spent on R&D.

3.40 The company has established datalinks to customers' premises through dial-up modems using ordinary telephone lines. These are used to provide support services, to carry out development work and download software. The company also supplies EDI products and uses computer based training. The majority of telematic linkages are with larger customers who have helped fund these developments. At present the company is trying to establish good reference sites for its products in the UK and Ireland before entering the market in the rest of Europe.

3.41 The possibility of using more advanced services such as ISDN could be of interest if this could improve the spread of service to the customer. The company also uses telematic services with an external accountant in South London who has direct access to the company's accounts through a modem. This reduces the cost of accountancy and allows a higher level of financial control to be exercised.

3.42 The company could expand its marketing activity in the future to give greater attention to the rest of Europe. At this stage it could be interested in networks which would allow it to locate potential licensing agreements and agents with knowledge of the language and markets concerned.

3.43 The company believes that location on the Science Park has advantages in terms of a high tech image and the ability to use University facilities is an attraction for staff. Other contacts with the University include some joint work on mathematics and student work placements.

Kelsey Instruments

3.44 Kelsey Instruments was formed in 1982 and produce test systems (hardware and software) for destructive fatigue testing. The equipment is used in the automotive and aerospace industries. As a consequence of the decline in defence business the turnover of the company has recently halved and employees have been reduced to 25.

3.45 The company does not sell a great deal into Europe (apart from the UK) and finds France a difficult market some sales are made however for the EFA project.

3.46 The company uses remote access to support its larger systems using a modem and ordinary telephone line. The company sends large datafiles to customers in the US and is constantly pushing for a higher band rate, for example using data compression.

3.47 The company has strong and productive links with the University and has been involved in R&D schemes funded by DTI such as LINK and SPUR. The company has not used the SPRINT network and can not see a great deal of attraction in greater networking with Science Parks in Europe.

Isogon

3.48 Isogon is a network systems integration company buying equipment from a range of companies and integrating these to solve a customer's problem. The company employs 16 people and has a turnover of £2m. ISDN is a big growth area for the company's markets and it has just found a new product in Scandinavia to sell into the UK. The company has an installed ISDN which it currently uses for testing products and to demonstrate products to customers. In the future ISDN may be used for communications with customers. The cost of ISDN installation has recently halved to £200 in response to competition from Mercury. The quarterly rental charges is £85. The company would be very interested in a demonstration centre particularly if this were located on its site.

3.49 For most remote maintenance, ISDN is not required and the company sells modems (£450 each) to the customers which are guaranteed to talk to the modems in the company's offices for remote maintenance.

3.50 The company would like to see two improvements in networking:

- an improved Public Frame Relay system. At present the BT system consists of only two an : three nodes and this provides an inadequate level of service. The customer is required to pay for a kilostream line from his premises to the nearest node and then to pay for the Frame Relay service on top

- an improved service to enable small companies to get in contact with other companies who have technology or products to sell or who wish to acquire these. The company had not used the SPRINT network

- a demonstration centre for ISDN

Swaptronics

3.51 Swaptronics manufacturers automated test equipment (hardware and software) for testing printed circuit boards. The company was formed in 1986 in a starter unit (400 sq ft) on the Science Park and has expanded to occupy a different location on the Science Park with 5500 sq ft. It currently employs 21. The company has three main lines of business:

- writing software to test particular circuit boards

- a test and repair facility providing repair of customers' boards

- a PCB building operation using surface mount technology to assemble bits or parts sent by customers

3.52 The majority of customers at present are from the UK and overseas customers are located through contacts with suppliers of specialised test machines which use the company's software. The company has few links with the University.

3.53 Over the last year there has been an increase in the use of remote telematic access manly for the transmission of CAD files for PCBs and to carry out tests and debug boards. The system uses modems and ordinary telephone lines for this access. The company transmits data to customers and to suppliers and transmits about five datafiles per week. A typical file might take 15 minutes to transmit. A modem with data compression and error correction is used. The company does not use E.Mail but has an extensive use of faxes.

3.54 The company markets its services to manufacturers of medical equipment, satellites, radio phones, computers and motor controls. It is increasingly interested in finding better ways to market itself to customers in Europe and would welcome any networking which would enable it to forge links in Spain, Germany and France.

Tailor Made Systems

3.55 The company produces a mobile monitoring system for remotely checking the performance of street lighting. The company currently markets its products mainly in the UK where it is establishing reference sites. It does not yet sell to Europe.

3.56 The company is sceptical about the value of schemes such as SPRINT because the chances of making a relevant match through the scheme are too small. The company has used the scheme but did not find it useful. It believes that networking at a local level is likely to be more effective than trying to arrange linkages with companies thousands of mile away. The company is currently active in a local Innovation Club.

3.57 There could be interest in finding companies with complementary technology or alternative uses for the technology the company has developed. The company has links with the University who carry out research and the company also uses University facilities.

3.58 The company would be particularly interested in any EC scheme which provided funds to enable them to demonstrate their system more widely or provide a demonstration centre of their equipment. Overall the company was very sceptical about the value of the SPNET project and the value of networking between Science Parks in Europe.

Woodway Engineering

3.59 The company was established 14 years ago and has 32 employees. The company is located about eight miles from the Science Park but have had links with the Science Park through a student project scheme to develop the French market. The company was contacted by the Science Park to find a placement for someone to do a marketing project. The project has now been completed. The company also has similar links with Aston and Coventry University. The company designs and manufactures lighting bars for emergency vehicles (police cars, ambulances etc) and has strong links with a company in the US whose designs it licenses. The product incorporates a considerable level of software. The company has links with Coventry University who do design work for them.

3.60 The company has considerable telematic linkages with its partner company in the US for the transmission of drawings and technical information. The system uses modems and ordinary telephone lines with data compression. It is described as providing cleaner drawings and safer delivery than fax.

3.61 The company does not do a great deal of business in Europe which is dominated by one or two big companies and where the technical regulations are different. The company uses telematics for drawings and technical data but does not use E.Mail or other telematic services. The majority of communications are carried out through telephone and fax. The company uses fax a great deal and has thought about investigating the use of ISDN.

3.62 The company does not use BCNET or TED's. It has not heard of EuroInfo offices. The company is a member of the Chamber of Commerce which is used for certificates of origin. The concept of a local demonstration centre for advanced telematics was not of particular interest since the firm had not had significant problems with its current methods.

Dixi Associates

3.63 The company manufactures sub components machined to the customer's drawings. The company does not manufacture its own products but carries out three areas of work

- sub contract machining
- sales of imported machine tools
- machine tool rebuilding

3.64 It currently employs 55 and is located about four miles from the Science Park and has developed a relationship with the Science Park for graduate work experience projects. These have been successful and the relationship with the Science Park will continue in future years.

3.65 The majority of the company's business is in the UK, but they would be very interested in agency agreements with companies in other countries. The company does not transfer data or drawings using telematics. Customer drawings are sent to the firm and these are the digitised and turned to machine tool controls.

3.66 The company would be very interested in locating agents for its sub contract machining services in Europe. It is currently discussing building parts for a German firm.

Computervision

3.67 Computervision produce CAD/CAM software which runs on other manufacturer's systems. These include Sun Microsystems, Silicon Graphics, Hewlett Packard and DEC. The company employs 110 at Warwick, about 300 in total in the UK and about 2500 worldwide.

3.68 Systems are sold to major customers, many of whom have their own networks for the transmission of drawings and other data. Systems will increasingly incorporate video conferencing to allow engineers to discuss drawings whilst talking to a remote site in real time.

3.69 The trend towards video conferencing using desktop workstations is being accelerated by shortening product lead times. In the past engineers would store up technical problems before visiting a distant location for a discussion. However, due to pressure to resolve problems immediately, video conferencing provides a cost effective method to allow engineers to discuss problems and arrive at solutions.

3.70 The advantages of ISDN which provides scalable bandwidth have been recognised. The company is involved in a research project with BT at Martlesham to investigate the use of ISDN in manufacturing industry. BT may become a hub for data exchange using ISDN. Some workstations companies such as Sun are now building ISDN into their range of workstations.

3.71 A has its own dedicated telephone network which links the four sites in the UK with the company's own office abroad. The company is also linked over the public network to all its suppliers and to a number of resellers of its systems. The company communicates regularly with this supplier and reseller network. EDI is not used because the company deals with a relatively small number of high value orders.

3.72 The company has extensive links with Warwick University particularly with the Advance Manufacturing Centre. The company carries out all its training in conjunction with the University and also uses Warwick and Cranfield for research.

3.73 The company is involved in Framework Programme research through RACE. The company would be very interested in the development of video conferencing facilities in the Science Parks in Europe. Such a facility could be based on their premises for demonstrations to local industries and for use by the company and other companies.

Interviews were held with

Mr D Rowe	Warwick Science Park
Mr S Brown	Warwick Science Park
Mr S Niven	Isogon
Mr J Boyce	Computervision
Mr T Waite	Swaptronics
Mr P Marsh	Dixi Associates
Mrs E Ellard	Woodway Engineering
Mr T Peck	Sun Microsystems
Mr V Tailor	Tailor Made Systems

Chapter 4

MANCHESTER SCIENCE PARK

Regional Background

4.1 The North West is a major industrial and commercial centre with industries such as textiles,defence engineering, chemicals, communications and financial services as well as a wide range of other manufacturing and service industries. The industrial base of the region has declined over a number of years and a range of programmes have been put in place to encourage economic regeneration. Overall, the rate of unemployment in the North West region is slightly higher (11.8%) than that for Great Britain as a whole (9.8%), but there are significant variations in the economic performance of different parts of the region.

4.2 The industrial problems of some parts of the region have led to Objective 2 status for large parts of Manchester and surrounding areas. Merseyside has recently obtained Objective 1 status. Within Greater Manchester, some inner city areas have suffered particular economic and social decline and it is in one of these areas, Hulme, that the Manchester Science Park is located.

4.3 The major economic actors in the area include:

- Manchester City Council which has a wide range of programmes for economic regeneration

- Department of Trade and Industry, North West Regional Office. The DTI and three other government departments are due to form single integrated regional office to facilitate development

- The new initiative called 'Business Link' is also about to be launched with the objectives of providing a single point of contact for all government and other assistance to business in the area. This organisation is based on a consortium of local organisations including the City Council and Chamber of Commerce is funded by government grant

- Manchester Science Park which is linked to 6 academic institutions in the city and is partly owned by the Universities and the City Council

- Greater Manchester BIC which is located about eight miles for the city centre and was initially funded by the local authorities, banks, major companies and the European Commission. The BIC is linked telematically to EBN

- The Universities and colleges in Manchester which form the largest academic campus in Europe

- There are a wide range of other important bodies in the area including research associations such as AMTRI (machine tools and automation) and BTTI (textiles research)

- The Trafford Park industrial park (one of the first to be created) is a major source of manufacturing employment in the area. An advanced manufacturing centre is about to be located on Trafford Park

- Manchester Chamber of Commerce and Industry is a long established body representing the interests of a large proportion of the city's trade and industry and which is about to join a national telematic network 'Chambernet'

- In adjacent areas of the North West are the two universities of Liverpool and the Merseyside Innovation Centre and the NIMTEC Regional Technology Centre

4.4 Within the overall Greater Manchester region there is a significant amount of cooperation and networking in relation to issues such as the formation of Business Link, Hulme City Challenge and the development of telematic networks in the city.

4.5 The Science Park plays an increasing role in these networking activities. It is an important node for high tech start up companies particularly spin-outs from the universities. The majority of companies on the Science Park were formed from within the universities. However, the Science Park is a relatively small player within the context of a large economy such as Greater Manchester. As such it has become increasingly pro-active and is developing a role as a focus for networking activities both human and telematic.

4.6 In order to develop a wider role in the networking activities and capabilities of the region, the Science Park wishes to obtain finance for investment in new resources such as cabling systems centres and a demonstration centre.

The Manchester Science Park

4.7 The Manchester Science Park is located in an inner city area of Manchester (Hulme) which has suffered economic, social and physical problems over a number of years. In 1992 Hulme launched its 'City Challenge' programme, a 5 year programme of economic and social regeneration involving a partnership of local bodies together with funding from central government.

4.8 The Manchester Science Park forms an important focus for the development of innovative and high technology SMEs in the Hulme area since it is adjacent to the largest academic campus in Europe and is closely associated with the majority of the universities in Manchester. The Science Park is situated in an area eligible for objective 2 support and has access to city challenge support as described above.

4.9 The Science Park was formed ten years ago through a partnership of University of Manchester, UMIST, Manchester City Council, and a number of major local companies (Granada, Ciba Geigy and Courtaulds). The recently formed Manchester Metropolitan University is currently discussing membership of the Science Park board.

4.10 The Park has developed in three phases and currently has 19 tenant companies on site employing 240 people. Growth has been relatively slow over the ten year period, but the Park is about to embark on a significant expansion (phase 4) of 22,500 sq ft which is planned to include facilities for telematic networking, ISDN and (if funding can be found) a systems centre and possibly a telematics demonstration centre. The expansion will also include improved conference facilities, restaurant and reception.

4.11 Merseyside Innovation and NIMTECH will be discussed as part of a separate interview/visit programme, but Greater Manchester BIC which is located about eight miles from the Science Park was visited as part of this case study.

4.12 Companies on the Science Park are involved in a wide range of industries and a large proportion (about 60%) were formed from concepts originating in the associated universities. Links with the universities are well developed and include research work, student placements and joint academic/industry posts.

Greater Manchester BIC

4.13 The Greater Manchester BIC is located on an industrial estate about eight miles from the centre of Manchester at Denton. It has recently established two linked satellite operations. One at Trafford Park which will specialise in process engineering and one at Rochdale specialising in Environmental technologies. The Trafford Park Site will be directly (computer) linked to the BIC.

4.14 The BIC was originally established in 1990 at Denton with assistance from Tameside MBC, National Westminster Bank, British Coal Industry and UMIST. Support was also received from the ERDF for the establishment of the BIC. The BIC currently employs 9 people. The BIC has recently established telematic links with EBN and believes that this will provide significant benefits in obtaining information about contracts in the Official Journal as well as networking with other BICs. It is not linked to other networks such as BCNET or Manchester HOST. The BIC obtains contracts from a range of bodies and schemes such as DTI, DG16, Konver, Rechar, Retex etc. It works with a wide range of firms in the region but tends to concentrate its attention on a smaller number of innovative firms where it can have most effect.

4.15 The BIC has launched a number of initiatives aimed at assisting companies which includes 'Capital access', an investment facility linked to a network of Business Angels and a Supplier Development Centre which will train small firms to enable them to supply the needs of major companies. In addition, the BIC is actively engaged in sales and marketing development on behalf of local companies.

4.16 The manager of the BIC has extensive networking arrangements with other BICs in Europe, but rather less with other organisations, for example links with Science Parks and other bodies regionally. The BIC has ambitious plans to extend the number of satellite operations to cover all the boroughs in Greater Manchester. This could include the Hulme area. The BIC has been relatively recently established and extensive networks have not been a prime objective during its initial phases.

Current Networking Activity

4.17 The Science Park currently has links to the UKSPA network linking UK Science Parks. This system is based on the Manchester HOST and is a modem based system in which the Manchester HOST provides a range of services to UKSPA including E.Mail, databases and document transfer. In addition, access to the HOST provides routes and gateways to other networks. The software used (Pop-Up) is described as being very simple to use. The Science Park is not currently involved in networks such as the SPRINT Technology Transfer network but has plans to become involved. One building on the site has a computer link into the Manchester University computer system, but this does not seem to be widely used at present.

4.18 There is considerable interest in the Greater Manchester region in developing telematic networks to enhance economic and social development. The Manchester City Council set up the Manchester Host to facilitate networking among the business and other communities in the area and to encourage interest, awareness and expertise in networking. The HOST is linked into the Anglo-German Geonet System and provides gateways into many other networks. At present the system is limited to low bandwidth applications such as text based E.Mail and bulletin boards but plans are being made for the development of ISDN facilities allowing multi-media applications to be provided as well as provision of a Graphical User Interface. This could allow the development for example simple video conferencing. At present, over 50 people in the city are employed in activities related to the Manchester HOST system such as support, training, awareness etc.

4.19 A major spur to the development of a metropolitan area network within Manchester is the provision of the Super Janet broadband system linking the academic and research networks within the UK. There are some 6 universities in the region and, rather than linking each 5 universities individually to the Super Janet system, a proposal has been developed by the universities for a broad based metropolitan ring (G MING) which would link all the relevant bodies together and to Super Janet. This would be more cost effective as well as saving telephone charges between institutions. The G MING proposal has subsequently been extended to include discussions with a wide range of organisations about the possibility of more extensive networking within the city. These include the Science Park, Manchester City Council, Hulme Regeneration, Manchester Chamber of Commerce and Industry and Central Manchester Development Corporation.

4.20 A study has been commissioned from CER (part of the Manchester Metropolitan University) which is examining the possibilities of linking the Science Park as well as other bodies in the region. The availability of advanced telecommunications is believed to provide a major advantage in attracting inward investment in high technology areas such as biotechnology. The City Council is pursuing a twin track approach to developing the telematics programme for the city which involves ERDF funding for technical developments and proposals for funding under the Fourth Framework Programme through which there will in future be opportunities for public authorities to participate in innovation programmes. The possibilities for funding for pilot and demonstration projects under the TURA (Telematics for urban and rural areas) programme are being investigated.

4.21 The availability of a broadband metropolitan network based on G MING would require the establishment of a network systems centre. The possibility of locating this on the Phase 4 Science Park development is being considered. This would provide opportunities for the development of demonstration and training facilities on the same site.

4.22 Manchester City Council is a leading member of Eurocities (a network of some 55 European cities) and is leading the development of the Telecities project which is networking initiative designed to provide trans European networks linking the developing metropolitan area networks in major European cities.

4.23 However there did not seem to be a great deal of networking activity between the science park and the Greater Manchester BIC partly due to time and resource constraints.

Use of Networking by Companies on the Science Park

4.24 There are currently nineteen companies located on the Science Park including companies involved in software development, health and hygiene, chemicals, textile, CAD/CAM equipment and a range of other industries. Discussions with companies at the Science Park were held to determine the likely networking needs for the future.

4.25 The majority of companies had established linkages with major suppliers or customers for specific purposes which sometimes included telematic linkages. The majority of networking was through informal mechanisms and the companies' own contacts. More formal networks did not seem to be of a major importance to any of the companies interviewed. However one company was part of the Anette network linking similar technology transfer bodies in seven other countries as well as TII. Anette is partially funded by SPRINT and operates at a personal level through quarterly meetings and the exchange of technology transfer profiles. About eight profiles are received per month and the network is currently run by fax and phone in English but there would be considerable interest in advanced telematics particularly video conferencing.

4.26 Other companies use telematic linkages to customers through ordinary telephone lines and modems in order to access equipment on the customers' premises and diagnose problems or download software. These telematic links tend to be used for single dedicated applications such as transfer of data or drawings directly to a particular customer. A host computer or E.Mail system is not used. In general companies have established specific links through modems to meet a particular need. Other telematic applications have not been investigated.

4.27 The majority of firms had linkages to the University for technology reasons and for student placement projects. Linkages with customers in Europe were limited, although one company expressed interest in identifying companies with complementary technologies or interests in marketing, research or agency agreements.

4.28 In general the existing schemes such as BCNET or databases were not used or were not known about. One company distributing graphics data to its distributors and customers expressed the need for higher bandwidth networks to allow greater graphics at faster speeds.

4.29 In general, companies did not seem to be aware of the schemes available for technology transfer (one company was a member of TII) and because of their small size did not have the resources to mount an extensive investigation of the possibilities.

Potential for Improved Networks

4.30 A number of possibilities exist to improve networking within the Greater Manchester region. The Science Park is currently considering joining the SPRINT technology transfer network. The possibility of an extension of the SPRINT scheme to provide assistance to Science Parks in developing feasibility studies for networks would be valuable. In particular a scheme could be developed to assist in the selection of appropriate Science Parks to form the partners in the new network and assistance in the development of appropriate networking facilities such as telematics.

4.31 The possibility of assistance to develop a non Executive Director/Mentor Scheme would be valuable. Informal arrangements along these lines are already being developed. Such an initiative would enable established Science Parks to provide long term guidance to newly established management teams in another country. The provision of assistance for the time involved and with the cost of travel would be needed to enable the scheme to succeed.

4.32 The need for ease of use and rationalisation of telematic systems was emphasised. Gateways from one network into another need to be made simpler.

4.33 The need for enhanced networks within Manchester to provide broad based links between the academic institutions, the science park and other industrial bodies are seen as important for future industrial success. The opportunity for the location of the relevant Systems Centre and possibly a demonstration centre on the Science Park were seen as significant opportunities.

4.34 Closer linkages between the various organisations in the region could be encouraged. For example the synergy between the Science Park and the BIC seemed small. The opportunities for co location of some activities could be explored.

Vuman Ltd

4.35 Vuman is wholly owned by the University of Manchester and has a prime role in the exploitation of technology developed in the University. A is part of TRN but also act as coordinator for the Anette network which links similar bodies in seven other universities (Barcelona, Karlsruhe, Ghent, Heraklion, Catania, Gothenburg and Berlin). A number of these linked bodies are themselves located on Science Parks adjacent to the relevant University. The network is partly funded by SPRINT and operates at a personal level with quarterly meetings and the exchange of profiles (2 pages) detailing technology transfer requirements.

4.36 The company receives about eight profiles per month and distributes these locally to relevant firms and other bodies. The network currently relies on mail, telephone and fax and does not have any telematic links. The network operates entirely in English. In addition, a technology compendium is published which provides details of the various technology opportunities available at each part of the network.

4.37 Currently, E.Mail is not perceived as being user friendly, and there would continue to be a need for quarterly meetings since personal contact is of considerable importance. The possibility of using video conferencing, if a low cost facility were available, was of considerable interest. Video conferencing or desk top video conferencing could be used after an initial technology match had been identified and documentation had been exchanged to allow discussions to take place between the parties without the time and financial cost of travel. The possibility of such facilities being established on the Science Park was of considerable interest.

Textile Computer Systems Ltd

4.38 The company was found some 11 years ago from developments made at UMIST and currently employs 26. The closeness of its location on the Science Park to UMIST remains a significant advantage. In addition, links have been established with other universities such as Royal College of Art, Central School of Art and South Carolina Textile Institute.

4.39 The company develops CAD/CAM systems for the design and manufacture of printed textiles including wall coverings. This involves equipment for the digitisation of designs which may use up to twenty base colours and the laser engraving of a screen. The company originated in the textiles department of UMIST. The equipment and software systems are sold to a range of companies around the world including design houses, converters, engravers and printers and several customers are located

in the USA. Telematic applications are used to link with these more distant customers. The company accesses systems installed in customers' premises using a standard telephone line and modem and utilises this link to down load software and to identify and solve software problems. In the UK floppy disks are posted to customers or visits are made rather than using telematic methods.

4.40 During a typical week links to customers in the US might be established four or five times. The company maintains a computer in Manchester which is used by customers whenever they need to send information. The system is primarily used for technical work and ordinary information is transmitted by fax.

4.41 A range of standard software tools are used for the telematic linkage which include data compression and error correction. Some data transmission, for example drawings of designs, can take a significant amount of time (3/4 of an hour) to transmit. The use of ISDN has not been investigated to date. The company trades mainly in the UK, USA, South Africa and Far East working through local agents.

4.42 At present, the company appears to have established those networks and telematic links which it needs. The capability of the firm to establish its own data links to major customers is related to the core technological capabilities of the firm in systems and software. At present the company has little business in Europe apart from the UK and networks within Europe are not a major issue.

WM Engineering

4.43 WM engineering were formed as a company about one year ago when the management team bought the company from the University. WM specialise in improving plant performance both in large manufacturing plants, process plants, and in major installations such as banking computer centres.

4.44 Condition monitoring and total production maintenance are core areas of business. The firm operates as a consultancy both in technical matters and in the organisational and teamwork factors involved. The company has a close relationship with the University through the sponsorship and direction of research, honourary academic appointments and participation in the SERC's Total Technology Scheme. Physical proximity to the university is a particular advantage. The company uses telematic linkages to major customers on a limited basis through normal telephone lines and modems. This telematic service could increase in the future, for example by offering a service to maintain plant databases and provide technical support remotely.

4.45 The company also licenses software systems to other companies around the world and would be interested in any networking opportunities which allowed it to identify suitable partner firms more easily. In particular C would be interested in establishing contact with firms of a similar size which had complementary technologies. Networks to establish links with other companies could involve joint research projects, complementary technologies and marketing or agency agreements.

Microdynamics

4.46 Microdynmics produce systems for computer aided garment design and manufacture. The company is connected to a telematic network which includes all its major distributors and clients. Links to major retail customers have led to consideration of the need for a wide area network (WAN) capable of handling the very heavy graphics based data traffic associated with the company's new systems such as the Product Data Management System.

4.47 The company has used routers, burst connection and data compression with varying degrees of success. However in the longer term greater speed and higher bandwidth will be needed and this will require the installation of high band-width fibre optic cable systems.

Interviews were held with

Dr J Allen	Manchester Science Park
Mr D Carter	Manchester City Council
Mr G Steele	DTI North West
Mr R Clay	DTI North West
Mr P Ellison	Greater Manchester BIC
Ms J Hilton	Vuman
Dr P Grigg	Textile Computer Systems
Mr T Henry	W M Engineering

Chapter 5

MERSEYSIDE INNOVATION CENTRE

Regional Background

5.1 Merseyside is a region covering five boroughs, Knowsley, Liverpool, Sefton, St Helens and Wirral. Its economic development is lagging behind the EC average with a decline in GDP from 95% of the EC average in 1983 to 73% in 1992. This resulted from the decline in traditional manufacturing industries and a lower than average growth of service industries. There has also been a significant loss of population from the area. To reverse this decline a proposal for Objective 1 status was prepared by a partnership led by the Merseyside Task Force (MTC) which was submitted to the European Commission.

5.2 Objective 1 status was recently approved by the Commission, and the detailed arrangements for implementing the plan are now being developed. This is likely to involve expenditure of £630m between 1994 and 1999. The plan proposes expenditure of £276m through the European Social Fund on human resource programmes particularly training and £352m through the ERDF on industry, services, telecommunications R&D and the environment.

The Regional Technology Infrastructure

5.3 Industry in the Merseyside region includes chemicals, food, motor vehicles, electrical engineering, glass, mechanical engineering and paper and publishing. There are two universities in Liverpool and another university at Lancaster about thirty miles away from Liverpool.

5.4 The DTI play an important role in the region through assistance to industry and the development of the Business Links programme which brings together the various bodies concerned with business assistance into a coherent structure. The Business Links office for Merseyside is due to open in April and will involve a consortium of local bodies including Chambers of Commerce, TECs, local authorities government and Enterprise Agencies to provide an integrated support service for industry using advanced Information Technology.

5.5 Within the bid for Objective 1 status, there are plans for a significant investment in telecommunication. The objective is primarily to provide demonstration facilities to SMEs who have not made extensive use of advanced telecommunications. The possibility of establishing a telecommunications audit facility for SMEs linked to a programme of awareness through case studies was of interest. Demonstration facilities of equipment in active firms would be of particular value for example to show the use of EDI. A Steering Group comprising relevant bodies is examining the possibilities for demonstration centres.

5.6 Other important actors in the region include the Liverpool City Council and the local authorities for the other four boroughs who provide a range of assistance to industry including Business Resource Centres and assistance with property and sites, and grants for investment.

5.7 The Wavertree Technology Park is a major development in Liverpool. This is a large site which was derelict in 1983 and has been transformed into a successful Technology Park covering 64 acres. A Phase 2 expansion of 23 acres is being developed which will include a new Business and Technology Centre which will be managed by MIC. The Watertree Research Park is not currently defined as a Science park since many companies on the park are predominantly in services eg credit card services or manufacturing and there is a relatively modest R&D activity. However the park is likely to take a more significant role in local networks when the Business and Technology Centre is established.

5.8 Nimtech is an important networking organisation in the field of technology transfer and support for innovative businesses. Its remit is wider than the five boroughs of Merseyside and extends to the whole of the North West including Manchester.

5.9 The various actors in the regional economy interact through a range of networks. The Merseyside Task Force has involved a wide range of bodies in developing the regional plan 'Merseyside 2000' submitted to the EC in support of Objective 1 status.

Merseyside Innovation Centre (MIC)

5.10 The Merseyside Innovation Centre (MIC) is closely linked to the University of Liverpool and the Liverpool John Moores University and is located in the centre of the city close to both universities. MIC was established in 1981 by the local authorities, Liverpool University and the then Polytechnic (now Liverpool John Moores University). The Innovation Centre is relatively small with 15000 sq ft of space occupied by 15 firms employing some 75 people. The objectives of the Innovation Centre were not primarily related to property or business premises. The prime objective of the Centre is to create a bridge between the Universities and industry throughout the area, making the universities more accessible to firms. To achieve this the MIC interacts with a network of over 1000 companies and employs some 25 staff many of whom are involved in the provision of business advice and training for companies. The objective of stimulating economic regeneration is carried out through a range of services to industry of which technology transfer is of particular importance.

5.11 The building which houses the MIC was refurbished by the local authority in 1981 and is divided into a number of small units. However, there is little room for growth and successful companies often leave the MIC to establish premises of their own. The development of the Business and Technology Centre at Wavertree will however provide a second site for the future.

5.12 The Innovation Centre requires funds to provide the technology and innovation services it provides to firms. It achieves this through fee earning activities including quality (ISO 9000 and TQM), Health and Safety, environment, design and technical trouble shooting. Its area of expertise lies in technical assistance. More traditional business matters are left to other bodies such as Local Authority Advice Centres and Enterprise Agencies.

5.13 However, the Innovation Centre would not satisfy the criteria of EBN and the annual subscriptions to EBN are not considered good value. Some local BICs such as Cheshire BIC are described as unsuccessful. The services offered by the centre are described as being more technical than those offered by a BIC. MIC does not participate in the SPRINT Technology Transfer network and is not particularly orientated towards Europe.

5.14 The Training and Enterprise Councils are an important source of project funding for MIC for example through a contract to administer a Graduate Training Scheme. The objective of this scheme is to attract high calibre employees into the local economy.

5.15 The MIC is a member of UKSPA but is not linked into the telematic UKSPANET, however it would like to develop a link in due course.

Linkages and Networking

5.16 MIC is linked to a number of other organisations in the region including the two universities, NIMTECH and North West Innovation. The Centre is linked through a desktop video conferencing facility to NIMTECH and to Pendle Training. This system was installed as part of a series of projects initiated by NIMTECH entitled 'WINNER' and funded under the STRIDE programme. The objective is to establish a 10 node network linking centres throughout the North West. However, the existing hardware which is based on a dedicated leased BT7000 system linked to ISDN 2 lines is described as inadequate since is will only operate in a monoplex mode ie one person talking at a time.

5.17 The possibility of upgrading to PC based desktop video conferencing is being investigated. The objectives of the existing system are evaluation and demonstration. The system has not been used extensively since only 3 centres are linked and there is a lack of critical mass of users together with the technology problems already mentioned. The ISDN 2 line into the MIC is separate from the main switchboard and is only used for video conferencing purposes.

5.18 MIC is keen to establish a demonstration centre for advance telematics. The development of the Business and Technology Centre at Wavertree would provide a suitable site for a demonstration centre which could be linked to the MIC with video conferencing and could also provide services to other companies on the site.

5.19 The companies on the MIC have not yet made use of the video conferencing facility. MIC have direct telephone link to Liverpool University which is attached to the University exchange. However, the centre is not joined to the national academic network Janet.

Networking by Companies

5.20 Companies located on and off the Merseyside Innovation Centre were interviewed. Those located off the MIC had moved because of growth.

5.21 Companies were using a range of telematic applications including:

- sending of programmes and data to sub contract software developers and customers using a 14.4, baud modem, data compression and a host computer (CIX). This could include direct data transfers to countries such as Holland. The advantages of using the host are that the two companies could send data to each other out of synchronisation since the host would store and forward information. Speed of delivery was another advantage over posting floppy disks. In addition there is the security of notification that data had arrived which was not possible with the post as well as the possibility of cost savings by programming the computer to send data packages at night on the cheap rate tariffs. Faxes are only used occasionally using the MIC fax facility. The possibility of using video conferencing might have been of relevance during negotiations with a Dutch Supplier/collaborator to allow more cost effective solution than travel. However, using a video conferencing facility off-site would not be practicable because there is a need to have all the company's documentation and materials available in the office.

- supplying software, training and network solutions which was involved in the operation of video conferencing systems for a public sector client. These systems were used extensively to link offices in different parts of the UK. The video conferencing suites cost £20,000 each and used ISDN lines for communication. However the possibility of cheaper desktop video conferencing was also being investigated by the company's customer. The company would be interested in using ISDN if this were available through the MIC switchboard in particular for transmitting multi media training package and developing intuitive multi media databases. A range of other organisations were used for solving technical problems including the National Computing Centre at Manchester. However links with the university were small. There was a growing need for simplified front end for accessing remote databases possibly using multi media. The company were investigating the possibility of remote banking using a modem. This would also be useful for any branch offices established in other cities.

- linking several offices together using E.Mail through a host system (Vitel). This was used for sending text based documents of up to 100 pages including messages of overseas countries. The possibility of using ISDN and video conferencing for multi media demonstrations and for linking technical experts with specialist knowledge to colleagues in other parts of the country was of considerable interest.

NIMTECH

5.22 Nimtech is a technology transfer and innovation network which covers the whole of the North West. It has 38 full time equivalent staff and a turnover of £1m. Nimtech has an extensive database of over 6000 companies and extensive networks at local, regional, national and international levels. Because of its wide geographical coverage, NIMTECH focuses its attention on those activities it can carry out most effectively without cutting across the activities of other organisations. As a consequence there are some 130 members of NIMTECH including 8 universities, companies, BICs and TECs. Both GMBIC and MIC are members of NIMTECH. Many of these organisations are themselves networks.

5.23 Nimtech has three main operating activities:

- awareness which is developed through a series of events such as exhibitions, conferences and special interest clubs
- broking which leads to business deals in technology transfer
- critical solutions where the organisation might carry out technical audits to determine a company's real needs

5.24 The NIMTECH activities are all business focused and a wide range of technology transfer activities have been developed including Eurotech North West in which French, German, Spanish and Italian nationals are employed using SPRINT and other funding sources to develop technology transfer agreements. The emphasis of this work is on contacts with the relevant employees visiting the countries concerned and developing partnership agreements between companies. The need for personal links to establish trust between the parties was emphasised.

5.25 The need for a fast response to business opportunities was stressed to ensure that Nimtech work with the same business practises as companies. To assist this the video conferencing facility will be upgraded to a PC based system and extended to cover the organisations in European countries with which NIMTECH collaborates. This will allow considerable cost savings once the initial personal contacts and trust have established and transactions can be processed with reduced overseas travel.

5.26 Nimtech are members of TII but have not used it a great deal. They have left BCNET because there was little of value in it. The ISDN line for the video conferencing facility is not currently connected to the switchboard, but the recently installed telephone system is fully ISDN compatible and the ISDN line will be linked to the main system shortly.

5.27 Nimtech are part of the Business Links programme operated by the DTI and will provide a technology counsellor in the Manchester Business Links Office. This counsellor will have access to NIMTECH's database of 6000 companies through a dedicated PC at Skelmersdale.

5.28 NIMTECH has a dedicated information desk to enable database searches to be carried out speedily and effectively. The system is linked to Manchester HOST through a locally dialled telephone call to Liverpool. The HOST has advantages because it allows much of the preparation work to be carried out off line keeping telephone and search charges to a minimum. The objective is to be able to take a technical or market enquiry from anywhere in the world and provide an answer within twelve hours. Nimtech would favour an advanced telecommunications demonstration centre and would like to establish satellite links for example through a teleport for communications throughout the world.

5.29 The DTI in the North West have an objective of establishing an effective regional technology and innovation network and support NIMTECH in this role. However there is core funding from central government and project funds are won by NIMTECH - open competition. There has been a rapid growth in innovation networking in the North West with the establishment of 'Innovation North West' which is based at NIMTECH. This involves project teams working on activities such as benchmarking, innovation self assessment and technology foresight.

Activities of other bodies

5.30 There are two operating BICs in the North West at Manchester and Blackburn. the Cheshire BIC is described as moribund. The lack of central government and local government support for BICs and the perception that BIC practises were not in tune with UK practises has led to slow growth.

5.31 The plethora of organisations providing business support services has led to the Business Links concept. This requires the establishment of a network or consortium of all the major bodies before government support is provided. The Business Links will operate with a central facility based in one of the organisations eg Chamber of Commerce with satellite links in other areas using telematics for communication. Staff for the Business Links will be seconded from other organisations but will report to a single Chief Executive.

5.32 The Liverpool City Council have provided loan guarantees for a study to develop a Teleport in Liverpool. This would utilise satellite communications to develop a European News Service which would collect news from local journalists and transmit relevant stories and TV pictures to the appropriate networked status throughout Europe. The objective is to develop a range of new services based on the Teleport which would initially begin with the news production but also extend to educational and leisure markets. The possibility of linking a Teleport to a broad based cable network would enable a wide range of local companies and other organisations to benefit.

5.33 The City Council is supporting the Business Links programme and the Business Links programme and the Business Links Centre will be linked to the Euro Info Centre which the City Council sponsor within the library.

Networking Opportunities

5.34 The main opportunities for networking include:

- establishing a demonstration centre for advanced telecommunications which could provide services to companies and demonstrate the cost effectiveness of new technologies through case study audits

- extending the desktop video conferencing network in the North West to provide more effective equipment and a critical mass of users of compatible technology

- building on the Business Links programme to develop a more integrated business support network with less duplication of activities and clearer definition or responsibilities

- using advanced telecommunications to establish new industries such as a news network

Those interviewed in Merseyside include:

Dr R Bell	Environmental Advisory Unit Ltd
Mrs L Gill	Merseyside Task Force
Mr J C Brown	DTI North West
Mr R Dawson	City of Liverpool
Mr N Kirkwood	Tachograph Analysis Consultants Ltd
Mr M Childs	Asbestos Analysis Ltd
Mr G Miller	Computer Centres UK Ltd
Mr G Helliwell	NIMTECH

EXECUTIVE SUMMARY

TECHNOLOGY DEMONSTRATION CENTRES

Introduction

1 The objective of the study is to review the experiences of current telecommunication demonstration centres (TDC).

The work has been carried out in two stages:

- Stage 1 consisted of desk research of existing operations. Some interviews of telecommunications operators and experts have been made.

- Stage 2 involved the analysis of the characteristics of the different experiences identified in Europe. A preliminary typology of TDC is proposed in this report. It is illustrated by case studies. General recommendations to the Commission are proposed in conclusion.

Field of the study

2 The preliminary field of the study included:

- teleports: the review of teleports experiences has been made through data from the World Teleports Association and a study completed by IBEX in 1992

- sciences parks which have made heavy investments in telecommunications infrastructure

- others experiences of telecommunications operators or technology transfer intermediaries.

Desk research, interview of experts and case studies led us to propose a preliminary typology of TDC experiences. Case studies illustrating the different categories proposed are in appendix to the TDC report.

Preliminary typology

3 We identify three criteria to categorise TDC experiences.

- **purpose**; schematically, TDC experiences can be considered as **"public service-oriented"** or **"market-oriented"**

- **targets**; they are **"specified"** or they are **"not specified"**

- **service** offered; they are schematically:

  - information and demonstration
  - consultancy and training
  - services and in particular value-added services based on infrastructures.

4 We identified from these criteria four categories of telecommunications demonstrations centres experiences.

- **Experiences "public service-oriented", "no specified targets", "information and demonstration".** One representative example is the **Futuroscope of Poitiers.**

- **Experiences "market-oriented", "no specified targets", "information and demonstration".** Show-rooms of telecommunications operators enter in this category: for example the "Espaces Enterprises" de France Telecom, the Dutch PTT Demonstration Centres, the OTE Demonstrations Centres in Greece.

- **Experiences "public service-oriented", "specified targets", "consultancy and training".** Two interesting experiences has been studied. One in Letterkenny (Ireland), the Information Technology Centre (ITC), another one in Trier (Germany), the Technology Transfer Trier (TTT).

5 The ITC was initiated in 1988 by the Letterkenny Regional Technical College in response to overwhelming number of requests it was receiving from local SMEs to provide information technology training and consulting.

6 The ITC provides consultancy, training, information technology services and a walk-in bureau which offers access to PCs, modems, database access and recently broadband services. The 15 members of staff audit not only the business's information and communication needs but also its ability to integrate technology.

7 The ITC has targeted its main market to firms with between 50 to 100 employees which have already made some initial investment in information technology and telematics.

8 An evaluation of the activities of the ITC was carried out by IBEX in 1992. ITC generates about one million Ecus in turnover and has been entirely self supporting since 1989. Their activities have had an impact on 150 companies and over 3000 individuals in four years. Nevertheless, the private sector is still a small proportion of the ITC business. Roughly 80% of turnover comes through public sector contracts and research contracts with EC programmes.

9 ITC of Letterkenny and Trier consider that their main competitors are private consulting firms involved in studies, engineering and support in advanced telematics.

Experiences "market-oriented", "specified targets", "service based on infrastructure"

10 Teleports and "Zones de Télécommunications Avancées" (ZTA) in France enter in this category. Teleports of Hanover, Amsterdam, Köln and the future teleports of Region Ile de France are examples of clearly market-oriented experiences. Very heavy investments have been made in most of them (eg 2 billion Ecus in Amsterdam). Services are based on state of the art infrastructure and high value services: bank dealing operations and flight reservation systems (Amsterdam), stock exchange and press information (Cologne). Clients are large firms generally within the service sector. Several experiences of this category (teleports of Toubaix, Lisbon, Louvain-la-Neuve) are still in the planning stage, and targets are still not specified.

11 ZTA are local operations led by France Telecom and the regional governments. They include primarily technopoles; the main objective is to favour sharing of telecommunications infrastructure and equipment. These operations have been considered as failures by many technopole constituents for two reasons:

- There is no demand for these services from firms and especially of SMEs which were the main target

- The sharply declining prices of telecommunications services and equipments favour individual use.

Conclusions

12 All of the experiences described here might be more or less considered as telecommunication demonstration centres. If we examine these experiences with the aim of promotion of information technologies among SMEs, the experiences of Letterkeny and Trier are particularly interesting. We can identify at least two factors of success: developing consultancy and training activities and high level of expertise of human resources.

13 As a conclusion, we recall the recommendations from the case study of the ITC in Letterkenny: "There is no rationale for further fuelling the supply of advanced telematics support providers. Those that exist are already finding it difficult to survive on business generated by firms. Instead, the Commission should focus on mechanisms to encourage the take up of these services in firms such as:

- schemes to raise awareness of advanced telematics and of advanced telematics support providers

- funding to allow firms to access this support.

14 The idea of financing "telecommunications audits" in SMEs and "demonstration projects" where users and suppliers of telematics applications or equipment are involved is a clear example of what kind of actions should be launched by the Commission.

RESULTS OF THE SP-NET POSTAL SURVEY

1 The postal survey of the SP-NET study was conducted over the period November 20 1993 to March 30 1994. In total, 382 science parks, technopoles, incubators, business innovation centres and teleports were contacted as part of the survey. In total, 161 organisations responded to the survey (42% of the number contacted).

2 To analyze the responses in a meaningful way, we identified several independent variables which we felt would have some explanatory relationship with the responses.

Stage of development

3 Depending on the organisation's stage of development, we expected a different pattern of responses. The majority of respondents (39%) have operated for less than two years or are still in the planning phase. From the data, Europe is still in a maturing stage of development vis-à-vis science parks.

North vs South

4 We have used a notional definition of North and South, where South includes Greece, Portugal Spain, Ireland and the southern part of Italy. The South contains a proportionately larger share of young and emerging science parks (50% of all Southern respondents). The North contains a proportionately larger share of mature parks (32% of Northern parks responding were older than six years) as well as in absolute terms (88% of respondents older than six years were from the North).

SURVEY RESULTS

Respondents	TOTAL	Belgium		Denmark		France		Germany		Greece		Ireland		Italy		Netherlands		Portugal		Spain *		UK	
NORTH	125	5	4%	4	3%	25	20%	51	41%	0	0%	0	0%	7	6%	4	3%	0	0%	0	0%	29	23%
SOUTH	36	0	0%	0	0%	0	0%	0	0%	3	8%	4	11%	8	22%	0	0%	4	11%	17	47%	0	0%
TOTAL	161	5	3%	4	2%	25	16%	51	32%	3	2%	4	2%	15	9%	4	2%	4	2%	17	11%	29	18%
0-2 years	62	1	2%	1	2%	6	10%	22	35%	2	3%	1	2%	5	8%	0	0%	3	5%	10	16%	11	18%
3-5 years	39	1	3%	1	3%	5	13%	12	31%	1	3%	0	0%	6	15%	3	8%	1	3%	5	13%	4	10%
6-9 years	25	1	4%	1	4%	5	20%	11	44%	0	0%	1	4%	1	4%	0	0%	0	0%	1	4%	4	16%
10+ years	26	1	4%	1	4%	5	19%	4	15%	0	0%	2	8%	2	8%	1	4%	0	0%	0	0%	10	38%
Blank	9	1	11%	0	0%	4	44%	2	22%	0	0%	0	0%	1	11%	0	0%	0	0%	1	11%	0	0%
TOTAL	161	5	3%	4	2%	25	16%	51	32%	3	2%	4	2%	15	9%	4	2%	4	2%	17	11%	29	18%
SP (single site)	74	2	3%	2	3%	10	14%	22	30%	2	3%	3	4%	2	3%	0	0%	1	1%	10	14%	20	27%
SP (multi site)	30	1	3%	1	3%	10	33%	10	33%	0	0%	0	0%	4	13%	0	0%	0	0%	0	0%	4	13%
Incubator/innov	89	5	6%	2	2%	14	16%	28	31%	1	1%	3	3%	9	10%	1	1%	3	3%	7	8%	16	18%
Teleport	2	0	0%	0	0%	1	50%	0	0%	0	0%	0	0%	0	0%	0	0%	1	50%	0	0%	0	0%
Other	3	0	0%	0	0%	3	100%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
Blank	10	0	0%	1	10%	0	0%	2	20%	0	0%	0	0%	2	20%	3	30%	0	0%	2	20%	0	0%
TOTAL	161	5	3%	4	2%	25	16%	51	32%	3	2%	4	2%	15	9%	4	2%	4	2%	17	11%	29	18%
NTBFs	79	0	0%	0	0%	9	11%	36	46%	1	1%	3	4%	6	8%	2	3%	2	3%	6	8%	14	18%
Inward Inv	10	2	20%	0	0%	1	10%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	2	20%	5	50%
Tech transfer	17	0	0%	0	0%	3	18%	6	35%	1	6%	0	0%	3	18%	0	0%	0	0%	3	18%	1	6%
Other	15	2	13%	0	0%	3	20%	3	20%	0	0%	0	0%	3	20%	1	7%	1	7%	1	7%	1	7%
Mixed objectives	40	1	3%	4	10%	9	23%	6	15%	1	3%	1	3%	3	8%	1	3%	1	3%	5	13%	8	20%
TOTAL	161	5	3%	4	2%	25	16%	51	32%	3	2%	4	2%	15	9%	4	2%	4	2%	17	11%	29	18%

5 Over two-thirds of the responses are from Northern countries. This is not unrepresentative as more science parks are located in the North. Spain, Ireland and Italy had good response rates; Portugal and Greece had below average response rates and this is likely to be due to the fact that science parks in both countries are at a particularly early stage of development. This pattern of response does not bias the results, but we should bear in mind the importance of Northern views in the survey results.

Type of organisation

6 The survey allowed organisations to select the types of organisation that best described them: single site science parks, multi site science parks or technopoles, incubators, innovation centres, teleports and Business Innovations Centres (BICS). In practice, organisations described themselves as more than one type. In order to use type of organisation as an explanatory variable, we selected the strongest feature of the organisation to describe it. For example, a science park which also contained an incubator and a teleport has been categorized as a science park. A EuroBIC which describes itself as a BIC, an incubator and a technology demonstration centre has been categorized as a "innovation centre/incubator". A teleport which indicates that it is both a teleport and a technology demonstration centre is classified as a "teleport". Three organisations described themselves as "Other"; these are all technopole associations.

Priority objective

7 As in the case of type of organisation, most respondents identified several objectives. In order to provide an analysis by objectives, we identified the priority objective for each respondent. The priority objective was that which was given the greatest weighting by the respondent. Priority objectives have been grouped in the following categories: new technology based firms (NTBFs), inward investment (of R&D or otherwise), technology transfer and other. In some cases, the respondent gave equal weighting to all objectives and these have been termed "mixed objectives".

8 Most (49%) respondents noted "NTBFs" as their priority objective, followed by 25% which had mixed objectives, 11% which identified technology transfer and only 6% for which inward investment was a priority.

B2	IS YOUR ORGANISATION CLOSELY LINKED TO A PARTICULAR ACADEMIC INSTITUTE, UNIVERSITY OR RESEARCH INSTITUTE?						
	Total	Yes		No		Blank	
NORTH	125	84	67%	40	32%	1	1%
SOUTH	36	29	81%	6	17%	1	3%
TOTAL	161	113	70%	46	29%	2	1%
0-2 years	62	40	65%	20	32%	2	3%
3-5 years	39	28	72%	11	28%	0	0%
6-9 years	25	17	68%	8	32%	0	0%
10+ years	26	21	81%	5	19%	0	0%
Blank	9	7	78%	2	22%	0	0%
TOTAL	161	113	70%	46	29%	2	1%
SP (single site)	74	58	78%	15	20%	1	1%
SP (multi site)	30	19	63%	11	37%	0	0%
Incubator/innov	89	65	73%	23	26%	1	1%
Teleport	2	1	50%	1	50%	0	0%
Other	3	2	67%	1	33%	0	0%
Blank	10	5	50%	4	40%	1	10%
TOTAL	161	113	70%	46	29%	2	1%
NTBFs	79	55	70%	24	30%	0	0%
Inward Inv	10	8	80%	2	20%	0	0%
Tech transfer	17	11	65%	6	35%	0	0%
Other	15	9	60%	6	40%	0	0%
Mixed objectives	40	30	75%	8	20%	2	5%
TOTAL	161	113		46		2	

B3 WHAT ORGANISATIONS ARE REPRESENTED ON THE MANAGEMENT BOARD OF YOUR 'SCIENCE PARK/ORGANISATION'?

	TOTAL	HEI/RI		Regional development organisation		City Council		Local company		Other	
NORTH	125	63	50%	43	34%	46	37%	23	18%	41	33%
SOUTH	36	22	61%	25	69%	16	44%	15	42%	16	44%
TOTAL	161	85	53%	68	42%	62	39%	38	24%	57	35%
0-2 years	62	28	45%	22	35%	25	40%	16	26%	20	32%
3-5 years	39	23	59%	18	46%	17	44%	8	21%	20	51%
6-9 years	25	12	48%	9	36%	6	24%	4	16%	5	20%
10+ years	26	16	62%	13	50%	8	31%	8	31%	10	38%
Blank	9	6	67%	6	67%	6	67%	2	22%	2	22%
TOTAL	161	85	53%	68	42%	62	39%	38	24%	57	35%
SP (single site)	74	44	59%	30	41%	33	45%	16	22%	27	36%
SP (multi site)	30	14	47%	11	37%	10	33%	8	27%	10	33%
Incubator/innov	89	51	57%	39	44%	37	42%	22	25%	33	37%
Teleport	2	0	0%	0	0%	0	0%	0	0%	1	50%
Other	3	2	67%	2	67%	1	33%	1	33%	0	0%
Blank	10	5	50%	5	50%	3	30%	4	40%	4	40%
TOTAL	161	85	53%	68	42%	62	39%	38	24%	57	35%
NTBFs	79	40	51%	34	43%	31	39%	16	20%	32	41%
Inward Inv	10	6	60%	4	40%	4	40%	2	20%	1	10%
Tech transfer	17	8	47%	7	41%	5	29%	5	29%	7	41%
Other	15	5	33%	6	40%	4	27%	3	20%	5	33%
Mixed objectives	40	26	65%	17	43%	18	45%	12	30%	12	30%
TOTAL	161	85		68		62		38		57	

B5 HOW WOULD YOU CLASSIFY THE STRATEGIC AIMS OF YOUR 'SCIENCE PARK/ORGANISATION' WITHIN THE FOLLOWING BROAD CATEGORIES?

Approximate proportions as a percentage agains the following key strategies

	TOTAL	AVERAGES IN PERCENTAGES						
		Establish new tech-based firms	Inward investment public R&D	Inward investment private R&D	Inward investment general	Technology transfer to existing firms	Technology transfer to new firms	Other
Belgium	5	18%	20%	35%	12%	11%	13%	43%
Germany	51	56%	10%	10%	13%	20%	15%	31%
Denmark	1	23%	13%	13%	12%	20%	22%	5%
Spain	17	35%	16%	21%	15%	21%	16%	14%
France	25	31%	13%	15%	20%	22%	14%	31%
Greece	3	38%	10%	10%	2%	32%	15%	3%
Italy	15	33%	14%	16%	10%	30%	20%	29%
Ireland	4	30%	10%	20%	14%	18%	16%	0%
Netherlands	4	55%	10%	10%	10%	20%	23%	60%
Portugal	4	33%	15%	15%	5%	13%	18%	35%
UK	29	46%	12%	24%	25%	20%	18%	40%
Total	161	42%	12%	17%	16%	21%	16%	31%

B6 HOW WELL HAVE THESE STRATEGIC AIMS BEEN ACHIEVED?													
	TOTAL	As expected		Mostly		Partially		Hardly		Too early		Blank	
NORTH	125	31	25%	37	30%	14	11%	1	1%	32	26%	10	8%
SOUTH	36	3	8%	9	25%	5	14%	0	0%	10	28%	9	25%
TOTAL	161	34	21%	46	29%	19	12%	1	1%	42	26%	19	12%
0-2 years	62	9	15%	8	13%	3	5%	0	0%	27	44%	15	24%
3-5 years	39	8	21%	16	41%	4	10%	1	3%	10	26%	0	0%
6-9 years	25	8	32%	10	40%	5	20%	0	0%	2	8%	0	0%
10+ years	26	9	35%	8	31%	7	27%	0	0%	1	4%	1	4%
Blank	9	0	0%	4	44%	0	0%	0	0%	2	22%	3	33%
TOTAL	161	34	21%	46	29%	19	12%	1	1%	42	26%	19	12%
SP (single site)	74	17	23%	18	24%	11	15%	0	0%	20	27%	8	11%
SP (multi site)	30	5	17%	6	20%	5	17%	1	3%	8	27%	5	17%
Incubator/innov	89	19	21%	28	31%	12	13%	0	0%	22	25%	8	9%
Teleport	2	0	0%	1	50%	0	0%	0	0%	1	50%	0	0%
Other	3	0	0%	1	33%	1	33%	0	0%	0	0%	1	33%
Blank	10	2	20%	4	40%	1	10%	0	0%	3	30%	0	0%
TOTAL	161	34	21%	46	29%	19	12%	1	1%	42	26%	19	12%
NTBFs	79	23	29%	26	33%	11	14%	0	0%	14	18%	5	6%
Inward Inv	10	2	20%	1	10%	1	10%	0	0%	3	30%	3	30%
Tech transfer	17	1	6%	4	24%	2	12%	0	0%	6	35%	4	24%
Other	15	1	7%	5	33%	0	0%	0	0%	7	47%	2	13%
Mixed objectives	40	7	18%	10	25%	5	13%	1	3%	12	30%	5	13%
TOTAL	161	34		46		19		1		42		19	

B7 HAVE THE STRATEGIC AIMS BEEN MODIFIED IN THE LIGHT OF EXPERIENCE?							
	TOTAL	No		Yes		Blank	
NORTH	125	70	56%	41	33%	14	11%
SOUTH	36	19	53%	8	22%	9	25%
TOTAL	161	89	55%	49	30%	23	14%
0-2 years	62	37	60%	9	15%	16	26%
3-5 years	39	22	56%	15	38%	2	5%
6-9 years	25	13	52%	12	48%	0	0%
10+ years	26	12	46%	12	46%	2	8%
Blank	9	5	56%	1	11%	3	33%
TOTAL	161	89	55%	49	30%	23	14%
SP (single site)	74	43	58%	20	27%	11	15%
SP (multi site)	30	12	40%	12	40%	6	20%
Incubator/innov	89	50	56%	30	34%	9	10%
Teleport	2	1	50%	1	50%	0	0%
Other	3	1	33%	1	33%	1	33%
Blank	10	5	50%	5	50%	0	0%
TOTAL	161	89	55%	49	30%	23	14%
NTBFs	79	52	66%	21	27%	6	8%
Inward Inv	10	5	50%	2	20%	3	30%
Tech transfer	17	6	35%	7	41%	4	24%
Other	15	6	40%	6	40%	3	20%
Mixed objectives	40	20	50%	13	33%	7	18%
TOTAL	161	89		49		23	

B7a IF YES, HAS THIS CHANGE IN STRATEGY INVOLVED A BROADENING OF THE ENTRY CRITERIA FOR ANY NEW TENANTS ON THE "SCIENCE PARK/ORGANISATION"?

	TOTAL		Yes		No		Blank	
NORTH	41	84%	26	63%	13	32%	2	5%
SOUTH	8	16%	8	100%	0	0%	0	0%
TOTAL	49		34	69%	13	27%	2	4%
0-2 years	9	18%	8	89%	1	11%	0	0%
3-5 years	15	31%	11	73%	2	13%	2	13%
6-9 years	12	24%	8	67%	4	33%	0	0%
10- years	12	24%	6	50%	6	50%	0	0%
Blank	1	2%	1	100%	0	0%	0	0%
TOTAL	49		34	69%	13	27%	2	4%
SP (single site)	20	41%	10	50%	9	45%	1	5%
SP (multi site)	12	24%	6	50%	5	42%	1	8%
Incubator/innov	30	61%	23	77%	7	23%	0	0%
Teleport	1	2%	1	100%	0	0%	0	0%
Other	1	2%	1	100%	0	0%	0	0%
Blank	5	10%	4	80%	1	20%	0	0%
TOTAL	49		34	69%	13	27%	2	4%
NTBFs	21	43%	18	86%	3	14%	0	0%
Inward Inv	2	4%	0	0%	2	100%	0	0%
Tech transfer	7	14%	4	57%	2	29%	1	14%
Other	6	12%	6	100%	0	0%	0	0%
Mixed objectives	13	27%	6	46%	6	46%	1	8%
TOTAL	49		34		13		2	

C1 DO YOU HAVE TENANTS ON SITE?

	TOTAL	Yes		No		Blank	
NORTH	125	112	90%	11	9%	2	2%
SOUTH	36	27	75%	8	22%	1	3%
TOTAL	161	139	86%	19	12%	3	2%
0-2 years	62	46	74%	15	24%	1	2%
3-5 years	39	36	92%	2	5%	1	3%
6-9 years	25	24	96%	1	4%	0	0%
10+ years	26	26	100%	0	0%	0	0%
Blank	9	7	78%	1	11%	1	11%
TOTAL	161	139	86%	19	12%	3	2%
SP (single site)	74	66	89%	7	9%	1	1%
SP (multi site)	30	24	80%	6	20%	0	0%
Incubator/innov	89	81	91%	7	8%	1	1%
Teleport	2	1	50%	1	50%	0	0%
Other	3	2	67%	0	0%	1	33%
Blank	10	10	100%	0	0%	0	0%
TOTAL	161	139	86%	19	12%	3	2%
NTBFs	79	73	92%	5	6%	1	1%
Inward Inv	10	8	80%	2	20%	0	0%
Tech transfer	17	11	65%	4	24%	2	12%
Other	15	12	80%	3	20%	0	0%
Mixed objectives	40	35	88%	5	13%	0	0%
TOTAL	161	139		19		3	

C2 DIFFERENT TYPES OF TENANT ORGANISATIONS

Percentages reflect variations from the average number of all tenants.

ALL TENANTS	TOTAL	Average no. of tenants	Size of firms						Public sector		Other	
			10 or less		11 to 50		50 plus					
NORTH	112	46	25.2	54%	8.9	19%	3.0	6%	2.4	5%	6.9	15%
SOUTH	27	27	14.4	54%	5.8	22%	3.4	13%	1.3	5%	1.8	7%
TOTAL	139	43	23.1	54%	8.3	20%	3.1	7%	2.2	5%	5.9	14%
0-2 years	46	19	14.0	73%	2.4	13%	0.7	4%	1.7	9%	0.5	3%
3-5 years	36	23	17.0	74%	3.5	15%	0.6	3%	1.1	5%	0.9	4%
6-9 years	24	47	28.3	61%	10.7	23%	2.8	6%	4.0	9%	0.9	2%
10+ years	26	110	46.0	42%	24.3	22%	10.1	9%	1.6	1%	28.4	26%
Blank	7	30	11.9	40%	4.3	14%	6.1	21%	7.4	25%	0.1	0%
TOTAL	139	43	23.1	54%	8.3	20%	3.1	7%	2.2	5%	5.9	14%
SP (single site)	66	48	28.2	59%	11.3	24%	4.1	9%	2.0	4%	2.1	4%
SP (multi site)	24	63	18.8	30%	7.1	11%	4.5	7%	4.8	8%	28.0	44%
Incubator/innov	81	52	28.4	54%	10.2	20%	2.9	6%	1.9	4%	8.7	17%
Teleport	1	28	12.0	43%	6.0	21%	6.0	21%	4.0	14%	0.0	0%
Other	2	11	0.0	0%	0.0	0%	0.0	0%	10.5	100%	0.0	0%
Blank	10	45	20.3	45%	10.3	23%	7.6	17%	1.9	4%	4.8	11%
TOTAL	139	43	23.1	54%	8.3	20%	3.1	7%	2.2	5%	5.9	14%
NTBFs	73	52	30.0	57%	9.8	19%	2.6	5%	1.0	2%	8.9	17%
Inward Inv	8	24	10.9	45%	4.6	19%	2.6	11%	0.8	3%	5.5	23%
Tech transfer	11	30	16.2	54%	3.7	12%	3.1	10%	3.5	12%	3.5	12%
Other	12	46	21.8	48%	12.0	26%	6.2	14%	5.7	12%	0.1	0%
Mixed objectives	35	29	14.2	48%	6.3	21%	3.1	10%	3.4	11%	2.5	8%
TOTAL	139	43	23.1		8.3		3.1		2.2		5.9	

C2 DIFFERENT TYPES OF TENANT ORGANISATIONS

Percentages reflect variations from the average number of domestic tenants.

DOMESTIC TENANTS	TOTAL	Average no of Domestic tenants	Size of firms						Public sector		Other	
			10 or less		11 to 50		50 plus					
NORTH	125	39	28	72%	12	31%	8	20%	6	15%	58	149%
SOUTH	36	19	15	79%	8	43%	7	39%	3	18%	7	37%
TOTAL	161	35	25	74%	11	33%	8	23%	5	15%	40	117%
0-2 years	62	14	16	115%	3	25%	2	13%	4	26%	3	21%
3-5 years	39	19	19	95%	5	27%	2	11%	5	26%	7	36%
6-9 years	25	43	27	63%	11	26%	7	15%	10	22%	7	15%
10+ years	26	108	58	54%	32	30%	19	18%	5	5%	123	114%
Blank	9	6	6	99%	4	63%	6	108%	2	27%	1	18%
TOTAL	161	35	25	74%	11	33%	8	23%	5	15%	40	117%
SP (single site)	74	41	32	78%	15	37%	8	20%	6	14%	11	26%
SP (multi site)	30	44	22	50%	9	21%	6	14%	6	13%	165	371%
Incubator/innov	89	46	31	68%	15	32%	9	20%	6	12%	88	191%
Teleport	2	13	10	80%	5	40%	6	48%	4	32%	0	0%
Other	3	7	0	0%	0	0%	0	0%	21	300%	0	0%
Blank	10	43	19	45%	11	25%	24	56%	5	11%	16	37%
TOTAL	161	35	25	74%	11	33%	8	23%	5	15%	40	117%
NTBFs	79	47	32	68%	12	27%	9	20%	3	7%	92	198%
Inward Inv	10	18	14	75%	6	35%	3	19%	3	17%	44	246%
Tech transfer	17	19	20	102%	10	53%	9	44%	13	66%	19	98%
Other	15	25	17	69%	13	52%	6	26%	5	19%	1	4%
Mixed objectives	40	25	18	73%	9	37%	8	31%	7	28%	8	31%
TOTAL	161	35	25	74%	11	33%	8	23%	5	15%	40	117%

C2 DIFFERENT TYPES OF TENANT ORGANISATIONS

Percentages reflect variations from the average number of foreign tenants.

FOREIGN TENANTS	TOTAL	Average no of for tenants	Size of firms						Public sector		Other	
			10 or less		11 to 50		50 plus					
NORTH	112	3	2	57%	1	20%	2	59%	37	1283%	1	44%
SOUTH	27	1	1	50%	1	42%	1	68%	9	675%	0	0%
TOTAL	139	3	1	56%	1	22%	2	58%	46	1781%	1	32%
0-2 years	46	1	1	89%	0	12%	0	56%	21	2542%	0	0%
3-5 years	36	2	1	62%	0	24%	1	26%	6	389%	4	200%
6-9 years	24	2	1	76%	0	6%	1	67%	10	667%	1	33%
10+ years	26	2	1	65%	1	39%	1	39%	7	325%	0	12%
Blank	7	23	8	37%	12	51%	37	163%	2	9%	0	0%
TOTAL	139	3	1	56%	1	22%	2	58%	46	1781%	1	32%
SP (single site)	66	2	1	68%	0	32%	1	44%	21	1400%	0	7%
SP (multi site)	24	8	3	42%	2	20%	4	51%	10	122%	3	40%
Incubator/innov	81	1	1	88%	0	11%	1	56%	27	2044%	0	22%
Teleport	1	3	2	67%	1	33%	0	0%	1	33%	0	0%
Other	2	0	0	0%	0	0%	0	0%	1	0%	0	0%
Blank	10	2	1	53%	1	33%	1	59%	4	235%	0	0%
TOTAL	139	3	1	56%	1	22%	2	58%	46	1781%	1	32%
NTBFs	73	2	1	86%	0	20%	1	41%	21	1278%	0	10%
Inward Inv	8	2	1	50%	1	60%	1	40%	2	100%	0	0%
Tech transfer	11	0	0	122%	0	0%	0	0%	3	3300%	0	0%
Other	12	14	5	31%	3	21%	8	59%	4	28%	0	0%
Mixed objectives	35	1	1	46%	0	10%	1	47%	16	1120%	2	114%
TOTAL	139	3	1	56%	1	22%	2	58%	46	1781%	1	32%

C3 - C4 AVERAGE EMPLOYMENT AND TRENDS

	TOTAL	Average Employment	Trends in numbers															
			Tenants								Employment							
			Increase		No change		Decrease		Not comparable		Increase		No change		Decrease		Not comparable	
NORTH	112	628	53	47%	9	8%	14	13%	36	32%	58	52%	6	5%	13	12%	35	31%
SOUTH	27	336	15	56%	3	11%	0	0%	9	33%	16	59%	1	4%	0	0%	10	37%
TOTAL	139	572	68	49%	12	9%	14	10%	45	32%	74	53%	7	5%	13	9%	45	32%
0-2 years	46	204	21	46%	3	7%	1	2%	21	46%	22	48%	1	2%	1	2%	22	48%
3-5 years	36	260	23	64%	2	6%	4	11%	7	19%	24	67%	1	3%	4	11%	7	19%
6-9 years	24	683	13	54%	1	4%	6	25%	4	17%	14	58%	1	4%	6	25%	3	13%
10+ years	26	1679	9	35%	5	19%	3	12%	9	35%	12	46%	4	15%	1	4%	9	35%
Blank	7	88	2	29%	1	14%	0	0%	4	57%	2	29%	0	0%	1	14%	4	57%
TOTAL	139	572	68	49%	12	9%	14	10%	45	32%	74	53%	7	5%	13	9%	45	32%
SP (single site)	66	536	27	41%	10	15%	7	11%	22	33%	31	47%	6	9%	7	11%	22	33%
SP (multi site)	24	1467	11	46%	1	4%	1	4%	11	46%	11	46%	0	0%	2	8%	11	46%
Incubator/innov	81	630	45	56%	6	7%	6	7%	24	30%	44	54%	5	6%	7	9%	25	31%
Teleport	1	0	0	0%	0	0%	0	0%	1	100%	0	0%	0	0%	0	0%	1	100%
Other	2	1206	0	0%	0	0%	0	0%	2	100%	0	0%	0	0%	0	0%	2	100%
Blank	10	961	9	90%	0	0%	0	0%	1	10%	9	90%	0	0%	0	0%	1	10%
TOTAL	139	572	68	49%	12	9%	14	10%	45	32%	74	53%	7	5%	13	9%	45	32%
NTBFs	73	529	38	52%	8	11%	7	10%	20	27%	43	59%	4	5%	6	8%	20	27%
Inward Inv	8	753	5	63%	1	13%	0	0%	2	25%	6	75%	0	0%	0	0%	2	25%
Tech transfer	11	799	3	27%	2	18%	1	9%	5	45%	4	36%	1	9%	2	18%	4	36%
Other	12	764	5	42%	0	0%	2	17%	5	42%	5	42%	0	0%	2	17%	5	42%
Mixed objectives	35	482	17	49%	1	3%	4	11%	13	37%	16	46%	2	6%	3	9%	14	40%
TOTAL	139	572	68	49%	12	9%	14	10%	45	32%	74	53%	7	5%	13	9%	45	32%

C5 WHAT ARE THE MAIN TYPES OF INDUSTRIAL SECTORS LOCATED ON YOUR 'SCIENCE PARK/ORGANISATIONS'

	Respondents with tenants			Averages - in percentages out of 100%							
	TOTAL	Blank	Responding	Electronics	Computer tech, soft	Engineering design	Biotech	Contract R&D	Consultancy	Business services	Other
NORTH	112	8	104	21	29	18	16	11	16	16	31
SOUTH	27	2	25	22	30	13	20	21	13	22	23
TOTAL	139	10	129	21	29	17	17	16	15	17	29
0-2 years	46	1	45	21	29	13	17	21	14	22	30
3-5 years	36	5	31	26	26	17	20	13	17	15	30
6-9 years	24	1	23	18	28	10	16	12	17	15	30
10+ years	26	3	23	15	35	15	14	10	13	15	24
Blank	7	0	7	37	26	22	18	50	18	16	27
TOTAL	139	10	129	21	29	17	17	16	15	17	29
SP (single site)	66	2	64	22	32	17	16	13	17	17	27
SP (multi site)	24	5	19	23	25	18	15	13	12	16	31
Incubator/innov	81	7	74	18	27	17	16	15	16	20	30
Teleport	1	0	1	0	30	10	0	0	20	0	40
Other	2	0	2	23	18	18	10	50	0	0	40
Blank	10	1	9	16	27	15	43	26	10	13	31
TOTAL	139	10	129	21	29	17	17	16	15	17	29
NTBFs	73	5	68	23	27	17	16	13	14	15	27
Inward Inv	8	0	8	15	21	36	9	50	13	12	39
Tech transfer	11	0	11	18	42	16	16	13	18	22	40
Other	12	1	11	23	29	10	17	10	18	19	36
Mixed objectives	35	4	31	17	32	11	24	21	16	24	26
TOTAL	139	10	129	21	29	17	17	16	15	17	29

C5b RESPONDING SCIENCE PARKS WITH TENANTS INDICATING NOMINAL INDUSTRY CLUSTERS

Where one industry sector represents 50% or more of the tenant population

	TOTAL RESPONDENTS	Total indicating clusters		Number of respondents indicating clusters															
				Electronics		Computer tech, soft		Engineering design		Biotech		Contract R&D		Consultancy		Business services		Other	
Belgium	5	3	60%	0	0%	1	33%	0	0%	0	0%	0	0%	0	0%	1	33%	1	33%
Germany	49	20	41%	6	30%	5	25%	3	15%	0	0%	0	0%	1	5%	1	5%	4	20%
Denmark	4	2	50%	0	0%	1	50%	0	0%	1	50%	0	0%	0	0%	0	0%	0	0%
Spain	17	7	50%	1	14%	2	29%	0	0%	0	0%	1	14%	0	0%	1	14%	2	29%
France	23	6	26%	1	17%	2	33%	0	0%	0	0%	1	17%	0	0%	1	17%	2	33%
Greece	2	1	50%	0	0%	1	100%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
Italy	10	3	30%	0	0%	1	33%	0	0%	2	67%	0	0%	0	0%	0	0%	0	0%
Ireland	2	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
Netherlands	3	1	33%	0	0%	0	0%	0	0%	1	100%	0	0%	0	0%	0	0%	0	0%
Portugal	3	1	33%	0	0%	0	0%	0	0%	0	0%	1	100%	0	0%	0	0%	0	0%
UK	24	10	42%	0	0%	4	40%	2	20%	0	0%	0	0%	1	10%	1	10%	2	20%
TOTAL	139	54	39%	8	5% a	17	11%	5	3%	4	2%	3	2%	2	1%	5	3%	11	7%
					15% b		31%		9%		7%		6%		4%		9%		20%

Notes

(a): Percentage out of total respondents with tenants (139)
(b): Percentage out of respondents indicating clusters (54)

C5b LOCATION OF INDUSTRY CLUSTERS IN EUROPEAN SCIENCE PARKS		
COUNTRY	SCIENCE PARK	CITY
BELGIUM (B)	CHARLEROI- IGRETEC	CHARLEROI 6000
	IDYES	BRUXELLES B-1030
	PARC SCIENTIFIQUE DE LOUVAIN LA NEUVE	LOUVAIN LA NEUVE B-1348
GERMANY (D)	BIC STENDAL - INNOVATIONS- UND GRUNDERZAENTRUM ALTMARK	STENDAL D-39576
	CENTRUM F. INNOVATION U. TECHNOLOGIE (CEFITOS)	OSNABRUCK
	ENTWICKLUNGSGESELLSCHAFT OSTHOLSTEIN MBH	EUTIN
	GRUNDER - UND TECHNOLOGIEZENTRUM SOLINGEN GMBH	SOLINGEN-OHLIGS
	GRUNDER- U. INNOVATIONSZENTRUM FREIBERG/ BRAND-ERBISDORF GMBH BRAND-ER	FREIBERG
	IGZ INNOVATIONS - UND GRUNDERZENTRUM BERLIN-ADLERSHOF	BERLIN
	IGZ NURNBERG-FURTH-ERLANGEN GMBH	ERLANGEN
	INTER. TRANSFER- U. SERVICE-CENTER BAESWEILER GMBH (ITS)	BAESWEILER
	MESCHEDER INNOVATIONS - UND TECHNOLOGIEZENTRUM GMBH	MESCHEDE
	TECHNOLOGIE PARK PADERBORN GMBH	PADERBORN
	TECHNOLOGIE - UND GRUNDER-ZENTRUM ILMENAU	ILMENAU 2
	TECHNOLOGIEFABRIK KARLSRUHE	KARLSRUHE 1
	TECHNOLOGIEHOF ROSENHEIM TGH BETRIEBSGELLSCHAFT MBH	ROSENHEIM
	TECHNOLOGIEORIENTIERTES GRUNDERZENTRUM RIESA	ZEITHAIN
	TECHNOLOGIEPARK MEPPEN GMBH	MEPPEN
	TECHNOLOGIEZENTRUM FUR MEDIZIN UND PHARMAZIE ATECHNOMEDICAL	CASTROP-RAUXEL

C5b LOCATION OF INDUSTRY CLUSTERS IN EUROPEAN SCIENCE PARKS		
COUNTRY	SCIENCE PARK	CITY
GERMANY (D)	TECHNOLOGIEZENTRUM TELTOW GMBH	TELTOW
	TECHNOLOGIE-PARK SYKE GMBH	SYKE
	TIG TECHNOLOGIE - INNOVATIONS UND GRUNDERZENTRUM GMBH	NEUBRANDENBURG
	WARTENBERGER INNOVATIONS- UND BILDUNGSZENTRUM GMBH	BERLIN 13059
DENMARK (DK)	FORSKERPARKEN FYN	ODENSE M
	SYMBION SCIENCE PARK	COPENHAGEN
SPAIN (E)	CEEI DE ALCOY	ALCOY E-03801 (ALICANTE)
	CEEI DE CASTILLA Y LEON SA	BOECILLO (VALLADOLID) E-47151
	CEEI DE ELCHE	ELCHE E-03205 (ALICANTE)
	PARQUE TECNOLOGICO DE ASTURIAS	ASTURIAS 33428
	PARQUE TECNOLOGICO DE MADRID - TRES CANTOS	TRES CANTOS - MADRID E-28760
	PARQUE TECNOLOGICO DEL PAIS VASCO - ZAMUDIO	ZAMUDIO - VISCAYA 48016
	VALENCIA PARC TECNOLOGIC SA	PATERNA 46980 - VALENCIA
FRANCE (F)	ANTICIPA TECHNOPOLE DE LANNION-TREGOR	LANNION
	CEEI SYNERGIE	FLORANGE - METZ F-57000
	GIE TECHNOPOLE NEVERS - MAGNY COURS	MAGNY-COURS 58470 - NEVERS
	RENNES ATALANTE SCIENCE PARK	RENNES
	TECHNOPARC DU PAYS DE GEX	SAINT GENIS POUILLY 01630 - GEX
	TOURS TECHNOPOLE VAL DE LOIRE	TOURS CEDEX 37200

C5b LOCATION OF INDUSTRY CLUSTERS IN EUROPEAN SCIENCE PARKS		
COUNTRY	SCIENCE PARK	CITY
GREECE (G)	SCIENCE & TECHNOLOGY PARK (STEP-C)	HERAKLION
ITALY (I)	PARCO TECNOLOGICO AGROALIMENTARE DELL'UMBRIA	PANTALLA DI TODI (PG) 06050
	SCIENCE PARK RAF SPA	MILANO 20123
	TECHNOPOLIS CSATA NOVUS ORTUS	VALENZANO (BA) I-70010
NETHERLANDS (NL)	ZERNIKE SCIENCE PARK CENTER	GRONINGEN 9747 AN
PORTUGAL (P)	TAGUSPARK - LISBON SCIENCE AND TECHNOLOGY PARK	OERIAS P-2780
UNITED KINGDOM (UK)	ABERDEEN SCIENCE AND TECHNOLOGY PARK	ABERDEEN
	ASTON SCIENCE PARK	BIRMINGHAM
	CRANFIELD TECHNOLOGY PARK	CRANFIELD BEDFORD
	INNOVATION CENTRE NORIBIC	LONDONDERRY BT48 0NA
	LISTERHILLS SCIENCE PARK	BRADFORD WEST YORKSHIRE
	NEWCASTLE TECHNOPOLE CENTRAL BUSINESS & TECHNOLOGY PARK	NEWCASTLE UPON TYNE
	SNOWDONIA TECHNOPOLE LTD	CAERNARFON GWYNEDD LL57 2DE
	UNIVERSITY COLLEGE LONDON	LONDON
	UNIVERSITY OF SWANSEA INNOVATION CENTRE	SWANSEA
	YORK SCIENCE PARK	YORK

C6 CURRENT PROVISION OF THE FOLLOWING COMMUNICATION SERVICES ON A SHARED BASIS TO TENANTS

	TOTAL	Blank	Switchboard		Fax		E.mail		Access to DBs		Videoconf		Modem access		ISDN		Satellite		LAN		Ded line HEI		Other	
NORTH	112	9	92	82%	98	88%	45	40%	64	57%	17	15%	47	42%	63	56%	9	8%	63	56%	34	30%	15	13%
SOUTH	27	0	23	85%	24	89%	16	59%	21	78%	8	30%	18	67%	9	33%	5	19%	12	44%	11	41%	9	33%
TOTAL	139	9	115	83%	122	88%	61	44%	85	61%	25	18%	65	47%	72	52%	14	10%	75	54%	45	32%	24	17%
0-2 years	46	2	35	76%	40	87%	25	54%	30	65%	14	30%	25	54%	29	63%	9	20%	30	65%	18	39%	10	22%
3-5 years	36	2	32	89%	33	92%	11	31%	19	53%	5	14%	15	42%	16	44%	2	6%	18	50%	9	25%	3	8%
6-9 years	24	1	20	83%	23	96%	9	38%	16	67%	0	0%	7	29%	12	50%	1	4%	12	50%	6	25%	6	25%
10+ years	26	4	21	81%	20	77%	12	46%	15	58%	4	15%	13	50%	11	42%	2	8%	11	42%	11	42%	3	12%
Blank	7	0	7	100%	6	86%	4	57%	5	71%	2	29%	5	71%	4	57%	0	0%	4	57%	1	14%	2	29%
TOTAL	139	9	115	83%	122	88%	61	44%	85	61%	25	18%	65	47%	72	52%	14	10%	75	54%	45	32%	24	17%
SP (single site)	66	5	55	83%	58	88%	30	45%	41	62%	15	23%	29	44%	35	53%	9	14%	31	47%	25	38%	11	17%
SP (multi site)	24	2	18	75%	18	75%	8	33%	16	67%	3	13%	6	25%	13	54%	2	8%	14	58%	9	38%	3	13%
Incubator/innov	81	3	69	85%	74	91%	37	46%	57	70%	14	17%	44	54%	44	54%	8	10%	44	54%	26	32%	16	20%
Teleport	1	0	1	100%	1	100%	1	100%	1	100%	1	100%	1	100%	1	100%	1	100%	1	100%	1	100%	1	100%
Other	2	1	1	50%	1	50%	0	0%	0	0%	0	0%	0	0%	1	50%	0	0%	0	0%	0	0%	0	0%
Blank	10	0	9	90%	9	90%	6	60%	6	60%	3	30%	5	50%	4	40%	1	10%	7	70%	5	50%	4	40%
TOTAL	139	9	115	83%	122	88%	61	44%	85	61%	25	18%	65	47%	72	52%	14	10%	75	54%	45	32%	24	17%
NTBFs	73	3	64	88%	67	92%	31	42%	42	58%	11	15%	37	51%	42	58%	5	7%	40	55%	18	25%	9	12%
Inward Inv	8	2	4	50%	5	63%	1	13%	4	50%	1	13%	3	38%	2	25%	2	25%	3	38%	3	38%	1	13%
Tech transfer	11	0	9	82%	10	91%	6	55%	8	73%	1	9%	4	36%	6	55%	0	0%	7	64%	6	55%	1	9%
Other	12	0	11	92%	10	83%	10	83%	10	83%	3	25%	8	67%	6	50%	2	17%	7	58%	2	17%	3	25%
Mixed objectives	35	4	27	77%	30	86%	13	37%	21	60%	9	26%	13	37%	16	46%	5	14%	18	51%	16	46%	10	29%
TOTAL	139	9	115	83%	122	88%	61	44%	85	61%	25	18%	65	47%	72	52%	14	10%	75	54%	45	32%	24	17%

D1 SP MANAGERS' CURRENT COMMUNICATIONS AND THE IMPORTANCE

AVERAGE IMPORTANCE OF COMMUNICATION WITH DIFFERENT GROUPS

COMMUNICATIONS	TOTAL	Companies & Orgs on SP	Other SP Managers	Other SP companies	Other companies	HEI/RIs	Government & Dev agency	Representative organisations	Financial community	Other
NORTH	125	9	6	4	6	6	7	5	6	7
SOUTH	36	8	6	5	7	7	8	7	7	9
TOTAL	161	9	6	4	6	7	7	6	6	7
0-2 years	62	9	6	5	6	7	7	6	6	10
3-5 years	39	9	6	5	6	7	7	6	7	10
6-9 years	25	9	6	5	6	6	7	5	6	7
10+ years	26	9	5	3	6	6	6	5	5	5
Blank	9	7	5	3	6	5	8	6	7	5
TOTAL	161	9	6	4	6	7	7	6	6	7
SP (single site)	74	9	5	4	6	7	7	6	5	6
SP (multi site)	30	9	6	4	6	6	6	5	6	0
Incubator/innov	89	9	6	4	6	6	7	6	6	9
Teleport	2	10	0	0	0	10	0	0	0	0
Other	3	4	4	2	3	5	6	4	6	5
Blank	10	9	7	6	7	7	8	7	6	0
TOTAL	161	9	6	4	6	7	7	6	6	7
NTBFs	79	9	6	5	6	6	7	6	6	8
Inward Inv	10	8	5	1	6	6	7	4	5	0
Tech transfer	17	9	6	5	6	7	7	6	6	7
Other	15	9	6	5	7	6	8	6	7	0
Mixed objectives	40	8	6	4	6	7	7	6	5	7
TOTAL	161	9	6	4	6	7	7	6	6	7

D1 SP MANAGERS' CURRENT COMMUNICATIONS AND THE IMPORTANCE

COMMUNICATION AND IMPORTANCE AT DIFFERENT SPATIAL LEVELS

AT A LOCAL LEVEL			Number of respondents who ticked as important (X)																	
LOCAL	TOTAL	Average importance	Companies on SP		Managers - other SP		Co.s/Orgs other SP		Other companies		HEI/RIs		Govt/dev agencies		Represent. orgs		Financial community		Other	
NORTH	125	8	98	78%	35	28%	31	25%	77	62%	74	59%	77	62%	58	46%	74	59%	2	2%
SOUTH	36	8	24	67%	2	6%	3	8%	24	67%	24	67%	17	47%	20	56%	21	58%	1	3%
TOTAL	161	8	122	76%	37	23%	34	21%	101	63%	98	61%	94	58%	78	48%	95	59%	3	2%
0-2 years	62	8	42	68%	12	19%	13	21%	39	63%	31	50%	30	48%	29	47%	34	55%	1	2%
3-5 years	39	8	32	82%	12	31%	10	26%	27	69%	28	72%	24	62%	22	56%	24	62%	1	3%
6-9 years	25	8	21	84%	5	20%	4	16%	15	60%	19	76%	17	68%	13	52%	18	72%	0	0%
10+ years	26	8	20	77%	7	27%	5	19%	17	65%	16	62%	19	73%	11	42%	15	58%	1	4%
Blank	9	7	7	78%	1	11%	2	22%	3	33%	4	44%	4	44%	3	33%	4	44%	0	0%
TOTAL	161	8	122	76%	37	23%	34	21%	101	63%	98	61%	94	58%	78	48%	95	59%	3	2%
SP (single site)	74	8	54	73%	13	18%	11	15%	45	61%	44	59%	42	57%	33	45%	40	54%	1	1%
SP (multi site)	30	7	25	83%	11	37%	9	30%	21	70%	20	67%	20	67%	16	53%	20	67%	0	0%
Incubator/innov	89	8	70	79%	21	24%	21	24%	57	64%	55	62%	53	60%	42	47%	53	60%	2	2%
Teleport	2	10	1	50%	0	0%	0	0%	0	0%	1	50%	0	0%	0	0%	0	0%	0	0%
Other	3	5	1	33%	0	0%	1	33%	1	33%	2	67%	2	67%	2	67%	2	67%	0	0%
Blank	10	8	8	80%	3	30%	2	20%	7	70%	7	70%	7	70%	7	70%	7	70%	0	0%
TOTAL	161	8	122	76%	37	23%	34	21%	101	63%	98	61%	94	58%	78	48%	95	59%	3	2%
NTBFs	79	8	68	86%	20	25%	20	25%	56	71%	50	63%	52	66%	41	52%	54	68%	2	3%
Inward Inv	10	7	6	60%	1	10%	1	10%	6	60%	6	60%	5	50%	2	20%	3	30%	0	0%
Tech transfer	17	8	12	71%	6	35%	5	29%	13	76%	11	65%	10	59%	11	65%	11	65%	1	6%
Other	15	8	10	67%	4	27%	4	27%	7	47%	8	53%	8	53%	7	47%	7	47%	0	0%
Mixed objectives	40	7	26	65%	6	15%	4	10%	19	48%	23	58%	19	48%	17	43%	20	50%	0	0%
TOTAL	161	8	122		37		34		101		98		94		78		95		3	

D1 SP MANAGERS' CURRENT COMMUNICATIONS AND THE IMPORTANCE

COMMUNICATION AND IMPORTANCE AT DIFFERENT SPATIAL LEVELS

AT A REGIONAL LEVEL			Number of respondents who ticked as important (X)															
REGIONAL	TOTAL	Average importance	Companies on SP	Managers - other SP		Co.s/Orgs other SP		Other companies		HEI/RIs		Govt/dev agencies		Represent. orgs		Financial community		Other	
NORTH	125	7		67	54%	50	40%	87	70%	78	62%	86	69%	68	54%	76	61%	3	2%
SOUTH	36	8		8	22%	6	17%	26	72%	25	69%	27	75%	19	53%	18	50%	1	3%
TOTAL	161	7		75	47%	56	35%	113	70%	103	64%	113	70%	87	54%	94	58%	4	2%
0-2 years	62	7		31	50%	23	37%	41	66%	39	63%	45	73%	34	55%	38	61%	1	2%
3-5 years	39	7		18	46%	14	36%	31	79%	26	67%	28	72%	24	62%	23	59%	1	3%
6-9 years	25	7		15	60%	11	44%	21	84%	19	76%	19	76%	12	48%	15	60%	0	0%
10+ years	26	6		9	35%	7	27%	14	54%	12	46%	14	54%	11	42%	12	46%	1	4%
Blank	9	7		2	22%	1	11%	6	67%	7	78%	7	78%	6	67%	6	67%	1	11%
TOTAL	161	7		75	47%	56	35%	113	70%	103	64%	113	70%	87	54%	94	58%	4	2%
SP (single site)	74	7		35	47%	22	30%	52	70%	47	64%	50	68%	40	54%	43	58%	1	1%
SP (multi site)	30	6		14	47%	13	43%	21	70%	18	60%	21	70%	17	57%	18	60%	0	0%
Incubator/innov	89	7		41	46%	33	37%	63	71%	58	65%	64	72%	45	51%	54	61%	2	2%
Teleport	2	0		0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
Other	3	7		1	33%	0	0%	2	67%	2	67%	2	67%	2	67%	2	67%	1	33%
Blank	10	8		6	60%	4	40%	8	80%	7	70%	9	90%	7	70%	5	50%	0	0%
TOTAL	161	7		75	47%	56	35%	113	70%	103	64%	113	70%	87	54%	94	58%	4	2%
NTBFs	79	7		41	52%	35	44%	60	76%	53	67%	57	72%	44	56%	51	65%	2	3%
Inward Inv	10	6		2	20%	1	10%	6	60%	4	40%	7	70%	5	50%	5	50%	0	0%
Tech transfer	17	7		11	65%	6	35%	12	71%	13	76%	14	82%	9	53%	10	59%	2	12%
Other	15	7		6	40%	5	33%	10	67%	10	67%	10	67%	8	53%	9	60%	0	0%
Mixed objectives	40	7		15	38%	9	23%	25	63%	23	58%	25	63%	21	53%	19	48%	0	0%
TOTAL	161	7		75		56		113		103		113		87		94		4	

D1 SP MANAGERS' CURRENT COMMUNICATIONS AND THE IMPORTANCE

AT A NATIONAL LEVEL			Number of respondents who ticked as important (X)															
NATIONAL	TOTAL	Average importance	Companies on SP	Managers - other SP		Co.s/Orgs other SP		Other companies		HEI/RIs		Govt/dev agencies		Represent. orgs		Financial community		Other	
NORTH	125	5		77	62%	64	51%	74	59%	66	53%	69	55%	50	40%	54	43%	1	1%
SOUTH	36	6		28	78%	18	50%	21	58%	21	58%	25	69%	17	47%	16	44%	2	6%
TOTAL	161	6		105	65%	82	51%	95	59%	87	54%	94	58%	67	42%	70	43%	3	2%
0-2 years	62	6		38	61%	33	53%	39	63%	35	56%	36	58%	30	48%	27	44%	0	0%
3-5 years	39	6		29	74%	22	56%	22	56%	22	56%	26	67%	17	44%	19	49%	1	3%
6-9 years	25	5		17	68%	10	40%	14	56%	12	48%	13	52%	9	36%	10	40%	1	4%
10+ years	26	6		15	58%	9	35%	15	58%	13	50%	14	54%	9	35%	12	46%	0	0%
Blank	9	5		6	67%	8	89%	5	56%	5	56%	5	56%	2	22%	2	22%	1	11%
TOTAL	161	6		105	65%	82	51%	95	59%	87	54%	94	58%	67	42%	70	43%	3	2%
SP (single site)	74	6		48	65%	35	47%	45	61%	36	49%	43	58%	31	42%	30	41%	1	1%
SP (multi site)	30	5		18	60%	17	57%	18	60%	17	57%	16	53%	12	40%	15	50%	0	0%
Incubator/innov	89	6		59	66%	43	48%	51	57%	51	61%	55	62%	37	42%	42	47%	2	2%
Teleport	2	0		0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
Other	3	4		1	33%	3	100%	2	67%	2	67%	2	67%	1	33%	1	33%	1	33%
Blank	10	6		8	80%	5	50%	8	80%	7	70%	6	60%	6	60%	5	50%	0	0%
TOTAL	161	6		105	65%	82	51%	95	59%	87	54%	94	58%	67	42%	70	43%	3	2%
NTBFs	79	6		52	66%	41	52%	52	66%	45	57%	52	66%	39	49%	40	51%	1	1%
Inward Inv	10	6		5	50%	4	40%	7	70%	4	40%	4	40%	3	30%	5	50%	0	0%
Tech transfer	17	5		13	76%	12	71%	11	65%	8	47%	10	59%	7	41%	6	35%	1	6%
Other	15	5		11	73%	7	47%	5	33%	7	47%	6	40%	6	40%	5	33%	0	0%
Mixed objectives	40	5		24	60%	18	45%	20	50%	23	58%	22	55%	12	30%	14	35%	1	3%
TOTAL	161	6		105		82		95		87		94		67		70		3	

D1 SP MANAGERS' CURRENT COMMUNICATIONS AND THE IMPORTANCE

AT THE EC LEVEL			Number of respondents who ticked as important (X)															
EC	TOTAL	Average importance	Companies on SP	Managers - other SP		Cos/Orgs other SP		Other companies		HEI/RIs		Govt/dev agencies		Represent. orgs		Fin com		Other
NORTH	125	3		34	27%	24	19%	40	32%	34	27%	29	23%	22	18%	22	18%	0
SOUTH	36	5		11	31%	7	19%	10	28%	9	25%	8	22%	8	22%	7	19%	0
TOTAL	161	3		45	28%	31	19%	50	31%	43	27%	37	23%	30	19%	29	18%	0
0-2 years	62	3		20	32%	11	18%	19	31%	17	27%	16	26%	16	26%	13	21%	0
3-5 years	39	5		8	21%	6	15%	11	28%	10	26%	9	23%	5	13%	4	10%	0
6-9 years	25	3		5	20%	6	24%	7	28%	4	16%	4	16%	3	12%	4	16%	0
10+ years	26	2		10	38%	7	27%	10	38%	10	38%	8	31%	6	23%	8	31%	0
Blank	9	4		2	22%	1	11%	3	33%	2	22%	0	0%	0	0%	0	0%	0
TOTAL	161	3		45	28%	31	19%	50	31%	43	27%	37	23%	30	19%	29	18%	0
SP (single site)	74	3		19	26%	14	19%	23	31%	19	26%	16	22%	16	22%	15	20%	0
SP (multi site)	30	3		11	37%	9	30%	11	37%	15	50%	9	30%	6	20%	6	20%	0
Incubator/innov	89	3		24	27%	17	19%	26	29%	22	25%	21	24%	16	18%	16	18%	0
Teleport	2	0		0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0
Other	3	1		1	33%	0	0%	1	33%	1	33%	0	0%	0	0%	0	0%	0
Blank	10	5		5	50%	3	30%	6	60%	4	40%	4	40%	3	30%	3	30%	0
TOTAL	161	3		45	28%	31	19%	50	31%	43	27%	37	23%	30	19%	29	18%	0
NTBFs	79	4		29	37%	18	23%	30	38%	25	32%	25	32%	17	22%	16	20%	0
Inward Inv	10	2		1	10%	1	10%	3	30%	3	30%	1	10%	2	20%	2	20%	0
Tech transfer	17	1		5	29%	4	24%	5	29%	5	29%	4	24%	4	24%	5	29%	0
Other	15	5		4	27%	3	20%	3	20%	2	13%	1	7%	1	7%	1	7%	0
Mixed objectives	40	4		6	15%	5	13%	9	23%	8	20%	6	15%	6	15%	5	13%	0
TOTAL	161	3		45		31		50		43		37		30		29		0

D2 ON AVERAGE, HOW OFTEN DO YOU USE THE FOLLOWING FORMS OF COMMUNICATION										
	TOTAL	No response	Meetings in SP	Visits outside SP	Letters	Calls	Faxes	Email	Conference etc	Other
NORTH	125	37	7	5	45	116	33	13	2	6
SOUTH	36	11	6	5	41	234	61	49	6	0
TOTAL	161	48	7	5	44	143	40	22	2	6
0-2 years	62	24	9	5	35	78	26	9	3	11
3-5 years	39	11	5	4	26	169	59	7	1	9
6-9 years	25	3	7	3	45	153	36	18	4	4
10+ years	26	6	8	9	47	239	49	42	2	0
Blank	9	4	2	1	229	112	36	3	1	5
TOTAL	161	48	7	5	44	143	40	22	2	6
SP (single site)	74	23	7	5	38	177	41	23	3	9
SP (multi site)	30	12	8	5	79	147	22	31	2	5
Incubator/innov	89	26	8	5	40	131	36	25	3	4
Teleport	2	0	1	1	5	10	10	30	10	1
Other	3	2	1	0	100	200	150	0	0	0
Blank	10	2	6	3	44	127	52	35	1	5
TOTAL	161	48	7	5	44	143	40	22	2	6
NTBFs	79	20	10	5	31	122	31	25	1	0
Inward Inv	10	4	2	1	14	83	14	10	1	0
Tech transfer	17	7	3	6	32	89	33	26	1	0
Other	15	5	2	2	130	91	29	18	5	1
Mixed objectives	40	12	5	4	55	233	71	16	5	7
TOTAL	161	48	7	5	44	143	40	22	2	6

Note: Average number per week

D3 INDICATE THE ORGANISATIONS AND NETWORKS IN WHICH YOU PARTICIPATE AND THEIR VALUE

	TOTAL	National SP Assocation			Internatl SP Association			Incubator Association			EBN			BCNET			SPRINT			TII/TRN			OTHER
		Members		Value	Members		Value	Members		Value	Members		Value	Members		Value	Members		Value	Members		Value	Members
NORTH	125	93	74%	4	30	24%	3	25	20%	3	21	17%	4	15	12%	2	24	19%	3	23	18%	2	10
SOUTH	36	17	47%	4	14	39%	3	7	19%	4	20	56%	4	5	14%	4	7	19%	4	16	44%	3	1
TOTAL	161	110	68%	4	44	27%	3	32	20%	3	41	25%	4	20	12%	3	31	19%	3	39	24%	3	33
0-2 years	62	40	65%	4	14	23%	3	6	10%	4	16	26%	5	5	8%	3	10	16%	4	12	19%	3	9
3-5 years	39	26	67%	4	12	31%	3	9	23%	3	11	28%	3	5	13%	2	8	21%	3	7	18%	2	5
6-9 years	25	20	80%	4	5	20%	2	7	28%	4	5	20%	4	4	16%	2	3	12%	4	8	32%	4	5
10+ years	26	19	73%	4	11	42%	3	8	31%	4	5	19%	3	3	12%	2	8	31%	4	9	35%	3	9
Blank	9	5	56%	3	2	22%	3	2	22%	3	4	44%	4	3	33%	3	2	22%	4	3	33%	2	2
TOTAL	161	110	68%	4	44	27%	3	32	20%	3	41	25%	4	20	12%	3	31	19%	3	39	24%	3	33
SP (single site)	74	57	77%	4	25	34%	2	12	16%	4	9	12%	3	6	8%	2	18	24%	3	17	23%	2	11
SP (multi site)	30	22	73%	4	10	33%	2	6	20%	3	4	13%	3	4	13%	2	7	23%	4	7	23%	2	5
Incubator/innov	89	56	63%	3	22	25%	2	24	27%	4	33	37%	4	14	16%	3	15	17%	3	26	29%	3	21
Teleport	2	0	0%	0	0	0%	0	0	0%	0	0	0%	0	0	0%	0	0	0%	0	0	0%	0	1
Other	3	2	67%	3	1	33%	3	1	33%	4	0	0%	0	0	0%	0	0	0%	0	0	0%	0	0
Blank	10	8	80%	5	5	50%	5	3	30%	5	1	10%	5	1	10%	1	4	40%	4	3	30%	1	1
TOTAL	161	110	68%	4	44	27%	3	32	20%	3	41	25%	4	20	12%	3	31	19%	3	39	24%	3	33
NTBFs	79	60	76%	3	15	19%	3	15	19%	4	24	30%	4	9	11%	2	16	20%	3	17	22%	3	16
Inward Inv	10	4	40%	3	2	20%	2	1	10%	2	1	10%	5	2	20%	3	3	30%	3	2	20%	3	0
Tech transfer	17	13	76%	4	6	35%	3	2	12%	4	1	6%	3	1	6%	4	3	18%	4	4	24%	2	1
Other	15	5	33%	4	4	27%	3	6	40%	3	7	47%	4	6	40%	3	1	7%	5	7	47%	3	4
Mixed objectives	40	28	70%	4	17	43%	3	8	20%	4	8	20%	5	2	5%	2	8	20%	3	9	23%	3	9
TOTAL	161	110		4	44		3	32		3	41		4	20		3	31		3	39		3	33

Note: Scale use 1-5, where 5 is good value

D4 ORGANISATIONS WITH WHICH YOU WOULD LIKE TO ESTABLISH CLOSER LINKS							
	TOTAL	Nationally		Within EC		Outside EC	
NORTH	125	29	23%	39	31%	23	18%
SOUTH	36	13	36%	15	42%	8	22%
TOTAL	161	42	26%	54	34%	31	19%
0-2 years	62	19	31%	24	39%	14	23%
3-5 years	39	8	21%	9	23%	7	18%
6-9 years	25	6	24%	10	40%	4	16%
10+ years	26	6	23%	10	38%	4	15%
Blank	9	3	33%	1	11%	2	22%
TOTAL	161	42	26%	54	34%	31	19%
SP (single site)	74	17	23%	28	38%	12	16%
SP (multi site)	30	8	27%	12	40%	9	30%
Incubator/innov	89	26	29%	26	29%	16	18%
Teleport	2	2	100%	2	100%	0	0%
Other	3	1	33%	1	33%	1	33%
Blank	10	2	20%	4	40%	2	20%
TOTAL	161	42	26%	54	34%	31	19%
NTBFs	79	22	28%	27	34%	16	20%
Inward Inv	10	4	40%	4	40%	3	30%
Tech transfer	17	4	24%	6	35%	5	29%
Other	15	5	33%	3	20%	1	7%
Mixed objectives	40	7	18%	14	35%	6	15%
TOTAL	161	42		54		31	

E1 ABOUT YOUR NEEDS FOR INFORMATION - ADVICE - ASSISTANCE

ALL areas of advice or expertise that you would like to gain from other Science Parks

	TOTAL	Links with HEI/RIs		Rental agreements		Site maintenance		Sources of technology		Potential Cust/distrib		Tech transfer		Marketing strategy		Legal issues		Obtaining Finance		Marketing assistance		Business planning		Focal point		Other	
NORTH	125	47	38%	24	19%	21	17%	69	55%	58	46%	73	58%	62	50%	24	19%	67	54%	46	37%	24	19%	48	38%	6	5%
SOUTH	36	26	72%	10	28%	12	33%	26	72%	26	72%	30	83%	22	61%	8	22%	24	67%	16	44%	17	47%	22	61%	2	6%
TOTAL	161	73	45%	34	21%	33	20%	95	59%	84	52%	103	64%	84	52%	32	20%	91	57%	62	39%	41	25%	70	43%	8	5%
0-2 years	62	33	53%	16	26%	19	31%	41	66%	29	47%	41	66%	37	60%	14	23%	39	63%	23	37%	18	29%	28	45%	1	2%
3-5 years	39	15	38%	7	18%	5	13%	22	56%	21	54%	23	59%	21	54%	6	15%	18	46%	20	51%	12	31%	15	38%	0	0%
6-9 years	25	11	44%	4	16%	3	12%	11	44%	15	60%	17	68%	11	44%	4	16%	17	68%	9	36%	3	12%	11	44%	1	4%
10+ years	26	11	42%	5	19%	5	19%	15	58%	15	58%	17	65%	13	50%	6	23%	12	46%	8	31%	6	23%	14	54%	1	4%
Blank	9	3	33%	2	22%	1	11%	6	67%	4	44%	5	56%	2	22%	2	22%	5	56%	2	22%	2	22%	2	22%	0	0%
TOTAL	161	73	45%	34	21%	33	20%	95	59%	84	52%	103	64%	84	52%	32	20%	91	57%	62	39%	41	25%	70	43%	8	5%
SP (single site)	74	39	53%	20	27%	17	23%	40	54%	41	55%	49	66%	39	53%	14	19%	41	55%	23	31%	16	22%	34	46%	5	7%
SP (multi site)	30	11	37%	3	10%	4	13%	18	60%	12	40%	17	57%	13	43%	8	27%	18	60%	11	37%	5	17%	13	43%	0	0%
Incubator/innov	89	42	47%	18	20%	16	18%	52	58%	47	53%	57	64%	41	46%	16	18%	54	61%	34	38%	29	33%	33	37%	7	8%
Teleport	2	1	50%	1	50%	2	100%	2	100%	1	50%	2	100%	2	100%	2	100%	2	100%	2	100%	2	100%	2	100%	1	50%
Other	3	0	0%	0	0%	0	0%	1	33%	1	33%	0	0%	0	0%	0	0%	1	33%	0	0%	0	0%	0	0%	0	0%
Blank	10	3	30%	0	0%	2	20%	8	80%	6	60%	5	50%	7	70%	1	10%	4	40%	7	70%	3	30%	5	50%	0	0%
TOTAL	161	73	45%	34	21%	33	20%	95	59%	84	52%	103	64%	84	52%	32	20%	91	57%	62	39%	41	25%	70	43%	8	5%
NTBFs	79	29	37%	17	22%	18	23%	45	57%	43	54%	49	62%	39	49%	13	16%	43	54%	35	44%	21	27%	30	38%	1	1%
Inward Inv	10	6	60%	3	30%	3	30%	8	80%	6	60%	8	80%	5	50%	2	20%	6	60%	1	10%	3	30%	3	30%	0	0%
Tech transfer	17	10	59%	2	12%	2	12%	7	41%	6	35%	12	71%	8	47%	4	24%	8	47%	5	29%	3	18%	6	35%	1	6%
Other	15	7	47%	4	27%	4	27%	9	60%	7	47%	9	60%	7	47%	5	33%	8	53%	6	40%	5	33%	8	53%	1	7%
Mixed objectives	40	21	53%	8	20%	6	15%	26	65%	22	55%	25	63%	25	63%	8	20%	26	65%	15	38%	6	15%	23	58%	2	5%
TOTAL	161	73		34		33		95		84		103		84		32		91		62		41		70		8	

E1 ABOUT YOUR NEEDS FOR INFORMATION - ADVICE - ASSISTANCE

TWO MOST IMPORTANT AREAS of advice or expertise that you would like to gain from other Science Parks

	TOTAL	Links with HEI/RIs		Rental agreements		Site maintenance		Sources of technology		Potential Cust/distrib		Tech transfer		Marketing strategy		Legal issues		Obtaining Finance		Marketing assistance		Business planning		Focal point		Other	
NORTH	125	19	15%	6	5%	7	6%	17	14%	19	15%	31	25%	11	10%	2	2%	21	17%	6	5%	5	4%	8	6%	3	2%
SOUTH	36	8	22%	0	0%	0	0%	6	17%	11	31%	13	36%	2	6%	0	0%	12	33%	4	11%	2	6%	4	11%	1	3%
TOTAL	161	27	17%	6	4%	7	4%	23	14%	30	19%	44	27%	15	9%	2	1%	33	20%	10	6%	7	4%	12	7%	6	4%
0-2 years	62	11	18%	3	5%	4	6%	9	15%	11	18%	18	29%	7	11%	1	2%	17	27%	3	5%	1	2%	3	5%	2	3%
3-5 years	39	7	18%	0	0%	0	0%	9	23%	6	15%	8	21%	4	10%	1	3%	6	15%	6	15%	2	5%	5	13%	0	0%
6-9 years	25	2	8%	0	0%	2	8%	3	12%	6	24%	11	44%	0	0%	0	0%	7	28%	1	4%	2	8%	3	12%	1	4%
10+ years	26	6	23%	1	4%	1	4%	2	8%	4	15%	4	15%	3	12%	0	0%	2	8%	0	0%	2	8%	0	0%	1	4%
Blank	9	1	11%	2	22%	0	0%	0	0%	3	33%	3	33%	1	11%	0	0%	1	11%	0	0%	0	0%	1	11%	0	0%
TOTAL	161	27	17%	6	4%	7	4%	23	14%	30	19%	44	27%	15	9%	2	1%	33	20%	10	6%	7	4%	12	7%	6	4%
SP (single site)	74	15	20%	2	3%	4	5%	12	16%	9	12%	25	34%	5	7%	0	0%	16	22%	2	3%	3	4%	4	5%	1	1%
SP (multi site)	30	7	23%	0	0%	0	0%	4	13%	5	17%	5	17%	3	10%	0	0%	5	17%	2	7%	0	0%	1	10%	0	0%
Incubator/innov	89	14	16%	4	4%	5	6%	12	13%	21	24%	23	26%	7	8%	2	2%	21	24%	7	8%	5	6%	6	7%		0%
Teleport	2	0	0%	0	0%	0	0%	0	0%	0	0%	1	50%	0	0%	0	0%	1	50%	0	0%	0	0%	1	50%	1	50%
Other	3	0	0%	1	33%	0	0%	0	0%	1	33%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
Blank	10	1	10%	0	0%	0	0%	2	20%	2	20%	3	30%	2	20%	0	0%	1	10%	1	10%	1	10%	1	10%	0	0%
TOTAL	161	27	17%	6	4%	7	4%	23	14%	30	19%	44	27%	15	9%	2	1%	33	20%	10	6%	7	4%	12	7%	6	4%
NTBFs	79	11	14%	2	3%	6	8%	10	13%	14	18%	21	27%	11	14%	1	1%	13	16%	6	8%	6	8%	5	6%	1	1%
Inward Inv	10	3	30%	3	30%	1	10%	1	10%	2	20%	2	20%	2	20%	0	0%	2	20%	0	0%	0	0%	0	0%	0	0%
Tech transfer	17	3	18%	1	6%	0	0%	2	12%	2	12%	6	35%	0	0%	1	6%	3	18%	1	6%	0	0%	1	6%	0	0%
Other	15	2	13%	0	0%	0	0%	0	0%	4	27%	2	13%	0	0%	0	0%	4	27%	1	7%	1	7%	3	20%	1	7%
Mixed objectives	40	8	20%	0	0%	0	0%	10	25%	8	20%	13	33%	2	5%	0	0%	11	28%	2	5%	0	0%	3	8%	1	3%
TOTAL	161	27		6		7		23		30		44		15		2		33		10		7		12		6	

E1 ABOUT YOUR NEEDS FOR INFORMATION - ADVICE - ASSISTANCE

Areas of advice or expertise where **FACE TO FACE COMMUNICATION IS ESSENTIAL**

	TOTAL	Links with HEI/RIs		Rental agreements		Site maintenance		Sources of technology		Potential Cust/distrib		Tech transfer		Marketing strategy		Legal issues		Obtaining Finance		Marketing assistance		Business planning		Focal point		Other	
NORTH	125	25	20%	8	6%	5	4%	20	16%	17	14%	26	21%	17	14%	6	5%	25	20%	18	14%	13	10%	13	10%	4	3%
SOUTH	36	16	44%	0	0%	1	3%	5	14%	12	33%	10	28%	7	19%	0	0%	11	31%	3	8%	1	3%	8	22%	0	0%
TOTAL	**161**	**41**	**25%**	**8**	**5%**	**6**	**4%**	**25**	**16%**	**29**	**18%**	**36**	**22%**	**24**	**15%**	**6**	**4%**	**36**	**22%**	**21**	**13%**	**14**	**9%**	**21**	**13%**	**4**	**2%**
0-2 years	62	17	27%	3	5%	4	6%	7	11%	12	19%	15	24%	9	15%	2	3%	15	24%	6	10%	4	6%	11	18%	1	2%
3-5 years	39	7	18%	0	0%	0	0%	8	21%	4	10%	6	15%	6	15%	0	0%	5	13%	6	15%	1	3%	1	3%	0	0%
6-9 years	25	7	28%	0	0%	1	4%	3	12%	6	24%	9	36%	4	16%	2	8%	9	36%	4	16%	2	8%	4	16%	1	4%
10+ years	26	8	31%	3	12%	1	4%	3	12%	5	19%	3	12%	4	15%	2	8%	4	15%	4	15%	4	15%	4	15%	1	4%
Blank	9	2	22%	2	22%	0	0%	4	44%	2	22%	3	33%	1	11%	0	0%	3	33%	1	11%	3	33%	1	11%	0	0%
TOTAL	**161**	**41**	**25%**	**8**	**5%**	**6**	**4%**	**25**	**16%**	**29**	**18%**	**36**	**22%**	**24**	**15%**	**6**	**4%**	**36**	**22%**	**21**	**13%**	**14**	**9%**	**21**	**13%**	**3**	**2%**
SP (single site)	74	22	30%	2	3%	2	3%	10	14%	12	16%	22	30%	8	11%	1	1%	16	22%	5	7%	5	7%	10	14%	2	3%
SP (multi site)	30	7	23%	1	3%	0	0%	4	13%	4	13%	6	20%	3	10%	0	0%	7	23%	1	3%	2	7%	3	10%	0	0%
Incubator/innov	89	26	29%	5	6%	3	3%	12	13%	18	20%	16	20%	12	13%	4	4%	21	24%	14	16%	11	12%	14	16%	2	2%
Teleport	2	1	50%	0	0%	1	50%	1	50%	2	100%	1	50%	1	50%	1	50%	2	100%	1	50%	0	0%	2	100%	1	50%
Other	3	0	0%	0	0%	0	0%	1	33%	1	33%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
Blank	10	1	10%	0	0%	0	0%	3	30%	2	20%	2	20%	4	40%	0	0%	0	0%	2	20%	0	0%	0	0%	0	0%
TOTAL	**161**	**41**	**25%**	**8**	**5%**	**6**	**4%**	**25**	**16%**	**29**	**18%**	**36**	**22%**	**24**	**15%**	**6**	**4%**	**36**	**22%**	**21**	**13%**	**14**	**9%**	**21**	**13%**	**3**	**2%**
NTBFs	79	15	19%	6	8%	4	5%	10	13%	12	15%	12	15%	9	11%	3	4%	14	18%	11	14%	7	9%	10	13%	1	1%
Inward Inv	10	2	20%	1	10%	0	0%	1	10%	1	10%	1	10%	0	0%	0	0%	2	20%	0	0%	1	10%	0	0%	0	0%
Tech transfer	17	6	35%	0	0%	0	0%	3	18%	2	12%	7	41%	2	12%	0	0%	4	24%	1	6%	0	0%	3	18%	0	0%
Other	15	7	47%	1	7%	1	7%	3	20%	5	33%	5	33%	4	27%	3	20%	7	47%	4	27%	4	27%	5	33%	1	7%
Mixed objectives	40	11	28%	0	0%	1	3%	8	20%	9	23%	11	28%	9	23%	0	0%	9	23%	5	13%	2	5%	4	10%	1	3%
TOTAL	**161**	**41**		**8**		**6**		**25**		**29**		**36**		**24**		**6**		**36**		**21**		**14**		**21**		**3**	

E1 ABOUT YOUR NEEDS FOR INFORMATION - ADVICE - ASSISTANCE

SUMMARY TABLE - Areas of advice or expertise required

	TOTAL	Links with HEI/RIs		Rental agreements		Site maintenance		Sources of technology		Potential Cust/distrib		Tech transfer		Marketing strategy		Legal issues		Obtaining Finance		Marketing assistance		Business planning		Focal point		Other	
ALL	161	73	45%	34	21%	33	20%	95	59%	84	52%	103	64%	84	52%	32	20%	91	57%	62	39%	41	25%	70	43%	8	5%
TWO MOST IMPORTANT	161	27	17%	6	4%	7	4%	23	14%	30	19%	44	27%	15	9%	2	1%	33	20%	10	6%	7	4%	12	7%	0	0%
FACE TO FACE	161	41	25%	8	5%	6	4%	25	16%	29	18%	36	22%	24	15%	6	4%	36	22%	21	13%	14	9%	21	13%	3	2%

E2 HOW COULD THIS ADVICE BE DELIVERED MOST EFFECTIVELY?									
STYLE OF DELIVERY									
	TOTAL	**As a single unit**		**On-going basis**		**Both**		**Blank**	
NORTH	125	10	8%	75	60%	7	6%	33	26%
SOUTH	36	3	8%	28	78%	2	6%	3	8%
TOTAL	161	13	8%	103	64%	9	6%	36	22%
0-2 years	62	4	6%	49	79%	2	3%	7	11%
3-5 years	39	5	13%	19	49%	6	15%	9	23%
6-9 years	25	1	4%	20	80%	0	0%	4	16%
10+ years	26	3	12%	11	42%	1	4%	11	42%
Blank	9	0	0%	4	44%	0	0%	5	56%
TOTAL	161	13	8%	103	64%	9	6%	36	22%
SP (single site)	74	7	9%	47	64%	3	4%	17	23%
SP (multi site)	30	3	10%	17	57%	2	7%	8	27%
Incubator/innov	89	4	4%	59	66%	4	4%	22	25%
Teleport	2	0	0%	1	50%	1	50%	0	0%
Other	3	0	0%	1	33%	0	0%	2	67%
Blank	10	2	20%	6	60%	1	10%	1	10%
TOTAL	161	13	8%	103	64%	9	6%	36	22%
NTBFs	79	9	11%	52	66%	3	4%	15	19%
Inward Inv	10	0	0%	7	70%	1	10%	2	20%
Tech transfer	17	3	18%	10	59%	0	0%	4	24%
Other	15	0	0%	8	53%	1	7%	6	40%
Mixed objectives	40	1	3%	26	65%	4	10%	9	23%
TOTAL	161	13		103		9		36	

E2 HOW COULD THIS ADVICE BE DELIVERED MOST EFFECTIVELY?

FOR THOSE PREFERRING TRAINING ON AN ON-GOING BASIS
The preferred mechanism of delivery

	TOTAL	In person		Telematics		Telephone		Correspondence		Other	
NORTH	75	64	85%	25	33%	23	31%	32	43%	4	5%
SOUTH	28	23	82%	15	54%	11	39%	8	29%	0	0%
TOTAL	103	87	84%	40	39%	34	33%	40	39%	4	4%
0-2 years	49	42	86%	22	45%	15	31%	20	41%	2	4%
3-5 years	19	14	74%	5	26%	5	26%	5	26%	1	5%
6-9 years	20	18	90%	4	20%	7	35%	8	40%	1	5%
10+ years	11	9	82%	6	55%	4	36%	6	55%	0	0%
Blank	4	4	100%	3	75%	3	75%	1	25%	0	0%
TOTAL	103	87	84%	40	39%	34	33%	40	39%	4	4%
SP (single site)	47	40	85%	20	43%	13	28%	17	36%	2	4%
SP (multi site)	17	14	82%	8	47%	6	35%	7	41%	1	6%
Incubator/innov	59	52	88%	24	41%	20	34%	24	41%	3	5%
Teleport	1	1	100%	0	0%	0	0%	0	0%	0	0%
Other	1	1	100%	1	100%	1	100%	0	0%	0	0%
Blank	6	5	83%	2	33%	2	33%	2	33%	0	0%
TOTAL	103	87	84%	40	39%	34	33%	40	39%	4	4%
NTBFs	52	44	85%	17	33%	17	33%	23	44%	2	4%
Inward Inv	7	6	86%	5	71%	3	43%	3	43%	0	0%
Tech transfer	10	5	50%	6	60%	3	30%	0	0%	1	10%
Other	8	8	100%	1	13%	3	38%	3	38%	1	13%
Mixed objectives	26	24	92%	11	42%	8	31%	11	42%	0	0%
TOTAL	103	87		40		34		40		4	

E2 HOW COULD THIS ADVICE BE DELIVERED MOST EFFECTIVELY?

FOR THOSE PREFERRING A SINGLE UNIT OF TRAINING
The preferred mechanism of delivery

	TOTAL	In person		Telematics		Telephone		Correspondence		Other	
NORTH	10	9	90%	2	20%	0	0%	2	20%	0	0%
SOUTH	3	2	67%	1	33%	0	0%	1	33%	0	0%
TOTAL	13	11	85%	3	23%	0	0%	3	23%	0	0%
0-2 years	4	3	75%	1	25%	0	0%	2	50%	0	0%
3-5 years	5	5	100%	0	0%	0	0%	1	20%	0	0%
6-9 years	1	1	100%	0	0%	0	0%	0	0%	0	0%
10+ years	3	2	67%	2	67%	0	0%	0	0%	0	0%
Blank	0	0	0%	0	0%	0	0%	0	0%	0	0%
TOTAL	13	11	85%	3	23%	0	0%	3	23%	0	0%
SP (single site)	7	5	71%	3	43%	0	0%	1	14%	0	0%
SP (multi site)	3	3	100%	0	0%	0	0%	1	33%	0	0%
Incubator/innov	4	4	100%	0	0%	0	0%	1	25%	0	0%
Teleport	0	0	0%	0	0%	0	0%	0	0%	0	0%
Other	0	0	0%	0	0%	0	0%	0	0%	0	0%
Blank	2	2	100%	0	0%	0	0%	1	50%	0	0%
TOTAL	13	11	85%	3	23%	0	0%	3	23%	0	0%
NTBFs	9	8	89%	2	22%	0	0%	1	11%	0	0%
Inward Inv	0	0	0%	0	0%	0	0%	0	0%	0	0%
Tech transfer	3	2	67%	1	33%	0	0%	1	33%	0	0%
Other	0	0	0%	0	0%	0	0%	0	0%	0	0%
Mixed objectives	1	1	100%	0	0%	0	0%	1	100£	0	0%
TOTAL	13	11		3		0		3		0	

E2 HOW COULD THIS ADVICE BE DELIVERED MOST EFFECTIVELY?

FOR THOSE SUGGESTING BOTH STYLES OF DELIVERY
The preferred mechanism of delivery

	TOTAL	In person		Telematics		Telephone		Correspondence		Other	
NORTH	7	6	86%	2	29%	2	29%	1	14%	2	29%
SOUTH	2	2	100%	2	100%	2	100%	2	100%	0	0%
TOTAL	9	8	89%	4	44%	4	44%	3	33%	2	22%
0-2 years	2	1	50%	1	50%	1	50%	0	0%	2	100%
3-5 years	6	6	100%	3	50%	3	50%	3	50%	0	0%
6-9 years	0	0	0%	0	0%	0	0%	0	0%	0	0%
10+ years	1	1	100%	0	0%	0	0%	0	0%	0	0%
Blank	0	0	0%	0	0%	0	0%	0	0%	0	0%
TOTAL	9	8	89%	4	44%	4	44%	3	33%	2	22%
SP (single site)	3	3	100%	2	67%	2	67%	2	67%	0	0%
SP (multi site)	2	1	50%	1	50%	0	0%	0	0%	1	50%
Incubator/innov	4	4	100%	1	25%	0	0%	1	25%	0	0%
Teleport	1	1	100%	1	100%	1	100%	0	0%	1	100%
Other	0	0	0%	0	0%	0	0%	0	0%	0	0%
Blank	1	1	100%	0	0%	1	100%	0	0%	0	0%
TOTAL	9	8	89%	4	44%	4	44%	3	33%	2	22%
NTBFs	3	3	100%	1	33%	0	0%	0	0%	0	0%
Inward Inv	1	0	0%	0	0%	0	0%	0	0%	1	100%
Tech transfer	0	0	0%	0	0%	0	0%	0	0%	0	0%
Other	1	1	100%	1	100%	1	100%	0	0%	1	100%
Mixed objectives	4	4	100%	2	50%	3	75%	3	75%	0	0%
TOTAL	9	8		4		4		3		2	

E2 HOW COULD THIS ADVICE BE DELIVERED MOST EFFECTIVELY?											
FOR THOSE WITH NO PREFERENCE AS TO THE STYLE OF DELIVERY The preferred mechanism of delivery											
	TOTAL	In person		Telematics		Telephone		Correspondence		Other	
NORTH	33	8	24%	4	12%	4	12%	5	15%	1	3%
SOUTH	3	2	67%	1	33%	0	0%	0	0%	0	0%
TOTAL	36	10	28%	5	14%	4	11%	5	14%	1	3%
0-2 years	7	2	29%	1	14%	0	0%	1	14%	0	0%
3-5 years	9	1	11%	2	22%	2	22%	2	22%	1	11%
6-9 years	4	1	25%	0	0%	0	0%	0	0%	0	0%
10+ years	11	3	27%	1	9%	2	18%	2	18%	0	0%
Blank	5	3	60%	1	20%	0	0%	0	0%	0	0%
TOTAL	36	10	28%	5	14%	4	11%	5	14%	1	3%
SP (single site)	17	4	24%	1	6%	2	12%	2	12%	0	0%
SP (multi site)	8	1	13%	1	13%	2	25%	2	25%	1	13%
Incubator/innov	22	7	32%	4	18%	3	14%	3	14%	0	0%
Teleport	0	0	0%	0	0%	0	0%	0	0%	0	0%
Other	2	1	50%	0	0%	0	0%	0	0%	0	0%
Blank	1	1	100%	0	0%	0	0%	1	100%	0	0%
TOTAL	36	10	28%	5	14%	4	11%	5	14%	1	3%
NTBFs	15	4	27%	3	20%	2	13%	2	13%	0	0%
Inward Inv	2	2	100%	0	0%	1	50%	1	50%	0	0%
Tech transfer	4	1	25%	0	0%	0	0%	0	0%	0	0%
Other	6	2	33%	1	17%	0	0%	1	17%	0	0%
Mixed objectives	9	1	11%	1	11%	1	11%	1	11%	1	11%
TOTAL	36	10		5		4		5		1	

E3 LOCATION OF THE SCIENCE PARK FROM WHICH THE RESPONDENT WOULD LIKE FREE ADVICE

	TOTAL	No response		Science park nominated		Location of science park nominated													
						Within EC		Belgium		France		Germany		Netherlands		Spain		United Kingdom	
NORTH	125	97	78%	28	22%	28	100%	2	7%	10	36%	3	11%	3	11%	0	0%	10	36%
SOUTH	36	19	53%	17	47%	17	100%	1	6%	11	65%	1	6%	1	6%	1	6%	2	12%
TOTAL	161	116	72%	45	28%	45	100%	3	7%	21	47%	4	9%	4	9%	1	2%	12	27%
0-2 years	62	43	69%	19	31%	19	100%	2	11%	7	37%	3	16%	3	16%	1	5%	3	16%
3-5 years	39	30	77%	9	23%	9	100%	0	0%	4	44%	0	0%	0	0%	0	0%	5	56%
6-9 years	25	17	68%	8	32%	8	100%	0	0%	3	38%	1	13%	1	13%	0	0%	3	38%
10+ years	26	19	73%	7	27%	7	100%	0	0%	6	86%	0	0%	0	0%	0	0%	1	14%
Blank	9	7	78%	2	22%	2	100%	1	50%	1	50%	0	0%	0	0%	0	0%	0	0%
TOTAL	161	116	72%	45	28%	45	100%	3	7%	21	47%	4	9%	4	9%	1	2%	12	27%
SP (single site)	74	52	70%	22	30%	22	100%	2	9%	12	55%	1	5%	1	5%	1	5%	5	23%
SP (multi site)	30	23	77%	7	23%	7	100%	0	0%	3	43%	2	29%	1	14%	0	0%	1	14%
Incubator/innov	89	65	73%	24	27%	24	100%	1	4%	12	50%	1	4%	2	8%	0	0%	8	33%
Teleport	2	2	100%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
Other	3	3	100%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
Blank	10	5	50%	5	50%	5	100%	0	0%	2	40%	1	20%	1	20%	0	0%	1	20%
TOTAL	161	116	72%	45	28%	45	100%	3	7%	21	47%	4	9%	4	9%	1	2%	12	27%
NTBFs	79	56	71%	23	29%	23	100%	1	4%	10	43%	3	13%	1	4%	0	0%	8	35%
Inward Inv	10	5	50%	5	50%	5	100%	2	40%	2	40%	0	0%	0	0%	0	0%	1	20%
Tech transfer	17	13	76%	4	24%	4	100%	0	0%	3	75%	0	0%	1	25%	0	0%	0	0%
Other	15	11	73%	4	27%	4	100%	0	0%	3	75%	0	0%	0	0%	0	0%	1	25%
Mixed objectives	40	31	78%	9	23%	9	100%	0	0%	3	33%	1	11%	2	22%	1	11%	2	22%
TOTAL	161	116		45	28%	45	100%	3	7%	21	47%	4	9%	4	9%	1	2%	12	27%

E3 NOMINATED SCIENCE PARK

Name	Location	Requesting country
AGIT	D	D
ASTON SCIENCE PARK	UK	IRE D D
BIC METZ	F	D
BIC TRIESTE	F	I
BIC TWENTE	NL	UK
BIRMINGHAM TECHNOLOGY LTD	UK	I E
BITZ BREMEN	D	D
BRUSSELS TECHNOPOLE	B	F
CAMBRIDGE TECH PARK	UK	UK
CRITT	F	UK
FONDAZIONE STEINBEIS		I
GRENOBLE	F	IRE IRE
HERIOT WATT	UK	NL UK UK
IDEON (PARQUE TECNOLOGICO DE LUND)		E
ITV	D	E
LYON TECHNOPOLE	F	UK F
MONTPELLIER	F	UK IRE
PARQUE TECNOLOGICO DE ZAMUDIO	E	E
PROMOTECH	F	E
RENNES ATALANTE	F	E E
SOCRAN	B	B
SOPHIA ANTIPOLIS	F	E I G NL UK UK I

E3 NOMINATED SCIENCE PARK		
Name	Location	Requesting country
SURREY RESEARCH PARK SURREY, UK	UK	UK
TECHNOLOGIEFABRIK		D
TECHNOPARK		D
TECHNOPOLE DE BERLOGNE	F	F
TECHNOPOLE SUD	D	D
TECHNOPOLIS	F	UK
TECNOPOLE	F	I
TZ GENTHIN		D
TZU TECHNOLOGIEPARK	D	D
UNIVERSIDAD LOVAINA	B	E
UNIVERSITY OF TWENTE	NL	UK
UNIVERSITY OF WARWICK	UK	UK UK
ZERNIKE SCIENCE PARK	NL	G DK I

F1 WHAT TOP TWO MANAGEMENT STRENGTHS OR EXPERIENCE DO YOU HAVE TO SHARE WITH OTHER SCIENCE PARKS?

	TOTAL	Links with HEI/RIs		Rental agreements		Site maintenance		Sources of technology		Potential Cust/distrib		Tech transfer		Marketing strategy		Legal issues		Obtaining Finance		Marketing assistance		Business planning		Focal point		Other	
NORTH	125	41	33%	18	14%	15	12%	12	10%	6	5%	24	19%	11	9%	5	4%	11	9%	8	6%	22	18%	14	11%	9	7%
SOUTH	36	6	17%	0	0%	2	6%	3	8%	3	8%	3	8%	0	0%	1	3%	1	3%	2	6%	5	14%	5	14%	1	3%
TOTAL	161	47	29%	18	11%	17	11%	15	9%	9	6%	27	17%	11	7%	6	4%	12	7%	10	6%	27	17%	19	12%	10	6%
0-2 years	62	14	23%	6	10%	7	11%	7	11%	3	5%	5	8%	4	6%	3	5%	3	5%	3	5%	7	11%	6	10%	3	5%
3-5 years	39	13	33%	5	13%	2	5%	3	8%	1	3%	9	23%	4	10%	1	3%	6	15%	2	5%	8	21%	5	13%	2	5%
6-9 years	25	7	28%	2	8%	1	4%	2	8%	1	4%	6	24%	1	4%	2	8%	1	4%	5	20%	6	24%	1	4%	0	0%
10+ years	26	9	35%	5	19%	7	27%	2	8%	4	15%	5	19%	2	8%	0	0%	1	4%	0	0%	4	15%	3	12%	1	12%
Blank	9	4	44%	0	0%	0	0%	1	11%	0	0%	2	22%	0	0%	0	0%	1	11%	0	0%	2	22%	1	44%	0	0%
TOTAL	161	47	29%	18	11%	17	11%	15	9%	9	6%	27	17%	11	7%	6	4%	12	7%	10	6%	27	17%	19	12%	10	6%
SP (single site)	74	28	38%	8	11%	8	11%	6	8%	4	5%	11	15%	3	4%	1	1%	5	7%	6	8%	10	14%	5	7%	4	5%
SP (multi site)	30	7	23%	4	13%	5	17%	4	13%	0	0%	5	17%	3	10%	2	7%	2	7%	1	3%	3	10%	4	13%	2	7%
Incubator/innov	89	20	22%	12	13%	14	16%	7	8%	7	8%	13	15%	6	7%	4	4%	10	11%	5	6%	21	24%	13	15%	5	6%
Teleport	2	0	0%	0	0%	0	0%	1	50%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	1	50%
Other	3	1	33%	0	0%	0	0%	0	0%	0	0%	2	67%	1	33%	0	0%	1	33%	0	0%	0	0%	1	33%	0	0%
Blank	10	2	20%	0	0%	1	10%	1	10%	1	10%	4	40%	1	10%	0	0%	0	0%	0	0%	1	10%	1	10%	0	0%
TOTAL	161	47	29%	18	11%	17	11%	15	9%	9	6%	27	17%	11	7%	6	4%	12	7%	10	6%	27	17%	19	12%	10	6%
NTBFs	79	18	23%	11	14%	11	14%	6	8%	5	6%	9	11%	6	8%	4	5%	8	10%	5	6%	13	16%	10	13%	4	5%
Inward Inv	10	4	40%	0	0%	1	10%	1	10%	0	0%	2	20%	0	0%	0	0%	1	10%	1	10%	2	20%	3	30%	0	0%
Tech transfer	17	6	35%	0	0%	0	0%	4	24%	1	6%	5	29%	1	6%	1	6%	1	6%	0	0%	1	6%	1	6%	3	18%
Other	15	2	13%	3	20%	2	13%	3	20%	1	7%	2	13%	0	0%	1	7%	0	0%	1	7%	6	40%	2	13%	1	7%
Mixed objectives	40	17	43%	4	10%	3	8%	1	3%	2	5%	9	23%	4	10%	0	0%	2	5%	3	8%	5	13%	3	8%	0	0%
TOTAL	161	47		18		17		15		9		27		11		6		12		10		27		19		10	

F2 DO YOU SEE ANY BENEFIT IN NETWORKING TO SHARE INFORMATION WITH MANAGERS OF OTHER SCIENCE PARKS/ORGANISATIONS? (EITHER TELEMATICALLY OR OTHERWISE)

	TOTAL	Regionally				Nationally				Within the EC				Outside the EC			
		yes		no		yes		no		yes		no		yes		no	
NORTH	125	78	62%	15	12%	96	77%	8	6%	96	77%	13	10%	64	51%	24	19%
SOUTH	36	18	50%	3	8%	27	75%	2	6%	33	92%	1	3%	19	53%	5	14%
TOTAL	161	96	60%	18	11%	123	76%	10	6%	129	80%	14	9%	83	52%	29	18%
0-2 years	62	39	63%	4	6%	50	81%	1	2%	49	79%	3	5%	33	53%	11	18%
3-5 years	39	21	54%	4	10%	27	69%	4	10%	30	77%	5	13%	17	44%	7	18%
6-9 years	25	17	68%	4	16%	19	76%	2	8%	20	80%	3	12%	13	52%	4	16%
10+ years	26	15	58%	5	19%	20	77%	3	12%	21	81%	3	12%	15	58%	6	23%
Blank	9	4	44%	1	11%	7	78%	0	0%	9	100%	0	0%	5	56%	1	11%
TOTAL	161	96	60%	18	11%	123	76%	10	6%	129	80%	14	9%	83	52%	29	18%
SP (single site)	74	42	57%	7	9%	55	74%	5	7%	59	80%	4	5%	33	45%	13	18%
SP (multi site)	30	20	67%	4	13%	25	83%	3	10%	25	83%	3	10%	16	53%	6	20%
Incubator/innov	89	57	64%	12	13%	71	80%	5	6%	75	84%	5	6%	50	56%	13	15%
Teleport	2	1	50%	0	0%	0	0%	0	0%	2	100%	0	0%	1	50%	0	0%
Other	3	1	33%	1	33%	1	33%	1	33%	2	67%	1	33%	2	67%	1	33%
Blank	10	6	60%	2	20%	9	90%	0	0%	9	90%	1	10%	6	60%	2	20%
TOTAL	161	96	60%	18	11%	123	76%	10	6%	129	80%	14	9%	83	52%	29	18%
NTBFs	79	47	59%	7	9%	59	75%	5	6%	61	77%	7	9%	40	51%	14	18%
Inward Inv	10	2	20%	3	30%	7	70%	1	10%	9	90%	0	0%	5	50%	3	30%
Tech transfer	17	9	53%	1	6%	15	88%	1	6%	14	82%	2	12%	6	35%	3	18%
Other	15	9	60%	3	20%	10	67%	0	0%	12	80%	2	13%	10	67%	2	13%
Mixed objectives	40	29	73%	4	10%	32	80%	3	8%	33	83%	3	8%	22	55%	7	18%
TOTAL	161	96		18		123		10		129		14		83		29	

G1 IS YOUR ABILITY TO COMMUNICATE WITH OTHER ORGANISATIONS RESTRICTED IN ANY WAY BY THE AVAILABILITY OF TELECOMMUNICATIONS SERVICES IN YOUR AREA?

	TOTAL	Yes		No		Blank	
NORTH	125	19	15%	100	80%	6	5%
SOUTH	36	10	28%	25	69%	1	3%
TOTAL	161	29	18%	125	78%	7	4%
0-2 years	62	12	19%	46	74%	4	6%
3-5 years	39	7	18%	31	79%	1	3%
6-9 years	25	4	16%	21	84%	0	0%
10+ years	26	5	19%	19	73%	2	8%
Blank	9	1	11%	8	89%	0	0%
TOTAL	161	29	18%	125	78%	7	4%
SP (single site)	74	18	24%	51	69%	5	7%
SP (multi site)	30	3	10%	25	83%	2	7%
Incubator/innov	89	15	17%	72	81%	2	2%
Teleport	2	0	0%	2	100%	0	0%
Other	3	0	0%	3	100%	0	0%
Blank	10	1	10%	9	90%	0	0%
TOTAL	161	29	18%	125	78%	7	4%
NTBFs	79	18	23%	58	73%	3	4%
Inward Inv	10	0	0%	10	100%	0	0%
Tech transfer	17	3	18%	14	82%	0	0%
Other	15	2	13%	12	80%	1	7%
Mixed objectives	40	6	15%	31	78%	3	8%
TOTAL	161	29		125		7	

G2 CURRENT USE OF PC & MODEM

	Total	Fax		E.mail		Networks		File transfer		Messaging		Telephone conference		Video conference		Remote services		Other	
NORTH	125	39	31%	35	28%	54	43%	28	22%	11	9%	6	5%	3	2%	2	2%	1	1%
SOUTH	36	9	25%	19	53%	18	50%	11	31%	5	14%	0	0%	0	0%	0	0%	0	0%
TOTAL	161	48	30%	54	34%	72	45%	39	24%	16	10%	6	4%	3	2%	2	1%	1	1%
0-2 years	62	20	32%	22	35%	28	45%	15	24%	9	15%	2	3%	1	2%	1	2%	1	2%
3-5 years	39	10	26%	10	26%	15	38%	10	26%	2	5%	1	3%	0	0%	0	0%	0	0%
6-9 years	25	9	36%	6	24%	8	32%	4	16%	1	4%	0	0%	0	0%	0	0%	0	0%
10+ years	26	6	23%	12	46%	15	58%	5	19%	2	8%	1	4%	0	0%	0	0%	0	0%
Blank	9	3	33%	4	44%	6	67%	5	56%	2	22%	2	22%	2	22%	1	11%	0	0%
TOTAL	161	48	30%	54	34%	72	45%	39	24%	16	10%	6	4%	3	2%	2	1%	1	1%
SP (single site)	74	26	35%	22	30%	31	42%	16	22%	6	8%	2	3%	1	1%	1	1%	0	0%
SP (multi site)	30	6	20%	7	23%	10	33%	4	13%	2	7%	1	3%	1	3%	0	0%	0	0%
Incubator/innov	89	23	26%	33	37%	43	48%	23	26%	9	10%	3	3%	1	1%	0	0%	0	0%
Teleport	2	2	100%	2	100%	2	100%	2	100%	1	50%	0	0%	0	0%	1	50%	1	50%
Other	3	2	67%	0	0%	1	33%	1	33%	0	0%	1	33%	1	33%	0	0%	0	0%
Blank	10	4	40%	6	60%	5	50%	4	40%	1	10%	1	10%	0	0%	0	0%	0	0%
TOTAL	161	48	30%	54	34%	72	45%	39	24%	16	10%	6	4%	3	2%	2	1%	1	1%
NTBFs	79	23	29%	25	32%	36	46%	16	20%	10	13%	3	4%	1	1%	1	1%	0	0%
Inward Inv	10	2	20%	2	20%	5	50%	2	20%	1	10%	0	0%	0	0%	0	0%	0	0%
Tech transfer	17	5	29%	5	29%	6	35%	5	29%	2	12%	1	6%	1	6%	0	0%	0	0%
Other	15	4	27%	10	67%	10	67%	7	47%	2	13%	1	7%	1	7%	1	7%	1	7%
Mixed objectives	40	14	35%	12	30%	15	38%	9	23%	1	3%	1	3%	0	0%	0	0%	0	0%
TOTAL	161	48	30%	54	34%	72	45%	39	24%	16	10%	6	4%	3	2%	2	1%	1	1%

G2 CURRENT USE OF ISDN

	Total	Fax		E.mail		Networks		File transfer		Messaging		Telephone conference		Video conference		Remote services		Other	
NORTH	125	52	42%	14	11%	24	19%	13	10%	10	8%	20	16%	12	10%	1	1%	1	1%
SOUTH	36	1	3%	1	3%	0	0%	1	3%	0	0%	0	0%	1	3%	0	0%	0	0%
TOTAL	161	53	33%	15	9%	24	15%	14	9%	10	6%	20	12%	13	8%	1	1%	1	1%
0-2 years	62	19	31%	9	15%	10	16%	4	6%	3	5%	7	11%	3	5%	0	0%	0	0%
3-5 years	39	11	28%	1	3%	4	10%	3	8%	3	8%	5	13%	3	8%	0	0%	0	0%
6-9 years	25	13	52%	4	16%	5	20%	4	16%	3	12%	5	20%	2	8%	0	0%	0	0
10+ years	26	8	31%	0	0%	3	12%	1	4%	0	0%	1	4%	3	12%	0	0%	0	0%
Blank	9	2	22%	1	11%	2	22%	2	22%	1	11%	2	22%	2	22%	1	11%	1	11%
TOTAL	161	53	33%	15	9%	24	15%	14	9%	10	6%	20	12%	13	8%	1	1%	1	1%
SP (single site)	74	25	34%	5	7%	12	16%	5	7%	4	5%	7	9%	4	5%	0	0%	0	0%
SP (multi site)	30	13	43%	5	17%	5	17%	4	13%	5	17%	7	23%	3	10%	0	0%	0	0%
Incubator/innov	89	30	34%	9	10%	16	18%	11	12%	7	8%	13	15%	7	8%	0	0%	0	0%
Teleport	2	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	1	50%	0	0%	0	0%
Other	3	1	33%	1	33%	2	67%	2	67%	0	0%	1	33%	2	67%	1	33%	1	33%
Blank	10	2	20%	1	10%	0	0%	0	0%	1	10%	1	10%	2	20%	0	0%	0	0%
TOTAL	161	53	33%	15	9%	24	15%	14	9%	10	6%	20	12%	13	8%	1	1%	1	1%
NTBFs	79	30	38%	6	8%	12	15%	6	8%	5	6%	11	14%	3	4%	0	0%	0	0%
Inward Inv	10	1	10%	0	0%	1	10%	1	10%	0	0%	2	20%	1	10%	1	10%	1	10%
Tech transfer	17	3	18%	3	18%	3	18%	2	12%	0	0%	0	0%	1	6%	0	0%	0	0%
Other	15	4	27%	3	20%	3	20%	2	13%	2	13%	2	13%	3	20%	0	0%	0	0%
Mixed objectives	40	15	38%	3	8%	5	13%	3	8%	3	8%	5	13%	5	13%	0	0%	0	0%
TOTAL	161	53	33%	15	9%	24	15%	14	9%	10	6%	20	12%	13	8%	1	1%	1	1%

G2 CURRENT USE OF BASIC TELEPHONE LINE

	Total	Fax		E.mail		Networks		File transfer		Messaging		Telephone conference		Video conference		Remote services		Other	
NORTH	125	65	52%	11	9%	15	12%	8	6%	10	8%	9	7%	5	4%	4	3%	2	2%
SOUTH	36	32	89%	4	11%	8	22%	2	6%	3	8%	16	44%	2	6%	1	3%	0	0%
TOTAL	161	97	60%	15	9%	23	14%	10	6%	13	8%	25	16%	7	4%	5	3%	2	1%
0-2 years	62	36	58%	4	6%	6	10%	4	6%	4	6%	9	15%	2	3%	2	3%	0	0%
3-5 years	39	26	67%	3	8%	10	26%	1	3%	0	0%	6	15%	1	3%	1	3%	0	0%
6-9 years	25	12	48%	2	8%	2	8%	2	8%	5	20%	5	20%	1	4%	0	0%	1	4%
10+ years	26	17	65%	3	12%	4	15%	2	8%	3	12%	4	15%	1	4%	2	8%	0	0%
Blank	9	6	67%	3	33%	1	11%	1	11%	1	11%	1	11%	2	22%	0	0%	1	11%
TOTAL	161	97	60%	15	9%	23	14%	10	6%	13	8%	25	16%	7	4%	5	3%	2	1%
SP (single site)	74	43	58%	5	7%	8	11%	3	4%	5	7%	14	19%	2	3%	2	3%	0	0%
SP (multi site)	30	17	57%	4	13%	6	20%	4	13%	3	10%	4	13%	3	10%	1	3%	2	7%
Incubator/innov	89	52	58%	9	10%	12	13%	4	4%	9	10%	11	12%	2	2%	3	3%	1	1%
Teleport	2	2	100%	2	100%	2	100%	2	100%	1	50%	1	50%	0	0%	0	0%	0	0%
Other	3	2	67%	0	0%	0	0%	0	0%	0	0%	1	33%	1	33%	0	0%	0	0%
Blank	10	9	90%	1	10%	2	20%	0	0%	1	10%	1	10%	1	10%	0	0%	0	0%
TOTAL	161	97	60%	15	9%	23	14%	10	6%	13	8%	25	16%	7	4%	5	3%	2	1%
NTBFs	79	41	52%	3	4%	7	9%	3	4%	5	6%	11	14%	1	1%	4	5%	0	0%
Inward Inv	10	7	70%	1	10%	3	30%	0	0%	0	0%	3	30%	0	0%	0	0%	0	0%
Tech transfer	17	13	76%	1	6%	1	6%	1	6%	0	0%	2	12%	0	0%	0	0%	1	6%
Other	15	11	73%	5	33%	4	27%	3	20%	3	20%	2	13%	1	7%	0	0%	1	7%
Mixed objectives	40	25	63%	5	13%	8	20%	3	8%	5	13%	7	18%	5	13%	1	3%	0	0%
TOTAL	161	97	60%	15	9%	23	14%	10	6%	13	8%	25	16%	7	4%	5	3%	2	1%

G2 TELEMATIC APPLICATIONS WHICH YOU ARE LIKELY TO USE IN FUTURE																		
	Total	Fax		E.mail		Networks		File transfer		Messaging		Telephone conference		Video conference		Remote services		Other	
NORTH	125	12	10%	31	25%	24	19%	20	16%	15	12%	18	14%	21	17%	16	13%	12	10%
SOUTH	36	1	3%	10	28%	8	22%	12	33%	9	25%	3	8%	10	28%	9	25%	5	14%
TOTAL	161	13	8%	41	25%	32	20%	32	20%	24	15%	21	13%	31	19%	25	16%	17	11%
0-2 years	62	7	11%	14	23%	12	19%	13	21%	11	18%	6	10%	13	21%	7	11%	6	10%
3-5 years	39	1	3%	14	36%	9	23%	9	23%	5	13%	7	18%	7	18%	6	15%	6	15%
6-9 years	25	3	12%	6	24%	6	24%	2	8%	2	8%	1	4%	3	12%	5	20%	2	8%
10+ years	26	2	8%	5	19%	4	15%	7	27%	5	19%	6	23%	7	27%	5	19%	2	8%
Blank	9	0	0%	2	22%	1	11%	1	11%	1	11%	1	11%	1	11%	2	22%	1	11%
TOTAL	161	13	8%	41	25%	32	20%	32	20%	24	15%	21	13%	31	19%	25	16%	17	11%
SP (single site)	74	4	5%	20	27%	14	19%	15	20%	15	20%	11	15%	19	26%	11	15%	6	8%
SP (multi site)	30	1	3%	5	17%	5	17%	7	23%	3	10%	4	13%	6	20%	5	17%	4	13%
Incubator/innov	89	11	12%	24	27%	20	22%	19	21%	13	15%	11	12%	15	17%	17	19%	11	12%
Teleport	2	0	0%	0	0%	0	0%	0	0%	1	50%	0	0%	1	50%	0	0%	0	0%
Other	3	0	0%	1	33%	0	0%	0	0%	1	33%	0	0%	0	0%	1	33%	0	0%
Blank	10	0	0%	1	10%	0	0%	1	10%	0	0%	2	20%	2	20%	0	0%	2	20%
TOTAL	161	13	8%	41	25%	32	20%	32	20%	24	15%	21	13%	31	19%	25	16%	17	11%
NTBFs	79	7	9%	24	30%	18	23%	16	20%	9	11%	11	14%	16	20%	10	13%	7	9%
Inward Inv	10	0	0%	4	40%	1	10%	2	20%	3	30%	0	0%	1	10%	1	10%	0	0%
Tech transfer	17	3	18%	6	35%	4	24%	4	24%	3	18%	1	6%	2	12%	2	12%	2	12%
Other	15	2	13%	1	7%	2	13%	2	13%	3	20%	2	13%	2	13%	3	20%	1	7%
Mixed objectives	40	1	3%	6	15%	7	18%	8	20%	6	15%	7	18%	10	25%	9	23%	7	18%
TOTAL	161	13	8%	41	25%	32	20%	32	20%	24	15%	21	13%	31	19%	25	16%	17	11%

G3 DO YOU CONSIDER YOUR ORGANISATION TO BE ADVANCED IN THE USE OF TELEMATIC SERVICES													
	Total	Compared with other science parks						Compared with most other local organisations					
		Yes		No		Blank		Yes		No		Blank	
NORTH	125	37	30%	67	54%	21	17%	66	53%	42	34%	17	14%
SOUTH	36	10	28%	19	53%	7	19%	25	69%	5	14%	6	17%
TOTAL	161	47	29%	86	53%	28	17%	91	57%	47	29%	23	14%
0-2 years	62	22	35%	31	50%	9	15%	39	63%	14	23%	9	15%
3-5 years	39	9	23%	22	56%	8	21%	20	51%	15	38%	4	10%
6-9 years	25	8	32%	12	48%	5	20%	16	64%	6	24%	3	12%
10+ years	26	4	15%	17	65%	5	19%	10	38%	10	38%	6	23%
Blank	9	4	44%	4	44%	1	11%	6	67%	2	22%	1	11%
TOTAL	161	47	29%	86	53%	28	17%	91	57%	47	29%	23	14%
SP (single site)	74	18	24%	41	55%	15	20%	39	53%	21	28%	14	19%
SP (multi site)	30	10	33%	15	50%	5	17%	18	60%	7	23%	5	17%
Incubator/innov	89	26	29%	49	55%	14	16%	54	61%	26	29%	9	10%
Teleport	2	1	50%	0	0%	1	50%	1	50%	0	0%	1	50%
Other	3	2	67%	0	0%	1	33%	1	33%	2	67%	0	0%
Blank	10	4	40%	6	60%	0	0%	6	60%	3	30%	1	10%
TOTAL	161	47	29%	86	53%	28	17%	91	57%	47	29%	23	14%
NTBFs	79	20	25%	47	59%	12	15%	46	58%	25	32%	8	10%
Inward Inv	10	2	20%	6	60%	2	20%	6	60%	3	30%	1	10%
Tech transfer	17	6	35%	8	47%	3	18%	7	41%	6	35%	4	24%
Other	15	6	40%	6	40%	3	20%	10	67%	3	20%	2	13%
Mixed objectives	40	13	33%	19	48%	8	20%	22	55%	10	25%	8	20%
TOTAL	161	47	29%	86	53%	28	17%	91	57%	47	29%	23	14%

G4 FOR TENANTS OF SCIENCE PARKS - AREAS OF ASSISTANCE THAT WOULD PROVIDE THE GREATEST BENEFIT

	Total	Databases		TDC		Training		Subsidy		Applications		Help		Network		Standards		Access		Other	
		resp	avg	resp	avg	resp	avg	resp	avg	resp	avg	resp	avg	resp	avg	resp	avg	resp	avg	resp	avg
NORTH	125	77	7	61	5	68	6	74	9	61	7	62	7	57	7	59	6	70	7	5	6
SOUTH	36	29	8	21	7	29	7	30	9	20	8	24	6	23	7	23	6	27	7	2	8
TOTAL	161	106	7	82	5	97	6	104	9	81	7	86	6	80	7	82	6	97	7	7	6
0-2 years	62	40	7	32	6	39	7	42	8	32	7	35	6	31	6	32	5	38	7	4	6
3-5 years	39	29	8	18	4	25	7	28	9	19	7	19	6	18	7	18	7	25	8	1	8
6-9 years	25	18	7	17	4	17	6	19	9	15	8	18	6	16	6	18	6	18	7	2	6
10+ years	26	13	7	11	7	12	7	11	8	11	8	11	7	11	8	10	7	12	7	0	0
Blank	9	6	5	4	6	4	5	4	8	4	6	3	8	4	7	4	5	4	6	0	0
TOTAL	161	106	7	82	5	97	6	104	9	81	7	86	6	80	7	82	6	97	7	7	6
SP (single site)	74	46	7	38	5	42	6	43	9	35	8	39	6	36	6	37	6	42	7	4	6
SP (multi site)	30	18	6	16	6	17	6	17	7	18	7	17	7	15	6	15	6	18	6	2	6
Incubator/innov	89	60	7	44	5	52	7	57	8	45	7	45	6	43	7	46	7	54	7	6	6
Teleport	2	1	9	1	2	1	10	1	7	1	5	1	4	1	6	1	3	1	8	0	0
Other	3	2	5	1	6	1	7	2	7	1	5	1	5	1	6	1	6	1	7	0	0
Blank	10	8	8	5	7	8	6	9	9	4	8	6	8	4	7	4	6	6	6	0	0
TOTAL	161	106	7	82	5	97	6	104	9	81	7	86	6	80	7	82	6	97	7	7	6
NTBFs	79	56	7	42	5	52	6	58	9	45	7	45	6	44	7	47	6	52	7	3	9
Inward Inv	10	6	6	2	6	4	7	6	9	4	6	4	5	3	6	3	7	5	9	0	0
Tech transfer	17	11	7	13	7	12	8	11	8	8	8	12	7	9	6	9	6	11	8	1	5
Other	15	7	6	5	4	6	8	7	7	5	6	5	7	5	8	5	7	6	7	1	8
Mixed objectives	40	26	8	20	6	23	7	22	8	19	8	20	7	19	6	18	6	23	7	3	4
TOTAL	161	106	7	82	5	97	6	104	9	81	7	86	6	80	7	82	6	97	7	7	6

Resp = responses Avg = average value on a scale of 1 to 10 where 10 is high

G4 FOR SCIENCE PARK MANAGERS - AREAS OF ASSISTANCE THAT WOULD PROVIDE THE GREATEST BENEFIT

	Total	Databases		TDC		Training		Subsidy		Applications		Help		Network		Standards		Access		Other	
		resp	avg	resp	avg	resp	avg	resp	avg	resp	avg	resp	avg	resp	avg	resp	avg	resp	avg	resp	avg
NORTH	125	98	7	82	6	85	6	96	8	78	0	82	7	74	7	79	7	97	8	7	7
SOUTH	36	30	8	22	6	29	7	31	7	21	0	30	7	24	7	25	7	30	8	2	10
TOTAL	161	128	7	104	6	114	6	127	8	99	0	112	7	98	7	104	7	127	8	9	8
0-2 years	62	49	8	41	6	46	6	51	7	37	0	45	7	38	7	42	7	51	8	3	8
3-5 years	39	31	7	20	5	26	7	32	9	23	0	29	7	21	7	23	7	30	8	1	9
6-9 years	25	22	7	22	5	19	5	20	8	16	0	19	6	17	6	18	7	22	7	2	6
10+ years	26	20	7	15	5	17	7	19	7	17	0	15	7	15	8	15	7	18	7	1	10
Blank	9	6	5	6	6	6	4	5	9	6	0	4	7	7	5	6	6	6	6	0	0
TOTAL	161	128	7	104	6	114	6	127	8	99	0	112	7	98	7	104	7	127	8	9	8
SP (single site)	74	62	7	52	6	57	6	58	8	47	0	51	7	46	7	47	7	60	8	5	8
SP (multi site)	30	24	6	17	6	17	6	24	8	20	0	18	6	17	6	19	6	23	8	2	6
Incubator/innov	89	73	7	56	5	60	6	71	8	53	0	60	7	53	7	59	7	70	8	7	7
Teleport	2	2	9	2	5	2	8	2	6	2	0	2	5	2	9	2	4	2	10	1	10
Other	3	0	0	1	4	2	1	1	0	2	0	1	0	1	3	1	2	2	5	0	0
Blank	10	7	8	5	8	8	7	9	9	5	0	7	7	5	7	5	7	7	7	0	0
TOTAL	161	128	7	104	6	114	6	127	8	99	0	112	7	98	7	104	7	127	8	9	8
NTBFs	79	64	7	50	5	55	6	61	8	49	0	58	7	49	7	55	7	63	8	3	9
Inward Inv	10	8	6	4	7	6	6	8	8	6	0	6	5	5	6	5	7	8	8	0	0
Tech transfer	17	14	8	16	6	15	7	14	6	10	0	12	7	11	6	12	6	15	8	1	10
Other	15	12	7	10	5	10	7	13	7	9	0	10		11	7	9	7	10	8	2	10
Mixed objectives	40	30	7	24	6	28	7	31	8	25	0	26	7	22	6	23	6	31	7	3	4
TOTAL	161	128	7	104	6	114	6	127	8	99	0	112	7	98	7	104	7	127	8	9	8

Resp = responses

Avg = average value on a scale of 1 to 10 where 10 is high

G5 WOULD YOU PARTICIPATE IF A LOW COST EASY TO USE TELEMATIC NETWORK WERE ESTABLISHED BY THE EC

	Total	Yes		No		Blank	
NORTH	125	113	90%	2	2%	10	8%
SOUTH	36	34	94%	0	0%	2	6%
TOTAL	161	147	91%	2	1%	12	7%
0-2 years	62	59	95%	0	0%	3	5%
3-5 years	39	37	95%	0	0%	2	5%
6-9 years	25	22	88%	1	4%	2	8%
10+ years	26	21	81%	1	4%	4	15%
Blank	9	8	89%	0	0%	1	11%
TOTAL	161	147	91%	2	1%	12	7%
SP (single site)	74	67	91%	0	0%	7	9%
SP (multi site)	30	27	90%	0	0%	3	10%
Incubator/innov	89	85	96%	1	1%	3	3%
Teleport	2	2	100%	0	0%	0	0%
Other	3	3	100%	0	0%	0	0%
Blank	10	8	80%	1	10%	1	10%
TOTAL	161	147	91%	2	1%	12	7%
NTBFs	79	74	94%	0	0%	5	6%
Inward Inv	10	9	90%	0	0%	1	10%
Tech transfer	17	17	100%	0	0%	0	0%
Other	15	11	73%	2	13%	2	13%
Mixed objectives	40	36	90%	0	0%	4	10%
TOTAL	161	147	91%	2	1%	12	7%

H1 USE OF TELEMATIC APPLICATIONS BY SCIENCE PARK TENANTS

	Total	Fax		E.mail		Network		Files		Messaging		EDI		Telephone conference	
		present	future	present	future	present	future	present	future	present	future	present	future	present	future
NORTH	112	103	4	68	21	91	13	61	19	42	19	57	22	33	22
SOUTH	27	25	2	17	7	18	7	11	10	8	6	8	5	10	3
TOTAL	139	128	6	85	28	109	20	72	29	50	25	65	27	43	25
0-2 years	46	44	1	29	8	34	9	24	10	13	10	19	8	12	8
3-5 years	36	33	1	19	10	30	5	17	10	14	7	13	12	11	8
6-9 years	24	24	1	18	4	22	2	16	3	11	3	15	4	10	4
10+ years	26	20	2	15	5	19	2	12	5	10	4	15	2	9	5
Blank	7	7	1	4	1	4	2	3	1	2	1	3	1	1	0
TOTAL	139	128	6	85	28	109	20	72	29	50	25	65	27	43	25
SP (single site)	66	60	3	49	9	53	7	40	11	27	12	37	11	25	11
SP (multi site)	24	22	0	11	4	20	1	10	3	9	2	9	4	8	3
Incubator/innov	81	75	4	49	18	64	15	42	18	25	17	37	19	24	16
Teleport	1	1	0	1	0	1	0	1	0	1	0	1	0	0	0
Other	2	2	0	1	0	2	0	1	0	1	0	1	0	1	0
Blank	10	9	1	6	3	7	2	6	4	5	2	4	2	5	2
TOTAL	139	128	6	85	28	109	20	72	29	50	25	65	27	43	25
NTBFs	73	68	4	45	17	57	13	39	17	27	13	39	11	21	14
Inward Inv	8	7	0	3	0	6	1	4	1	2	1	3	2	3	0
Tech transfer	11	11	0	6	2	10	1	6	1	2	2	5	1	2	1
Other	12	12	1	9	3	10	2	6	3	3	4	5	4	2	3
Mixed objectives	35	30	1	22	6	26	3	17	7	16	5	13	9	15	7
TOTAL	139	128	6	85	28	109	20	72	29	50	25	65	27	43	25

H1 USE OF TELEMATIC APPLICATIONS BY SCIENCE PARK TENANTS continued														
	Video conference		CAD/CAM		Remote services		Satellite		PC/modem		ISDN		Other	
	present	future	present	future	present	future	present	future	present	future	present	future	present	future
NORTH	15	21	75	7	19	21	0	0	74	12	68	19	2	1
SOUTH	6	10	16	2	4	9	0	0	18	5	3	11	0	0
TOTAL	21	31	91	9	23	30	0	0	92	17	71	30	2	1
0-2 years	7	10	30	2	5	8	0	0	29	7	26	8	1	0
3-5 years	2	9	24	4	7	11	0	0	24	5	14	11	0	1
6-9 years	7	5	20	2	5	4	0	0	16	2	16	5	0	0
10+ years	3	7	13	1	6	7	0	0	19	2	11	6	0	0
Blank	2	0	4	0	0	0	0	0	4	1	4	0	1	0
TOTAL	21	31	91	9	23	30	0	0	92	17	71	30	2	1
SP (single site)	14	16	49	5	10	13	0	0	44	8	33	17	0	0
SP (multi site)	4	5	15	1	7	5	0	0	15	1	14	3	1	1
Incubator/innov	9	15	52	6	13	20	0	0	55	8	41	18	0	1
Teleport	1	0	1	0	1	0	0	0	1	0	1	0	1	0
Other	0	0	1	0	0	0	0	0	0	0	2	0	0	0
Blank	2	4	4	0	2	2	0	0	6	3	3	3	0	0
TOTAL	21	31	91	9	23	30	0	0	92	17	71	30	2	1
NTBFs	7	18	54	4	10	18	0	0	50	10	40	15	0	1
Inward Inv	1	0	4	0	1	1	0	0	4	1	3	1	0	0
Tech transfer	2	3	7	1	1	1	0	0	10	1	6	2	0	0
Other	2	2	6	2	3	4	0	0	10	1	7	3	2	0
Mixed objectives	9	8	20	2	8	6	0	0	18	4	15	9	0	0
TOTAL	21	31	91	9	23	30	0	0	92	17	71	30	2	1

Note: Sample is only for Science Park with tenants - sample size 139

H3 EXISTENCE OF TELEMATIC TECHNOLOGY DEMONSTRATION CENTRES NEARBY							
	TOTAL	Yes		No		Blank	
NORTH	125	45	36%	63	50%	17	14%
SOUTH	36	19	53%	14	39%	3	8%
TOTAL	161	64	40%	77	48%	20	12%
0-2 years	62	25	40%	29	47%	8	13%
3-5 years	39	16	41%	19	49%	4	10%
6-9 years	25	9	36%	15	60%	1	4%
10+ years	26	11	42%	10	38%	5	19%
Blank	9	3	33%	4	44%	2	22%
TOTAL	161	64	40%	77	48%	20	12%
SP (single site)	74	28	38%	33	45%	13	18%
SP (multi site)	30	10	33%	16	53%	4	13%
Incubator/innov	89	39	44%	44	49%	6	7%
Teleport	2	2	100%	0	0%	0	0%
Other	3	1	33%	0	0%	2	67%
Blank	10	4	40%	6	60%	0	0%
TOTAL	161	64	40%	77	48%	20	12%
NTBFs	79	31	39%	40	51%	8	10%
Inward Inv	10	1	10%	5	50%	4	40%
Tech transfer	17	8	47%	7	41%	2	12%
Other	15	8	53%	6	40%	1	7%
Mixed objectives	40	16	40%	19	48%	5	13%
TOTAL	161	64		77		20	

I1 THE MOST IMPORTANT NEEDS OF TENANT COMPANIES WHERE COMMUNICATION NETWORKS CAN HELP
Average value on a declining scale of 10 to 1

BY AREA OF INTEREST

	TOTAL	AVERAGES				
		Networks with cust/supplrs	Potential Distrib/serv	Potential tech sources	Potential R&D partners	Other
Tenants	139	8	7	6	6	9
No tenants yet	19	7	7	8	8	0
Blank	3	10	10	5	3	0
NORTH	125	8	7	7	6	10
SOUTH	36	8	7	7	7	8
TOTAL	161	8	7	7	6	9
0-2 years	62	8	7	7	7	9
3-5 years	39	7	7	7	7	0
6-9 years	25	8	7	6	6	0
10+ years	26	8	7	7	6	0
Blank	9	7	8	7	6	0
TOTAL	161	8	7	7	6	9
SP (single site)	74	8	7	7	7	0
SP (multi site)	30	7	6	7	7	0
Incubator/innov	89	8	7	7	6	8
Teleport	2	7	7	6	4	10
Other	3	0	0	0	0	0
Blank	10	8	7	6	6	0
TOTAL	161	8	7	7	6	9
NTBFs	79	8	7	6	6	8
Inward Inv	10	8	7	6	7	0
Tech transfer	17	8	7	7	8	0
Other	15	8	7	6	6	10
Mixed objectives	40	8	7	7	8	0
TOTAL	161	8	7	7	6	9

11 THE MOST IMPORTANT NEEDS OF TENANT COMPANIES WHERE COMMUNICATION NETWORKS CAN HELP
Average value on a declining scale of 10 to 1

ON A LOCAL NETWORKING LEVEL

	TOTAL	Average value	Suppliers and distrib.		Potential suppl r/dist		Potential tech sources		Potential R&D partners		Other	
Tenants	139	7	90	65%	81	58%	78	56%	79	57%	3	2%
No tenants yet	19	6	12	63%	9	47%	9	47%	9	47%	0	0%
Blank	3	7	1	33%	1	33%	1	33%	1	33%	0	0%
NORTH	125	7	77	62%	67	54%	67	54%	68	54%	1	1%
SOUTH	36	7	26	72%	24	67%	21	58%	21	58%	2	6%
TOTAL	161	7	103	64%	91	57%	88	55%	89	55%	3	2%
0-2 years	62	7	37	60%	32	52%	32	52%	34	55%	2	3%
3-5 years	39	7	25	64%	25	64%	23	59%	21	54%	0	0%
6-9 years	25	7	20	80%	14	56%	16	64%	16	64%	0	0%
10+ years	26	7	16	62%	15	58%	14	54%	15	58%	1	4%
Blank	9	5	5	56%	5	56%	3	33%	3	33%	0	0%
TOTAL	161	7	103	64%	91	57%	88	55%	89	55%	3	2%
SP (single site)	74	7	42	57%	39	53%	40	54%	39	53%	1	1%
SP (multi site)	30	7	18	60%	14	47%	14	47%	16	53%	0	0%
Incubator/innov	89	7	59	66%	50	56%	46	52%	48	54%	2	2%
Teleport	2	6	2	100%	2	100%	2	100%	2	100%	1	50%
Other	3	0	1	33%	1	33%	1	33%	1	33%	0	0%
Blank	10	6	7	70%	7	70%	7	70%	8	80%	0	0%
TOTAL	161	7	103	64%	91	57%	88	55%	89	55%	3	2%
NTBFs	79	7	59	75%	49	62%	46	58%	47	59%	2	3%
Inward Inv	10	6	5		5		5		5		0	
Tech transfer	17	7	9		8		9		8		0	
Other	15	7	10		9		9		8		1	
Mixed objectives	40	7	20		20		19		21		0	
TOTAL	161	7	103		91		88		89		3	

11 THE MOST IMPORTANT NEEDS OF TENANT COMPANIES WHERE COMMUNICATION NETWORKS CAN HELP
Average value on a declining scale of 10 to 1

ON A NATIONAL NETWORKING LEVEL

	TOTAL	Average value	Suppliers and distrib.		Potential supplr/dist		Potential tech sources		Potential R&D partners		Other	
Tenants	139	7	106	76%	98	71%	95	68%	96	69%	2	1%
No tenants yet	19	7	11	58%	9	47%	11	58%	11	58%	0	0%
Blank	3	7	1	33%	1	33%	1	33%	1	33%	0	0%
NORTH	125	7	86	69%	79	63%	79	63%	82	66%	1	1%
SOUTH	36	7	32	89%	29	81%	28	78%	26	72%	1	3%
TOTAL	161	7	118	73%	108	67%	107	66%	108	67%	2	1%
0-2 years	62	8	42	68%	40	65%	41	66%	40	65%	2	3%
3-5 years	39	8	30	77%	27	69%	28	72%	26	67%	0	0%
6-9 years	25	7	24	96%	20	80%	20	80%	22	88%	0	0%
10+ years	26	7	16	62%	16	62%	13	50%	16	62%	0	0%
Blank	9	6	6	67%	5	56%	5	56%	4	44%	0	0%
TOTAL	161	7	118	73%	108	67%	107	66%	108	67%	2	1%
SP (single site)	74	7	49	66%	45	61%	46	62%	47	64%	0	0%
SP (multi site)	30	7	19	63%	18	60%	17	57%	19	63%	0	0%
Incubator/innov	89	7	70	79%	63	71%	60	67%	59	66%	1	1%
Teleport	2	6	2	100%	2	100%	2	100%	2	100%	1	50%
Other	3	0	1	33%	1	33%	1	33%	1	33%	0	0%
Blank	10	7	7	70%	7	70%	8	80%	9	90%	0	0%
TOTAL	161	7	118	73%	108	67%	107	66%	108	67%	2	1%
NTBFs	79	7	67	85%	62	78%	58	73%	56	71%	1	1%
Inward Inv	10	7	5		6		5		6		0	
Tech transfer	17	8	11		10		11		11		0	
Other	15	7	11		10		10		8		1	
Mixed objectives	40	7	24		20		23		27		0	
TOTAL	161	7	118		108		107		108		2	

I1 THE MOST IMPORTANT NEEDS OF TENANT COMPANIES WHERE COMMUNICATION NETWORKS CAN HELP
Average value on a declining scale of 10 to 1

AT THE EC NETWORKING LEVEL

	TOTAL	Average value	Suppliers and distrib.		Potential supplr/dist		Potential tech sources		Potential R&D partners		Other	
Tenants	139	7	97	70%	92	66%	90	65%	97	70%	2	1%
No tenants yet	19	8	9	47%	10	53%	10	53%	11	58%	0	0%
Blank	3	7	1	33%	1	33%	1	33%	1	33%	0	0%
NORTH	125	7	79	63%	75	60%	77	62%	81	65%	1	1%
SOUTH	36	8	28	78%	28	78%	24	67%	28	78%	1	3%
TOTAL	161	7	107	66%	103	64%	101	63%	109	68%	2	1%
0-2 years	62	7	34	55%	35	56%	37	60%	40	65%	2	3%
3-5 years	39	7	31	79%	27	69%	28	72%	28	72%	0	0%
6-9 years	25	7	19	76%	19	76%	19	76%	20	80%	0	0%
10+ years	26	7	18	69%	16	62%	13	50%	16	62%	0	0%
Blank	9	7	5	56%	6	67%	4	44%	5	56%	0	0%
TOTAL	161	7	107	66%	103	64%	101	63%	109	68%	2	1%
SP (single site)	74	7	47	64%	46	62%	45	61%	49	66%	0	0%
SP (multi site)	30	7	16	53%	15	50%	15	50%	19	63%	0	0%
Incubator/innov	89	7	62	70%	59	66%	54	61%	58	65%	1	1%
Teleport	2	7	2	100%	2	100%	2	100%	2	100%	1	50%
Other	3	0	1	33%	1	33%	1	33%	1	33%	0	0%
Blank	10	7	8	80%	7	70%	9	90%	10	100%	0	0%
TOTAL	161	7	107	66%	103	64%	101	63%	109	68%	2	1%
NTBFs	79	7	58	73%	56	71%	53	67%	55	70%	1	1%
Inward Inv	10	8	6		5		5		7		0	
Tech transfer	17	8	10		10		10		12		0	
Other	15	7	11		11		9		9		1	
Mixed objectives	40	8	22		21		24		26		0	
TOTAL	161	7	107		103		101		109		2	

11 THE MOST IMPORTANT NEEDS OF TENANT COMPANIES WHERE COMMUNICATION NETWORKS CAN HELP
Average value on a declining scale of 10 to 1

NETWORKING OUTSIDE OF THE EC

	TOTAL	Average value	Suppliers and distrib.		Potential supplr/dist		Potential tech sources		Potential R&D partners		Other	
Tenants	139	6	78	56%	75	54%	75	54%	73	53%	2	1%
No tenants yet	19	8	6	32%	5	26%	6	32%	6	32%	0	0%
Blank	3	0	0	0%	0	0%	0	0%	0	0%	0	0%
NORTH	125	6	66	53%	62	50%	62	50%	62	50%	1	1%
SOUTH	36	7	18	50%	18	50%	19	53%	17	47%	1	3%
TOTAL	161	6	84	52%	80	50%	81	50%	79	49%	2	1%
0-2 years	62	6	27	44%	26	42%	29	47%	29	47%	2	3%
3-5 years	39	6	24	62%	22	56%	23	59%	20	51%	0	0%
6-9 years	25	6	15	60%	14	56%	13	52%	14	56%	0	0%
10+ years	26	6	15	58%	14	54%	13	50%	13	50%	0	0%
Blank	9	8	3	33%	4	44%	3	33%	3	33%	0	0%
TOTAL	161	6	84	52%	80	50%	81	50%	79	49%	2	1%
SP (single site)	74	7	37	50%	37	50%	39	53%	37	50%	0	0%
SP (multi site)	30	5	13	43%	12	40%	12	40%	13	43%	0	0%
Incubator/innov	89	6	44	49%	42	47%	39	44%	38	43%	1	1%
Teleport	2	7	2	100%	2	100%	2	100%	2	100%	1	50%
Other	3	0	1	33%	1	33%	1	33%	1	33%	0	0%
Blank	10	5	8	80%	7	70%	9	90%	9	90%	0	0%
TOTAL	161	6	84	52%	80	50%	81	50%	79	49%	2	1%
NTBFs	79	6	46	58%	45	57%	41	52%	42	53%	1	1%
Inward Inv	10	7	5		4		5		5		0	
Tech transfer	17	6	7		7		7		7		0	
Other	15	7	8		9		8		8		1	
Mixed objectives	40	7	18		15		20		17		0	
TOTAL	161	6	84		80		81		79		2	