

Government innovation support for commercialisation of research, new R&D performers and R&D networks

Eds: Erik Arnold, Jari Kuusisto

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Government innovation support for commercialisation of research, new R&D performers and R&D networks

Case studies from
France (Lorraine), Germany (Bayern), Ireland,
Korea, Netherlands, United Kingdom, Singapore
and Sweden

(Eds.)
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TECHNOPOLIS



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National Technology Agency

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Tekes' primary objective is to promote the competitiveness of Finnish industry and the service sector by technological means. Activities aim to diversify production structures, increase productivity and exports, and create a foundation for employment and social well-being. Tekes supports applied and industrial R&D in Finland to the extent of some EUR 390 million, annually. The Tekes network in Finland and overseas offers excellent channels for cooperation with Finnish companies, universities and research institutes.

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Foreword

As the mechanisms through which innovation contributes to economic growth have become better understood it has become obvious that governments need to rethink their role in supporting innovation. Innovation processes are complex and the attempt to tackle this complexity has resulted in a wide range of policy measures. During the last decade, systemic theories have been instrumental in understanding the big picture. Today, in a rapidly changing world, the main challenge of policymaking is to learn and adapt quickly.

Finland is in many respects considered to be a leading country in innovation policy design and implementation. In order to sustain its relative position, policies and policy measures can not merely be adapted from other countries. Innovative policies and policy measures need to be developed continuously. There is, however, a lot that can be learned from the experiences various countries have had in designing and implementing different innovation policies.

Tekes' role as one of the key actors in the Finnish innovation system entails a need to have a deep understanding of the innovation system and its development challenges and potential. In October 2000, Tekes decided to launch a study to survey institutional structures and processes related to government funding for R&D. The study concentrated on countries which have been able to demonstrate good performance and favourable development in their innovation system. The study looked at both the current structures and activities and expected or planned reforms to them.

The study was executed in two parts mostly during spring 2001. One of the parts analysed the innovation system through customers eyes focusing on the demand and supply of innovation services and funding. This part of the study was implemented by Technopolis. The other part of the study concentrated on a systemic analysis of key actors in the innovation system, public R&D funding streams and institutional structures. This part of the study was implemented by RAND Europe and Gaia Group. Both teams worked and prepared their reports separately, although joint meetings were organised during the study to exchange information.

This report describes the results of the Technopolis part of the study. Tekes wishes to express its gratitude to the experts at Technopolis for their thorough and extensive work in this study.

Helsinki, January 2002

Tekes, the National Technology Agency

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1 Introduction

The ability to create, distribute and exploit knowledge and information seems ever more important for the success. Increasingly, the health of national innovation systems is regarded as the single most important factor underlying economic growth and improvements in the quality of life. So far much of the innovation systems related literature has focused on macro level issues and institutional structures. As a result our in-depth understanding of the innovation process remains very limited.

This study seeks to create new process level information about the innovation systems under examination. The aim is to understand key processes and good practices in assisting university spin offs, new R&D performers and R&D networks. The focus of the analysis is on selected government programs in France (Lorraine), Germany (Bayern), Ireland, Korea, Netherlands, United Kingdom, Singapore and Sweden.

Chapter two includes a short discussion on the theoretical issues which are closely linked to commercialisation of research, firms' R&D capabilities and the significance of networking as a part of innovation process. The *following eight chapters* present the country reports. In each case university spin offs (commercialisation of research), New R&D performers and R&D networks will be examined separately in their specific country contexts. *Chapter 2* presents conclusions for good practice. In each country the three case studies were specified as follows:

Case 1: Support for university based high-technology start-ups

'A start-up high tech SME is about to be launched, based on university research. The entrepreneur is a university researcher or student and the research project originates from a project funded by public money'

Case 2: Support for new R&D performers

An EU definition SME launching an R&D project aimed to result in the firms first own product. The firm is located in a region eligible for EU structural funds. The project is planned to be implemented without any partners. The company has no systematic R&D processes, but the idea for the product shows real potential.

Case 3: Support for R&D networks

A subcontractor network of medium high-tech SMEs and their large multinational high-tech customer corporation are launching a project in collaboration with one local and one foreign university. The project includes both product and process development, but none of it could be described as radical innovation. The SMEs are from different regions, some eligible for EU structural funds, some not. The large multinational has major production facilities in the country, but head offices are located in another country

Focusing the study on these cases allowed us to be selective in the data collection and ensured comparability of the data. The international data set provides a basis for identification of good practices in innovation promotion.

2 Need and supply of government innovation support

The emphasis of this paper is on an empirical investigation of public innovation support practices in selected eight OECD countries. Companies' ability to create, distribute and exploit knowledge, will be discussed in connection with government innovation support policies and instruments. The focus of the discussion is on demand-supply analysis. The aim is to clarify how current government innovation support schemes cater for the various needs that exist within the innovation system. The analytical scope adopted is not limited to R&D and productions systems only. Instead, innovation system is seen as embedded in a wider national constellation of production structure and human resource development structures.¹

The following sections discuss the need for public innovation support in three different situations: commercialisation of research in university based start-ups, new R&D performers, and R&D networks.

2.1 Support needs – commercialisation of research and university based start-ups

To be able to support innovation process, government is increasingly in a facilitator role, enabling businesses and consumers to adapt to the demands and opportunities of the changing economy. In other areas, such as investment in fundamental research and ensuring stakeholder's involvement in policy design and implementation, where an active role for government is also indispensable.² In the 1990s public funding for research, especially applied research, has increased in most OECD countries, even if there has been some increase in the attention paid to basic research at the end of the decade. In parallel, there is an increasing pressure to realise results from the allocated resources. In many countries, the government view is that public sector research establishments should co-operate more closely with industry. This is seen as a way to increase the effec-

tiveness of the funding and overall as a way to ensure commercialisation of research results.

This section will first discuss the increasing pressures to commercialise research results. The commercialisation process itself can be divided into two separate but related issues: universities as an environment for commercial activities; and the actual commercialisation phase, licensing or setting up of new ventures to exploit the innovation commercially.

2.1.1 Commercialising research in the university context

Commercial, financial and time related pressures are now everyday concerns also in the research community. While research is getting increasingly specialised and complex to carry on, it is expected to produce outcomes which can be commercialised swiftly, before anybody else makes use of the new knowledge. For the researchers commercial exploitation of research means not only pressure to produce results, but opportunities for extra funding and access to better research facilities.

There are several reasons for the increasingly high rate of innovation and rapid application of new scientific advances in products and processes. In a globalised environment, knowledge and ideas move across the borders in a matter of seconds rather than days. Overall, the economy has shifted towards more knowledge-intensive industries and services which have rising skill requirements. Growing use of ICT in the economy and society has created a situation where the processing power increases exponentially, communications become ever faster and product cycles are compressed to a shorter period of time.

These developments put the linear model of innovation into an interesting light. To what extent will commercial pressures and the growth of ICT capacity be able to compress the innovation process? Where are the bottlenecks in the process? Are they most apparent at the basic research,

1 Extending and Deepening the Analysis of Innovation Systems – with Empirical Illustrations from the DISCO project, Lundvall, B. and Lindgaard Christensen J., Aalborg University Working Paper No: 99-12, 1999.

2 Science, Technology and Innovation in the New Economy, OECD Observer – Policy Brief, September 2000.

applied research, product development or at the final commercialisation stage or at the linkages between these? What should be the government role in the process? Those who abandon the linear model claim that innovations happen at every stage of the process as a result of complex interaction between those who are involved in research, development and use of the existing products. In any case, actors normally need each others specialised skills before inventions can be commercially utilised. Hence, it is important that the entire system is well linked up and able to co-operate. This requires some common understanding and language so that the parties are able to work together when necessary. For example, the university based research community needs to understand commercial realities. Similarly, the business community needs to cater for researchers' needs, such as freedom to publish and to pursue basic research in addition to applied one.

2.1.2 Government support for commercialisation of research results

Inevitably, some parts of the research and innovation system are more supportive than others for entrepreneurial activities. The following highlights some potential areas where policy intervention can advance the effectiveness of the innovation system.

Catalysing change in university structures

Universities, research establishments and businesses all tend to benefit where there are strong links between science and industrial innovation. However, traditionally research institutions are structured so that they are not very fertile environments for commercial activities. Together institutional structures, attitudes of the research community and administrative obstacles can create barriers to commercialisation. Many recent policy initiatives seek to change this situation.

Policy initiatives may also seek to change university structures and staff attitudes. The aim is to change thinking to become more market oriented and supportive of commercialisation of research results, as well as allowing commercial and strategic considerations to influence the direction of research. Another way to promote change is to alter incentive systems, for example offer financial rewards to universities on the basis of the number of co-operative projects they have with industry. IPR management is another key area. Universities and other research establishments need to have clear rules on who owns the IPR. It is vital that those who own the IPR have or can access resources to

commercialise the knowledge. In addition, most entrepreneurs need support in managing IPR related matters. The following illustrates some policy measures aimed at tackling such development needs.

Promoting entrepreneurship and better business skills

Lack of entrepreneurship culture and business skills amongst students and university staff is often seen as a weakness of European countries in comparison to the USA.³ As a consequence, research based innovations are not very effectively exploited.

To address these problems, entrepreneurship courses have been introduced in many universities. Such courses are seen as one way to cultivate university spin-offs set up by the students. Often the courses are targeted especially to engineering and science students who may have many technical ideas but lack entrepreneurship and business skills. Positive attitudes towards entrepreneurship are only the first necessary step. In addition, there is a need for the practical skills required in setting up a business. The ability to create high quality business plans can be promoted by competitions organised for university students, teachers and staff. In order to minimise the risks involved in the business start-up phase, potential entrepreneurs can benefit from feasibility studies and start-up assistance.

Entrepreneurs need business and management skills so that they are able to run the fledging new enterprise. These needs can be met through various types of management courses as well as mentoring. Access to incubator facilities is crucial for many academic entrepreneurs. These facilities provide entrepreneurs with support services and infrastructure from idea screening to the initial public offering stage (IPO). Such support encourages potential entrepreneurs to make the start-up decision. University based incubators offer a local environment where they can test the viability of the business. Low key access to pre-seed and seed financing are important. In addition to providing financing, they have a significant symbolic value, and they encourage students and academics to take the risk of setting up their own enterprise. Provided the business succeeds and grows, venture capital and IPO become relevant at the more advanced stage of the business. Most start-ups benefit if they can access a support package which offers some seed financing, management support and clear rules for IPR management. Money alone is not sufficient if the applicant does not have sufficient skills to make use of it. Support packages are also convenient for the start-up because they offer a package of help, eliminating the burden of several application processes.

3 Funding Technology – Lessons from America, Gill, D., Martin, C., Minshall, T. and Rigby, M., Wardour Communications, 2000.

Exhibit 1. An indicative list of support needs – commercialisation of research.

Need for support	R&D support measures
<i>Lack of entrepreneurship and business skills</i>	Entrepreneurship courses across the faculties Incentives for researchers to become entrepreneurs Business plan competitions Business management courses Feasibility studies Mentoring
<i>Practical help with:</i> <ul style="list-style-type: none"> • Business start-up • Management • Risk assessment and financing • IPR-management 	IPR assistance (Office of Technology Licensing services) Sabbatical or dual employment (faculty & spin out) Incubator facilities Pre-seed financing Seed-financing Venture Capital Packaged support for spin-offs Networking activities
<i>Limited access to business knowledge</i>	Assigned contact person / consultant Regional contact point General start-up support – web & databases

Support accessibility

Support needs to be easily accessible and the applicant needs to trust those who offer the assistance. Various types of networking activities as well as local access to support and an assigned contact person can be a great benefit for an aspiring entrepreneur. Internet portals and data-bases are also becoming an increasingly important support delivery channels for university based start-ups. This type of service works well in university environments, with up to date computer networks and high level of computer literacy among academics and students.

2.2 New R&D performers

One of the key roles of public support is to help companies build the business and technology needed to adapt to the demands and opportunities of the economy. In the current knowledge intensive environment, R&D is one of the key functions upon which the success of the enterprises is based. Yet, large parts of the SME sector have very limited R&D capabilities which means that this area has a lot of potential for improvement.

Among other things, the need for support depends on the industry sector and the development stage of the individual business. Forms of assistance range from simple R&D awareness building to skills up-grading, network assistance to large scale programs on strategic high technology areas. Although advanced technology programs are challenging in terms of technological expertise, up-grading of

low technology enterprises may be even more challenging, simply because of the large number of potential clients. The core skills of the organisation specialised in technology diffusion are market knowledge and marketing related rather than high technology issues. From the national development agency perspective, it is often very uneconomic to initiate contacts with a large number of small firms and to run many small projects with them. Another barrier is the fact that small firms may be unwilling or unable to co-operate with technology support agency.

2.2.1 Need to raise awareness of R&D

Numerically, the bulk of potential R&D performers are small firms. They make up a major share of the entire business population and represent a very significant technology development potential. Effective needs based technology assistance requires an intimate knowledge of the SME population. Support should be delivered in a cost-effective way to a large number of small firms.

The figure below illustrated that the first step in the process is to raise SMEs awareness of the potential benefits of technology assistance. This may not be an easy task since many small firms have rather low technological capabilities (see Exhibit 2, low technology SMEs). Often such businesses also lack interest in developing technology, as well as the ability to communicate with technology experts. Hence, the first task for technology support is to activate these businesses and thereafter to enable them to upgrade their technological capabilities.

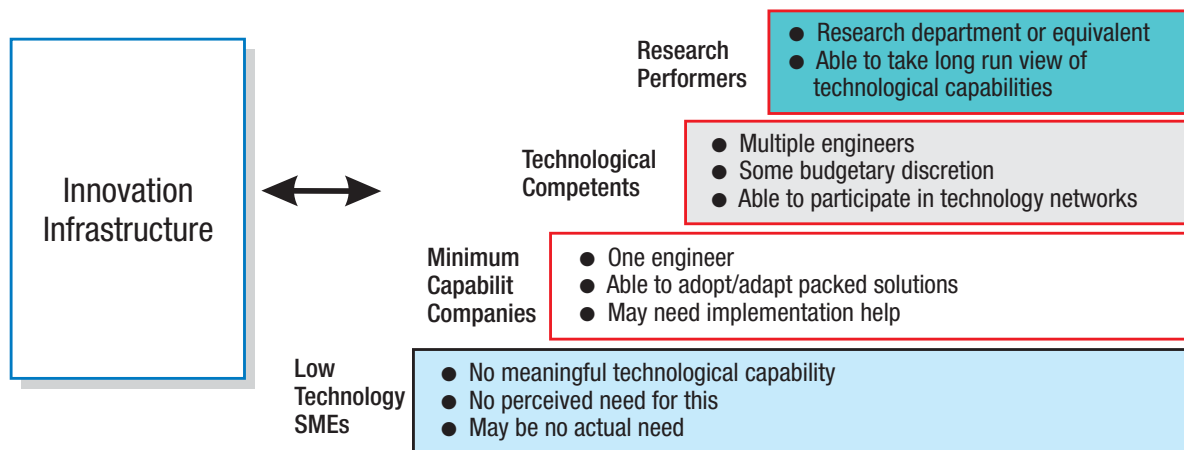


Exhibit 2. Demand for R&D support is segmented⁴.

The ‘steps’ model illustrates how assistance can help small firms to climb up the technology capability ‘stairs’. Each stage in this process represents different needs that the technology agency has to accommodate. Starting from awareness generation, help in implementing packed solutions, financing, management development, networking with experts, and finally technology programs for high capacity firms. Steps one and two represent the situation of new R&D performers. In the case of low technology SMEs and minimum capability companies the support focus is on technology diffusion whereas with more competent companies the focus is on technology development.

2.2.2 Financing of R&D activities

A justification of public R&D financing is often based on its ability to promote projects, which might not otherwise actualise, for instance due to uncertainty or lack of immediate commercial prospects. The effectiveness of public funding of business R&D seems to have an inverted-U shape, increasing up to an average subsidisation rate of about 13 % and decreasing beyond. Over 25% public subsidy appears to substitute for private funding. In addition to the appropriate level of funding the effectiveness of government funding increases where there is a long-term framework (this reduces uncertainty), and consistency between different instruments.⁵

As Exhibit 2 illustrates, needs for technology support are diverse. The same applies to the public financing for R&D. Needs for support depend on the industry sector, firm size and numerous other issues. Typically, large firms receive a significant share of public R&D financing through strategic technology programs. Besides encouraging high risk and long-term projects, technology programs can play a role in keeping large firms engaged in the national innova-

tion system. The benefits of their active presence are obvious. The large firm contribution can improve the overall level of R&D within the country. In addition, spill outs and technology transfer to other firms are typical outcomes from large firms’ R&D and other technological activities.

SMEs are typically involved in somewhat smaller technology projects, often as part of a larger network of businesses. Many SMEs benefit from R&D financing as part of a package which involves also some elements of management support and process development measures. Many of these firms have very limited internal technological expertise. Here public financing for technology projects can have an important catalytic role, such assistance helps companies to take the critical first step in the development process towards improved technological capability. There is a large segment of small firms which can benefit by upgrading some parts of their production process with the help of publicly financed projects. Access to networks is another important outcome from many government financed projects to small firms. Forms of government R&D financing include: tax breaks; innovation strategy development support; state-subsidized R&D programs; loans; grants; loan guarantees and capabilities development.

Packaged support for R&D performers is becoming increasingly important, especially in the case of small firms. In comparison to pure financing, a tailored combination of financing and management development can yield better results.

2.2.3 Access to knowledge

Access to technology and related knowledge varies within the business population. Firms have different routes through which they access knowledge and many low capa-

⁴ Developing Firm’s Technological Capabilities, E. Arnold and B. Thuriaux, Technopolis, 1997.

⁵ Science, Technology and Innovation in the New Economy, OECD Observer – Policy Brief, September 2000.

Exhibit 3. An indicative list of support needs – new R&D performers.

Need for support	R&D support measures
<i>No perceived need for R&D</i>	Technology audits
<i>Lack of financial resources for R&D activities</i>	Product development assistance R&D tax breaks R&D / innovation strategy development support State-subsidised R&D programs R&D loan guarantees R&D loans R&D grants
<i>Limited R&D capabilities</i>	Integrated business & innovation development Manufacturing consultancy Placements of qualified personnel, e.g. graduates R&D management courses Networking activities / introduction services Packaged support for R&D performers
<i>Limited access to knowledge</i>	Linkage to EU programs/financing Mentoring Assigned contact person / consultant Regional contact point General innovation / R&D support – web site etc.

bility firms are fairly isolated from the R&D community. Smaller firms' limited resources create a need for local access points, mentoring and consulting services. There is a need for regional innovation agency type of services which can link small firms to national and EU-programs. Besides creating access to R&D and related support activities, these agencies can help small firms by providing ideas for suitable projects and by assisting in project management. More recently the Internet has emerged as an increasingly important information channel for computer literate businesses. Again, limited resources and skills may put smaller firms in a disadvantaged position in making use of Internet-based R&D information delivery.

Exhibit 3 above summarises the most important support needs and measures in the case of new R&D performers.

2.3 Network based research and development

The complexity of technologies that drive economic performance today is making obsolete both the mythic image of the brilliant lone inventor and parts of the traditional

technology policy. By 1995 complex technologies made up of 82 % of the most valuable types of goods exports. Increasingly, innovation in complex technologies is the work of organisational networks which has led to the 'death of lone inventor'. Many technologies are just too complex for an individual or firm to manage alone. As a result, increasing numbers of specialised operators create complex networks that behave as learning organisations for success in innovation. Typically networks involve a mix of services and manufacturing activities / organisations.⁶

Crucial network resources include capable people and social knowledge, both of which are key elements of successful co-operation and innovation. Lifelong learning and a supply of relevant education are increasingly important in the rapidly changing network environment. Typically, R&D networks include research establishments and businesses which have to adapt to each other's culture and somewhat different aspirations. In addition, a balance needs to be found between the network members' business interests. Various combinations of horizontal and vertical co-operation are possible. However, companies which are in direct competition with each other can have difficulty in belonging to the same R&D network⁷. A key task for government is to create a supportive environment for network

6 Innovation Policy for Complex Technologies, Issues in Science and Technology Online (www.nap.edu/issues/16.1/rycroft.htm), Rycroft, R., and Kash, D., Fall 1999.

formation and development. The need for more focused government intervention in R&D network activities will be discussed in the following sections.

2.3.1 Network development support

Increasingly complex innovations require specialised expertise from a number of businesses and research establishments. Typically, the benefits of networked R&D can be realised when it brings together organisations with diverse tacit and explicit knowledge. However, setting up and managing of network organisations is not simple. As a consequence there is a need for advice on how to operate effectively in groups, teams, and sociotechnical systems that include, for instance, large firms and SMEs as well as re-

search establishments. Previous sections have identified potential support needs in the areas of R&D awareness, technological capability upgrading and financing of technology investments. All these support needs can exist also in the R&D networks. Hence it is important that also R&D networks can receive similar support as individual firms.

Networks can build up capabilities by creating a critical knowledge mass as a result of co-operation. Thus support for network based R&D can be at least as important as the support for individual firms. A key issue in terms of network based R&D is the establishment of a well functioning consortia. Setting up of a network is a potential area for public funding. For instance, support may be needed for hiring a person who will be in charge of organising and managing of the network.

Exhibit 4. An indicative list of support needs – R&D networks.

Need for support	R&D support measures
<i>Network development</i>	Specific programs for networks (applicant) <ul style="list-style-type: none"> ◆ Business – research establishments ◆ Large firm – SMEs
<i>Lack of financial resources for R&D activities</i>	R&D tax breaks State-subsidised R&D programs R&D loans R&D grants Industrial design assistance R&D loan guarantees
<i>Limited R&D capabilities</i>	Manufacturing consultancy Placements of qualified personnel, e.g. graduates R&D management courses Packaged support for R&D networks
<i>Limited access to knowledge</i>	Mentoring Assigned contact person / consultant Regional contact point Linkage to EU programs/financing

7 Competitors typically collaborate only in R&D questions, which are well away from commercialisation, such as pre-competitive research, or which tackle industry-wide problems such as standards. See Erik Arnold, Ken Guy and Mark Dodyson, Linking for Success: Making the Most of Collaborative R&D, London: IEE/NEDC, 1992

3 France (Lorraine)

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3.1 Introduction

The Lorraine region in the North-East of France is one of the regions in the core of Europe that suffered most from the decline of its traditional industries: steel and coal in the North; textiles in the South. Its 2.3 million inhabitants have lost around 10.000 jobs per year, and have suffered net emigration in the first part of the nineties, including many of the younger and better-qualified people.

Unemployment in Lorraine is more than 8.9% of the active labour force, but amounts to 21% among the younger part of the population. The concentration of activities and population is growing within the metropolitan axis (Nancy/Metz), at the expense of the rural parts and old industrial areas within the region. Still concentrating in the metalworking (40% of industrial employment), agrifood (12%), wood and paper (10%), and textile – clothing (7%) industries, the industrial activity of the is in the process of evolving towards higher value-added production and escape from captive sub-contract markets and dependence on larger firms.

Lorraine benefits from a good geographical position, at the cross-roads between France, Germany and Belgium. It has many universities and higher education establishments as well as a number of technical colleges and vocational training organisations. It benefits from the availability of good quality technology centres, covering the main technical needs of the regional sectors. Signs of renewal of the industrial fabric are now apparent, mainly in the vicinity of the two main centres: Metz in the North, and Nancy in the South. A number of newer, knowledge-based SMEs are emerging and restructuring policies engaged in the '80s have started to have effects. There is a remarkable increase in the number of companies applying for the first time to innovation support schemes.

The industrial fabric of the Lorraine region is characterised by large and multinational enterprises, and a surprisingly small number of SMEs⁸. Large groups account for 70% of employment and 80% of regional turnover, and Lorraine

has a high (by French standards) rate of employment in foreign, European-controlled⁹ companies (27% in 1998). This foreign presence is both an asset, because of the direct and indirect effects of the activities and capabilities of these companies in the region, and at the same time a threat since the headquarters of these companies are outside the region.

3.2 Case 1: Supporting university based high tech start-ups

In the French case (Lorraine) we identified the following types of supports for commercialisation of research and university based start-ups.

In Exhibit 5 listed programs will be discussed in more detail in the following sections.

3.2.1 University based start-up offices

Most universities offer start-up advice to their researchers. A good example is the University of Nancy 2. Apart from giving general advice on legal and financial matters, the university offers a whole series of courses for young founders, ranging from simple courses to lecture cycles. The "Entrepreneurship and SME Development" course allows students to obtain a sort of entrepreneurship diploma. According to staff at Nancy 2, the interest on the part of students is big. In addition, Nancy 2 provides a lecture hall with audio, video and electronic devices for self-study. The university maintains close links with industry, researchers from other universities, RTOs, laboratories and legal and financial experts. Cre@ctive, a special interdisciplinary program designed by the university, aims at teaching the basics of entrepreneurship to students from all backgrounds. Some of the modules are held by experienced university staff usually coming from business related subjects, others are taught by entrepreneurs themselves. The use of modern information and communication technologies facilitates videoconferencing and online instruction.

⁸ In France, SMEs are defined as companies with up to 2000 employees

⁹ Defined as owned by foreign companies by a rate of 20% of capital.

Exhibit 5. Needs and supply of start-up support – Lorraine.

Need for support	Support measures
<i>Entrepreneurship and business skills</i>	Start-up competitions – Min. of research & industry/Anvar Assistance for young researchers – Anvar Cre@ctive; entrepreneurship and business skills for students across the faculties – Universities Entrepreneurship diploma – Universities
<i>Practical help with:</i> <ul style="list-style-type: none"> • Business start-up • Management • Risk assessment and financing • IPR-management 	University start-up offices – universities Assistance for start-ups – Anvar Venture capital – Institut Lorrain de Participation and banks
<i>Limited access to business knowledge</i>	Experts fees covered by public sector – Anvar (consultants, patent lawyers, IP-specialists) Subsidised costs of hiring educated staff – Anvar

3.2.2 Start-up competition

Every year, the French Ministry for Research and Industry and Anvar conduct a Business Plan Competition. Although this is a national scheme, it needs to be mentioned given its huge popularity in the country and the lack of comparable regional schemes. The objective of this competition is to encourage start-ups with an innovative potential. Apart from financial help, the winners obtain assistance in all matters relating to the foundation of an enterprise. The competition is open to all French citizens intending to create an innovative start-up, as well as to European Union nationals residing in France. Start-ups in the conception as well as in the development phase are admitted. Preferred, though by no means exclusive, sectors are life sciences, information and communication technologies, new materials and environmental technologies.

3.3 Financial assistance

3.3.1 Assistance for young researchers by Anvar

Although not designed explicitly for start-ups, this program aims at supporting young researchers in developing innovative products, processes or services. The project has to be designed by young researchers aged between 15 and 25 years, and the product, process or service developed during the course of the project has to be commercially viable. Applicants can be university researchers, but also pupils from secondary schools and other public education institutions. All costs associated with the project can be financed (including materials costs, travel costs, external expertise, research costs, personnel costs...etc). The money

is paid out directly to the beneficiaries. The total sum granted cannot amount to more than 50% of project costs. Projects above FF 40,000 (EUR 6000) are supported only in very special cases.

3.3.2 Anvar assistance for start-ups

In addition to the program for young researchers, Anvar runs a variety of programs explicitly designed for innovative start-ups. It helps the enterprise with feasibility studies and offers financial support for the SME by paying for the use of external expertise such as financial councillors, patent lawyers and IP specialists. The sum granted is designed as a subsidy with a maximum value of FF 200 000 (EUR 30,500) and can cover up to 70% of all project costs. Furthermore, Anvar provides financial recruiting assistance for SMEs. The sum of money granted varies according to the educational level of the recruited person and covers up to 50% of costs related to recruiting in the first year (salary, training...etc.).

3.3.3 The Participation Institute of Lorraine (ILP)

The ILP (*Institut Lorrain de Participation*) is the foremost venture capital institution in the region. Its main shareholders are the Regional Council of Lorraine and major regional and national banks. ILP is a public risk capital fund with the mission to support young innovative firms to realise new products and processes, even in the very early phases of business start-ups. The fund, which is endowed with FF 180m, is especially targeted at the needs of young high-tech companies in the region to assist them with the development and commercial exploitation of new products.

Financial aid is given in the amount ranging from FF 100,000 to FF 8.5m (EUR 15,000 to 300,000). The project has to be implemented in large part by the applicant itself within the region of Lorraine, it has to comprise a technological challenge with calculated risk, and be relevant to the economic success of the applicant. The application form has to be sent to ILP, which may require further documentation. The main selection criteria are:

- A convincing unique selling proposition (USP)
- A clear and achievable strategic vision (where does the company want to be in three years?)
- Future cash flows
- Description of management team. A team approach is crucial, for it is unlikely that one person alone unites the management as well as technological skills necessary to carry out an innovation project. Equally, the business plan has to show that the relevant positions are filled with competent people
- Estimates of the amount needed as well as purpose of use.

3.4 Case 2: New R&D performer

Unlike in Germany, where innovation policy and industry support are largely regionalised, in France most relevant organisations and programs are national. Due to the relatively centralised character of the French system, it is thus difficult to talk about regional innovation networks in the same ways as in a German states/ regions. However, in

France most national institutions do have regional subsidiaries. Thus, Anvar has regional offices (délégations régionales) which deliver services tailored to local needs. The organisation of Anvar has been considerably decentralised over the last years, and discussions are under way to devolve even more powers to the regional units. The same is true for the SME Development Bank.

There has also been efforts to consolidate the regional actors into an effective innovation network. The RDT (Réseau de diffusion technologique) and the RFI (Réseau de financeurs d'innovation) are two of such networks comprising the most important institutions within the region. The RDT consists of Anvar (see below), some other public bodies, universities and technology transfer centres called CRITT (see below). Most venture capital institutes as well as Anvar are members of RFI. Both networks are informal, but regular meetings as well as the relatively small size of the region facilitate good personal relations and continuous exchange of experience. SMEs looking for help are referred to the appropriate source by the members of these networks.

3.4.1 General assistance

By far the most significant organisation in the region is the regional delegation (DR) of Anvar (*Agence nationale pour la valorisation de la recherche*). Its primary task is to promote and finance innovation in Lorraine particularly for SMEs. With a budget of FF 1.4bn, the agency helps entrepreneurial and research organisations to tackle the techni-

Exhibit 6. Needs and supply of support for new R&D performers – Lorraine.

Need for support	R&D support measures
<i>No perceived need for R&D</i>	Ad hoc advertising in the press/radio – Anvar
<i>Lack of financial resources for R&D activities</i>	Grants + loans – Anvar regional branch Soft loans – ADI (aide au projet d'innovation)
<i>Limited R&D capabilities</i>	General assistance; technical, human resources, Commercialisation – Anvar regional branch Technology transfer – Attelior (Association pour le Transfert de Technologie en Lorraine) Centres Régionaux d'Innovation et de Transfert de Technologie (CRITTS) – technology transfer to SMEs; Product design & testing, feasibility studies, process Development, modelling and simulation
<i>Limited access to knowledge</i>	CRITTS services; (continues) Consultancy and training Conferences, workshops and seminars Information services Placement of qualified personnel – Anvar, DRIRE, DRRT

cal, commercial, financial and human challenges of innovation. Anvar is a public body under the authority of ministries for industry, small business and research. Anvar is well known to most enterprises in France and it provides the first point of access to SMEs.. The agency has strong reputation based on its flexibility to meet enterprise needs and its relatively unbureaucratic procedures. Apart from a variety of specific programs, which are described in the course of this report, Anvar offers consultancy for SMEs and refers them to appropriate source of help.

The regional delegation of Anvar in Lorraine consists of 13 people. Apart from the director and the deputy director, there are seven case officers, who are affiliated to different sectors (this affiliation is informal, based on their personal interest and background). These case officers are supported by four assistants who are mainly doing administrative work. Anvar does some marketing directed to the companies in the region. However, this is not systematic. Rather, every case officer keeps his/her eyes for companies which could need help. Anvar also does advertising through the local press, arranges press conferences and meetings at the regional council. Nevertheless, there is still a need to extend these marketing activities. For many companies, Anvar still has a very elitist image. Especially among SMEs, the perception is that they are only there for big, high-tech enterprises and that their company is not sophisticated enough for their services.

3.4.2 Technology Transfer

RDT and Attelor

The most important technology transfer network in Lorraine area is the RDT, which is administered by *Attelor (Association pour le Transfert de Technologie en Lorraine)*. The main task of Attelor is to co-ordinate the activities of the different players in the region and to facilitate SMEs' access to technology. Although such networks exist in most French regions, Lorraine has been the pilot region chosen by the French Ministry for Research and Industry in 1994. The steering committee of Attelor comprises the Regional Council of Lorraine, Anvar and other public sector bodies. In total, RDT has 35 members, consisting of the major RTOs, Chambers of Commerce and universities in the region. The most important member organisations are:

- 11 regional innovation centres (called CRITTS in French and described in more detail below)
- Chambers of Commerce
- Academy of Nancy
- Université Henri Poincaré in Nancy
- Université de Metz
- Université Nancy 2.

All members of the network have taken on the task to identify the technological needs of SMEs, to assist them with innovative projects, to act as a point of reference directing

SMEs to the appropriate source of help, and to give information on all matters relating to innovation.

The CRITTS

The most important members of RDT are the *CRITTS (Centres Régionaux d'Innovation et de Transfert de Technologie)*. There are eleven of them, each one affiliated to a specific industry sector. The most important CRITTSs are Metal, Wood and Apollor which is specialised in energy and gas industry. All CRITTS work closely with the industry and specialise on the needs of SMEs. They are closely linked to other network partners and act as a point of referral. They charge for most services apart from pure information services. For example, a feasibility study at the CRITT for the wood industry costs roughly FF 3000 (EUR 457). However, public support is available to cover these costs. For instance, Anvar can provide financing for these costs. The most important services they offer are: product design and testing, feasibility studies, process development and optimisation, modelling and simulation, consultancy, specialist training and conferences, information services and finally, workshops and seminars

3.4.3 Financial support – ADI program

By far the most popular program in the region – and in France as a whole – is the *ADI (aide au projet d'innovation)*. ADI is a program giving out soft loans to innovating SMEs which are converted into a subsidy in case of failure. Although the program has not been designed for any specific group of SMEs (e.g. in terms of sector, technological sophistication), there is a bias in terms of sector: ICT and everything related to the Internet are the biggest receives of ADI finance. This bias is surprising given the industrial make-up of the region (although there are lots of Internet companies around Nancy and Metz). Internet firms tend to be particularly well networked and informed, which gives them a certain advantage over other firms.

ADI finances all costs necessary for the execution of a project. The enterprise has to provide details of the costs it intends to cover with Anvar money. Otherwise there are no restrictions. Thus, personnel, material and outside expertise can all be financed through ADI. There is no maximum sum defined by Anvar. Normally, however, ADI does not exceed F 10m. Typically, between 40 and 50% of project costs can be financed through Anvar. The rest has to be financed by other means. However, it is possible to complement Anvar finance through venture capital, equity finance, state subsidies or bank loans. It is important to note that an approval by Anvar provides SME with a quality 'guarantee' which makes it easier to obtain financial help from other sources.

After a project has been closed, there is no follow-up. Sometimes, SMEs are contacted again, but this does not

happen on regular and systematic basis. The great number of projects makes follow-up very difficult. However, according to Anvar it would be useful to conduct a thorough evaluation in order to assess the efficiency of ADI programs.¹⁰

3.5 Case 3: Support for R&D network

Besides national programs, additional network specific support could not be identified within the Lorraine region. The following will discuss briefly the characteristics of the national level support for R&D networks. The French are now focusing on promotion and diffusion of an innovation culture. R&D networks are one of the key focus areas. Ministry of Education, Research and Technology (MENRT) and the Ministry of Economy, Finance and Industry (MEFI) are the most important government actors in charge of research and innovation promotion activities. In the French system program frameworks and priorities are set at the national level but the implementation of the research and innovation policy is left to regional actors. A result is that national priorities are not always in line with the regional implementation. As such the situation where two ministries are involved in innovation policy related activities is somewhat problematic. This is reflected at the regional level where the complex agency structure can be confusing for SMEs. Overall, complexity is typical of the French innovation and regional development system. In total the system consists of more than 100 organisations and actors.

Among other things, French policy is promoting co-operation between public research institutes and private firms,

organised in thematic research networks. Research networks set up by MENRT involve public research institutes and private firms. The participants work together setting the research priorities, which are mainly catering the needs of the larger firms that can make use of the leading edge research. Thus, SMEs which tend to have needs for simpler links of R&D can benefit little from these networks. Moreover, the assistance offered at the regional level is often characterised by administrative confusion because both national and regional agencies offer various support measures for SMEs (see Exhibit 7). In some regions more than 110 support measures are offered by around 70 public or semi-public agencies (national and regional agencies, technology transfer programs and associations).

EVARISTE is an official web site of the French Ministry of Industry (MEFI), focused on innovation and technology transfer. It provides a starting point and access to numerous web sites, databases and links to research establishments (www.evariste.org/aides/).

The Technology Diffusion Network (RDT) brings together public sector actors who are involved in technology transfer or industrial development (CCI, Technical Centre, DRIRE, DRRT, ANVAR, Laboratories, Universities, Regional Councils etc.). Members of the network have to undertake visits to regional SMEs in order to identify innovation needs. They are also responsible for delivering a large number of public sector measures for innovation promotion. Within this policy framework a particular emphasis is given to support for those SMEs that have never been in contact with public authorities or research establishments.

The Technology Unit (Direction de la Technologie) of the Ministry of Research seeks to enhance the value of the research and co-operation between enterprises and state re-

Exhibit 7. Needs and supply of support for R&D networks – Lorraine.

Need for support	R&D support measures
<i>Network development</i>	Technology diffusion network (RDT) brings together wide range of public sector actors <ul style="list-style-type: none"> • aimed at improving their SME support provision Business and research establishments networks – MENRT <ul style="list-style-type: none"> • caters mainly large businesses needs
<i>Limited access to knowledge</i>	Regional contact / sign posting facility – Anvar Evariste web site provides an access point – MEFI EU programs/financing co-ordinated by MEFI Placement of qualified personnel – Anvar, DRIRE, DRRT

10 Since we interviewed Anvar in Lorraine, Technopolis has in fact evaluated Anvar’s ADI scheme. Unfortunately, at the time of writing, this report remains confidential.

search institutes. The technology Unit is also responsible for various technological organisations such as: National Environmental Agency (ADEME), Agency for technologies diffusion (ADIT), National research and innovation agency (ANVAR), The French Atomic Energy Commission (CEA), French research institute for exploitation of the sea (IFREMER), Agricultural and environmental engineering research (CEMAGREF).

Technology Unit co-ordinates and monitors R&D programs financed by the European Commission. The Unit is also organising the financing of research and innovation programs and it manages the “Technology Research Fund” (FRT).

3.6 Summary

The French innovation support system involves many agencies and initiatives. On the national level the French support system for SMEs and regions has some very distinctive features. First of all, the entire system is strikingly complex and difficult to decipher. However, the French have a long tradition in administration and it seems that they can make the complex bureaucratic system work reasonably effectively. A key ingredient of this success is the relative stability of the agency structure. Although constant development does happen, the Anvar case illustrates that a combination of stability and the distinctively French way to ‘interpret’ bureaucratic rules can produce a well functioning support system. However, the constantly evolving system is becoming increasingly complicated as layers of programs, agencies and measures continue to accumulate.

The need for co-ordination at regional level is obvious. This requires closer co-operation between the state agencies and a more transparent innovation support system which is better able to cater for SMEs. needs. The goal of setting up a “one stop” agency in each region is difficult to achieve, given the complexity of the system and rivalry between national agencies. Political interference and mistrust between regional authorities and the state – often accused of imposing its priorities on regions – are not helping the creation of a more transparent support system.

Since 1999 a number of measures have been outlined to address these problems, including the creation of incubators within universities and greater co-operation between local research establishments, local authorities and advisory bodies. In each region of France, a technology diffusion network (RDT) co-ordinates innovation promotion to SMEs.

The investigated Lorraine region has had a great need for effective use of available support measures and it has been able to create an environment where networking plays a key role between the support agencies and as a feature built into the support programs. The process of transformation of Lorraine from a region based on traditional industry to a modern industrial region is still under way. The innovation network activities seems to have helped that process. Regional venture capital companies also have an important role. In particular, the *Institut Lorrain de Participation* and the regional technology transfer organisations which are helping SMEs to engage in innovative processes by giving advice and sharing the risk.

The support agencies around the Lorraine Region claim that they nowadays are well networked both formally and informally. This provides basis for co-ordination, co-operation and sign posting. The financial institutions of the region are linked together in the RFI, and the technology transfer organisations are members of the RDT. The members of both organisations meet on a regular basis and refer SMEs to the appropriate source of help within the network. By far the most important player in the innovation network is the regional Anvar office. It offers a variety of support programs to SMEs and is active in both innovation support and start-up finance. The organisation is perceived well by the market for its proximity to industry, its competence and its unbureaucratic procedures. It also provides a complementary source of financing for long-term innovation projects, which require a substantial amount of R&D, and success is often far from certain. By comparison, venture capital focuses on relatively short-term innovation projects with high growth potential, preferably in the biotech and ICT sectors. Hence Anvar provides a valuable source of support, without which many SMEs could not engage in innovative activities.

4 Germany (Bavaria)

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4.1 Introduction

The Land of Bavaria is one of the most dynamic regions in Germany. The Land's gross domestic product was 643 billion DM in 1999 per capita, more than twice as high as the German average. Its capital Munich has 1.3 million inhabitants and has the highest spending power of all major German cities. The city advertises itself as the European high-tech and venture capital centre and has an ambition to become Europe's leading location for firms in emerging technologies such as information technology, multimedia and biotechnology.

Munich has the second highest density of *venture capital companies* in Germany. Approximately ten venture and risk capital companies are located in the city, amongst them three of the 'top ten' in Germany. Some of them are typical high-tech VC companies such as Atlas Venture, Techno Holding VC, Techno Venture Management. Of total gross VC investment in Germany, 20% went to Bavaria based companies, with a high share in Greater Munich. Overall, there is more than 1 billion DM waiting to be invested in the region. Of all large German cities, Munich has the largest share of highly qualified personnel with 12% of the labour market. The city also has more than 100.000 students spread across several universities and polytechnics, 20% of whom are in the sciences. Munich is the seat of the European Patent Office, the German Patent Office and the German Patent Court. These organisations have not only attracted a dense network of specialised patent lawyers but also the main patent institutes of the Max Planck Gesellschaft and the Fraunhofer Gesellschaft, two of the major research and technology organisations in Germany.

In terms of economic structure the city has some of the Germany's best known multinational companies such as Siemens, Siemens Nixdorf, BMW, Audi, Daimler Benz Aerospace, and a number of global players in micro-electronics such as Apple, Compaq, Intel, Lotus, Oracle, Microsoft and Texas Instruments. In matters of R&D, Bavaria is placed extremely well among the German regions. 2.8% of GDP is being invested in science and technology,

compared to the German average of 2.4%. Within Europe, this percentage is relatively high (compared to 2,2% for France and 1.9% for Great Britain).¹¹

4.2 Case 1: Supporting university based high tech start-ups

Among the German regions, Bavaria offers the most lavish support for start-ups. Support in all phases is abundant, access is easy and unbureaucratic, and the institutions involved are relatively transparent. Given the strong presence of excellent universities in the region, support for university start-ups has grown stronger over the last years. The major universities have start-up offices providing prospective entrepreneurs with information, support, and sometimes physical facilities.

In addition to these specific support measures, student-entrepreneurs profit from the innovation support infrastructure, from the growing Bavarian business plan culture and the abundance of venture capital in the region. However, despite these well-functioning and growing support mechanisms, the number of university start-ups is still relatively low compared to other countries, especially the United States.

4.2.1 Initial advice for early start-ups

The Bavarian innovation support network is very dense. The institutions (described in case study one) offer advice for all start-ups. In the Bavarian Ministry for Economics, Transport and Technology and in each of the chambers of commerce, there is a department focusing on the creation of enterprises. These are valuable signposting agencies consulting companies on all matters related to start-ups, from finance to innovation and management support.

On the web-page of *Bayern Innovativ*, a lot of information can be found on start-ups. Under the link "Innovation Network Bavaria", (www.innovations-netz-bayern.de/theme/ger/) all major actors and support schemes can be accessed either on an institutional or on a thematic basis. For example, if an SME wants to find out information on equity finance, it can

11 "Bayrische Technologiepolitik", Bayrisches Staatsministerium für Wirtschaft, Verkehr und Technologie, Juni 2000

Exhibit 8. Needs and supply of start-up support – Bavaria.

Need for support	Support measures
<i>Entrepreneurship and business skills</i>	Gründer Region; start-up promotion – Bavarian Government Business Plan Competition – higher education & private sector Researcher can work half-time for the university / new business – Ministry of Economics, Transport & Technology (METT)
<i>Practical help with:</i> <ul style="list-style-type: none"> • Business start-up • Management • Risk assessment and financing • IPR-management 	University start-up support offices – universities Office space for start-ups – universities Support Circle for New Technologies (FNT) – Independent Munich Business Angel Network – linked to FNT Bayern Kapital – public sector controlled VC firm SME Credit Programmme – loans from state bank Bavarian Innovation Program – grants from state Support for technology start-ups – state grants
<i>Limited access to business knowledge</i>	Bayern Innovativ – Web site / data base Sign posting – METT / Chambers of Commerce

click on the relevant link which brings it to a sub-menu featuring information, training, tips for taxation, and much more. For first-time innovators, Bayern Innovativ is an effective first-stop shop for finding their way through the complex Bavarian innovation system.

4.2.2 Universities support for start-ups

A university researcher is most likely to go to the start-up offices of their own university. Each of the big universities in the region has a number of staff dedicated to counselling start-up entrepreneurs and to helping them to transform their ideas into economic success. They give advice on all matters concerning start-ups – finance, patent issues, legal and tax matters, incubation facilities...etc. Very often, as is the case with Ludwig-Maximilian-University (LMU), start-ups can use offices and facilities at the university. Most of the university start-up centres are members of the initiative *GründerRegio* (Founders’ Region), a program founded by the Bavarian Government under its “High-Tech Initiative”. The Long-term goal of *GründerRegio* is the development of a world-renowned “start-up cluster” with a focus on life sciences, information and communication technologies (ICT), new materials and environmental technologies.

4.2.3 Management and technological support

After taking initial advice on founding a company, a researcher can receive management, technological and financial support for the start-up business. Financial support will be dealt separately in the next section. The first step is to

write a sound and convincing business plan. Advice for this stage is abundant in Bavaria, including numerous events focused on this topic, and other forms of knowledge on business planning which is widely available. The most famous event is the *Munich Business Plan Competition*, which is jointly organised by higher education and industry. This event aims at building and enhancing a high-tech, high-growth start-up culture. The first business plan competition was organised in 1996 by McKinsey & Company jointly with universities, FNT, venture capitalists, companies and business associations. Since then, the competition has taken place once a year.

4.2.4 FLÜGGE. – support program for university start-ups

After the initial set up of the business the next step for a researcher could be to join FLÜGGE. This program has been designed by the Bavarian Ministry for Economics, Transport and Technology with the aim at supporting university start-ups in the conception phase. Researchers are offered the possibility to work half-time and receive the other half of their salary as support for setting up their business. Within this program, researchers continue to work half-time for the university, and should not have any other sources of income. Equally, applicants are not allowed to receive any other source of funding while in the program.

Applicants can be individuals or groups of researchers. In this case groups must not exceed three people and it is required that all members come from different academic backgrounds (e.g. physics, electronics, management... etc.). Applicants also need to have a university degree

equivalent to a Master's degree or higher, the degree should not have been obtained longer than six months prior to application (for details see Appendix F).

4.2.5 Support Circle for New Technologies

Fostering close links within the regional innovation support system is indispensable for new start-ups in order to access expertise and financing, and to find partners for future innovation projects. A good opportunity to do that is to join the *Support Circle for New Technologies (Förderkreis Neue Technologien – FNT)*, a network platform for high-tech start-ups. Formerly located in the Munich Chamber of Commerce, the FNT is now an independent organisation bringing together the most important players from politics, VC and the industry in the field of new technologies. FNT has created a region-wide network of successful high-tech companies, leading venture capital associations and financial institutes, professional consultants as well as universities and RTOs. In addition, Support Circle for New Technologies (FNT) also takes part in the initiative GründerRegio.

FNT organises numerous events throughout the year in order to consolidate and to extend its network. In March of 2001, it organised a conference called “Venture City”, a meeting between venture capitalists, start-ups, consultants and business angels. To become a member of FNT, the only requirement is that a company is active in a high-tech sector. A short form has to be filled out, simply giving name, address and very basic information about the company. The annual fee varies between DM 99 and DM 2000, depending the size of the SME.

4.2.6 Financial support

Venture capital

Munich has the second highest density of *venture capital companies* in Germany. Approximately ten venture and risk capital companies are located in the city, amongst them three of the ‘top ten’ German venture capital companies. Some of them are typical high-tech venture capital (VC) companies such as Atlas Venture, Techno Holding VC, and Techno Venture Management. Of total gross VC investment in Germany, 20% went to Bavaria based companies, largely to Greater Munich area. Overall, there is more than DM 1 billion available to be invested in the region. In addition to venture capital companies, there is the *Munich Business Angel Network (MBAN)*, which is closely related to the Support Circle for New Technologies (FNT). The business angels are mainly interested in high-growth sectors such as biotechnology and life sciences, ICT and new materials (see Appendix G).

Another source of equity finance is *Bayern Kapital*, a public risk capital fund established by Bavaria as part of the ‘Future of Bavaria Campaign’. Its mission is to support young innovative firms to realise new products and processes, even in the very early phases of business start-ups. The original endowment of Bayern Kapital Fund was DM 150 million. Due to the strong demand for capital, an additional fund with DM 140 million has been established. This fund is especially targeted at the needs of young Bavarian high-tech companies to assist in the development and commercial exploitation of new products.

The maximum amount of funding is DM 2 million per firm, or in the case of bio-technology DM 5 million per firm. Financial assistance requires co-investment. The fund will match every DM that is brought in by external investors (i.e. banks, VC companies or private investors, who act as lead investors), or by the company itself (see Appendix H).

Debt financing

There are various possibilities for SMEs to obtain loans, but the most common one in Bavaria are the specific start-up programs offered by *LfA*, a Bavarian bank owned by the region. One of LfA's main tasks is to support start-ups from all sectors. The most important program is the *Bavarian SME Credit Program*, which is designed for SMEs with no more than 250 employees and an annual turnover of not more than EUR 40 mill. If necessary, the on-lending bank can be partially exempted from its liability (40% or 70%, depending on the agreement) (see Appendix I).

Public Grants

Bavarian Program for Innovation Support (BayIP)

This program aims at the development of new technologies and their commercial exploitation in the form of new products, processes and services. The program is designed to offer support throughout the development phase and is especially targeted at risky investments, which have not been commissioned by a third party. All SMEs located in Bavaria are eligible. However start-ups are favoured. The following costs can be covered by the grant:

- Development Costs
 - Personnel costs
 - Material costs
 - Costs for the usage of facilities...etc.
- Costs arising from the acquisition of know-how
 - Patents
 - Market research.

Bavarian Program for the Support of Technology-oriented Start-ups (BayTOU)

This program is designed to support the foundation of technology-oriented companies with high technological and commercial risk. The aim of the program is to encourage start-ups in technology-intensive sectors and to contribute

to the creation of high-quality jobs and the competitiveness of the Bavarian industry. Within this scheme, R&D projects aiming at improving the technological base of start-ups are financed. Assistance can be granted at the conception and the development phase. Eligible companies are either prospective start-ups or companies, not more than three years old, employing no more than five employees. Only SMEs are eligible (not more than 250 employees, annual turnover must not exceed 40m Euro). The companies must not be more than 25% owned by a large company. Applicants must be company directors and must hold at least 50% of the shares. The amount of the grant can not exceed 35% of the eligible costs which include: personnel and material related expenses, project related consultancy (i.e. expertise and market studies) use of incubation facilities.

The program was initiated in 1996. By the end of 1999, assistance worth DEM 22 mill. has been granted for 128 young entrepreneurs.

4.3 Case 2: New R&D performer

In Bavaria, there are many routes an innovative SME can take depending on the sector the SME is in, its innovative potential, need for financing and other firm specific issues. There are different institutions offering advice on issues related to certain industry sectors, as well as cross-sectoral RTOs. The supply of both debt and equity finance is pro-

vided by strong regional Venture Capital industry and Mittelstand-oriented banks. Equally, there are institutions helping companies in each phase of the innovation cycle, from idea conception to development and market entry.

4.3.1 Initial Advice

The Bavarian innovation system is highly complex and multi-layered. It is therefore relatively difficult for the average SME to find appropriate support. The Bavarian Government has recognised this problem and it has prepared a number of brochures giving practical and legal advice to entrepreneurs. Also a listing of support centres is available. These brochures can be obtained freely from the Chambers of Commerce and from the Bavarian Ministry for Economy, Transport and Technology, as well as from most innovation support organisations.

Bayern Innovativ

Bayern Innovativ was set up by the Bavarian Government as a catalyst for innovation and as a driver of closer science – industry co-operation in the region. It is effectively linking together different aspects of the innovation system. Bayern Innovativ and its innovation projects have an annual budget of DM 15 million. As a region-wide centre for technology transfer the main function of Bayern Innovativ is to enhance the competitiveness of Bavaria as a location for industry and technology. Its main tasks are:

Exhibit 9. Needs and supply of support for new R&D performers – Bavaria.

Need for support	R&D support measures
<i>No perceived need for R&D</i>	Bayern Innovativ; promoting innovation, co-operation between science and industry – State of Bavaria
<i>Lack of financial resources for R&D activities</i>	Venture capital – Private and state controlled (BayBG) Loans – private and state controlled banks (LfA)
<i>Limited R&D capabilities</i>	Subsidised advice: OTTI & WETTI technology transfer institutes, Fraunhofer institutes, universities, fachhochschulen, German Aerospace Centre, Association of German RTOs (AIF) Feasibility studies – Munich Chamber of Commerce Technology Transfer Net – service and finance providers OTTI & WETTI technology transfer institutes Technology contact centres – universities Technology advisers – universities Technology application centres – educational institutes SME industry Consulting Program – State subsidised
<i>Limited access to knowledge</i>	Bavaria International, overseas info – METT Bayern Innovativ – Web site / data base Sign posting – METT / Chambers of Commerce Technology Transfer Net – web site/data base Munich Chamber of Commerce, sign posting service

- To intensify the transfer of knowledge and technology between industry and science
- To initiate technological co-operation between companies through the creation of inter-sectoral networks
- To support industry to access EU funds for research and technological development as well as with the international transfer of knowledge and new technologies
- Co-ordination of the institutionalised Technology-Transfer-Network
- To contribute to the dissemination of technological knowledge and to enhance its application by SMEs
- To enhance the competitiveness of Bavarian SMEs in the European and global markets.

For the first time innovator, the most important service of Bayern Innovativ is its well-organised web-site providing easy and quick access for companies to the major providers of support, consultancy, and finance. Under the link “Innovation Network Bavaria”, all major actors and support schemes can be accessed either on an institutional or on a thematic basis. However, the web-page does not go beyond mere listing of relevant institutions.

Technology Transfer Net (TT-NET)

Bayern Innovativ also administers the *TT-NET*, which has been set up by all the major providers of industry support and financial service providers in Bavaria. This network consists of more than one hundred institutions and research organisations. TT-Net is an effective referral network facilitating the search for appropriate advice. Apart from the information services created by TT-Net and Bayern Innovativ, there are a number of innovation first-stop shops in the Ministry for Economics, Transport and Technology, in the regional Chambers of Commerce, as well in some other institutions. The Eastern and Western Bavarian Technology Transfer Institutes (OTTI and WETTI, respectively) act as intermediaries between demand and supply of technological know-how, and signpost firms to the appropriate source of support. In order to facilitate access to institutions of research and higher education for SMEs, many Bavarian universities feature technology contact centres or technology advisers, which again refer companies to relevant experts.

IHK München (Chamber of Commerce for Munich)

In the IHK München, SMEs are offered advice on a wide range of issues, covering technology transfer, finance, networking, training...etc. The process is very simple, only a phone call is needed before the first appointment. During the appointment, the customer receives a first feasibility assessment. Most SMEs are encouraged to proceed with their idea further to business plan analysis, technology audits or feasibility studies. On-site visits are made from time to time, including interviews with staff and management. There are no exclusion criteria with regard to sectors or firm

size, although the service is mostly being used by SMEs. As the ministry and the chambers of commerce do not give any specific advice, the most valuable service offered by the innovation centres is a referral to the appropriate source of support. In matters related to legal or taxation issues, the SME is often referred to the relevant departments within the organisation itself. One of the distinctive features of the Bavarian innovation system is that actors are well networked with each other on institutional as well as personal level.

4.3.2 The conception phase

Once the SME has been assigned to the relevant experts in the different technology transfer and innovation support organisations, the next step will be a thorough risk assessment of its innovative endeavour. Bavarian government has supported the creation of a region-wide network of contact points offering advice and feasibility studies at the beginning of an innovative project. This network is highly complex, consisting of different organisations, some specialising on specific sectors or processes, others being cross-sectoral and regional in nature. However, most technology transfer and innovation support institutions are listed in the TT-Net database.

Technology transfer organisations

The way these support organisations are organised varies to a great extent. The East Bavarian Technology Transfer Institute (OTTI) is a membership organisation. Fees are between DM 300 and 500 per year. Most of the institutions offer free initial consulting, which goes further than the advice provided by the chambers of commerce, but falls short of thorough company analysis or feasibility studies. Customers can access this service by phone and making an appointment. Some institutions also offer free drop-in days with experts in different fields. Most of these organisations offer feasibility studies involving business plan analysis and on-site visits, but those are usually charged for (list of the institutes offering support, see Appendix K).

Association of German RTOs (AIF): *AIF* is a private sector organisation with more than 107 members in Germany providing expertise, advice and contract research for a variety of sectors. Its task is to enhance the innovative potential of SMEs. *Fraunhofer Management (FhM)* is a consulting firm for industry and commerce, research and the public sector, and assists start-ups and SMEs in all matters of innovation and technology transfer, ranging from feasibility studies over project development, implementation, management and realisation. In addition, FhM gives advice on financing models as well as on training and recruiting.

To support the use of external experts, the government has designed a program for technology-related consultancy for SMEs. Within this program, 25% to 75% of the consulting cost can be covered. Application forms can be obtained

from the Bavarian Ministry for Economics, Transport and Technology.

4.3.3 Development phase

There are plenty of opportunities in Bavaria to share the risks in development phase, either by totally contracting out product or process development to a public or private organisation, or by developing that product or process in conjunction with external experts. A third possibility, development in a network of firms, will be examined in the next case study. As with the conception phase, financial support is available for expert involvement.

Development support organisations

The institutions offering support in this phase are mainly universities, *Fachhochschulen* (research institutions similar to universities) and RTOs. The technology-transfer centres at Ludwig-Maximilians University (LMU) and Fachhochschule Ingolstadt, for example, two of Bavaria's foremost technical universities, refer SMEs to the relevant on-site experts. Co-operation can take different forms: professors work with companies as part of their university responsibilities, or they consult firms individually in different forms. Again, the procedure is very simple. Typically a telephone call or an e-mail is sufficient for the SME to be referred to the relevant expert within a short period of time.

There are also some highly developed technology-application centres focusing on different technologies. Co-operation with one of these is a good way of accessing the newest technologies and processes. Most of these application centres do contract research, i.e. developing a product/service or process as commissioned by a company, or work in close co-operation with their clients. They are mainly focussed on key technologies, such as microelectronics, robotics, environmental technologies, software, and laser technology.

4.3.4 Commercialisation phase – support organisations

Together with all the institutions involved in TT-Net, SMEs can present their innovative products, prototypes, processes at common stands organised by Bayern Innovativ at various regional, national and international trade fairs. This enables SMEs to get in touch with suppliers and customers, and to market their products internationally. As trade fairs usually get a lot of press coverage, these events provide a useful tool for SMEs for making themselves known in the marketplace. Not only SMEs can participate, but also university and research institutes based in Bavaria take part in these fairs.

Another organisation worth mentioning in this respect is *Bavaria International*, which has been set up the Bavarian Ministry for Economics, Transport and Technology to promote Bavarian products outside of Bavaria. The purpose of the company, as defined in the Articles of Association, is to perform operational activities for the Bavarian Government with a view to promoting international trade in Bavaria. This task includes

- Organising Bavarian participation at international trade fairs abroad
- Organising entrepreneurial trips, co-operation fairs and business meetings in Germany and abroad
- Preparing joint tours by political and industrial delegations as well as catering for foreign delegations visiting Bavaria
- Informing Bavarian industry and business about opportunities to promote international trade
- Developing and implementing new initiatives for supporting Bavarian companies in their commitment abroad.

The sole shareholder of this company is the State of Bavaria. It is financed by funds capitalised from the proceeds of privatisation of state-owned companies and invested on a long-term basis at fixed terms. In order to develop market entry strategies, SMEs can often benefit from professional management consultants. The *SME Industry Consulting Program* has been created to partly bear the cost of these consultants. Within this program, a maximum of 20 consulting days during four years period can be financed. The amount contributed per day amounts to DM 350.

4.3.5 Financial support

Apart from technological support, SMEs need the financial means to carry out the innovation process. Information on the different types of support available can be obtained from the same institutions described in earlier sections. As with technological support, SMEs are sign-posted to the organisations offering the support appropriate for their business. In the chambers of commerce, for example, SMEs are advised on the right mix between debt and equity, and are given a broad portfolio of financing options.

Besides loans, innovators need risk capital. For a first-time innovator VC is very unlikely to be the best option, for VC companies are looking for high-growth, high-risk companies. However, there are other options for an SME to obtain equity or participation capital. *BayBG*, the Bavarian Participation Society (*Bayrische Beteiligungsgesellschaft*) is owned by the state bank LfA and other Bavarian banks and it offers financial support schemes for all phases of a company's lifecycle. The focus of BayBG is on SMEs with a potential for stable and continuous growth. There are no exclusion criteria with regard to sector, although notorious low-growth sectors such as construction are usually not dealt with. There are no criteria related to turnover (for details, see Exhibit 9)

4.4 Case 3: Support for R&D network

Bavaria is conscious of the importance of R&D networks and co-operation between companies and the science base. Therefore, innovation networks are actively promoted. There are a number of platforms aiming at bringing the different actors in the innovation system together and creating synergies between them. Bayern Innovativ is especially active in developing and implementing platforms for joint R&D and technology-transfer acting as multipliers in the region. Some of the platforms administered by Bayern Innovativ are described below.

There are no separate funding schemes available for the specified R&D networks. A general rule is that companies are eligible for funding as long as their R&D is being implemented in Bavaria. Thus, foreign companies operating in Bavaria are as eligible as are Bavarian-owned firms. The same principle applies to Bavarian-based firms co-operating with a research institute or a university somewhere else – it is not a requirement that SMEs look for help within Bavaria. However, there is a restriction on size. Most funding programs are exclusively for SMEs. BayBG and Bayern Kapital, the region’s foremost participation and VC companies, specify in their requirements that firms which are eligible for funding must not employ more than 250 people, and may not be owned by more than 25% by a company which is not an SME. Equally, many loans and credit schemes have an SME focus (e.g. the SME Credit Program described earlier). The LfA, Bavaria’s public bank, has been exclusively designed to help SMEs in all phases of their life cycle. Thus, large companies can get financing only from regular commercial banks at current market conditions.

4.4.1 R&D network support initiatives

Bavarian innovation and co-operation initiative for the automotive suppliers industry (Baika)

Baika has been set up by Bayern Innovativ. It is a joint initiative between the car manufacturers, component suppliers,

and the public sector. It brings together small and large firms resources and activates previously unused potential. The initiative has the following goals: maintenance and further expansion of international competitiveness, securing existing jobs and creating new jobs, improvement of co-operation between component suppliers and between component suppliers and car manufacturers. The target groups of the project are:

- Automotive component suppliers
- Component, module and system suppliers, service providers
- Electrical and mechanical engineering, metal processing, plastic, ceramics, glass, logistics, computer technology, order development, etc.
- Companies with a minimum turnover of approx. 25% in the automotive component sector
- Companies with the intention of taking the next step towards co-operation, qualification and information acquisition.

Baika organises events where suppliers can network and integrate themselves in the value chain. Regional working groups are established and supported by local partners and external know-how providers. These working groups are important platforms for the generation of ideas and the initiation of joint R&D projects.

Bavarian Energy Forum

The Bavarian Energy Forum aim is to: disseminate information on energy usage, enhance co-operation in the field of energy, promote energy efficiency and use of renewable energies, and finally, enhance innovative concepts in the energy sector. Target groups are architects, construction companies, public authorities, consultants, end customers and utility companies. The Forum organises symposia and discussion events, trade fairs and workshops, and offers support and coaching to the energy industry.

Exhibit 10. Needs and supply of support for R&D networks – Bavaria.

Need for support	R&D support measures
<i>Network development</i>	Baika (Bavarian innovation and co-operation initiative for the automotive suppliers industry) – Bayern Innovativ Bavarian Energy Forum – Bayern Innovativ MedTech and Pharma Forum – Bayern Innovativ Bio-Tech Region Munich – BioM
<i>Limited access to knowledge</i>	Bayern Innovativ – Web site / data base/ advice/ promotion

4.4.2 MedTech and Pharma Forum

This forum deals with medical technologies and the pharmaceutical industry. The objectives of this forum are:

- Maximise the potential for growth in medical technology and pharmaceuticals
- Safeguard existing and create new high-tech jobs for the future
- Contribute to cost efficiency and to continuous improvement in health care
- Improve the leading position of Bavaria in medical technology and pharmaceuticals
- Improve acceptance and understanding of people for medical technology and pharmaceuticals.

The forum aims at establishing a network with regional partners and thematical working teams. It specialises on the planning and scientific management of technology transfer events, workshops, platforms, symposia, conferences...etc. Members participate on the joint pavilion of the Bayern Innovativ at high-tech fairs including both industry and science. The long-term goals of the forum are to initiate R&D projects and to establish a collaborative research centre under the name "Medical Technologies". Any interested company can become a member by filling out a declaration of membership which can be downloaded from the Internet. Annual membership fees vary between DM 250 and DM 5,000 depending on turnover.

4.4.3 Bio-Tech Region Munich

The BioTech-Region Munich centred in Martinsried which is a dynamically developing location featuring over 120 pharmaceutical and biotechnology corporations. Martinsried has experienced a dramatic increase in the number of business start-ups within the past three years, the number of biotechnology-oriented companies growing from 10 to more than 50 at present. BioM is the co-ordination agency of the BioTech-Region Munich and key provider of financial support, business advice and helpful contacts or partners for both newly formed and already existing biotech companies. As a service, consulting and financing company, BioM aims to promote the development of the BioTech-Region Munich into an internationally renowned centre of excellence in the field of innovative biotechnology. With its seed finance program, BioM provides venture capital to young and promising biotechnology companies in Bavaria in their initial seed and start-up phases. Besides financing, BioM provides support through various consulting and information services, networking, and referral of contacts. Companies are also offered the opportunity to participate in larger exhibitions, partnership conferences and other events. In terms of partnership conferences, seminars and the like, BioM co-operates with many other bio-regions in Europe and around the world.

4.5 Summary

It seems that Bavaria has managed to pull together key elements necessary for the development of an innovative region: A strong science base, a well educated population, strong banks, abundance of venture capital, large enterprises acting as innovation hubs, and a lot of high-tech firms. The innovation support infrastructure is very strong, offering support in all phases of the innovation process. In addition, the system is relatively transparent, signposting works and the actors are very well networked. Also the website of Bayern Innovativ (www.bayern-innovativ.de), one of Bavaria's foremost innovation support organisations, acts as a first-stop shop for companies helping them in navigating their way through the system.

In terms of access to support, there are many routes a first time innovator can take depending on the sector the SME is in, its innovative potential, its financial structure and other individual features of the applicant. There are different institutions offering advice on issues related to certain industry sectors, as well as cross-sectoral RTOs. Available support covers all phases of the innovation cycle, from conception to the market entry.

In addition, Bavaria has recognised the importance of R&D networks and co-operation between companies and the science base. Therefore, innovation networks are actively promoted. There are a number of platforms aiming at bringing the different actors of the innovation system together and creating synergies between them. Bayern Innovativ is especially active in developing and implementing platforms for joint R&D and technology-transfer acting as multipliers in the region.

Finally, Bavaria is one of the most start-up friendly regions. Support in all business development phases is abundant, access to it is fairly easy plus unbureaucratic and finally, the institutions involved are relatively transparent. Given the strong presence of high caliber universities in the region, support for university start-ups has grown stronger over the last years. The major universities host start-up offices which provide prospective entrepreneurs with all the necessary information, support, and sometimes also incubation facilities. In addition to these specific support measures, student-entrepreneurs benefit from the well developed innovation support infrastructure, the growing Bavarian business plan culture and the abundance of venture capital within the region.

A distinct feature of the Bavaria is that the available financing, except venture capital, is to a large extent coming from the public sector. This may be a weakness if the public sector is not able to secure funds for the growing financial needs of the expanding economy. Also, there is a danger that public sector may not be able to develop new and innovative financing instruments as effectively as the private sector does.

5 Ireland

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5.1 Introduction

In many respects Ireland belongs to Europe's most dynamic economies. The Irish economy outperformed all other European economies in the 1990's, recording a growth rate throughout that period of three times the EU average. Ireland's per capita GDP has risen from 66% of the EU average in the 1980s to over 100% today. It is expected that GDP in 2001 will be £92 billion.¹² According to the OECD, Ireland's economy (as measured by real GDP) grew at an annual average rate of 8.5 % in the six years from 1994 to 1999, compared to an EU average of 2.3%.

5.1.1 Government policy

The transformation of Ireland's economy in the 1990's is the result of many factors: favourable demographics, substantial inward investment inflows; deployment of EU Structural and Cohesion Funds; pragmatic government policies, social Partnership approach to economic development; an openness to international trade; and an emphasis on education and technological innovation.

The Republic of Ireland has a track record of successful industrial policy and enterprise support since mid 1990s. National policy has been formulated to make effective use of EU programs and Ireland has also been successful in attracting inward investments. As a result the country is the second largest exporter of software and related products. Over the last ten years the leading principle of Irish policy has been that the enterprise support structures and processes need to follow the development of Irish industry. Since the industry has developed rapidly, the support system has also gone through several overhauls. Although these radical changes are necessary, it has been recognised that such

changes require extended transition periods, during which the development agency will spend much of its energy on internal re-structuring rather than on enterprise support.¹³

5.1.2 Support organisations

Enterprise Ireland (EI) was established in 1998 as a merger of several different agencies, aiming to have single customer interface which can offer tailored support for enterprises across the Ireland. The agency is still developing its internal processes but it is becoming increasingly effective in performing its support functions. Key features of enterprise support in Ireland include

- A bottom up process where the agency service offer is developed on the basis of customer needs
- Support packages for enterprises include both financing and management capability development
- The aim of regional development is to create an infrastructure which provides a fertile ground for continuing enterprise development.

Regional development and enterprise promotion have distinct roles but at the same time these policies support each other. *Enterprise Ireland* is the national business and economic development agency. It has 13 regional branches that focus their activities on enterprises which employ more than 10 staff and are seeking to grow.

Regional County and City Enterprise Boards (CEB) were established in 1993. They provide support for micro firms which employ less than 10 staff. These 35 boards are organised as locally controlled enterprise development companies operating in each county and urban local authority area in Ireland. The overall aim is to increase new enterprise formation, improve micro business survival, performance and job creation in the local area. They can also forge strategic alliances with other enterprise development bodies. Their main tools in promoting micro enterprises include grants, advice and training as well development of a stronger enterprise culture more generally. CEB's are cent-

12 Ireland – The New Millennium, Enterprise Ireland, Dublin, 2001.

13 According to Enterprise Ireland management, practical preparations for merger started 6 months before any action was taken. The merger related internal process absorbed 75% of the management attention during a period of 12 months, and still 18 months after it took about 40% of management time.

rally funded with some funds coming from the EU Structural Funds. The CEBs represent a significant formal delegation of decision-making regarding resources for enterprise support to a sub-national level. CEBs are local in three ways:

- Their activities are focused through strategic plans devised at county/city level
- Decision about allocating financial assistance and funding priorities are made within the county
- The emphasis is on local (i.e. small) enterprise opportunities.

Other key actors in enterprise development include the *Department of Enterprise Trade and Employment* which is in charge of strategic development. *Shannon Development* is a regional development agency which has a mission is to initiate, participate in and support economic development in both Urban & Rural areas of the Shannon Region. *Údarás na Gaeltachta – the Gaeltacht Authority – was established by the Irish Government to promote the economic, social and cultural development of the native Irish-speaking regions.*

Access to innovation support

Enterprise Ireland (EI) branches and County Enterprise Boards (CEBs) are the key access points to enterprise support. Enterprise Ireland assigns a Development Adviser to each client company. The Development Adviser acts as the primary point of contact giving access to the full range of Enterprise Ireland solutions which are delivered as part of a structured development process agreed with the client. CEBs are based on their region and their contact personnel has a good knowledge of the local economy and enterprise stock. Both organisations also have web sites which provide information on available services (www.enterpriseireland.com and www.etradebusinessireland.com).

5.2 Case 1: Supporting university based high tech start-ups

Enterprise Ireland (EI) administers and promotes a range of support measures for enhancing research skills within the higher education sector and for helping to apply these skills to the benefit of industry. In addition to EU Fifth Framework Program for Research & Technological Development, Ireland has seven national Programs in Advanced Technology, through which centres of expertise offer specialist services to industry.

5.2.1 Programs supporting commercialisation of research

Campus Companies Program

The Campus Companies Program was established in 1996 as an Enterprise Ireland initiative, designed to assist individuals in commercialising R&D on the college campus. The *Campus Companies Program* supports the development of existing third level based companies and the establishment of new companies. It provides assistance to researchers interested in commercialising R&D emerging from the college campus. An element of this is CORD feasibility funding, which helps an academic entrepreneur or campus company to assess the commercial viability of their innovative technology. Since then it has assisted about 140 enterprises, and it is estimated that over 2000 jobs have been created. The program has been instrumental in providing training for lecturers, and researchers interested in gaining business and commercial skills. The key criteria for support is that the assisted projects must be in high tech manufacturing, software or international traded services areas. (See Appendix M for details).

Exhibit 11. Needs and supply of start-up support – Ireland.

Need for support	Support measures
<i>Entrepreneurship and business skills</i>	Graduate Enterprise Program; improves student skills – EI – part of Campus Companies Program
<i>Practical help with:</i> <ul style="list-style-type: none"> • Business start-up • Management • Risk assessment and financing • IPR-management 	Campus companies program; assistance for academics – EI Research Innovation fund; funding research based ideas – EI Business Incubation Centre Program – EI Regional Innovation Infrastructure Measure – EI Advanced Technologies Research Program; grants – EI Enterprise Platform Program; rapid incubation – EI
<i>Limited access to business knowledge</i>	Mentor Network Program – EI Enterprise Ireland Website and data base

Research Innovation Fund

The Enterprise Ireland *Research Innovation Fund* aims to support research ideas with commercial potential that arise from researchers/potential entrepreneurs within the third level academic community. (See Appendix rif_gen.doc).

Business Incubation Centre Program

Enterprise Ireland's *Business Incubation Centre Program* is aimed at expanding the base of high tech companies operating on college campuses by providing funds to develop and expand incubation space facilities. Through the *Regional Innovation Infrastructure* measure the aim is to build and strengthen the infrastructural supporting the growth of new high tech companies. Support is available to all Institutes of Technology and equivalent 3rd level colleges. The measure will provide up to a maximum of EUR 2.5m (£2m) towards the costs associated with the development of a campus incubation and commercial R&D Centre. The level of support is between 80-95% of the costs. (see Appendix bic.doc).

The Advanced Technologies Research Program

The Advanced Technologies Research Program 2001 is a new program that has evolved from the Programs in Advanced Technology (PATs) Research Program 2000. The objective is to generate technologies, products or processes that can provide the basis of new start-up companies in Ireland or can improve the competitiveness of industry in Ireland. Grants, which will be subject to the terms of a contract between the host institution and Enterprise Ireland, will cover 100% of all eligible costs (e.g. personnel, equipment, material and travel) and will be in the range £100,000 to £400,000 for projects typically up to three years duration. The program is open to all full-time researchers in the third level sector and non-profit research agencies/organisations. (See Appendix Atrp_prop.doc).

Graduate Enterprise Program

The Graduate Enterprise Program is part of the campus companies program. It provides training and business development for graduates with industrial experience to assist them in establishing new enterprises. It consists of a one-year course involving a third level college and a business development organisation.

Mentoring services for new start-ups

University based and other start-ups can make use of the offered free of charge advisory service. Enterprise Ireland maintains a countrywide panel of high calibre voluntary mentors, consisting mainly of retired or semi-retired managers across all areas of business. The idea is to match them with the needs of companies seeking to grow. The 300+ mentors will confidentially provide strategic guidance and practical, reliable advice drawing on their wide experience gained in senior positions in industry.

Through the *Mentor Network* Enterprise Ireland also acts as a matching and introduction service between private investors, or so called "Business Angels", and projects seeking equity. The Mentor Network operates on a referral basis primarily through the company's Development Adviser in Enterprise Ireland or Shannon Development, or through their County Enterprise Board. Companies interested in Mentor assistance can contact the relevant agency. Since its inception over ten years ago, the *Mentor Network* has provided almost 5,000 Irish companies with pragmatic advice and assistance to help them identify and overcome barriers to growth. A survey of companies which have participated in Enterprise Ireland's Mentor Network has shown significant increases in sales, exports and employment as a result of participation. More than 90% of respondents described the Mentor's input as either very important or important.¹⁴ (See Appendix M)

Enterprise Platform Program

The Enterprise Platform Program is a one-year long rapid incubation program. This full time scheme is designed to provide hands-on support and management development for entrepreneurs who wish to start their own business. The program operates in connection with 7 educational institutions providing support for start-ups in university environments. (see Appendix M) The aim is to provide the participants with the skills necessary to develop a solid business idea, which can be launched on the markets. With the help of the package, businesses that are already trading can strengthen their market and trading position. Participants need to have a well thought out business idea that has the potential to be transformed into a profitable company with export potential. Ideally participants will have a 3rd level qualification and a level of practical experience gained from working in a relevant professional environment. Grant funding (£433 per month) and the possibility of additional support from Enterprise Ireland CORD scheme (total package of up to 50% of applicants current salary, if one is leaving full-time employment and has an eligible busi-

14 Enterprise Ireland, 'Mentor Network: Guidelines for Companies', Dublin, 2000.

ness concept) to assist entrepreneur’s business in its first year. This funding can ‘soften’ researchers’ transition from their existing secure job, to a start-up business.

5.3 Case 2: New R&D performer

There are several R&D management programs offering training courses, consultancy support, overseas programs and masters/diploma courses. These measures aim to increase the levels of investment in R&D among business population. To qualify for support, proposals for investment must represent a clear “step-up” in the development of the R&D function compared to the company’s current situation.

5.3.1 Support measures targeting new R&D performers

Intellectual Property Assistance

Enterprise Ireland manages the *Intellectual Property Assistance* program, which provides advice on the development and commercialisation of patentable technology and, in appropriate cases, financial assistance with the cost of patenting. The key areas of advice are: use of intellectual property rights (patents, copyright, designs and trademarks); confidentiality agreements; and licensing (negotiations, royalty rates etc.).

Research & Development Capability Initiative

The *R&D Capability Initiative* offers financial support for companies which are significantly enhancing their R&D function, and for technology based start-ups with a heavy dependence on R&D. Support is only available as part of an overall business plan from the company. The objective of the R&D Capability Initiative is to increase the levels of investment in R&D infrastructure by Enterprise Ireland / Shannon Development client companies. It will encourage these companies to build up their R&D function by offering financial support towards the costs of additional staff and facilities/equipment, significantly beyond their current level of R&D activity. R&D Capability investment will normally be a once-off support for a specific company. Proposals for support can only be considered within the context of the client development process between the client and their Development Advisor. The requirement for an R&D Capability investment will emerge from consideration of the company’s business plan, and the agreement of a program of development with Enterprise Ireland. At that stage, the client will be invited to prepare an application for R&D Capability funding. A technical assessment is conducted on each application, by an Assessor appointed by Enterprise Ireland (see Appendix N).

Research Technology & Innovation (RTI) Competitive Grants Scheme

Research Technology and Innovation (RTI) Competitive Grants Scheme offers financial assistance for in-company product and process development, with a particular focus

Exhibit 12. Needs and supply of support for new R&D performers – Ireland.

Need for support	R&D support measures
<i>No perceived need for R&D</i>	Design initiatives; raise awareness of the added value of design, capability building – EI
<i>Lack of financial resources for R&D activities</i>	Intellectual property assistance; patent financing – EI R&D capability programme; R&D grants – EI Research, technology and innovation competitive grants; Grants for in company R&D – EI Design initiative – grants for design projects
<i>Limited R&D capabilities</i>	Intellectual property assistance; advice – EI R&D capability programme; R&D management – EI – available for start-ups. SMEs and large firms R&D management program; management skills and Commercialisation (workshops, consulting, qualified staff Placements) – EI
<i>Limited access to knowledge</i>	Design web site /data base – EI

on established companies. The Research Technology & Innovation (RTI) initiative aims to bring about a substantial net increase in the level of high quality research and development in businesses in Ireland. The scheme will support commercially focused, industry led projects in product and process development. RTI grants are administered by Enterprise Ireland, are available for projects submitted by Irish-based firms in manufacturing and internationally traded service businesses. All manufacturing and internationally traded services companies in Ireland are eligible to apply for the grants. The scheme is particularly directed at established companies planning to undertake their first R&D projects, and those which are significantly developing their existing R&D activity (See Appendix O).

R&D Management program

Enterprise Ireland's R&D Management program helps companies develop their R & D management skills and maximise the commercial effectiveness of their innovation activities. Through the program, Enterprise Ireland provides financial and specialist support for workshops on innovation management, consultancy on management and exploitation of R&D, placements and exchanges of staff, post-experience qualifications in R&D management and exploitation. The program also helps to enhance the interaction between the Irish higher education sector and industry and to support high level researchers.

Technology Transfer / Business Partners Program

The objective of Technology Transfer / Business Partners Program is to help Irish and overseas technology companies to develop mutually profitable business alliances. The starting point is that every project will be unique and the approach needs to be flexible to match specific needs. The process begins with a thorough assessment of the client's strategic partnership objectives. Following that EI will search for potential partners using extensive industrial databases and global contact network. When suitable candidates are identified, EI can facilitate introductions and organise forums and face-to-face meetings. Services are available throughout the negotiation process, if needed. The whole portfolio of Enterprise Ireland's expertise – technical, commercial, intellectual property, legal, financial marketing skills – is available for participants. A wide range of firms can participate in the program, including such sectors as Information & Communications Technologies, software, electronics, engineering, biotechnology, healthcare and food. The focus is on growing Irish companies seeking to license technology or form partnerships / joint ventures with overseas companies and, overseas companies looking to license technology, access new markets, form partnerships/joint ventures, share R&D risks, access complementary expertise, access an established EU sales network. To date successful partnerships have included: joint ventures, licensing of

products and processes, collaborative research & development, contract manufacturing or "linkage" and distribution and marketing agreements. Over 300 partnerships have been formed world wide and around 40 new partnership/joint venture agreements are signed each year.

Design initiatives

Design initiatives aim to raise awareness among Irish manufacturing and service companies of the added value that design can bring to their business development. Enterprise Ireland's also helps the Irish design industry in building its capabilities. Design Advisory Service and funding for design projects are available to Enterprise Ireland's client companies through the Development Adviser network. To promote business development through design, a series of seminars – National Design Focus – has been organised for the business community. Through the Sectoral Design program, Enterprise Ireland delivers workshops, study visits and seminars to specific industry sectors. For the design industry and profession itself, EI business and management training programs are aimed at building its capabilities. The design resource website (www.D2ireland.ie) provides an interactive information and training resource for the design profession.

5.4 Case 3: Support for R&D network

Although many Irish innovation assistance programs do emphasize co-operation there is only limited support targeted especially for networks.

Innovation Partnership Program

The aim of the Innovation Partnership Program is to enable new product and process development for industry through collaboration with Third Level Institutions resulting in mutually beneficial co-operation and interaction. The program is supported under the National Development Program and is co-funded by the European Regional Development Fund. Grants are available to researchers in the Third Level Institutions to undertake research and development projects in collaboration with one or more industry partners. Applications for grants, which may be submitted to Enterprise Ireland anytime, must have the approval of administration of the Third Level Institution. Projects should be of potential benefit to a company, which need to make a significant financial contribution to the project. Enterprise Ireland will only support the costs incurred by the Third level Institution at the appropriate grant level. Any in-company costs are not eligible. Applications for grants will be considered from research workers (or group of research workers) in Third Level Institutions in collaboration with companies in the Republic of Ireland only (for details see Appendix P).

Exhibit 13. Needs and supply of support for R&D networks – Ireland.

Need for support	R&D support measures
<i>Network development</i>	Innovation partnership program; co-operation with educational institutes; grants – EI Technology transfer/business partner program; Promotes partnerships with overseas companies; Data bases, global contact network. Programs in Advanced Technology (PAT); interface between businesses and higher education – EI
<i>Limited access to knowledge</i>	Programs in Advanced Technology; provide access to University research – EI

Programs in Advanced Technology (PATs)

The Programs in Advanced Technology (PATs) are partnerships between Enterprise Ireland, industry and universities/third level colleges. They were established to meet a need for a strategic expertise base in the following key technologies: Advanced Manufacturing Technology, BioResearch, Materials Ireland, Power electronic, Optronics, Software, Telecommunications. The seven PATs are located across more than thirty centres located within Ireland’s universities and institutes of technology. The aim of these programs is to help industry to: access new technology, improve the competitiveness of existing production, move into new higher value areas, attract overseas and domestic investment in high technology areas that lead to the establishment of new technology based start-up companies. Advanced technology programs provide a multifaceted capability to tackle large projects. For instance, Advanced Manufacturing Program services span the manufacturing value chain, from design, through production, to distribution and logistics. They include

- application of methodologies and tools including Benchmarking, World Class Manufacturing (WCM) and Business Excellence Model (BEM)
- product development and new product introduction
- training and learning systems
- manufacturing process engineering and business system design
- problem solving.

5.5 Concluding comments

Ireland provides a successful example of national industrial policy based on effective use of EU funding opportunities and foreign direct investments. During the 1990s Ireland has become a large exporter of software, ICT related products and at the same time the employment situation has improved dramatically. Among other things the rapid development of technology based industries has been made possible by an effective education system.

The government agency system has been a key element in successful implementation of the industrial policy. Enterprise Ireland is a very centralised agency, which has sufficient resources and expertise to run effective technology programs. Regionally based County Enterprise Boards are able to target the small firm (less than 10 employees) population very effectively due to their good local knowledge. In the Irish support agency configuration, clear division of labour is coupled with active co-operation and referral between the organisations.

Another key feature of enterprise support is the bottom-up principle which secures the right mix of support for each region. The system builds on the local representatives detailed knowledge of their client population. By summing up these businesses development needs each representative is able to set realistic targets, correct support mix and required resources. This information will then be compiled to

regional and national level budgets. Such a market driven approach will facilitate constant development according to the developing industrial structure. A problem is the Irish system has seen frequent organisational change, which absorbs energy in internal management, at the cost of the main function – promoting the industrial development.

Industry needs are reflected in the offered support. It seems that the Irish system has handled the commercialisation of research fairly effectively. The Mentor network has been in place for ten years and has delivered good results. The Enterprise Platform Program which is in place in seven universities seems to offer a good route for researchers to start-up a business. The scheme provides hands-on support, management development and funding, all of which are essential for many academic entrepreneurs.

Development advisors are in a key role in assisting new R&D performers. Their task is to ensure that each applicant goes through a well structured planning and development program as a part of the funding process. Hence soft and

hard supports can be combined effectively to aim to ensure that the full benefit is gained from the public R&D funding.

R&D networks are also supported, although the support is limited to companies and universities based in Ireland. The Innovation Partnership Program offers grants to third level institutions that undertake research and development projects in collaboration with one or more industry partners. New collaborative relations are especially encouraged. Projects should be commercially viable and private enterprises must demonstrate their confidence by making significant financial contributions to the project.

Specific Programs in Advanced Technology have been established to develop the knowledge base and absorptive capacity in certain key technologies. These programs are focused on: advanced manufacturing, bioresearch, materials, power and electronics, optronics, software and telecommunications. The aim is to help industry to access new technology, improve the competitiveness of existing production and move into new higher value areas.

6 Korea

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6.1 Introduction to the Korean context

Korea is a middle-sized OECD nation, with a population of around 46 million. It ranks quite well in terms of science and technology indicators, but its international competitiveness (as measured by IMD) falls far below that of Singapore and most European competitors (See Appendix R). The Korean economy was hit particularly hard by the Asian crisis of 1997–98. The Koreans have completely transformed their approach to industrial policy since the East Asian financial crisis. They have always actively encouraged R&D in the business sector – but mainly in the Chaebol (or big business groups). During the last two-three years, Korea has put in place a tremendous infrastructure to support what they call “Venture Businesses” (see below). The economic and business policy response to the crisis can be summed up as:

- Reform the corporate system – moving from a chaebol-oriented system to one based on market competition. This involves major efforts to: improve the corporate governance system and global business practices

- Policy transformation from growth-oriented development to technology-oriented development, with great attention being paid to fostering a business environment conducive to creative and risk-taking ventures
- Promotion of market competition and deregulation, with market opening and deregulation of goods and factor markets.

Significant structural shifts in industry have proceeded rapidly. The decline of heavy machinery, chemical, textile industries has been accompanied by the emergence of new industries such as TFT-LCD, cellular phones, semiconductors, which now lead economic growth, creating a huge demand for the development of high-tech industries supplying parts and accessories. At the same time, Korea has witnessed the emergence of ICT, e-commerce, biotech, and services as major sources of value-added, with a much greater participation of young entrepreneurs with S&T backgrounds. A major priority of the new government has been to generate jobs, develop technology in critical areas, maintain competitiveness, and reflect the changing global circumstances (see Appendix S). Many of the new industrial and S&T policy developments are in their infancy – and have not been extensively analysed in English (or even Korean for that matter). Programs are being developed and extended that have significant implications for SMEs and technology-intensive activities. This high level of “experimentation” and the focus on high technology are key features of the new approach. The shifts in policy guidelines are summarised in Exhibit 14.

Exhibit 14. Science and Technology Policy.

Area	Previous Focus	21st Century Focus
Policy	Government-initiated Development-oriented	Private sector driven Diffusion-oriented
Investment	Quantitative expansion	Efficient allocation
Research	Domestic co-operation between industry and academia	Global networks
Strategy	Short-term meeting of demand	Long-term market creating

6.2 Case 1: Supporting university based high tech start-ups

Commercialisation of research, or rather lack of it, has attracted policy makers' attention in Korea. Exhibit 15 presents a range of measures aimed at supporting university start-ups and commercialisation of research.

6.2.1 Support for academics for setting up a venture business

To support the establishment of Venture Businesses by academics, the government has allowed them to start up a company and hold a concurrent position as an academic for one year, before being required to take a leave of absence. In addition, financial support is provided for new start-ups by professors and research scientists. While only 5.6% of new technology based firms (NTBFs) in 1999 were formed by staff of universities and government research laboratories (GRLs), the numbers are increasing rapidly. From 1999 to June 2000, 337 public spin-offs were recorded – 286 by professors, 51 by research scientists from GRLs.

The Korean government has used various means to bring about effective linkages between GRIs, universities, industry and inter-firms. However, co-operation between firms and different institutes seems to be the weakest part in the Korean national innovation system (NIS).¹⁵ At present 76.8% of researchers with doctorates are working in universities but universities use only 12% of the total national R&D expense. Only 2% of total R&D expenditure of private firms is allocated to universities. The agenda for future policy measures in this area is to promote collaboration between the university, industry, and GRLs. Given the teaching orientation of universities, there is a fundamental lack

of interaction between the universities and the private sector. At present university research is not linked to industrial need, and it plays only a marginal role in aiding the capability creation of private firms. The academic culture of graduate schools has a tendency to emphasise theoretical development rather than practical knowledge development. Their capability to solve technical problems arising in firms still remains weak. Firms also tend to turn their research orders away from universities, creating a vicious circle, which is weakening the relationship between industry and universities.

6.2.2 Promoting university participation in national R&D projects

The government, as a way to promote university-industry co-operation, opened its national R&D projects to universities. However, university participation remains low, in only sixty-six of the 914 projects, involving 105 billion won, or 6.4% of total government R&D expenditure in 1997. In short, the linkage between the university and industry has been insignificant. But, informal collaboration in the form of consulting by individual faculty members is quite prevalent. This may be symptomatic of Korea's position as a catch-up country where technological tasks are not yet at the frontier.

6.2.3 Promoting co-operation between Government Research Institutes (GRIs) and industry

GRI-industry linkage is evaluated as being a little stronger than the university-industry linkage. Since GRIs were originally established for the purpose of assisting industry, the

Exhibit 15. Needs and supply of start-up support – Korea.

Need for support	Support measures
<i>Entrepreneurship and business skills</i>	Researcher can work half-time for the university / new business – Ministry of Science & Technology (MOST)
<i>Practical help with:</i> <ul style="list-style-type: none"> • Business start-up • Management • Risk assessment and financing • IPR-management 	Financial support for university start-ups – MOST Incubators within universities – SMBA Regional techno-parks (have incubator facilities) – SMBA Incubators within research institutes – KAIST Support for start-ups in commercialising R&D – MOST
<i>Limited access to business knowledge</i>	Incubators provide info and qualified personnel – SMBA, KAIST

15 Characteristics of Korea's National Innovation System, Lee, Kong Rae, Science & Technology Policy Institute (STEPI), 1999

GRI has focused on applied research, which is closely associated with industrial need. The government has facilitated industry-GRI co-operation by giving higher priorities to co-operative research proposals between private firms and GRIs in project selection. The majority of national R&D projects, the Highly Advanced National R&D Project, in particular, were conducted by joint research teams composed of researchers from GRIs and private firms. In spite of incentives provided for industry-GRI co-operation, the bridging between them was weak until recently. Large firms often tend to shy away from receiving government support in order to keep their R&D activities confidential. Researchers in GRIs failed to show confidence that they are able to meet industrial needs. In fact, it is a difficult job for researchers in GRIs to solve the firm-specific technological problems in the short term. Moreover, research projects that GRIs have conducted tend to move into more basic and generic technology as intended by the government, which further separates GRIs from industry. In mid 1990's around 1/3 of the GRI projects were commercialised.

6.2.4 Business Incubators

A critical incentive for setting up new technology companies has been the recent emphasis on business incubators. They operate as comprehensive assistance centres for start-up companies. The government provides financial support to universities and research institutes to form business incubators which provide low-priced space, comprehensive management support, fund raising, entrepreneurial education, etc. to client companies. In addition, regional techno-parks, established with government support, also provide incubator facilities for new technology firms. So far, 230 Business Incubators have been supported by the Small and Medium Business Administration (SMBA) as of September 2000, serving 2,274 client firms.

The Korean Advanced Institute of Science and Technology (KAIST) has established comprehensive incubator facilities, as have five national research institutes, each of which has a technically specialised incubator. MOST supports the construction of buildings and incubators operating cost as well as providing an information infra-structure. Typically the incubators give support in technology, qualified personnel, and equipment to new technology-based start-up firms. The measures discussed so far have added to numerous existing measures to support private sector R&D. However, the focus on SMEs is a recent phenomenon which emerged since the last recessions.

Besides incubator activities MOST also subsidises start-up firms in the commercialisation of the R&D results from the national programs.

6.3 Case 2: New R&D performer

The Small and Medium Business Administration (SMBA) was founded in 1996 to focus attention on supporting SMEs and to co-ordinate the numerous support programs. It is the basic starting point for any SME seeking government R&D support. The SMBA maintains an extensive information base – in electronic as well as print form – on all the programs in place to support SMEs. Many existing policies are being enhanced and new policies being introduced (see Appendices Q to U).

Most new initiatives are related to strengthening entrepreneurship and the technological capacity of Korean SMEs. Encouragement of Venture Businesses is a key issue on the policy agenda. Special Measures for the Promotion of Venture Businesses set the framework for creating an environment conducive to business establishment and to the rapid growth of new technology-based firms. A venture business is a smaller company that meets one of the following four criteria:

- a) more than 10 percent of its capital is held by a venture capital fund
- b) a major portion of its sales are based on its own intellectual property and the commercialisation of government-oriented technology development projects in basic research
- c) it is deemed by the government to be a “high technology” firm, or
- d) it carries out R&D activities of more than 5% of sales.

6.3.1 Tax breaks for venture businesses

Venture Businesses, which are required to obtain a certificate from the SMBA, get significant tax breaks (50% of normal corporate income taxes) and financial support (in the form of grants, loans, and guarantees). There are now estimated to be more than 10,000 venture businesses. Many high-level technical staff have spun-off from the big companies and set up their own operations – estimated to employ more than 200,000 workers at present.

6.3.2 Korean Small Business Innovation Research program (KOSBIR)

The Korean Small Business Innovation Research program (KOSBIR), modelled on the SBIR program in the United States, aims to foster SMEs R&D by requiring 18 government agencies in various areas (including state-owned-enterprises) to allocate certain proportions of their R&D budgets to help SMEs develop technologies. The amount presently is 5%, and there are plans to increase the rate in 2002, as well as providing special incentives for technology innovation.

Exhibit 16. Needs and supply of support for new R&D performers – Korea.

Need for support	R&D support measures
No perceived need for R&D	Promotion of venture businesses – SMBA
Lack of financial resources for R&D activities	50 % corporate tax break for venture businesses – SMBA Promotion of venture capital supply – KOVA / SMBA Promotion of business angel activities – KOVA / SMBA Grants for prototype development – MOST Loan guarantees for R&D projects Subsidised loans for R&D projects National R&D program; R&D grants – MOST
Limited R&D capabilities	Technology diffusion program – MOST Technology diffusion program – MOCIE Korean Small Business Innovation Program (KOSBIR) Some gov. R&D funds allocated to SMEs – MOST Development Project for Industrial-based Technology – MOCIE
Limited access to knowledge	Techno-Parks outside of metropolitan areas – MOST Regional Science and Technology Promotion Plan – National Science & Technology Council (5-year scope) Regional Science and Technology Promotion – MOST (yearly plan) S&T advisors – provincial governments S&T Cyber community – MOST

6.3.3 The Development Project for Industrial-based Technology

The Development Project for Industrial-based Technology, operated by the Ministry of Commerce, Industry and Energy (MOCIE), is targeted at increasing local firms’ technological capacity and to support innovative R&D projects.

6.3.4 Venture business association

In 1995, the Korean Venture Business Association (KOVA) was formed with the basic objectives of

- a) maximising the synergies of the activities and concerns of venture businesses
- b) examining ways to cope with various impediments
- c) promoting exchange of information on technology and management
- d) supporting and influencing government policies on promoting and fostering entrepreneurship.

KOVA has been particularly active in the last 2–3 years as the number of venture businesses has boomed. SMBA has close linkages with KOVA. In addition to the existing tax and financial incentives, the Ministry of Science and Technology (MOST), and the Ministry of Commerce, Industry, and Energy (MOCIE) both have programs to diffuse technology to industry.

6.3.5 Financing innovation in Korea

The Korean government has devoted serious attention to strengthening the innovation finance system throughout the finance value chain – from basic subsidies to R&D projects through business angel capital through venture capital through listing on the stock exchange through ongoing bank financing.

National R&D Program

Subsidies made at the early stage of innovation come from the National R&D Program, initiated in 1982 by MOST. The program supports two types of research. First, “*government-initiated projects*” that deal with high-risk research or research with public externalities, which are entirely government-funded. Second, “*industry-initiated projects*”, which involve core industrial technologies that private firms can not develop alone owing to the scarcity of investment funds and R&D capabilities. They are co-funded by the government and participating companies. The National R&D programs have been oriented toward technology development. Recently MOST has given attention to technology diffusion to industry. MOST gives funds needed to develop prototypes from public R&D results.

S&T promotion fund

With the aim of providing loans to innovative firms, MOST established the fund for promotion of S&T and since 1992, has raised about 950 billion Won. The firms involved in the National R&D programs may have loans for R&D with a low rate of interest. SMEs can borrow 100% of R&D cost. MOST also provides for firms to offer technologies as a guarantee when getting a loan. This requires an exact evaluation of the technologies. Five government-supported research institutes evaluate technologies.

Informal venture capital – business angels

Personal investor (business angel) financing has grown rapidly in Korea in the past few years. The growth has been galvanised by government income tax deductions. Investors get (30%) deduction for the amount of investment in venture businesses and any capital gains from such investments are tax-free. Recently, a number of Angel Funds have been established.

Formal Venture Capital for New technology and SME sectors

Venture Capital firms were established and actively promoted in Korea to invest in start-ups and to pursue capital gains with the growth of invested enterprise, particularly technology-based enterprises. They also serve as a window to foreign technology and overseas investments. There are two types of venture capital firms operating in Korea. The first is the New Technology business Financing Companies (NTFC), which provide comprehensive financing support for small and medium enterprises with equity investments, loan financing, leasing, and factoring services. The second type is called the Small Business Investment Companies (SMBC), which focus on equity investment during the early stages of a company's development. Recent rapid growth of private Venture Capital has happened with strong government support (either through incentives or through government funds actually being allocated to venture capital funds). As a result venture capital is becoming an increasingly important source for technology start-ups.

6.3.6 Impacts of the innovation support

Korean policymakers, with direct involvement of the President, have put together a panoply of programs to support NTBFs that are most impressive, building on an already extensive set of public sector R&D programs. But most initiatives are very recent and it is hard to evaluate their impacts. A number of major policy issues can be identified

- The need to maintain the momentum of the development of the financial sector support infrastructure for new technology businesses, especially in the face of the downturn in the KOSDAQ

- The need to develop better co-ordination between the numerous agencies implementing support programs, and to address the potential problem of increasing moral hazard due to excessive public sector support programs
- The need already to re-orient programs to be more flexible and create an environment where NTBFs can grow, without becoming too reliant on public sector support programs and initiatives.

6.4 Regionalisation of innovation policy

Recognising that science and technology are key factors for regional economic development and public wealth, and that the “regional innovation systems” in Korea were (and remain) very weak, the National Science & Technology Council set up a five-year Comprehensive Regional Science and Technology Promotion Plan. The plan is composed of six main projects

- developing strategic technologies suitable to the level of the provinces
- making centres for regional technological innovations
- raising man-power skills needed in the development of technologies
- setting up regional science and technology information systems
- expanding the science culture in the provinces, and
- increasing the R&D budget of the provincial governments and strengthening science and technology policy system of the provincial governments.

The yearly plan for the Comprehensive Regional Science and Technology Promotion includes the details of six main projects. These six government initiated projects comprise 198 sub-projects which amount to 813,300 million Won in 2001.

Developing S&T capabilities at the provincial level

In order to enhance the S&T policy-making capabilities of provincial government officials, the government started a project whereby science and technology advisors work in provincial governments. The advisor analyses the situation concerning science and technology in the province as well as gives advice to the provincial government about regional S&T policy making. In addition, the government is constructing a cyber-community for promoting regional science and technology by setting up an interactive web site (<http://www.most.go.kr>) that has a discussion room, web-mail and a database of policy documents.

Next year (2002), the government will initiate two projects: development of strategic technologies in the provinces; and educating provincial government officials about regional innovation systems, technology transfer, national

R&D programs, etc. The government hopes that such projects will help the Comprehensive Regional Science and Technology Promotion Plan to reach its goal: an expansion of the potential power of economic growth in the provinces and a balanced development among the provinces. Another recent initiative is the establishment of Techno-Parks in areas away from the main metropolitan areas. While still new, these offer some potential lessons for the development of regional capacities in the innovation field.

6.5 Case 3: Support for R&D networks

Inter-firm linkages in Korea are rather under-developed. According to the IMD report, in 1998 Korea ranked 41st out of forty-six countries in terms of inter-firm technological co-operation. A reason for this weak performance is that trust among people and organisations is low throughout Korean society. Such lack of trust means that private firms are reluctant to co-operate and to make strategic alliance with local firms. To alleviate the problem, collaboration between universities and industry has been given high priority in the national R&D program since 1994.

The existing legislation provides co-operating actors with the funds, manpower, facilities, and information necessary for collaboration. Further to encourage collaboration, science research centres (SRC), engineering research centres (ERC) and regional research centres (RRC) have been set up. The SRCs focus on new theories in basic research and in-depth research in the natural phenomena, while the ERCs develop advanced industrial technologies. The RRCs stress co-operative research between regional universities and industries.

6.5.1 Keeping large companies linked to the national and regional level innovation systems and networks

In the past Korea achieved fast economic development by favouring large industrial conglomerates such as Samsung,

Hyundai, and Daewoo. Although they have expanded the scope of their products and technologies, they still have difficulties in competing in state-of-the-art technologies. These days they are devoting their efforts to R&D activities to catch up with other foreign firms in highly advanced technologies. Private R&D amounts to over 70% of total national R&D. Large firms continue to account for a large, but decreasing, share of that. Large firms role in the national innovation system remains important since they

- Participate in national S&T planning. Whenever the government makes a national S&T plan, large firms provide knowledge in setting up priorities in technologies
- Play a role in implementing the national R&D projects. Big national R&D programs normally incorporate large firms
- Employ trained researchers who are involved in national R&D programs or government-supported research institutes (GRIs)
- Tend to use expensive R&D facilities and equipment owned by public research institutes.

As new technology-based products mean greater national wealth, the government is giving more attention to new technology-based firms, particularly in bio-technology. The Korean government actively supported the large groups to develop exclusive (and captive) suppliers in the past. This practice has declined since the financial crisis, and the new trend is towards multiple suppliers and global sourcing. This is creating new challenges both for the suppliers and the principals.

The SMBA provides incentives (including tax benefits) to large enterprises to develop stronger linkages with SME suppliers. SMBA plans to introduce a system that evaluates relationships between the largest business groups and their supply chains, with awards being granted to those enterprises with excellent co-operative practices. The role of foreign firms has not, until recently, been a major issue since few foreign firms operated in the Korean market. But considerable interest was expressed among interviewees about better ways of strengthening value chains and involving smaller firms in international value chains – both of production and innovation.

Exhibit 17. Needs and supply of support for R&D networks – Korea.

Need for support	R&D support measures
<i>Network development</i>	Science Research Centres – MOST Engineering Research Centres – MOST Tax benefits for large firms co-operating with SMEs – SMBA Awards for excellent co-operative practices – SMBA
<i>Limited access to knowledge</i>	Regional Research Centres – MOST

7 Netherlands

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7.1 Introduction to the Dutch context

The Netherlands has, for some years, been in a phase of higher than average EU economic growth, and diminishing unemployment. The economy is expected to grow by 4% in 2001 and by more than 3% per year thereafter. Unemployment has been falling since 1995 and was 3.5% in 2000. Despite the Netherlands' economic success, the perception is that there is still a need for more innovation in the market sector and for better exploitation of available knowledge in the (public) research sector.¹⁶

The main priorities of Dutch innovation policy are to improve the interaction between public research and industry, and to provide public research organisations with incentives to become more market orientated. Several collaborative R&D schemes are designed to help this happen, and the budget for more strategically oriented competitive research funding has been increased. Policy aims at making IPR's (especially patents) better known as instruments that can help stimulate innovation. New areas of policy emphasis are the cluster approach, and an emerging focus on entrepreneurship and new-technology-based firms. The former has meant that innovation support mechanisms have changed. In the mainstream direct policy mechanisms (subsidy programs), R&D is supported for groups of firms or firms with universities, rather than individual firms. For individual firms, indirect tax schemes are still available. The government is aiming to shift its role from financier to facilitator and cluster broker, and has therefore re-focused existing policies towards a cluster approach.

New technology-based firms have been neglected in Dutch national innovation policy for a long time, leaving the initiative to universities and regional government bodies. In the last two years, more national policy emphasis has been put on this issue and initiatives have been launched at national level. Innovation finance has become more focused.

Due to shortage of labour, particularly in technical areas, most efforts are directed towards getting more people interested in these labour markets. Education in entrepreneurship is also emerging.

7.1.1 Key innovation policy actors and actions

Ministry of Economic Affairs (EZ) plays a key role in the Dutch technology policy (www.EZ.nl). It is responsible for innovation and business oriented science and technology support, including the applied science organisations. About 10 key instruments form the core of EZ's support for businesses. Together these measures account for about NLG 1 billion (EUR 0.45 billion) of technology support. Exhibit 18 presents these instruments and their focus area, or policy objective, and the resources allocated to the individual instruments.

Policy areas that have received increasing emphasis in recent years are the cluster approach and new-technology-based firms. The focus on clusters has meant that innovation support mechanisms have changed. First of all, in the mainstream instruments for R&D co-operation (Exhibit 18), the emphasis is on groups of firms or industry-university partnerships, rather than individual firms. Second, the government is aiming to shift its role from financier to facilitator and cluster broker.

New technology-based firms have been rather neglected in the Dutch innovation policy and the initiative has been left to universities or regional government bodies. More recently new technology related initiatives have been launched at national level. Although technology policy is centralised in the hands of EZ, important initiatives exist also at the regional level. The responsibility for policy making resides with the regional governments (Provinces). Regional development companies (ROMs) and the innovation network Syntens are key executive agencies. They provide a regionally based support and advice network focusing on the needs of the SME population.

16 European Trend Chart on Innovation – Country Report: The Netherlands (July 2000 – December 2000), European Commission, DG ENTERPRISES, “Innovation and SME” program, 2000.

Exhibit 18. Business oriented technology instruments in the Netherlands, 2000 (MEUR).

Focus area (policy objective)	Instrument	Resources committed in 2000
R&D co-operation	BIT	22
	BTS	55
	SMO	3
	EET	20
Knowledge transfer	HMKB	7
	KIM	4
Support for private sector R&D	KREDO ^a	9
	MPO ^a	1
	TOK ^a	43
	WBSO ^b	298
Total		463

Source: Ministerie van Economische Zaken, *MEET: Bedrijfsgerichte technologiestimulering – wat levert het op?*
Den Haag: Ministerie van Economische Zaken, November 2000.

^a Credit facility

^b Tax facility

7.2 Case 1: Supporting university based high tech start-ups

In the Netherlands, a variety of measures and facilities exist to assist start-ups in various stages of the start-up process. Measures and facilities at the national level are administered by the Ministry of Economic Affairs. At the regional level, regional governments, chambers of commerce, and regional development agencies are the main actors. It seems that at the regional level, the activities are fairly well co-ordinated and the various actors co-operate to provide an integrated package consisting of finance, advice and services.

In order to help entrepreneurs through the process of starting up the Ministry of Economic Affairs has recently launched 'Dreamstart'. This web-site (www.dreamstart.nl) provides a clear and consistent overview of all the information and knowledge that is useful for setting up a business, from specifying an idea to writing a business plan, and facilities that exist to support start-ups. Dreamstart also supports starters in establishing contacts with coaches and other experienced entrepreneurs. Overall, Dreamstart is the key access point for (techno-)start-ups.

Most measures and facilities are available to any kind of business start-up. Besides such generic support, specific

Exhibit 19. Needs and supply of start-up support – Netherlands.

Need for support	Support measures
<i>Entrepreneurship and business skills</i>	BioPartner Network; courses – Life Science Action Plan / EZ Twinning Initiative – EZ
<i>Practical help with:</i> <ul style="list-style-type: none"> • Business start-up • Management • Risk assessment and financing • IPR-management 	Twinning Initiative; packaged support (funding, advice, accommodation) for ICT firms – Ltd company (EZ) Life Sciences Action Plan; packaged support (funding, advice, accommodation) – NWO (Dutch Research Council) Subsidised loans for start-ups – EZ Tax benefits for Start-ups – EZ General start-up support – Chambers of Commerce Packaged support – regional development companies
<i>Limited access to business knowledge</i>	Twinning Initiative; linking universities and businesses – EZ Start-up website / Easy Start software – Chambers of Commerce Dreamstart website for start-ups – EZ BioPartner Network; linking start-ups with investors – Part of Life Science Action Plan/EZ Regional development companies – regional governments

arrangements exist in the area of ICT and life sciences, i.e. the Twinning Initiative and the Life Sciences Action Plan. The Twinning Initiative and the Life Science Action Plan are different from other measures in the sense that they represent integrated packages for start-ups, including measures for funding, advice and even accommodation. The Twinning Initiative represents a Dutch view of best-practice. The concept has recently been extended into the Life Sciences Action Plan. Here, we discuss the Twinning Initiative and Life Sciences Action Plan alongside the generic measures and facilities in the area of start-ups.

7.2.1 Twinning initiative

The Twinning initiative was founded in 1998 as a private company in order to increase the dynamics in the market for ICT starters and to raise the number of high-quality ICT starters in the Netherlands. It is administered by the Ministry of Economic Affairs.¹⁷ And it receives funding from the central government. The geographical scope is national, but the Twinning Centres have a rather local character with buildings in Amsterdam, Eindhoven, Twente and Delft-Rotterdam. Twinning employs three major tools which provide an integrated package of support (See Appendix X for details)

- Financing
- Networking
- Business premises and management support.

It is only one or two years since government has looked upon this issue as a general policy theme. The Twinning Centre initiative was the first policy instrument to take up the issue as one of its key points. Due to the success of the Twinning initiative the government is considering to spin it off to private parties by the end of 2001. Twinning has successfully contributed to the dynamics in the market for ICT starters.¹⁸ Accordingly, it has realised its most important objective. The government has set an important wheel in motion. This role can now be left to private organisations. There are two possible future scenarios: a) Twinning will be sold integrally as a “state of the art incubator; or b) Strategic investors will take over the government shares while Twinning will concentrate on innovation clusters and corporate venturing.

7.2.2 Life Sciences Action Plan

The Twinning concept has been expanded to other new technology areas. The most developed example of this is the Life Sciences Action Plan. The aim of the plan is to increase the number of start-ups in life sciences. The measure is aimed at researchers in universities and public research institutes who perform applied research in the area of life sciences, and is specifically aimed at starting up a company

in the area of life sciences. The action plan is organised along 5 main activities of BioPartner: Network, First Stage Grant, Facilities Support, BioPartner Centres and Start-up Ventures

The first line of action, the BioPartner Network is aimed at all phases in the development of life sciences start-ups, from fundamental research, and applied research and development (seed phase) to start up and growth and continuity. BioPartner Network initiates and organises activities such as network development, courses, linking of start-ups and investors and promoting of Dutch life sciences abroad. In addition, BioPartner Network monitors the relationship between the BioPartner Instruments, evaluates progress and where necessary makes recommendations for changes in the BioPartner set-up. The Life Sciences Action Plan has only been launched recently, so there is no information available on impacts at this stage.

7.2.3 Regional initiatives offering supports for start-ups

At the regional level the following organisations are involved in support for (university) start-ups: Chambers of Commerce; the innovation network Syntens; regional development companies; and venture capital companies. These organisations co-operate to a large extent so as to offer integrated packages of support, i.e. both financial support and management advice, at the regional level. Financial support for start-ups is also provided by regional development companies (ROMs). In addition to venture capital, starting entrepreneurs have access to an extensive network of coaches – experienced entrepreneurs who can advise starters. In this respect the ROMs co-operate closely with Syntens, the organisation whose mission is to strengthen the innovative capacity of SMEs through active information and advice (see below, section 2.1).

Chambers of Commerce have general services for starting a business. Two particular services include EasyStart, a software package to assist entrepreneurs in writing a business plan and a handbook for writing a business plan. Both the software package and the handbook take entrepreneurs on a step-by-step procedure by providing all the right information about the company. These support kits can be bought in the Chambers of Commerce offices or ordered on-line (www.kvk.nl/kvk/starters).

7.2.4 Fiscal measures

In order to encourage start-ups, the Dutch government has introduced a number of fiscal measures.

17 However, it will be spun off before the end of 2001, see section 1.1.5 Results.

18 This has been established by an evaluation carried out by Booz Allen.

The fiscal measure most directly aimed at starters is the ‘starters’ deduction’. Starting entrepreneurs are granted an additional tax exemption of NLG 3,775 (EUR 1,715) for a period of 3 years. The starters’ deduction is an additional deduction on top of the tax deduction for the self-employed. In other words, a Ltd or Plc cannot benefit from this measure

The tax deduction for setting one’s own company, the self-employed tax deduction, is dependent on the profit realised by the company. The amounts that can be deducted from taxes are indicated in the box below.

Through the Aunt Agatha scheme start-up companies can borrow at an interest rate that on average is 0.5 per cent below the rate for a medium-term loan. At the same time, the Aunt Agatha scheme offers private investors a tax exemption. In case the loan is irretrievable, the investor can deduct the loss from income taxes.

Tax exemptions for new businesses, NLG.

Profit	Exemption
0 to 25,001	11,056
25,001 to 29,001	10,157
29,001 to 33,012	9,258
33,012 to 94,561	8,356
94,561 to 98,561	7,457
98,561 to 102,572	6,556
102,572 to 106,570	5,657
106,570 >	4,758

7.3 Case 2: New R&D performer

Initiatives in the area of innovation awareness, increasing the use of technologies and ICT by SMEs are mainly managed by intermediaries such as Syntens. They provide diagnostic tools, technology demonstrations and so on as part of their SME support package. To strengthen the competitive capability of SMEs in weaker regions, EZ has implemented the SME Initiative. This initiative too, is aimed at intermediaries.

The Dutch Organisation for Applied Physics Research, TNO has a special program called the TNO-SME Initiative that intends to increase the SMEs in the areas of strategic planning and reorientation. The initiative aims at increasing the SMEs’ demand for technology and technological services. Besides advice and services delivered through intermediary organisations, there is various kinds of financial support available for R&D performers. The most important ones include TOK and WBSO.

7.3.1 Syntens

Syntens are regional centres, which provide support and advice to SMEs on technology and innovation. The geographical coverage of the measure is national with regional implementation. The centres operate partly as a network, partly as individual centres in order to adopt regional specificities. The network is administered by the Ministry of Economic Affairs. Most of the funding for the centres is central, but some additional regional funding is provided by Provinces. The network has its own web-site (www.syntens.nl) which

Exhibit 20. Needs & supply of support for new R&D performers – Netherlands.

Need for support	R&D support measures
<i>No perceived need for R&D</i>	SME initiative; increase demand for technology services – TNO Diagnostic tools, technology demonstrations – SYNTENS
<i>Lack of financial resources for R&D activities</i>	TOK; Encourages R&D activities – SENTER TOK; Subsidised feasibility studies – SENTER WBSO; deduction breaks – SENTER / Tax authorities
<i>Limited R&D capabilities</i>	Advisory services & sign posting – SYNTENS Partnership & capability development – SYNTENS TOK; R&D loans – SENTER SME initiative; capability development – EZ
<i>Limited access to knowledge</i>	Website signposting for R&D services – SYNTENS R&D Advisors – SYNTENS / higher education Regional offices – SYNTENS Information from SME sector to government – SYNTENS

gives an overview of the services offered by Syntens and the projects that are being carried out at the national level. The web-site contains sign posting and links to other useful organisations, e.g. Twinning, Dreamstart, the Ministry of Economic Affairs, Chambers of Commerce. The network has been evaluated in 2000 and the following conclusions have been presented:

- 54 % of the Syntens customers see, or anticipate, concrete improvements in business management due to the activities of Syntens and 14 % of the customers have developed new ideas as a result of working with Syntens;
- customers of Syntens clients appraise the increase in innovativeness of their suppliers more positively than customers of non-Syntens clients;
- almost half of the customers have been in contact with Syntens 5 times or more;
- the revenue of the customers has on average increased by 16 % between 1997 and 1999, the revenue of non-customers by 10 %;
- In 1999, Syntens customers derived more revenue (21%) from new products and/or services than non-customers (14%)
- The antenna function (identifying and communicating relevant trends for SMEs) is almost non-existent.

7.3.2 TOK

The reason for launching TOK is to encourage development in companies and to bridge the financing gap between research and commercialisation. TOK is aimed at companies (of less than 25,000 employees) with special conditions for SMEs (less than 100 employees). The main objective of TOK is to stimulate the development of activities in the area of innovative process and products by making available risk capital to innovative companies and projects. TOK is administered by Senter. The measure receives central funding. The geographical scope is national. The government and Senter play important roles in providing information about TOK. Examples include publications, advertising on exhibitions and Senter's internet site. Evaluation of the measure shows that accountants and consultants in the area of subsidies and public support are the main sources of information for companies. Of the respondents 27 % indicates that they have been informed about TOK in this manner.

TOK was evaluated in 2000.¹⁹ With respect to the administration of the measure, the evaluation has produced the following results. The time taken to process the applications is realistic and generally does not cause any problems for companies. The preliminary interview by Senter and the processing of the applications are commended. The conclusion of approved projects by Senter runs smoothly. Moreover, written information by Senter – application

forms, brochures and credit agreements – is satisfactory. So on average, no major bottlenecks have emerged from the evaluation. A point of minor concern is that not all firms (in the target group) are aware of the instrument. A remarkable finding of the evaluation is that various TOK projects involve co-operation with other companies (mainly suppliers and/or buyers) and/or knowledge institutes. This represents a spontaneous form of co-operation, not required by TOK. Moreover, it appears that co-operation is often continued in new projects.

7.3.3 WBSO

The goal of the WBSO is to stimulate R&D in the business sector by alleviating the wage burden for companies through tax reduction. Technological innovation as a result of this will strengthen Dutch competitive position and through that the continuity of production and employment. The measure is a tax deduction. Since it operates via the wage tax rather than corporation tax, it is available to companies (such as start-ups) which are not making profits. This R&D tax deduction amounts to 40% of first f.150.000 of total R&D wage costs in a year and 13% of remaining R&D wage costs. The contribution per company or fiscal unity has a maximum of f.15 million in a year. The corresponding self-employed tax deduction has a maximum of f.10.621 in a year. The percentage of tax deduction depends on applications in relation to total annual budget available. This can change during the year. Therefore planning of R&D expenditures is made more difficult.

In 1999 the effectiveness of the Law was assessed by independent evaluators. With respect to the impact of WBSO on R&D it was found that

- Firms that make use of the WBSO spend more on R&D and have a higher R&D wage sum than companies that do not use the WBSO. However, the direction of the causality could not be established yet
- There is a significant positive correlation between the size of WBSO per employee and the R&D intensity (the direction of the causality could not be established yet)
- WBSO leads to more R&D employees.

It was found that there is a significant positive correlation between the R&D intensity and the number of innovations per employee. Further, it was found that an increase in the share of innovative products in revenue generates more employment. WBSO is considered to be easily accessible to companies (low administrative burdens) and therefore attractive for SMEs. In 1998 60% of the budget went to SMEs. Other positive elements are the efficiency of its implementation and the effectiveness of the measure.

19 Bureau Bartels, Evaluatie van de TOK-regeling, Amersfoort: May 2000

7.4 Case 3: Support for R&D network

Clustering and co-operation is one of the key elements in Dutch innovation policy since the launch of the Cluster Policy Paper ‘Opportunities through synergy, the public sector and innovation oriented cluster development in the market sector’ in 1997.²⁰ Clusters are seen as ‘value chains’ where firms collaborate with their supplier network, with knowledge bearers and other partners to create value-added products and services. In the three key elements of this cluster policy the public sector

- Ensures better framework conditions for specific clusters and thus act as a facilitator to improve competition and innovation
- Acts as a broker developing clusters. This is done by providing strategic information on clusters and sectors and by bringing stakeholders together in various platforms and projects. A larger share of the R&D instruments is targeted to networks of firms and firms with knowledge instead of individual companies. Good practice in R&D collaboration will be disseminated to a wider audience
- Acts as sophisticated a public customer in procurement policy, in which it will actively stimulate networking between contractors.

A wide variety of programs is aimed at stimulating clusters and co-operation. On the national level collaborative R&D projects are supported by three main instruments

1. Business-oriented Technological Co-operation Projects (BTS)
2. Industry oriented International Technology Co-operation (BIT)
3. Economy, Ecology and Technology (EET).

At the national level, there are no separate funding arrangements for foreign firms based in the Netherlands. By and large the measures are open to foreign firms which are operating in the Netherlands.

In addition to national measures there is a range of regional level support programs. These programs are frequently aimed at strengthening the competitiveness of regional industry by reinforcing the links between industry and knowledge institutions, and among firms. An example of a program in this respect is the Stimulus Cluster Arrangement in the region Eindhoven. These programs will be discussed in the following sections.

7.4.1 Business-oriented Technological Co-operation Projects (BTS)

The reasons for launching the BTS was to further stimulate a broad range of collaborative associations in the field of basic, industrial and applied research. The measure is aimed at companies of all types and knowledge institutions. This national measure is administered by Senter and it receives central government funding. The BTS subsidy scheme is implemented via public tenders organised three times a year. Support offered amounts to 37.5% of the project costs. In order to finalise the selection of proposals, Senter has to consult the Advisory Committee on Technological Co-operation Projects. Cumulative support is allowed up to 37.5% of total project costs via other national sources or EU Programs (possible use of the fiscal stimulation measure for R&D (WVA) being not considered part of the subsidy).

The progress of the BTS corresponds to expectations and objectives. There are no real bottlenecks in processing the applications. The selection criteria are clear and the applicants understand them. The simplicity and brevity of the procedure are valued. The BTS reaches the envisaged target group: innovative companies. There is a positive correlation between participation in the BTS and the R&D intensity of firms. Moreover, participation in the BTS has a positive impact on R&D co-operation. Over half of the projects have already generated innovations. The innovations are relatively often protected by patents and do well internationally.

Exhibit 21. Needs and supply of support for R&D networks – Netherlands.

Need for support	R&D support measures
<i>Network development</i>	Technological co-operation projects; grants (BTO) - SENTER International co-operation (BIT); grants - SENTER Economy, Ecology & Technology; grants- Novem Stimulus Cluster (Eindhoven); grants - Stimulus
<i>Limited access to knowledge</i>	BIT and BTO projects - SENTER

20 ‘Opportunities Through Synergy, The public sector and innovation oriented cluster development in the market sector’, Ministry of Economic Affairs, Letter to Parliament, December 1997.

7.4.2 Industry oriented International Technology Co-operation (BIT)

The reason for launching the BIT is the insufficient participation of Dutch companies, especially SMEs, in international programs. The goal is to promote Dutch companies participation in international technology programs. Designated international technology programs are Eureka and technology co-operation with industrialised and developing countries. In principle similar rules apply, albeit that for EUREKA the rules of the International Program must be followed. SENTER administers the program but has to discuss proposals with an independent Advisory Board, appointed by EZ. BIT is a national program which receives central government funding.

Subsidies are granted for feasibility studies or research projects. The subsidy covers up to 37.5 per cent of the Dutch project costs, or a maximum of NLG 250,000 for feasibility studies and NLG 3,000,000 for research projects, in the case of EU and industrialised countries, and NLD 250,000 and NLG 1,000,000 in case of the emerging markets.²¹ BIT programs targeted to innovative firms. According to BIT report participants have increased their R&D effort as a result of the scheme. BIT also has a positive impact on the participation in new partnerships. Over half of the projects have already generated innovations, many of which are successful on international markets. Patent applications are also relatively common in connection with BIT projects.

7.4.3 Economy, Ecology and Technology (EET)

The goal of the EET program is to develop Dutch industry so that it will be globally at the leading edge of the environmental technologies. It is also contributing to the state-of-the-art knowledge in Dutch research centres and to finding solutions to environmental problems. Long-term support seeks to advance the development of sustainable technological solutions. The program is aimed at co-operations of companies and/or knowledge institutions. The national level program is administered by NOVEM and it receives central government funding.

Support can be granted for basic research, industrial research, pre-competitive development, and seed projects. The seed projects are those which fit the EET criteria but

are too premature, or have too high technological risks to fit the R&D category. The measure is a stand-alone subsidy program. Support for seed projects can be up to NLG 250,000, whereas support for regular EET-projects can be up to NLG 10 million. The amount of subsidy depends on the development stage. Public support can cover costs as follows: 62,5% for basic research; 40% for industrial research and, 25% pre-competitive development. Also in this case the Basic Law Ministry of Economic Affairs Subsidies (Kaderwet EZ-subsidies) applies²². Outcomes of the measure are not available since the program has not yet been evaluated.

7.4.4 Stimulus Cluster Arrangement

The Stimulus Cluster Arrangement of the Eindhoven region attempts to increase the benefits of R&D by stimulating technological co-operation between firms and research institutes and among firms. The goal is to improve the competitiveness of the firms within the region. In particular, industry and service sector SMEs are targeted by stimulating their own innovative activities and contacts with research institutions. The measure is administered by an organisation called Stimulus, named after the program. The measure is co-financed by the EU (European Fund for Regional Development and European Social Fund) and Dutch governmental organisations. EZ, the Province of Brabant and the Eindhoven region. The geographical coverage of the Stimulus Cluster Arrangement is regional. Only firms or research institutes that are located in the Eindhoven region are eligible for funding. More detailed information about the application process and eligibility criteria can be found on the Stimulus web page (www.stimulus.nl).

Financial support through the Stimulus Cluster Arrangement involves a subsidy of maximum 45 % of eligible costs, with a maximum subsidy of EUR 1.2 million per application. The measure is based on matched funding by the EU and Dutch governmental organisations. The latter usually involve EZ, the Province of Brabant and the region Eindhoven. The Stimulus program has been running since 1995. Under Stimulus 1 and 2 programs over 400 projects were approved during the period 1995–1999. The program has been renewed twice, the last renewal occurring in 2000. Stimulus 3 (2000–2005) projects have not yet been approved because the financial contribution of the EU has not been received.

21 The costs incurred by the foreign partner(s) are paid by the government of its home country.

22 According to the existing code of practice other subsidies from the Ministry of Economic Affairs (Kaderwet EZ-subsidies) are not available for the successful applicants. However, other governmental, local, regional or EU subsidies are allowed up to a maximum of 50 % of project costs.

7.5 Summary of the Dutch support measures

The Dutch systems comprises a relatively centralised national innovation support program, consisted of ten major instruments, all under the Ministry of Economic Affairs. There is a number of executive agencies and other organisations such as Dutch Research Council, TNO and private companies (Twinning initiative) which deliver the programs on national level. Such a portfolio of organisational forms creates some flexibility in choosing delivery organisations for different types of support programs. In theory it is possible to optimise the effectiveness of the delivery system by matching the characteristics of delivery organisation and the program requirements. Another interesting feature of the Dutch approach is the spin off and privatisation of some elements of the innovation support system²³.

Dutch innovation policy puts emphasis on cluster/network development, perhaps more than any other of the countries investigated. Hence it provides an interesting case and in this respect worth further evaluation.

As in the Nordic countries, a relatively high level of taxation is typical for the Netherlands. Hence, the use of fiscal measures as part of the enterprise/innovation promotion policy is an interesting feature of the Dutch system.

Significant elements of the SME support have been organised through regional organisations. In this respect the Dutch system is similar to the rather successful Irish model. There, a regionally based support and advice network is focusing on the needs of the SME population. Unlike in the Irish system, the Dutch programs are delivered through a number of different agencies including regional governments, chambers of commerce and regional development agencies. Regional delivery is considered important in the Netherlands as well as in Ireland, even if in terms of geography both countries are relatively small.

23 The Twinning Initiative, a highly successful ICT incubator will be privatised by the end of 2001. It was founded in 1998 as limited company in order to increase the dynamics in the market for ICT starters and to raise the number of high-quality ICT starters in the Netherlands.

8 United Kingdom (England)

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8.1 Introduction

Although the UK economy performed well in 1999, the pattern of economic growth over the last decade has been uneven and regional disparities have widened slightly. The UK is currently experiencing record levels of employment and the lowest rates of unemployment since the 1970s. UK GDP per head remains close to the EU average but is still around 21 per cent below the G7 average. In terms of labour productivity, the UK lags behind all G7 countries except Japan. This can be accounted for by the present skills gap, the low spending levels on R&D and innovation, a legacy of under-investment, and a culture which does not sufficiently encourage risk-taking and enterprise. Whether there is any evidence of new economy effects in the UK is not clear-cut. There is evidence of a sharp pick up in ICT investment in the UK, but as yet little evidence that this is boosting overall productivity in the same way that it appears to have done in the US. This poor productivity performance contrasts with the UK's strong performance in job creation.²⁴

Overall the UK is receptive to new ideas and effective at accessing the global knowledge pool. However, it performs relatively poorly in terms of turning new ideas into commercial success. Although service sector companies appear to perform well, the UK's larger manufacturing companies' spend on innovation is especially low in comparison with their main competitors. The UK rates as one of the most attractive locations for foreign-owned R&D, and the second highest level of international technological alliances between firms. However, weak collaboration at the commercial level between UK businesses and universities is hindering its performance on innovation. In terms of entrepreneurship, the UK needs to do more to provide a supportive climate, and overall remains relatively risk averse.

The following section presents a range of new policy actions by the UK government. These measures address many of the issues discussed above and provide practical examples of the latest thinking in public innovation support.

8.1.1 New measures aimed at increasing the opportunities for research based innovation

Recently the UK government outlined a number of new innovation promotion initiatives.²⁵ According to the paper, scientific breakthroughs are often not exploited to the full because universities and businesses operate at arm's length. Public funding, especially at a regional level, can help spawn clusters of innovation that draw them together. In addition to the existing programs, the Government has plans to extend opportunities for innovation via following initiatives. The UK government is about to

- Establish a *Higher Education Innovation Fund* of £140
- Launch a new *Foresight fund*, initially up to £15 million
- Run one further round of the *University Challenge competition* and put £15 million more into *Science Enterprise Centres* to bring business skills into the science curriculum
- Create new *Regional Innovation Funds* worth £50 million
- Support 20 *Business Fellows*
- Publish *science and innovation strategies for Government departments*
- Introduce a *Small Business Research Initiative*
- *Change the rules for Government funded research*, and
- Double the number of *International Technology Promoters* from 8 to 16.

8.1.2 Accessing the UK innovation support system

The UK innovation support can be accessed through a relatively small number of organisations. Although all prog-

24 UK Competitiveness Indicators: Second Edition, Department of Trade and Industry Economics and Statistics Directorate, London, 2001.
25 Excellence and Opportunity - a science and innovation policy for the 21st century (Cm 4814) - Stationery Office Ltd., London, 2001.

rams are not administered under these organisations they do, Business Links in particular, provide the first access point and sign posting services to the potential customers. The UK Government has set up the *Small Business Service (SBS)* which started to operate in April 2000. It is an agency within the United Kingdom's Government promoting the interests of small businesses. Essentially, small business matters have now been moved into a one organisation instead of being under several directorates within the Department of Trade and Industry. *Business Links* are the customer interface arm of the SBS, providing an access point and sign posting to services available for SMEs. *Regional Development Agencies (RDAs)* were formally launched in eight English regions on 1 April 1999. They aim to co-ordinated regional economic development and regeneration, enable the English regions to improve their relative competitiveness and reduce the imbalances that exists within and between regions. Agencies' specific functions are

- Formulating a regional strategy in relation to their purposes
- Regional regeneration
- Taking forward the Government's competitiveness agenda in the regions
- Taking the lead on regional inward investment
- Developing a regional Skills Action Plan to ensure that skills training matches the needs of the labour market
- A leading role on European funding.

Government Offices (GOs) will continue to be the arm of Government in the regions working very closely with their RDAs, as they take forward their broad spectrum of responsibilities in the economic development and regeneration fields (www.local-regions.detr.gov.uk).

8.2 Case 1: Supporting university based high tech start-ups

Despite a large number of initiatives, support for university based high tech start-ups is somewhat patchy in the UK. Some universities have developed very good, sometimes abundant support mechanisms whereas other universities have hardly any provision for start-up support. Overall the UK government's science and innovation policy seeks to create a climate where science and enterprise go hand in hand not only by increasing the amount spent on R&D and innovation but also by bringing business and universities together. There are a number of schemes designed to take ideas from the laboratory to the markets.

8.2.1 Reach-out to Business and the Community Fund

The Fund, administered by the Higher Education Funding Council, is a scheme designed to help graduates acquire sound skills in business and enterprise. *HEROBC* which is co-funded by the DTI and Department for Employment and Education (DfEE), aims to strengthen partnerships between the business sector and higher education institutions in England and Northern Ireland. In total, £60 million is aimed at helping to develop a range of capabilities in universities from setting up incubator units through to programs for staff exchange with business and other links with industry. Both the Science Enterprise Challenge and Reach-out schemes recognise that the main outputs from universities are its graduates and postgraduates; and that the best way to transfer knowledge is to transfer people.

Exhibit 22. Needs and supply of start-up support – England.

Need for support	Support measures
<i>Entrepreneurship and business skills</i>	HEROBC; funding skills development – Higher Education Funding Council Science Enterprise Challenge/ University Challenge Fund; packaged support for commercialisation – Universities PTP (Postgraduate Training Partnerships) – DTI
<i>Practical help with:</i> <ul style="list-style-type: none"> • Business start-up • Management • Risk assessment and financing • IPR-management 	NESTA; packaged innovation support – NESTA (trustees) Science Enterprise Challenge/ University Challenge Fund; packaged support for commercialisation – Universities
<i>Limited access to business knowledge</i>	TCS (Teaching Company Scheme) – Small Business Service CBP (College-Business Partnerships) – Small Business Service STEP (Shell Technology Enterprise Program)

8.2.2 National Endowment for Science, Technology and Arts (NESTA)

NESTA was created in July 1998 as Britain's first ever national endowment. It was given £200 million, in order to generate an annual income of at least £10 million. This in turn will be invested in British creativity and innovation. It is an independent public body with 13 trustees who will oversee its strategic direction and safeguard its accountability to the public and to Parliament. NESTA's three main purposes are to enable

- Exploration – helping talented individuals pursue their creative potential
- Exploitation – helping people turn ideas into products or services, and
- Explanation – contributing to public knowledge and appreciation of science, technology and the arts.
- Information on London based NESTA and its support programs can be accessed via the website (www.nesta.org.uk).

8.2.3 Science Enterprise Challenge

The Science Enterprise Challenge scheme was established to set up world class Centres of Enterprise in British universities. The centres will provide an opportunity for academia and business to work together and in so doing encourage best practice and the teaching of enterprise in the science and engineering curricula. The *University Challenge Fund* offers university researchers funding for the first stages of commercialisation of their research. The competition fund of £45 million was set up with the Wellcome Trust and the Gatsby Foundation. This has led to the creation of a £60 million seed fund to help support the early stages of research exploitation by providing investment in scoping studies, market research, developing prototypes and setting up spin-out companies.

8.2.4 Other DTI programs providing businesses an access to knowledge

Postgraduate Training Partnerships (PTP) is aimed at increasing the number of high quality postgraduates with skills, experience and training relevant to the needs of industry. Groups of postgraduate students work within a Research and Technology Organisation on industrially relevant research projects supervised jointly by academics and RTO personnel (www.dti.gov.uk/mbp/access/access.html)

TCS (formerly known as the Teaching Company Scheme) facilitates the transfer of technology and knowledge between the science, engineering and technology base and business by enabling high quality graduates to work for

two years on projects central to company needs. The scheme is now managed by the Small Business Service.

College-Business Partnerships (CBP) is based on the same principles as TCS, but primarily involving further education colleges in partnerships with SMEs. The scheme is now managed by the Small Business Service.

Shell Technology Enterprise Program (STEP) is a Summer vacation placement scheme for undergraduates to encourage SMEs to consider employing graduates and to provide undergraduates with industrial experience. The scheme is now managed by the Small Business Service.

8.3 Case 2: New R&D performer

An EU definition SME launching an R&D project aimed to result in the firm's first own product. The firm is located on a region eligible for EU structural funds. The project is planned to be implemented without any partners. The company has no systematic R&D processes, but the idea for the product shows real potential.

8.3.1 Business Link network

The Small Business Service (SBS) manages nationally a network of Business Link services which are run by local providers. Business Link provides independent and impartial business advice, information and a range of services to help small firms and those trying to start up new businesses. Each of the Business Link local providers has a dedicated team of Personal Business Advisers whose role is to provide with long term business support. In the UK, innovation and technology support is mainly offered through the Business Link one-stop-shops. This network offers a first access point to a wide range of services through the country.

8.3.2 Personal Business Advisers and Technology Councillors

For new R&D performers, Business Links have Business Advisers and Innovation Technology Councillors who offer local advice and also to help businesses to tap into European Research and Development initiatives. Advisors provide a simple and local route to impartial information about new markets, exporting, technology and business support. They also help clients identify the need for business support services including specialist advice and to select suitable providers, acting as account manager, monitoring and reviewing with the client the quality of services provided. Many of their services are subsidised by the Small Business Service. Business Link Advisers have wide ranging business experience and many have run their own small businesses.

Exhibit 23. Needs & supply of support for new R&D performers – England.

Need for support	R&D support measures
<i>No perceived need for R&D</i>	SMART; grants for technology reviews, technology studies and feasibility studies – Small Business Service
<i>Lack of financial resources for R&D activities</i>	R&D tax credit scheme – DTI / Inland Revenue SMART; grants – Small Business Service (SBS)
<i>Limited R&D capabilities</i>	SMART; grants for micro projects, development projects and exceptional development studies TCS* (Teaching Company Scheme) – SBS CBP* (College-Business Partnerships) – SBS STEP* (Shell Technology Enterprise Program) SBS * see case one for details
<i>Limited access to knowledge</i>	Business Links and Personal across the country – SBS Innovation & technology councellors – SBS Technology Councellors – Business Links Business Advisers – Business Links BIO-WISE; advice, helpline, website – DTI UK online for business; advice and website – DTI ACTT Program; info and networking – DTI Laser for Industrial Laser Users, advice – Association of Industrial Laser Users The International Technology Service; info – DTI

8.3.3 R&D Tax Credit Scheme

An R&D tax credit for small firms is a new initiative introduced in 2000 to help small and medium-sized companies undertake R&D either for the first time or encourage them to undertake even more R&D. At the same time new guidelines were introduced on the definition of R&D for tax purposes (based on the OECD definition). These guidelines include detailed rules, which will benefit both large and small companies by providing added certainty for their tax affairs. The scheme is administered jointly by DTI (enterprise matters) and Inland Revenue (taxation related matters).

Under the scheme the company can increase the amount that it deducts for qualifying R&D spending when it computes its profits for tax purposes from the normal 100% to 150%. This is called *R&D tax relief*. A company that is not in profit can surrender its qualifying R&D losses (including the R&D tax relief) to the Exchequer in exchange for a cash payment, worth 24% of the spending on R&D. This is called the *payable R&D tax credit*. The Inland Revenue makes the payment, R&D tax relief and the payable R&D tax credit can be claimed by a company even though it has not started to trade for tax purposes. However, not everyone can claim R&D tax credits, and not all expenditure qualifies.

The Inward Investment Information Unit has been established so that potential investors who do not have a UK tax presence have ready access to the tax information they need to set up business in the UK. Investors who already have a UK tax presence can contact the Inspector of Taxes currently dealing with their tax affairs.

8.3.4 SBS SMART

The SMART scheme is the most established national scheme targeted at new R&D performers. It provides grants to individuals and small/medium sized businesses to review, research, or develop technologies leading to commercial products. SMART is the Small Business Service’s (SBS) initiative, a package of support to help individuals and small and medium-sized businesses to make better use of technology and to develop technologically innovative products and processes.

SMART applicants can benefit from a wide range of support services. Businesses and individuals may seek help in filing their applications from the local Business Links signpost telephone service or from the website (www.businesslink.co.uk). The available help covers many other aspects such as financial and business planning, marketing, innovation & technology, design and intellectual property. However,

Business Links may charge for these services and such costs are not eligible for support. During the last financial year (31.03.2000–1.4.2001) 580 awards were granted and their total value was GBP 28.6 mill. All applications which met the eligibility criteria got the award. SBS has launched an advertising campaign because there are some doubts about the take up of the scheme at the moment.²⁶ The SMART scheme is currently under evaluation and the report will be published during 2001. There are some concerns that the take up of the scheme may not be as high as it could be despite the recent marketing campaign. This may well be the case because 580 awards per year is not very big figure considering the size of enterprise stock (the number of SMEs) in England is around 3.26 million.²⁷

8.3.5 BIO-WISE

BIO-WISE is a major UK Government Program funded by the DTI. It aims to improve the competitiveness of UK industry through the use of biotechnology. Also, it supports the development of the UK biotechnology supplier industry. The offered services include:

- Independent advice through a Helpline and website
- Free publications describing the economic and environmental benefits of using biotechnology
- Free visits to SMEs from an industrial biotechnology specialist
- Grant support to companies to demonstrate the benefits of biotechnology
- Free events that present biotechnology in action and provide opportunities to network
- Information and advice to biotechnology suppliers.

8.3.6 UK online for business

UK online for business is part of UK online, a nation-wide partnership that brings together Government, industry, the voluntary sector, trades unions and consumer groups to help make the UK one of the world's leading knowledge economies. As part of UK online the overall objective is to make the UK the best place in the world for doing business online. The assistance includes (www.ukonlineforbusiness.gov.uk/).

- Business Advice shows where to get help from a network of UK online for business advisers. This section can be used to enhance understanding of e-business through free publications, available e-commerce pack and briefings on various business topics
- Business Benefits helps to learn from the e-business experience of comparable UK firms. There are over 100 case studies (organised by business sector), sector im-

pact studies, and international research section to obtain a global perspective.

8.3.7 Industrial Laser Users

The Association of Industrial Laser Users was launched in 1995. DTI has provided support to this technology transfer club to help it disseminate laser technology the Department has helped support through R&D projects along with other laser expertise resident in the UK. The overall aim is to ensure that laser users or potential laser users can access the best possible advice available in the UK. The association provides

- A forum and mechanism for exchanging experience and expertise on non-competitive matters
- Annual directory of all members
- 'Hot-line' for guidance and contacts for particular expertise required
- Regular magazine and calendar of meetings and laser events
- Specialist discussion sessions and tutorial groups
- Educational seminars/workshops
- Advice on safety and standards in using laser technology
- Companies, organisations and academic institutions can access and contribute to all these activities by joining the association.

8.3.8 Advanced Control Technology Transfer Program for improving controls in manufacturing (ACTT)

The ACTT Program provides information to UK companies, particularly small enterprises, to help them gain improvements in competitiveness from adopting advanced control techniques. This has been done through a range of activities including a newsletter, case studies, and events such as seminars, workshops, demonstrations, regional events and regional ACTT networks. The program has also been useful in creating networking opportunities for users, system integrators and suppliers of advanced control solutions. Local participation has been the major success of the ACTT Program during the last 18 months and has increased seminar attendance from about 25 to a peak of 95. The Program is now completed,

There are a range of other programs to help industry to profit from knowledge and technology from the higher education institutions and others (these were discussed in connection with Case 1).

26 Roy, Evans, 2001, DTI Finance & Information, DTI London.

27 Bank of England, 2001, Quarterly Report on Small Business Statistics, January 2001, London.

8.3.9 The International Technology Service

The International Technology Service keeps companies aware of new technological developments and management best practice from across the world. Businesses can also tap into a range of regionally-based schemes that are designed to help them benefit from innovative ideas and technological advances and which are supported by European Structural Funds. They are normally administered by Government Offices in the English regions and delivered through the local Business Link (and equivalent offices outside England).

8.4 Case 3: Support for R&D network

A subcontractor network of medium high-tech SMEs and their large multinational high-tech customer corporation are launching a project in collaboration with one local and one foreign university. The project includes both product and process development, but none of it could be described as radical innovation. The SMEs are from different regions, some eligible for EU structural funds, some not. The large multinational has major production facilities in the country, but head offices are located in another country.

8.4.1 Introduction

The UK system does not offer much support for the above type R&D networks. The schemes listed below offer some help for Research and Development projects located in the UK and are also available to foreign-owned companies looking to set up in the United Kingdom

- Faraday Partnerships
- LINK Collaborative Research Scheme
- SMART (see case 1 for details)
- R&D Tax Credit (see case 1. for details).

As an overall rule multinational companies can participate the programs provided they have a significant manufacturing and research operation in the UK, and the benefits of research are exploited in the UK or European Economic Area. The foreign university status has not been specifically addressed but the rules concerning multinationals can be applied also to them. ([Http://www.ukresearchanddevelopment.com/rd_assistance.cfm](http://www.ukresearchanddevelopment.com/rd_assistance.cfm)).

Faraday Partnerships and LINK program are specifically designed to promote R&D collaboration between universities and businesses. The following will offer a closer look at the functioning of these schemes.

8.4.2 Faraday Partnerships

Faraday Partnerships promote improved interactions between the UK science, engineering and technology base and industry through the involvement of intermediate organisations. Faraday Partnerships are expected to be business-friendly, knowledge base/industry partnerships that are recognised regionally and nationally as centres of expertise and collaboration in their sector or technology. The Department of Trade & Industry (DTI) runs the Faraday Partnership initiative in conjunction with the Research Councils and other Government Departments. The DTI is committed to establishing a UK-wide network of 24 Faraday Partnerships by 2002 (for details see Appendix X).

8.4.3 LINK Collaborative Research Scheme

LINK is a well established mechanism and the main way the Government supports partnerships between research and industry. It operates particularly in areas vital to the UK economy. LINK supports programs that cover specific technologies or markets. These usually last between three and six years. So far there have been 66 programs, with over 1,300 projects; 27 of these remain open for applica-

Exhibit 24. Needs and supply of support for R&D networks – England.

Need for support	R&D support measures
<i>Network development</i>	LINK; promotes research industry partnerships, financing for Programs – DTI / Gov. Departments. Faraday Partnerships; promote & finance flows of people, partnerships, research with commercialisation potential, post-graduate training – DTI/Research Councils/Gov. Depts. through intermediary organisations.
<i>Limited access to knowledge</i>	Business Links across the country – SBS Innovation website (www.innovation.gov.uk) – DTI

tions. Projects involve about 200 research institutions and over 1,900 companies, of which half are SMEs. Government Departments and Research Councils provide up to half the total eligible costs of a LINK project with the rest coming from industry. Annual Government funding for LINK projects is currently £37 million. The total value of LINK projects underway or completed exceeds £550 million.

LINK provides financial support to individual programs of research. It aims to enhance the competitiveness of UK industry. This happens through support for managed programs of pre-competitive science and technology in market or technology sectors. Each LINK program supports a number of collaborative projects involving partners from industry and the research base. LINK focuses on areas of strategic importance for the future of the national economy. All new programs address priorities under the Government's Foresight program encouraging innovative research well ahead of the market but with good potential for later commercial exploitation.

LINK projects are typically collaborative research projects, each lasting around 2-3 years. Newsletters and seminars disseminate information about each program. Government funding provides up to 50% of eligible costs of a LINK project, which is at least matched by industrial support. Exact levels of funding for each partner depends on the allocation of work within a project. Small and medium sized enterprises (SMEs) are particularly encouraged to get involved. Multinationals can also participate provided they have a significant manufacturing and research in the UK, and the benefits of research are exploited in the UK or European Economic Area.

8.5 Concluding remarks on the UK support system

The UK (in this case England) is characterised by a very large number of initiatives aimed to support: commercialisation of research, technology transfer and SMEs. Over the years the support system has become rather fragmented even if there is emphasis on a one-stop-shop type of delivery system. Overall, short-termism is typical of UK government – every action has a horizon of 3 to 5 years. As a result there is little progress towards a consistent approach. This is somewhat opposite to the German national system which has its own set of problems. Policies which have kept issues like the excellent apprenticeship system and organisations like Steinbeis and Fraunhofer under consistent growth through a series of coalition governments have also resulted in little in the way of innovative ideas and initiatives to help firms.

Many of the most recent programs focus on commercialisation of research by encouraging university-based start-ups. Overall, support for start-up firms has been in and out of fashion in the UK over the past 30 years. Political views seem to shift between nurturing start ups because they are considered to be the most fertile ground for innovative ideas, and only helping established firms – the so called 'winners' – because with a little help they have the resources and management skills to see things through.

The support delivery system in the UK is currently once more in the process of change. The 'One Stop Shops' for business – the Business Links – are being re-branded under the DTI's Small Business Service. The Business Link rationale was to help only the winners (those employing 10 and above) but SBS will include start-ups. However, we remain sceptical of this change for two main reasons

The SBS outlets (still to be called Business Links) are expected to produce value for money, so they are likely to seek to generate income from users for training, counselling, etc. Start-ups are generally seeking funding rather than seeking to pay for support, so may be excluded on this basis. They are also as expensive to market to as bigger firms, but don't give as good a return

Scottish Enterprise have pioneered electronic delivery of services at the first (initial contact) stage. They openly admit that this will be aimed at dealing with start-ups so that they can concentrate more valuable time on better cases (winners?). At its worst this could present an electronic 'revolving door' for start ups who again may be excluded. DTI have been watching these developments very closely and are investing heavily in a 'National SBS Portal' which will offer first level signposting to users. It seems too easy to interpret this as a mechanism for dealing with the nuisance of start-ups.

Overall the national support systems may not cater very well for start-ups very effectively. However, university-based high technology start-ups are likely to benefit from the recent measures aimed at commercialisation of research.

For new R&D performers, the UK system offers relatively limited amount of financial support through two key measures. The SMART scheme is currently under evaluation and the report will be published during the summer 2001. Despite the recent marketing campaign only 580 awards were granted during the last year, which is not very much considering the size of the enterprise stock (the number of SMEs) in England is around 3.26 million.²⁸

Under the Tax Credit scheme the company can increase the amount that it deducts for qualifying R&D spending when

28 Bank of England, 2001, Quarterly Report on Small Business Statistics, January 2001, London.

it computes its profits for tax purposes from the normal 100% to 150%. A company that is not in profit can surrender its qualifying R&D losses (including the R&D tax relief) to the Exchequer in exchange for a cash payment, worth 24% of the spending on R&D.

The UK tends to argue that large firms can look after themselves and should have enough commercial sense to see that they have to remain innovative to survive. State activity in this area tends to be limited to general awareness campaigns, tax breaks and award schemes. The UK system does not offer a specific innovation support program for

subcontractor networks. Such networks are not recognised as applicants for support. However, some support is available for individual firms through a number of initiatives such as: Foresight, Eureka, Link, Smart and R&D tax credit scheme. This support is available for research and development projects located in the UK, also to foreign-owned companies looking to set up in the United Kingdom

The LINK program is a well established mechanism and the main way the Government supports collaborative partnerships between research and industry

9 Singapore

Jane Tebbutt
Technopolis Group

9.1 Introduction

Singapore is a small (3.2m population), thriving economy with a GDP of S\$143,981m. It has had high rankings in the world competitiveness tables²⁹ and is striving to maintain these positions. In terms of S&T it has 13,800 research scientists and engineers (RSE) of which 80% are Singaporean or permanent residents. Despite the rapid development over the last decade (70 RSEs per 10,000 population up from 28 in 1991) Singapore still lags behind many of its competitor nations. In 1999, GERD was 1.84% of GDP, which lags the US, Japan, Finland, Germany and Korea (amongst others). The target is to increase this to between 2–3% of GDP by 2005. In 1999, 673 Singaporean patents were filed (with 161 awarded), up from 142 and 52 respectively in 1992.

9.1.1 National Science and Technology Board (NSTB) and the National Technology Plan

The National Science and Technology Board (NSTB) was established in 1991 under the auspices of the Ministry of Trade & Industry. Its mission is *“To encourage, develop and nurture Human Capital in science and engineering research and indigenous capability development for a Knowledge Based Economy. We will achieve this through collaboration with tertiary research institutions in Singapore and abroad”*.

The current NSTB’s focus is on developing human capital. However, new schemes under the National Technology Plan (NTP) are still ‘in a state of flux’ and very little hard information is currently available. The NSTB itself has just (early 2001) been re-organised into two research councils (BioMedical – BMRC and Science and Engineering – SERC) and a policy and administration division. These Research Councils are very important, and will

- Support and manage the entire value chain of public sector research from basic to applied R&D
- Focus and coordinate research in research institutes/centres (RI/Cs) and institutions of higher learning (IHLs) to enhance overall efficiency and effectiveness
- Advise government on technology policies, set priorities in research and develop technology roadmaps.
- The two research councils are both setting up technology transfer offices, but this is still in progress and public domain information is not forthcoming.

9.1.2 Technopreneurship

There has been a general move in Singapore towards the concept of ‘technopreneurship’. This is basically encouraging citizens and businesses to become more entrepreneurial and less risk-averse. It has involved a relaxing of certain legislation, such as lowering corporation tax and personal tax, and allowing businesses to be run from domestic premises. Rebates are available for certain types of investment, employing overseas workers is less onerous and there is no Capital Gains Tax.

9.1.3 Industry clusters

As far as S&T efforts are concerned there are four new industry clusters which take priority, with associated funding, Research Institutes and Centres (RICs) etc. They are:

- Chemicals Science
- Biomedical Science
- Communications Technologies
- Electronics.

In addition, manufacturing and automation remains important. Companies reported that S\$13.3 billion of their sales revenue in 1998 was attributed to R&D performed in Singapore, an increase of 38% from S\$9.6 billion in 1997. The amount represents 13% of their total sales revenue in 1998. 60% (of s\$13.3 billion) or 8 billion of the sales revenue were due to the commercialised products and processes attributed to R&D performed and launched in the last two years (1997/98).

29 Placed first or second by the World Economic Forum, and the International Institute of Management Development - IMD in 1999)

9.2 Case 1: Supporting high tech start-ups

The environment to support and stimulate high tech start-ups is well developed in Singapore. There are some public-sector schemes run at a national level as well as schemes run by individual institutions – primarily the two Universities and the 14 Research Institute Centres (RICs). For the purposes of illustration we show how both Universities tackle the support of spin-off New Technology Based Firms (NTBFs), and we highlight the experience of one of the more dynamic (in this respect) RICs.

9.2.1 Publicly Supported Schemes

The main actor concerning publicly supported schemes to assist NTBFs is the Singapore Economic Development Board (EDB) (www.sedb.com.sg). The EDB works with other government agencies to ensure that relevant infrastructure and key manpower capabilities are available for industry and business needs. It plays a significant role in planning and implementing economic strategies for industrial development. Priorities include creating the right conditions for Singapore to become a Knowledge Based Economy (KBE), and promoting Singapore as a global hub. For both, attracting Multi-National Corporations (MNCs) and inward investment is key. One of the key ways the EDB supports NTBFs is by creating and supporting Venture Capital (VC).

Singaporean public investment in VCs is marked. Since 1985 EDB has managed specific tax incentives to accelerate the formation of funds and VC companies. It is estimated that approximately one third of the total VC funds in Singapore (currently US\$3 billion) has been incentivised by EDB. In 1990 EDB created Singapore's first dedicated seed fund, called Seed Ventures. This fund was worth S\$3 million. Since then, another two Seed Funds have been created, along with a number of sector-specific funds including biotechnology and M-Commerce (mobile commerce).

Overall VC is very important in Singapore, with US\$10.2 billion under management in 1999. There are approximately 90 fund management groups, and almost 400 investment professionals employed. Generally speaking, technology related investments are preferred – accounting for 80% of funds invested. In 1999, almost one third of firms receiving VC were in the IT, communications and media sector; 19% were in Electronics and 19% in Industrial Products. The largest and most relevant one is Technopreneur Investment Fund (See Appendix FF).

9.2.2 Individual Institution-level Schemes (academia)

There are a number of different approaches available to researchers or students wishing to set up an NTBF, as each institution has its own methodology. Below we present 4 approaches, found in 3 different institutions. These are the two Universities (the University of Singapore and the Nanyang Technological University) and one of the Research Institutes – Kent Ridge Digital Laboratories.

National University of Singapore (NUS) and Nanyang Technological University (NTU)

There are two separate 'technology transfer' bodies at NUS. The International Transfer and Relations Office (*INTRO*) and the Centre for the Management of Innovation & Technology, (*CMIT*).

INTRO specialises in identifying and commercialising technology transfer opportunities from a University project where there is tangible, identifiable IPR related or patentable material. INTRO is informed of all University R&D activity by the Office of Research. It then assesses each RTD project in terms of its IPR or commercial potentiality interest - INTRO is only interested in the latter. The rationale is that there is little incentive to spend lots of money on ideas which will never reach the marketplace. Every researcher has to disclose what they are doing via a IPR declaration

Exhibit 25. Needs and supply of start-up support – Singapore.

Need for support	Support measures
<i>Entrepreneurship and business skills</i>	CMIT; advice and entrepreneurship promotion – Universities
<i>Practical help with:</i> <ul style="list-style-type: none"> • Business start-up • Management • Risk assessment and financing • IPR-management 	INTRO; commercialisation of research – Universities Technopreneur investment fund; attracts overseas VC – EDB Start-up Singapore; national scheme – CMIT ITTO; one-stop-shop for advice, incubation facilities – University Kent Ridge Laboratories; software incubator – Kent Ridge Institute
<i>Limited access to business knowledge</i>	

form, which is given to INTRO. The office takes a proactive role, asking the researchers exactly what they are doing to find out the research details.

CMIT works with INTRO, but is quite different. CMIT works with University staff, students and alumni to help them bring their ideas to fruition and set up NTBFs. At NTU, there is the Innovation and Technology Transfer Office. This facility is akin to INTRO at NUS, but concentrates more on providing physical incubator space. It advises INTRO staff on the business case behind attractive ideas which are under consideration for formal patenting etc. But it also undertakes a lot of work of its own, particularly with start-ups and directly advising both staff and students. It also works extensively with alumni.

ITTO at NTU

ITTO started to operate early 2000 and it provides a number of services. It acts as a one stop shop for staff and students on all matters relating to technical entrepreneurship. This includes providing ad-hoc advice, arranging seminars for engineering staff, and in-house practical training for 2nd year engineering students (in the form of a business plan competition) which is a requirement part of their degree course, and factory visits. It also carries out technology transfer activities, very similar to INTRO at NUS. This includes finding and logging IPR-protectable work within the University, and creating a database to help match the University opportunities with likely partners. Technology licensing is a key task, and there is also a very small VC fund, which is used to help a small number of the firms in the incubator centre. It is disbursed on a very selective basis, and the criteria and value of the fund are not available (for details on CMIT, INTRO and ITTO see Appendix GG).

9.2.3 Kent Ridge Digital Laboratories (KRDL)

Formed in 1998, as a merger between two research institutes, this national research institute develops software. It employs 350 full time researchers, has recently been re-organised and is moving more into applied research (now about 50/50 with basic research). It has been streamlined into three divisions: Intellectual Property Generation (IPG); Product Engineering Group (PEG); and Incubation. There are only 2 people employed in the Incubation team – a VP and the Incubator Manager. This is to ‘keep it lean and mean’.

Money is raised from both public and private sources, nationally and internationally. The incubator manager and VP typically attend and lead pitches to potential investors, who are all personally sourced. Networking is vital. Typical sums raised are US\$5-10 million over 2 – 3 years. Since 1992, 20 firms have been set up, spun off roughly at the rate

of 1 every 2 months. 6 firms were spun off in 2000, and 3 in 1999. So far there has been a 100% success rate of spinning firms from the incubator. The new firms typically employ 20 staff. In terms of future strategy, the domestic market is quite small, so KRDL is making links with overseas partners – EU, US, Japan. The strategy is to choose complementary partners of excellent quality; typically one per country, either a VC or another incubator (for more details see Appendix HH).

9.3 Case 2: New R&D performer

There is no clear cut support mechanism to aid first time R&D performers in Singapore. Their first port of call would be to the Productivity and Standards Board (PSB). This organisation has had quite a traditional background in providing measurement and testing facilities to manufacturing firms. However, in November 2000 it decided to separate its regulatory and its operational roles and on April 1st 2001 it set up two corporations. PSB Corporation Pte Ltd will undertake training, consultancy, and technology and testing services.

9.3.1 PSB Corporation

PSB offers a first-stop service for SMEs. This serves as the first point of contact for SMEs via a phone call or email firststop@psb.gov.sg (www.psb.gov.sg). Full operational details are not currently available. However, (in the short term at least) the previous PSB functions will continue. PSB Corporation’s mission is to be a one-stop integrated service provider to help organisations achieve business excellence through people, products and processes, (3Ps). It aims to have at least 35% of its revenue from overseas markets in three years’ time (current overseas revenue is 5-10%). The aim of raising overseas business is to increase economies of scale, which will allow it to improve its level of service to all its clients. Overall, growth is expected to double in the next three years to \$160 million. In 1998, PSB had provided more than 3,800 cases of assistance to SMEs through SME First Stop. This included providing financial, technical consultancy, new start-ups, business expansion, and overseas ventures advice. Of these, financial assistance and technical consultancy made up about 50% of the total assistance rendered.

Below we highlight some other schemes which partially fulfil the case study criteria.

9.3.2 SME 21

SME 21 is a 10-year strategic plan (www.psb.gov.sg/aboutus/plans/sme21.html) aimed at building up the capabilities of SMEs so as to enhance their contribution to Singa-

Exhibit 26. Needs & supply of support for new R&D performers – Singapore.

Need for support	R&D support measures
<i>No perceived need for R&D</i>	SME 21; strategic program to up-grade SME sector – PSB (www.psb.gov.sg/aboutus/plans/sme21.html)
<i>Lack of financial resources for R&D activities</i>	LETAS; business up-grading & technical assistance + grants – PSB PLE; help for ‘promising local enterprises’ – EDB LEFS; fixed rate loans – PSB / financial institutions CGP; Credit Guarantee Program – PSB / financial institutions CGB; Credit Guarantee Program – PSB / financial institutions
<i>Limited R&D capabilities</i>	Product design and development service – PSB LIUP; Local Industry Upgrading Program – EDB BusinessConnect; helps to tap into overseas R&D Knowledge / partnerships – PSB
<i>Limited access to knowledge</i>	First-stop telephone & website advice and sign posting Service – PSP

pore’s competitiveness and economic growth. The overall vision of SME 21 is to create vibrant and resilient SMEs that will enhance Singapore’s competitiveness and economic growth in the Knowledge based Economy (KBE). Currently many SMEs face structural weaknesses which lead to poor productivity. These include weak entrepreneurial culture, insufficient management know-how and professionalism, shortage of professional and technical manpower, insufficient use of technology, outmoded, unproductive methods of operation, limited ability to tap economies of scale, small domestic market. To attack these problems there is a number of measures for harnessing technology and knowledge for growth including

- SME Business Support Centres to offer a wide array of integrated business support services and advice to SMEs
- Technology Network (TechNet) Program to facilitate connections between aspiring technopreneurs, innovative SMEs, researchers and experts and venture capitalists
- Technology Incubator Program to provide SMEs with access to management assistance, finance, and business and technical support services.

The SME 21 plan will be implemented jointly by the government, chambers of commerce, industry associations and the private sector. A multi-agency SME 21 Implementation Committee, led by the Productivity and Standards Board (PSB).

9.3.3 Local Enterprise Technical Assistance Scheme (LETAS)

A scheme to help local enterprises defray costs incurred in modernising and upgrading their operations through the

engagement of an external expert for a limited period of time. Eligible firms must have at least 30% local equity, fixed assets not exceeding S\$15m, and not more than 200 workers. Generally up to 70% of the cost of engaging an external expert is provided for an approved short-term assignment. Although the eligible areas of assistance do not specifically include R&D, the following may be supported

- Identification and solving of technical problems
- Technical improvements to present operations or process
- Mechanisation, automation or computerisation of operations or processes
- Quality management systems
- Business development
- Financial development
- Market development
- Management information
- Human resource management
- Product development.

9.3.4 Local Enterprise Finance Scheme (LEFS)

Although this is not designed specifically to help a firm undertake R&D, it is possible that a working capital loan (see below) could then be used to finance R&D. LEFS is a fixed interest rate financing program designed to encourage and assist local enterprises to upgrade, strengthen and expand their operations. It is administered by PSB and offered through 22 participating financial institutions. A maximum of S\$15m may be loaned. Five different loans are available: Factory Term Loan, Machinery Term Loan, Machinery Hire Purchase Loan, Working Capital Loan, Factoring Loans.

Eligible firms must have at least 30% local equity, fixed assets not exceeding S\$15m, and not more than 200 workers. Eligible uses for the loans include:

- Establish a viable new business
- Modernise and automate plant and equipment
- Expand existing manufacturing capacity
- Diversify into other product lines
- Augment working capital needs.

9.3.5 Credit Guarantee Program (CGP)

This is a variation on the LEFS, through the provision of loan guarantees. It is administered by PSB and offered through 18 participating financial institutions. There are four different loans facilities (as above, but excluding Factory Term Loan), interest rates are fixed by the lender, and the eligibility criteria and use of loans are as above.

9.3.6 BusinessConnect

Although not strictly within the definitions of an SME R&D project, this is a service available from the PSB which enables Singaporean firms to meet foreign firms with a view to a business relationship. This could take various forms such as licensing of technology, exchange of expertise, joint ventures, joint R & D projects, investments, contract manufacturing, marketing or distribution agreements. It could also be loose alliances of like-minded companies that have the potential to develop over time into more formal partnerships. To date, delegations for inbound missions have come from Australia, Belgium, Canada, France, Germany, Italy, Japan, UK and USA. PSB has already led outbound business matching missions to Canada, Chile, Australia, Japan, France, Switzerland, Italy, UK, Belgium, Holland, USA, Sweden and Denmark. For the first half of 2001, PSB is planning missions to Germany in April, USA in May and Canada in June.

SMEs are informed about BusinessConnect events through a series of promotional activities such as seminars, newsletter and magazines articles, and direct mailings. The events are also publicised on the Internet through PSB's website. To date, about 4,000 local and foreign companies

have participated in BusinessConnect, and more than 5,700 one-on-one meetings have been conducted.

9.3.7 Promising Local Enterprises (PLEs)

This scheme, which is administered by the EDB is used to identify local Singaporean companies which have 'potential' in terms of growth, sales, exports etc. Information on how they are identified is not forthcoming from the agency. The aim is to have between 50 and 100 of them. One of the EDB's VC funds has been set up especially to support PLEs, to help them enter new export markets and build capabilities. Although most PLEs are probably not first time RTD performers, this would be another avenue of potential financial help.

9.3.8 Local Industry Upgrading Program (LIUP)

Finally, this scheme, which is also administered by the EDB, to help local supply chain companies of MNCs upgrade their personnel and technical competences could, potentially be used to conduct an RTD project. But its real focus is on developing manufacturing or service operational competencies to become best in class. It is arranged sectorally (everything from electronics to marine) and involves large numbers of MNCs and local firms (over 600).

9.4 Case 3. Support for R&D network

Support programs involving international collaboration are quite normal in Singapore. There is a distinct culture of encouraging the flow of expertise from overseas firms or academic institutions into the country, but it is often carried out directly by transferring knowledge and know-how via individuals rather than at the corporate or institutional level. However, there are no discernible 'national' schemes to which the participants in our imaginary scenario could apply. Instead, Universities or RICs have their own individual programs which support this type of collaboration.

Exhibit 27. Needs and supply of support for R&D networks – Singapore.

Need for support	R&D support measures
<i>Network development</i>	Matched funding for foreign research institutes / centres – NSTB Joint Research Program; Singapore/Canada – NSTB Environmental Technology Institute; works local/foreign firms and research institutes – NSTB / NTU
<i>Limited access to knowledge</i>	Website / data base – NSTB (www.nstb.gov.sg/)

The following sections present some programs which meet, or partially meet, the case study criteria.

9.4.1 Matched Funding

This program does not fully meet the criteria because its aim is to ‘incentivise’ the research partner to work with local firms, not with overseas firms or universities. However, locally based subsidiaries of MNCs are eligible for funding, on the understanding that they materially participate in the R&D project, and are not just ‘fronting’ the MNC. It is not 100% clear whether an overseas University is eligible to participate, although theoretically it is possible as “*The RICs have full autonomy in deciding how to use the Matching Funds*”. However, an overseas University would not attract Matched Funds. Their participation would have to be funded by other means (for details see Appendix JJ).

The Matched Funding Scheme is designed to incentivise the Research Institutes and Centres (RICs) to have greater R&D collaboration with locally based organisations, from both the private and public sectors, with the objective of improving their competitiveness, through technology. It is designed to be an incentive scheme. Matching Funds received are **not** meant as a subsidy for the collaborative project. The terms of the R&D collaboration are to be determined by the parties involved.

9.4.2 NSTB-National Research Council (NRC) Joint Research Program

This is an example of a bi-lateral RTD program between Singapore and Canada, managed by the NUS. The NSTB-NRC Joint Research Agreement was signed on 10 December 1997. The NSTB-NRC Joint Research Program (JRP) aims to encourage technological co-operation through strategic alliances, involving scientists and engineers in research laboratories supported by the NSTB and NRC with industrial partners from both regions. Eligible research areas include Communications Technologies (particularly in the fields of optical networking) nanotechnology; and bioinformatics.

The 2001 competition was closed in April. Applicants had to submit complete short joint proposals (10 pages not including attachments) to the national coordinators (NSTB and NRC) for peer review. Projects should be up to 2 years, with possible extension to 3, if there was strong industry support and a successful project review. Successful teams were to be notified by August 2001.

9.4.3 Environmental Technology Institute (ETI)

This is an example of how one of the RICs would fund a networking type project. In fact, this model is very fluid, and at its most sophisticated it matches Case Study 3 rather more.

The ETI is a young institute, launched in 1996, and operates as a company limited by guarantee (by the NSTB and NTU). It is therefore, perhaps more receptive to collaborative proposals for technology developments that address SE Asia’s environment issues and/or have relatively near-term commercial opportunities, than a traditional RIC. For example, only 15% of its research budget is spent on fundamental, in-house, basic research. Staff are typically experienced in the private sector, and there is a strong team of ‘corporate function’ staff, such as HR, finance, communications and business development. ETI works with local firms, RICs and tertiary level institutions, but it also works extensively with overseas firms and institutions. It has created ‘strategic links’ with several other research organisations, including TNO in the Netherlands and the private sector AEA Technology in the UK. Network projects could therefore be set up involving local firms and RICs and overseas partners. These projects could involve joint venture approaches or direct contract R&D. The JVs can be research partnerships with other academic institutions (with or without industrial involvement) or they can be directly with SMEs, where ETI typically carries out very tough due diligence before proceeding.

Perhaps the most interesting example is that of partnering with foreign firms, where ETI will act as a ‘broker’ or facilitator. Here, ETI will identify a particularly interesting overseas technology. After a technical due diligence exercise, they will ask the foreign company if they would like to set up a firm in Singapore, in which (at some point) ETI is likely to take an equity stake of between 5% and 15%. ETI will source a local partner as well (better market knowledge, knowledge of local conditions, contacts, source of capital etc). ETI will offer the new firm use of its physical and network facilities (in return for a fee), and staff from the foreign firm will work in ETI’s laboratories, often matched by ETI staff.

ETI focuses on niche technologies with high added value and does not necessarily try to cover the entire spectrum of all environmental technologies. It adopts an ‘opportunistic approach’ when the right technology comes along, regardless of which medium or industrial sectors it falls under. This type of model is seen as a ‘win win’ partnership because it offers advantages for all parties. For the foreign firm there is earlier entry into the Asian market with associated lower front end costs, and access to local partners, ETI

facilities and networks. For the local firm there is access to world-class cutting edge technology, with potential for business growth, new products, increased sales and the opportunity to acquire new technical competencies and capabilities. For ETI, there is easy access to leading technology world-wide, an ability to 'jump start' national capacity building build up successful partnerships between local and international firms and attract a critical mass of niche-focused and successful environmental firms to Singapore.

9.5 Concluding remarks

Singapore is a thriving economy which has constantly had high rankings in the world competitiveness tables. To remain competitive Singapore has adopted a systematic way to promote technology entrepreneurship – labelled as technopreneurship.

In terms of encouraging entrepreneurship there are policies that encourage citizens and businesses to become more less risk-averse. Other supportive measure involve relaxation of legislation, such as lowering corporation tax and personal tax, and allowing businesses to be run from domestic premises. Rebates are available for certain types of investment and employing overseas workers is less onerous. Finally, there is zero level Capital Gains Tax.

However, the culture of 'technopreneurship' is relatively recent phenomena, and the Government's policy push started only in the late 1990s. At present the principle of providing tailor-made innovation support for NTBFs appears to be strengthening rapidly in those institutions which are already dealing with the research environment. The primary research has revealed four main approaches to supporting academic spin off firms

- Financial capital
- Physical facilities
- Intellectual capital
- A holistic approach combining all three elements.

It is the latter approach which is the most sophisticated, where the support agency is able to bring together all the actors in the creation and sustenance of a NTBF. Crucially, it is the recognition that the 'softer' issues (such as management capabilities, business acumen and marketing) are just as important as the 'harder' features such as technological capabilities and the existence of finance. Those schemes which are driven by *motivated, entrepreneurial and experienced* individuals and rigorous systems appear to stand the greatest chance of success, and it is apparent

that these schemes and institutions are benefiting from 'first mover advantage' by attracting, nurturing and acquiring slices of potentially lucrative NTBFs, with high success rates.

The political environment of the country also enable it to enact policies unilaterally, which also helps in terms of achieving 'big picture' goals, such as becoming a world class player in terms of attracting, and investing, VC. The 'luckiest' feature of the Singaporean innovation landscape in this regard is the size of the country in that it is possible for well-networked individuals to know all the 'people who matter'. However, it is equally true that access to finance and expertise is increasingly becoming a global phenomenon, and it is a mark of the ability of these key, somewhat visionary, individuals that they can continue to be central players.

It would seem that the good practice examples of Singaporean NTBF support shows that real success factors are down to, and the ability to have some vision and the ability to implement it. This applies equally to national policy (like attracting world class VC funds) and to institution-level policy, where well-connected and experienced individuals are able to implement properly thought out schemes.

Nevertheless, there does not appear to be any focused support to encourage new RTD performers. Most schemes centre on building capabilities within firms (there are lots of training assistance schemes and manpower upgrading schemes), solving operational problems (like a consultant) and getting certified/standards approval. It is not at all clear how the emphasis on building research capabilities in academic institutions (under the auspices of the NSTB) is translated in a clear and obvious way into industry support (under the auspices of the EDB). So the knowledge transfer network appears quite weak, there seems to be quite a 'separate box' approach, rather than an integrated one in terms of the management and national strategic approach, although on the ground the firm would go to the PSB for advice in the first instance.

The NSTB fund the Universities and RICs via the Singaporean equivalent of a block research grant to conduct domestic research in-house. International collaborative projects appear to be funded on an 'individual' basis, as University departments see fit, partially depending on their field of research, strength of networks or national research agreements. There is no national collaborative RTD scheme. So again, the knowledge transfer network seems a bit patchy, depending on sector.

10 Sweden

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10.1 Introduction

After some problems in the 1990s, currently, the Swedish economy is in good shape. Employment has risen steadily and the balance of national budget has improved substantially. Unemployment is at 4%, inflation at 1.5% and budget accounts are showing a surplus. After almost a decade of deep economic crisis, the Swedish growth policy agenda went through important changes towards the end of the 1990s. The policy reformulation took place against the background of almost three decades of comparatively slow growth in Sweden and increasing regional economic imbalances.³⁰

In Sweden the concept of innovation policy has been rather absent until very recently, although the importance of innovation and production of new knowledge is widely recognised. Instead, at a general level, the political agenda has been developed along two different strands: one in growth policy and another in research policy. The concept of innovation systems in general, and national innovation systems in particular, rapidly entered and spread in the industrial, research and economic policy debate and policy thinking towards the end of the 1990s. There is presently a major reorganisation underway in structure of public funding of R&D and support to business and regional development, which can be seen as an expression of a move towards a national innovation policy, most explicitly manifested through the establishment of the Swedish Agency for Innovation Systems (Vinnova) which became operational on January 1, 2001. The Agency integrates research and development in technology, working life and society. Vinnova's main roles are to

- Finance research, development and demonstration activities
- Foster co-operation between universities, industrial research institutes and business
- Promote the diffusion of information and knowledge, especially to SMEs

- Stimulate increased Swedish participation in the Eu's general R&D programs.
- Technology Foresight process
- Develop the role of research institutes in innovation systems.

Two major policy strategies have been brought forward. The first focused on creating an increased co-ordination in growth and research policy through a considerable reorganisation of the Swedish institutional structure, which came in effect on 1 January 2001. The other focused on stimulating regional economic growth through the implementation of a new institution in Swedish growth policy, the "regional growth agreements" launched in March 2000. All in all, the reorganisation involves some 15 organisations and will reduce their number to six. The new structure is to enable more focused public efforts in areas of strategic importance, greater efficiency and a better adaptation to the needs of target groups.

10.2 Case 1: Supporting university based high tech start-ups

In Sweden much of the existing support for commercialisation of research is directed towards developing closer co-operation between industry and higher education. Thus Vinnova Competence Centre Program and KK-foundation support for commercialising research do not fit exactly the above described case specification of university based start-ups. These programs will be presented shortly after Technology Transfer Foundation Stockholm case, which involves a number of pioneering initiatives for supporting university based start-ups.

10.2.1 The Stockholm Foundation of Technology Transfer (TBSS)

The seven regional Foundations for Technology Transfer (TBS) were founded in 1994 by the Swedish Ministry of Industry and Trade. The foundations work mainly with the universities but also with other local actors promoting regional innovation systems. In total SEK 1 Bill was invested

30 European Trend Chart of Innovation, Country Report Sweden, Director General Enterprises, 'Innovation and the SME program', European Commission, 2000.

Exhibit 28. Needs and supply of start-up support – Sweden.

Need for support	Support measures
<i>Entrepreneurship and business skills</i>	Staff exchange programs SMEs/Universities – TBSS/Univ. Entrepreneurship courses across the faculties – TBSS/Univ. inventions Incentives for Univ. staff and students to commercialise their projects Support for student projects Pre-incubators – TBSS / Universities
<i>Practical help with:</i> <ul style="list-style-type: none"> • Business start-up • Management • Risk assessment and financing • IPR-management 	Network program for SMEs – TBSS / Universities Early stage funding for business ideas – TBSS / Universities Assistance in setting up rules for IPR – TBSS / Universities Management capability training for inventors – TBSS / Univ. Technology parks / holding companies to handle IPR – TBSS/Univ. Competence Centre Program; co-operation between industry and research community – Vinnova.
<i>Limited access to business knowledge</i>	Competence bridge; help desks for SMEs – TBSS / universities Matching service for universities and SMEs – TBSS / Univ. Seminars and conferences – TBSS / Universities Research schools within enterprises – KK-foundation

into funds until the end of 2007 when the inflation compensated funds need to be paid back to the government. TBS-foundations are located across the country in the main university areas of Sweden: Gothenburg, Linköping, Luleå, Lund, Stockholm, Umeå, and Uppsala.

- The mission of each Stockholm Foundation for Technology Transfer (TBSS) is to increase the industrial growth in the region by promoting knowledge transfer between industry and academy, including commercialisation of academic research and entrepreneurship among academics. All the existing projects will have a cutting point at 2002, their results will be reviewed and the last five year period will be started from a ‘clean sheet’. A key objective of the limited time project funding is to encourage them to seek external funding and to become self supporting on their own right. The following incentives and policies are used to improve knowledge exchange between academy and industry
- Commercialisation functions for university-based ideas and innovations
- Simple and effective entrance functions for companies into universities
- Defined academic products and processes in line with industry needs.

The catalytic influence of TBSS activities can already be seen at the universities which are beginning to change their own processes more favourable to commercialisation.

- SME-contact functions (help desks for SMEs)
- Entrepreneurial training of students

- Pre-incubators
- Early stage funding for development of business ideas
- SME-oriented proactive contact and marketing functions
- Technology focused networks between academic institutions and SME’s in some areas of importance for the region.
- Staff-exchange programs between SMEs and universities.

10.2.2 KK-foundation support for commercialising research

KK-foundation develops Swedish research and higher education, especially strong links with industry. It focuses on developing new research environments in the new universities and within small and medium size universities. The aim is to build up competencies and thus strengthen the Swedish competitiveness in a number of different areas.

Practical measures include doctoral of ‘research’ schools which work in close connection with commercial enterprises. These are aimed at catalysing R&D activities and competence building in enterprises. Typically such research school has around 10 research students who do at least 25% of their studies in issues related to real life business situations. KK-foundation finances up to 50 % of the incurred costs. It can also support individual students studying for masters (50 %) and doctoral degree (60 %) by covering a share of the costs.

10.2.3 Vinnova Competence Centre Program

Vinnova Competence Centre is a program which aims to stimulate and develop research co-operation between universities/institutes and industry within strategic and multi-disciplinary areas of technology. The scheme was initiated in 1992 by Nutek and about 30 competence centres were established in eight universities/institutes. These Centres are organised jointly by industry, university/institute and Vinnova or Swedish National Energy Administration. The parties contribute to the project either financially or through active participation. Vinnova and Swedish national Energy Administration may finance the operation up to ten year period. It is expected that these Competence Centres

- Offer industry an attractive and concentrated research environment for collaboration, problem-solving and long-term competence development
- Have enduring participation from the industry in terms of management, implementation and financing of research program. Industrial partners financing share has to match the Vinnova contribution
- Have a clear competence profile, are internationally competitive and can meet the industry needs for technological-scientific development
- Are continuously liaising with industry, including SMEs and collaborate with other research groups
- Achieve results in terms of research, qualifications, human mobility and attracting external funding.

These centres are administered by the universities.

10.3 Case 2: New R&D performer

A range of organisations can potentially offer support to new R&D performers. Regional Almi companies and the Swedish Inventors' Association represent the most customer oriented agencies sensitive to customer needs. The Innovation Centre Foundation also supports early stages of innovation and it often comes into the picture after Almi has given the initial funding and soft supports for the new R&D performer. Vinnova/Nutek as more centralised organisations represent the push mode, running centrally designed national programs. However, NUTEK's web site provides access to a financing database which can be a very attractive easy access route for an increasing number of internet-savvy customers. This database appears to be a very effective and customer friendly way of exploring available business support and R&D financing.

10.3.1 ALMI

Almi's mission is to stimulate growth and development by helping Swedish SMEs to achieve healthy economic growth, create employment and contribute to a thriving society. Almi pursues various development programs to achieve the aforementioned targets.

The Almi parent company is state-owned agency which manages funds of 447 MEUR (4,000 MSEK). The fund is used for making loans to Swedish SMEs. In 1999, 87 MEUR (779 MSEK) was used to provide credit for new clients. Almi's operations are financed by its owners – the government and the county councils – by EU funding for

Exhibit 29. Needs & supply of support for new R&D performers – Sweden.

Need for support	R&D support measures
<i>No perceived need for R&D</i>	Active marketing of development services – Almi
<i>Lack of financial resources for R&D activities</i>	Loans; no full collateral required – Almi Soft loans for R&D and marketing – SIC Risk finance & capital – Swedish Industrial Development Fund Financing of R&D – Nutek / Vinnova
<i>Limited R&D capabilities</i>	Courses on innovation management – SUF Management programs; subsidised price – Almi Business development and consultation; subsidised price – Almi International business development; subsidised price – Almi Management mentoring; subsidised price – Almi
<i>Limited access to knowledge</i>	Regional advisory boards for R&D and new technology – Almi Project Councils; help to evaluate viability of the idea – Almi Financing Data Base – Nutek / Vinnova

specific project activities, and by revenues from various services and projects. In 1999 the net turnover of Almi group was 61.5 MEUR (SEK 551 Mill.), of which more than half was income from the loans and investment.

Almi offers loans to SMEs that can and want to grow. The terms of the loans may vary from case to case but typically full collateral is not provided and interest rates are higher than in commercial financing due to the greater risk involved. Thus Almi loans are complementary to existing commercial financing. Almi financing is always accompanied by soft development support. The advisory component of Almi services includes business information, business-development programs and consulting services which the agency offers at subsidised prices. In offering these services the agency puts considerable effort into identifying SMEs that are capable of growing, and which have the desire to grow.

Regional ALMI companies provide an access point to support services. In terms of new product development. Project Councils located in each county are a key actors. These councils can help SMEs by giving advice, by evaluating the viability of the idea and by providing support up to SEK 35.000. Provided the project will continue after the initial stage, Almi can also offer further advice in development and it can also offer financing for the development project. Many of the projects which receive Almi financing at the initial stage will get further financing for the development from the Innovation Centre Foundation.

10.3.2 Innovation Centre Foundation

Innovation Centre Foundation (SIC) is a small 5 person organisation specialised in innovation promotion and support. Since 1994 it has processed 3000 applications and granted support for 1500 projects. The foundation works in co-operation with NUTEK (project evaluation), Swedpark (early stage financing), SUF (customer interface) and the ALMI Project Councils (innovation support).

Soft loans are available for

- Patent applications (SEK 30.000)
- PCT applications, stage 1 (SEK 40.000)
- Trademark protection (SEK 15.000)
- Production costs (materials, workshop use, expert advice, testing, programming etc.)
- Design and visualisation of the product
- Prototype
- Testing, functionality, standards, CE-certificate etc.
- Contractual assistance; legal consultation, licensing, confidentiality agreements etc.
- Initial marketing of the product: brochures, trade fairs, travel costs etc.

Businesses can request support for projects which have commercial potential, the normal application processing time is between 2–21/2 months. The project can get financing from SIC only if it has not got more than SEK 35.000 financing from ALMI Project Council. Projects which take place entirely outside of Sweden cannot get support. SIC project funding covers wider area of activities and has softer terms than NUTEK financing for technical development projects.

10.3.3 The Swedish Inventors' Association (SUF)

The Swedish Inventors' Association is the world's oldest inventor association, offering services for those who want to commercialise their inventions. As a professional organisation for inventors SUF plays an important role in promoting innovation in Swedish society. It

- has unique knowhow and contacts within the field of innovation
- provides service and information regarding innovation
- covers questions regarding patent legislation and acts in the interest of inventors.

SUF is networking between its individual members and the different parties within the field of innovation such as financing, marketing etc. by organising meetings, seminars, visits and by participating in fairs. Special activities and projects concern women and youth. The association is an active and recognised partner in the field of development and innovation and an inventor's natural contact at the early stage of the chain of innovation. Today, there are about 2800 members, including individual members as well as companies. SUF collaborates with about 60 regional associations and it has 13 client executives operating across the country offering free advice on managing the innovation process. The foundation organises also a range of courses for each stage of the innovation process. These include: innovation management, needs analysis, marketing, materials, computers, project planning, financing, design, costs analysis, legal issues, intellectual property rights, environmental issues, creative working methods etc.

10.3.4 The Swedish Industrial Development Fund

The Swedish Industrial Development Fund was established by the government in 1979. The objective of the Fund is to stimulate industrial growth in Sweden by investing capital and expertise in projects and enterprises where banks and other sources of financing hesitate to do so. Typically the fund finances and assists R&D and market entry stages of the innovation process. The reasons for the fund's intervention may be lack of collateral, unacceptably high technical risks, or a project beyond the capacity of a company. Where, despite these factors, the potential for success exists, the

Fund can offer financing and expertise. The two main areas of activity are

- Co-financing of industrial development projects and market introductions
- Participation in the form of owner capital in small and medium-sized developing companies.

There are eight regional representative offices where businesses can discuss with representatives and submit their funding applications. The fund has a web site (<http://www.industrifonden.se>) that presents a good amount of information for the applicants (for details see Appendix PP).

10.3.5 Nutek/Vinnova

The Swedish Agency for Innovation Systems (VINNOVA) became operational on January 1, 2001. The Agency integrates research and development in technology, working life and society. Vinnova is a national organisation with regional development dimension but it has no regional network of its own. Instead County Government Boards provide the regional outlet for services. In relation to County administration the agency has an advisory role. The regional activities are co-ordinated by organising meetings and seminars with local bodies. Vinnova's main roles are to

- Finance research, development and demonstration activities that meet the needs of business and the public sector
- Foster co-operation between universities, industrial research institutes and business
- Promote the diffusion of information and knowledge, especially to small and medium-sized enterprises
- Stimulate increased Swedish participation in the EU's general R&D programs
- Evaluate and develop the Technological Prescience process
- Develop the role of research institutes in innovation systems.

Financing database

The financing data base offers easy access to information on available financing for development activities. It can be

accessed via the Internet and provides information on a wide range of available financing (<http://www2.nutek.se/finans/sok/sokstart.taf>). The service has a simple user friendly interface which offers a range of search alternatives for all types of SMEs and start-ups (Appendix MM).

10.4 Case 3: Support for R&D network

Nutek/Vinnova is the key promoter of R&D networks in Sweden. Networks are recognised as entities, typically a group of local businesses and research institutes/universities. The key objective of the network activities is increase connections between SMEs and research establishments. There is no explicit mention of foreign participants although there are individual cases of foreign companies participating in R&D networks on a self-funding basis. To qualify for Almi support, the company needs to be registered in Sweden and often the director needs to be resident in Sweden.

10.4.1 Technology brokers

Technology brokers (Teknikmeklare) is a service which can connect technology and other business development experts, financing included, with businesses. These Nutek certified experts come from a range of organisations (Almi, research institutes, university based technology centres, industrial development centres and consulting firms) and represent a wide range of high quality expertise. The first batch of 29 brokers got their certification in October 2000 and the second batch of 26 in April 2001. The aim is that within a few years time there will be 100–150 certified experts working across the country. The network services can be accessed by telephone or via the internet (www.nutek.se). At the initial stage the experts discuss with the representatives of the business and make the first analysis using the tools they have acquired before achieving the certification. On the basis of the analysis brokers are able to put the company in contact with the specialists who are best able to

Exhibit 30. Needs and supply of support for R&D networks – Sweden.

Need for support	R&D support measures
<i>Network development</i>	TUFF; easy access to technical expertise for SMEs, finance for network development - Vinnova AIS; promotes & finances co-operation between research institutes and Businesses - Vinnova
<i>Limited access to knowledge</i>	Technology brokers; linking experts and businesses – Vinnova / Nutek

meet the businesses development needs. The brokers also provide an access to local companies wishing to join R&D networks.

10.4.2 TUFF initiative

Nutek/Vinnova has developed the brokery service as part of the national *TUFF* initiative (Teknikutbyte för företag-sutveckling / Grundplåt) which is a national program aimed at developing to an easy access point for SMEs to technical expertise. This initiative started in 1995 and it seeks to bring together universities, research institutes and SMEs. It offers up to SEK 100.000 financing for local business networks which develop their technical capabilities together with research establishments. Support can cover the costs of technical development, seminars on network co-operation, needs analysis and the development of project plans. So far 150 business networks have received this type of support. The aim is that 15.000 enterprises will be involved into the program in the near future. The support applications are judged on the basis of

- A project plan which includes the cost and timing of actions
- Joint agreement between the group members on handling the applied support
- The qualifications of the project group leader.

The minimum size of the network is five SMEs. There is no strict upper limits for the number of participants, however in practice the group size is limited by the genuine interaction between the companies. It is up to companies to contact Vinnova experts in Stockholm and sign-up for the program. Vinnova aims to make funding decisions within one month of the March deadline. The experience so far indicates that successful networks are characterised by companies which have identified a technology that is a feasible step further for them. Such technology may not be new to the markets but the key thing is that it suits the real needs and capabilities of the participants. Most successful networks consist of a relatively homogeneous group of companies in terms of their size and the industry sector. There are also successful examples of vertical networks that bring together complementary businesses from different parts of the value chain, e.g. manufacturers, distributors, service providers and customers. A successful network co-operation requires a well resourced and motivated project leader who is capable to promote entire groups cause and interests. It is always useful to contact some existing network and draw lessons from their experience. It is common that some firms leave the group and some others join it. This happens often during the phase where the network is establishing itself. The group needs to have goals which benefit all of its members. Some of the

goals ought to be in the near future so that the participants can realise the benefits of their efforts.

10.4.3 AIS networks

AIS (aktiv industriell samverkan) is another Nutek/Vinnova program which encourages businesses for co-operation. Typical projects involves 1–2 technical institutes, 1–2 higher education institutes and 6–15 enterprises which work actively together over a three year period. The budget for this period is normally around SEK 6–8 Mill. of which the agency contribution is around SEK 3 Mill. The companies will contribute the financing for wages of their staff involved into the project. Technology/knowledge transfer is an integral part of this type of R&D projects. Businesses can submit applications for Nutek assistance three times a year (1.3, 1.6 and 15.9). Businesses can submit applications directly to Nutek or via R&D institutions.

10.5 Concluding remarks

The Swedish innovation support system is in a process of change as two of the major agencies, Nutek and Almi, are being re-organised. The new agency called Vinnova started to operate in the beginning of 2001 and it is still at the start-up phase. As a result it is rather difficult to get a clear view of the Swedish innovation support system. However, Vinnova and Nutek are about to propose to the Swedish government a new regional development program which focuses on cluster and innovation system development.

The aim is to shift focus from individual businesses to regional clusters and business networks³¹. (See Appendix NN).

Support for university start-ups has been organised through specialised funds which act as catalytic agents encouraging and financing projects within universities. These projects are aimed at changing university structures and organisational climate to become more favourable towards commercialisation of research results. The Stockholm based foundation has a policy to keep its own organisation as small as possible by giving the project management, whenever possible, to the universities that receive the support. Hence, it has free hands to initiate a great variety of different types of projects with the view that at least some of the projects will be successful.

Regional Almi companies and the Swedish Inventors' Association appear to be the most customer driven agencies offering support for new R&D performers. Innovation Centre Foundation also supports early stages of innovation

31 Nya tillväxtregioner – ett nationellt program för innovationssystem och klustern, Gemensam skrivelse 2001-05-14, VINNOVA dnr: 2001/04888, NUTEK dnr: 50-2001-1631

and it often comes into the picture after Almi has given the initial funding and soft supports for the new R&D performer. These organisations are most capable contact points since they have a regional service delivery network and a hands on knowledge of their customer base. In the pull mode customers needs are the starting point service delivery. Whereas in the top down approach programs are pushed down from the central organisation towards the objects which are considered potential recipients of the support.

Vinnova/Nutek are more centralised organisations and they are closer to the push mode, running centrally designed national programs. However, the Nutek web site provides an access to a financing database which can be a very attractive easy access route for an increasing number of internet savvy customers. This database appears to be very effective and customer friendly way of finding out available business support and R&D financing. However, such a web site is useful only for those SMEs that are using internet. This leaves some potential customers out of the reach of such service. Often new R&D performers also require an initial push from the agency and in this sense the Internet is too passive an instrument.

Nutek/Vinnova are the key promoters of clusters and R&D networks in Sweden. Networks are recognised as entities, typically a group of local businesses and research insti-

tutes/ universities. As indicated in the beginning of this section also business networks are becoming a target for innovation support. Technology brokers is a new service which can connect technology and other business development experts, financing included, with businesses. The target is to have 100–150 certified experts working across the country as a first contact point to a wide range of expert services. Since the program is very new it is not possible to assess how effective it will be when it becomes fully operational. The TUFF initiative is a national program aimed at bringing together universities, research institutes and SMEs. It offers up to SEK 100.000 financing for local business networks developing to an easy access point for the SMEs to technical expertise. This initiative started in 1995 and so far 150 business networks have received support. AIS is another Nutek/Vinnova program which encourages businesses and research organisations for co-operation. Typical projects involves 1–2 technical institutes, 1–2 higher education institutes and 6–15 enterprises which work actively together over a three year period. Technology/knowledge transfer is an integral part of this type of R&D projects.

Sweden has a wide portfolio of support programs and a number of agencies executing them. The system seems to be somewhat fragmented and it can be questioned how many of the initiatives, often rather similar to each other, reach a required critical mass.

11 Some concluding remarks, good practices and key instruments in public innovation support

This final chapter will present a synthesis based on the findings from eight country cases. It presents a framework which combines demand and supply factors of public innovation support. Needs for innovation support services and available types of assistance will be highlighted in the selected cases; commercialisation of research (university based start-ups), new R&D performers and networked R&D. Supply side discussion will focus on good practises and novel solutions to support innovations. Various types of support needs and instruments of public support have been compiled in summary tables. These tables illustrate country specific profiles of available support services. There is a great variety of innovation support services available to businesses, even if these tables do not provide a fully comprehensive map of support services in the investigated countries.

It may seem that the supply of services is more than enough to cater the existing needs for innovation support. However, there are two main reasons why this perception may be misleading. First, the supply of services is often very patchy. This means that businesses do not have access to suitable services. For instance, some parts of the country or certain type of businesses may be left out of the system. Secondly, the take-up of the services may remain low. This means that, for some reason businesses do not make use of the available support. Hence the impact of the instrument may remain very limited.

11.1 Commercialisation of research and support for university based start-ups

In this report, commercialisation support refers to all measures aimed at better exploitation of research results. These measures can focus on either structures or processes within the research establishments. Both structures and processes determine how fertile ground universities as well as other research organisations provide for commercial activities. In this case commercialisation of the research results includes licensing and university start-ups exploiting the research results. Support for start-up firms is a more specific measure seeking to help those who start university based spin-off business.

Overall support for start-up firms has been in and out of fashion over the past 30 years. Political views seem to shift between nurturing start ups because they are considered to be the most fertile ground for innovative ideas, and only helping established firms – the so called ‘winners’ – because with a little help they can have the resources and management skills to see things through. More recent start-up support programs often focus on well-defined target groups, such as university-based start-ups. This policy shift would seem to be a welcome development. A narrower focus can tackle a number of important issues and perhaps avoid some of the common mistakes of previous start-up policies. In the case of supporting university based start-ups

- The substitution effect is less evident – government support for research based business is less likely to harm existing non-supported firms
- Dead weight is more acceptable in connection with new technology – new technologies are always a high-risk venture
- Support for university start-ups is in a cross section of science and enterprise policy – the support creates synergies between these policy areas.

11.1.1 Proactive measures promoting commercialisation of research results

Commercialisation support is relatively recent development in most countries. Much of the efforts aim at building of an enterprise culture within the research community. Various types of promotional campaigns play a vital role at this early stage of the development. Such proactive measures increase awareness among the research staff and build up favourable attitudes towards commercialisation of research. Business plan competitions, liaison offices & officers also have a key role in activating researchers and in developing university-industry networks which enable commercialisation. Several investigated countries have already developed clear rules for IPR and profit sharing. Hence researchers have a clear understanding of the available assistance for commercialisation and financial gains they can expect from successful cases.

Exhibit 31 identifies a number of support measures aimed at promoting the commercialisation of research results.

Lack of entrepreneurship and relevant business skills is a recognised problem in many research communities and many countries are offering business training and entrepreneurship courses for researchers and students aspiring to start-up a business. More positive attitudes towards entrepreneurship are also seen as an area which needs further development. Such changes are difficult to achieve in short term and positive publicity is often considered a way to cultivate more favourable attitudes towards commercial activities within research community. Structural changes within the higher education institutions may also be needed. However, such measures tend to be very context specific and hence they have not been included in the summary table.

An example of good practice in promoting commercialisation of research

The Stockholm foundation of Technology Transfer (TBSS) offers a good practice case of an attempt to change university structures. It is a time limited project with very independent status and sufficient resources. TBSS aim is to act as a catalyst of change for university administration and other bridging mechanisms that enable better commercial exploitation of research based knowledge. The first step is to 'educate' universities so that they realise the beneficial effects of the required change. The administration and teaching staff needs to realise that sensitivity to the needs of the external society is essential for the successful commercialisation of research results.

In this case additional funding creates an incentive for universities to change their structures. TBSS has flexibility to support a wide range of projects in terms of objectives, length and scale. As long as universities can present an acceptable development plan they have a chance of getting support for starting a project. After the initial period, new structures are expected to be self-supportive and their aim is to instigate wider changes in the university processes. Examples of projects include commercialisation functions for university based ideas, simple and effective entrance function for companies into universities, and defined academic products and processes in line with industry needs. Finally, TBSS task is to monitor that university projects really do help creating more enterprise friendly environment and initiate structural changes.

Incentives for researchers who are starting up a business

Incentives for researchers can have a key role at the early stages of the commercialisation process. The following presents a brief summary of the country specific measures that were identified during the analysis.

The French system provides incentives for researchers, among other things financing up to 50 % of the development costs of commercially viable new product or service. In Germany researchers can divide their working time between the university and new start-up business. In addition, researchers can use university offices and facilities when

Exhibit 31. Support for university spin-offs (commercialisation research).

Need for support	R&D support instruments	F	D	Irl.	Nl	Kor	Si	Swe	UK
<i>Lack of entrepreneurship and business skills</i>	Entrepreneurship across the faculties	x	x				x	x	x
	Incentives for researchers to become entrepreneurs	x	x	x	x	x	x	x	x
	Business plan competitions / assistance		x		x		x	x	x
	Business management courses / advice	x	x	x	x		x	x	x
<i>Practical help with:</i> • Business start-up • Management development • Risk assessment and financing • IPR-management	Feasibility studies	x	x	x	x		x	x	x
	Mentoring	x	x	x	x		x	x	x
	IPR assistance	x	x				x	x	
	Incubator facilities	x	x	x	x	x	x	x	
	Pre-seed financing	x	x	x	x	x	x	x	
	Seed-financing	x	x	x	x	x	x	x	x
<i>Limited access to knowledge</i>	Venture Capital	x	x			x	x	x	x
	Packaged support for spin-offs	x	x	x	x		x	x	x
	Networking activities	x	x	x	x	x	x	x	x
	Assigned contact person / consultant	x	x				x	x	x
	Regional/local contact point	x	x	x	x	x	x	x	x
General start-up support (www databases)				x	x		x	x	

starting-up a new business. They can also receive management, technological and financial support for their new enterprise. The Irish Research Innovation fund supports commercially potential ideas that arise from researchers/potential entrepreneurs.

In Korea researcher can also work part-time at the university while starting a new business. Researchers can also receive financial support for setting up a new business. In Netherlands researchers are targeted by sector specific initiatives which seek to raise the number of high calibre start-ups. Twinning Initiative offers financing, networking, premises and management support for researchers setting up their own ICT businesses. Life sciences action works similarly in the biosciences sector. The UK Science Enterprise Challenge offers researchers funding for the first stages of the commercialisation of their research. This seed funding can be used for scoping studies, market research, prototypes, and setting up spin-out companies. In Singapore transfer organisations are active in collecting IP-related information from researchers. As soon as commercialisation opportunities arise advice and incubator facilities are available for researchers. In Sweden researchers can receive advice and seed funding for their commercial enterprises.

Support for university based start-ups

Start-up support activities, such as enterprise training, incubation facilities and industrial liaison offices act as bridges between universities and enterprises. Government agencies can stimulate such activities within the university system by promoting the setting-up of these start-up support structures. Universities themselves are best positioned to manage these projects and to offer operational support and grants to individual start-ups. Low key access to the services is important especially at the very early stages of the start-up development. Having a local contact person within the academic faculties seems to be very important as a door opener, source of encouragement and as a mentor to potential academic entrepreneurs. Much of the start-up support involves hands on assistance for the aspiring entrepreneurs including management skills, risk analysis, testing the viability of ideas, financing and IPR protection. Also incubator facilities are essential, although the, 'heat, light and dial tone,' type incubators are not very efficient as such. Effective innovation support consists of an assistance package which can deliver support and financing from pre-seed stage until the possible initial public offering. Packaged support has proven an effective way to deliver support since the applicants are requested to develop their business skills before they'll receive the financial support. The following provides a good practice checklist for commercialising research and promoting university start-ups

- Initiate change in university structures

- Increase positive attitudes towards entrepreneurship and stimulate scientific entrepreneurialism
- Improve physical facilities /incubation centres
- Secure sufficient funding for university start-ups
- Develop intellectual capital and clear rules for managing it
- Make use of well connected experienced individuals who assist start-ups
- Take a holistic regional approach by combining the above elements.

The Cambridge Entrepreneurship Centre is another good practice case of a holistic support system for university based start-ups. Cambridge offer covers full range of instruments from: student activities to practical help in start-up, financing, intellectual property management, training and incubation facilities. The investigation revealed two main weaknesses in the Cambridge case. There seems to be some lack of co-ordination between the parties involved in numerous support activities. Another weakness is related to the limited coverage of services. The supply of commercialising services in the UK and many other countries is very patchy. Only a very few universities offer as comprehensive support package as Cambridge does. As a result, large number of researchers and students are left without innovation support services.

The Bavaria case provides a good practice case of systematic development of regional level innovation support within and outside of the universities. In Bavaria university based start-ups can receive lavish support at all phases of the development, access to the system is easy and the institutions involved in delivering the activities are relatively transparent to the applicants. All above combined with high-class universities, good availability of seed and venture capital, training and burgeoning business culture have created a radical increase in the number of university based start-ups. Bayern Innovativ web site offers an easy first-stop-shop access point to all major actors and support schemes within the region. Although Bavaria has a very well developed regional innovation support system the success is very context dependent. The region has sufficient independence, industrial and research base upon which the comprehensive innovation support system can work effectively.

The Dutch case is worth mentioning separately because the government is stimulating start-ups by fiscal measures. Each start-up can claim EUR 1.715 'starters deduction' over a three-year period. Also tax exemptions are used as a start-up support measure. The maximum amount of EUR 5022 can be claimed by the businesses that make profit between EUR 0–11.357. As the profits raise the exemption becomes gradually smaller. This design is an attempt to cater the very common situation among start-ups, those which really need support most do not make any profit over their first years in operation.

11.2 Support for new R&D performers

Support for new R&D performers seeks to expand the number of businesses which are actively developing their products and processes. This business segment consists mainly of a large number of small firms and thus represents significant potential in terms of technology development. The small business population is very heterogeneous one and difficult to mobilise effectively. Due to their limited technological capability and ‘fortress enterprise’ mentality, some firms are reluctant to take up public support. Technology audits and R&D assistance are instruments which can be used in encouraging small firms to undertake technology development projects. Lack of financial and manpower resources are other common barriers preventing systematic R&D activities in small firms. These needs are commonly tackled with a range of financial instruments ranging from grants and loans to tax breaks. R&D strategy development assistance helps firms which do not have capability and/or manpower for long-term development tasks.

Limited R&D capabilities require also mentoring and hands on support which consists of consulting, training, placements of qualified personnel and networking. These instruments are frequently combined to a package which includes e.g: training, setting up network supports and some financing for these activities.

11.2.1 How to deliver support effectively to new R&D performers?

Exhibit 33 illustrates small firms’ large share of the total business population. Most of the new R&D performers belong to the small business segment which tends to be an elusive target group for any type of government support. This fragmented segment represents a wide range of industries, needs and capabilities. From the national support agency point of view this segment involves a very large number of small projects which are uneconomic in terms of marketing and management.

Although it is a challenging task to deliver support effectively to new R&D performers, some good practices can be distilled from the material analysed. As a starting point, Exhibit 33 illustrates the ‘market’ situation. That is, new R&D performers constitute a large number small firms which have relatively low technological capabilities. In terms of assistance these firms need a combination of management support and technological capability development. In such situation technology agencies have to focus on effective technology diffusion instead of developing high technology. Thus the key question is how to market and deliver tailored support effectively to such a large number of customer firms. In this case, the Irish system seems to offer a case of good practice: local delivery combined with some central co-ordination and instrument development. Exhibit 34 presents a schematic diagramme of the marketing & delivery system.

Exhibit 32. Support for New R&D performers.

Need for support	Supply of R&D support	F	D	Irl.	NI	Kor	Si	Swe	UK
<i>No perceived need for R&D</i>	Technology audits	x	x	x	x		x	x	x
	Product development assistance	x	x	x		x	x	x	x
<i>Lack of financial resources</i>	R&D tax breaks				x	x			x
	R&D / innovation strategy development support	x	x	x		x		x	x
	State-subsidized R&D programs	x						x	x
	R&D loans	x	x			x		x	
	R&D grants	x		x	x	x		x	x
	R&D loan guarantees					x			x
<i>Limited R&D capabilities</i>	Integrated business & innovation development	x	x	x	x	x	x	x	x
	Manufacturing consultancy	x	x	x	x		x	x	x
	Placements of qualified personnel, e.g. graduates	x	x	x		x	x	x	x
	R&D management courses	x	x	x	x		x	x	x
	Networking activities / introduction services	x	x	x	x	x	x	x	
	Packaged support for R&D performers		x	x	x			x	x
<i>Limited access to knowledge</i>	Linkage to EU programs/financing	x	x					x	
	Mentoring							x	
	Assigned contact person / consultant		x	x			x	x	
	Regional contact point	x	x	x	x	x		x	
	General innovation / R&D support -web site etc.					x		x	x

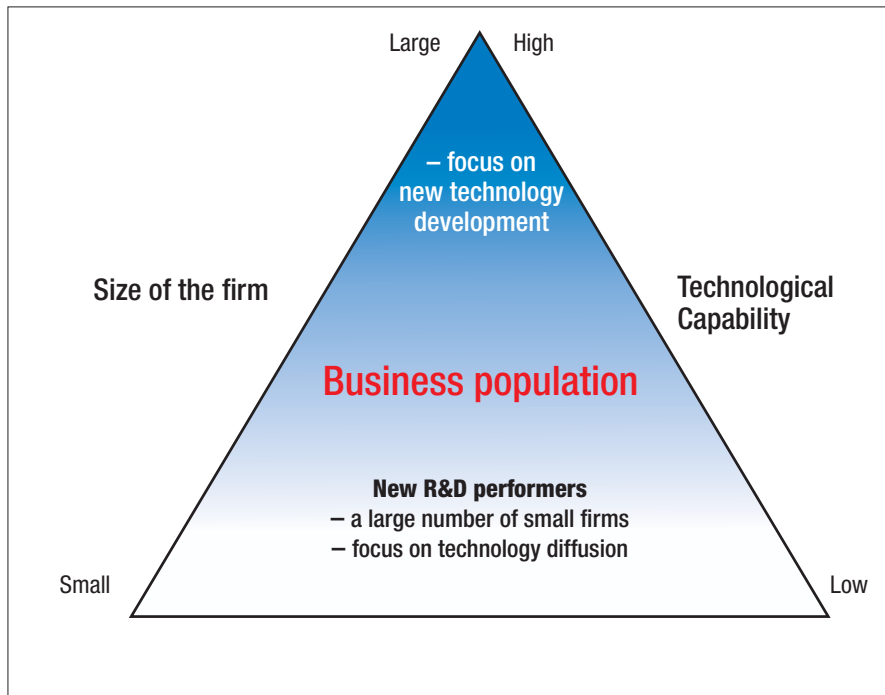


Exhibit 33. The Business Population and new R&D Performers.

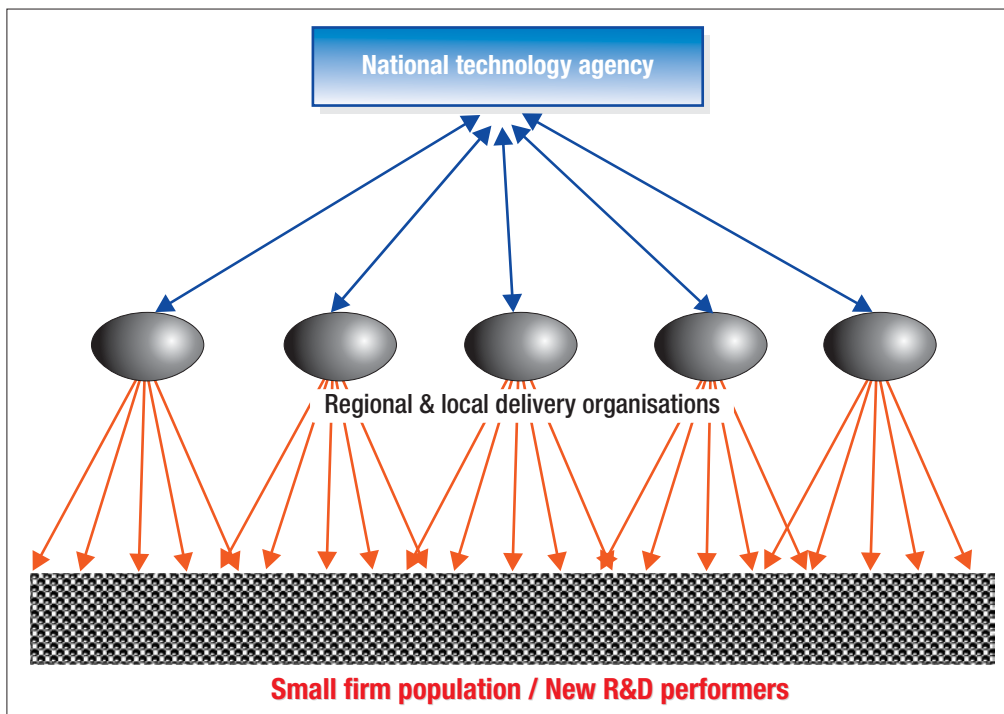


Exhibit 34. Reaching a large number of small firms– R&D support delivery system for New R&D performers.

Enterprise Ireland and County Enterprise Boards have jointly rationalised the support delivery system. First, the agencies have split the market and each one focuses on their own customer segment. In practical development work Enterprise Ireland focuses on businesses which employ more than ten staff and have ability and willingness to

develop products and services with export potential. As a national organisation it has sufficient resources to develop high level expertise as well as a wide range of business development and technology services. Due to its national level perspective it can co-ordinate development activities effectively and maintain extensive international contacts.

At the same time Enterprise Ireland secures fairly effective customer interface where each company deals with the agency through a single customer Development Advisor. This makes the the interaction process very much easier and allows scope for tailored support delivery.

In Ireland, the 35 County and City Enterprise Boards (CEB) are locally controlled enterprise development companies. CEBs operate across the country and they have an extensive field organisation based on local representatives, each of whom has a customer portfolio of some 20 firms. CEBs focus their development efforts on micro businesses which employ less than ten staff, delivering support in terms of grants advice and overall development of an enterprise culture. Each representative builds their budgeted proposal on the basis of their customer portfolio's needs. This ensures that each region will be allocated resources which fit the local businesses needs.

The Irish system seems to put in practice three important elements of an effective innovation and enterprise development support:

- It is based on bottom up process where the agency's service offer (budgeting) is based on the customer firms' needs. Each development advisor collects the needs firm by firm from their own district. This information will then be the basis for their budget and resource allocation
- Support packages for enterprises include both financing and management capability development. The combination of soft and hard supports improves the impact of R&D support
- The aim of regional development is to create an infrastructure, which provides a fertile ground for continuing enterprise development. The Irish system has a clear role for regional development projects and enterprise development. This improves co-ordination and the effective use of resources.

The above illustrates how large numbers of small firms / new R&D performers can be reached effectively through a limited number of regional delivery organisations. Almi and County Enterprise Boards provide practical examples of good practice in this area. Both of these delivery agencies are organised as locally controlled enterprise development companies. Also other locally based organisations may take care of the marketing and delivery of the support for new R&D performers. For instance, technical and business colleges which may provide a local customer interface to a vast number of small firms. However, market orientation and active interaction with the customers are key ingredients of successful marketing and delivery of support services. It may well be the case that locally controlled and specialised business development companies are best equipped to deliver the services.

In the delivery system described above, the national agency task is to train, motivate and co-ordinate the local delivery system and, to provide tools for effective R&D

support. The strengths of the local support delivery are based on thorough knowledge of and constant contacts with the business community. In terms of access to businesses local agencies tend to have an advantage because especially small firms are more willing to work with a familiar locally based support organisation. To an extent also centralised national agencies can deliver cost effective support services for a large number of new R&D performers. For instance, the Nutek web site provides a financing database which provides an easy access route for increasing numbers of internet savvy customers. This database appears to be very effective and customer friendly way to inform SMEs on available business support and R&D financing. However, internet delivery relies on small firms' own activity, which is not enough to guarantee optimal take-up of the support offered.

A portfolio of support delivery organisations may increase the chances of success

The Dutch system is a relatively centralised national innovation support program, comprised of ten major instruments, all within the mandate of one Ministry. However, the delivery of the national programs is organised through a number of different type organisations. These include government agencies and organisations such as Dutch Research Council, TNO as well limited companies (Twinning initiative). Such a portfolio of organisational forms creates some flexibility in choosing the delivery organisation for different types of support programs. Hence, it is possible to improve the delivery system by matching the characteristics of the delivery organisation and the program requirements. Another interesting feature of the Dutch approach is the spin off and privatisation of some elements of the government innovation support system.

Tax reliefs for new R&D performers

In the UK the government has introduced a scheme which encourages R&D by means of tax incentives. Under the scheme the company can increase the amount that it deducts for qualifying R&D spending from the normal 100% to 150%, when it computes its profits for tax purposes. This is called R&D tax relief, a company that is not in profit can surrender its qualifying R&D losses (including the R&D tax relief) to the Exchequer in exchange for a cash payment, worth 24% of the spending on R&D. This is called the payable R&D tax credit. The Inland Revenue controls the system according to a set of rules it has published for R&D performers. It also makes the payment, R&D tax relief and the payable R&D tax credit can be claimed by a company even though it has not started to trade for tax purposes.

Detailed rules for qualifying expenditures seem to be the weakness of this system. Such complexity means that the scheme is not customer friendly and take up of the instrument remains low.

11.3 Support for R&D networks is seen important but the supply of assistance is patchy

Networking is cited frequently in connection with innovation policy and it is seen as one of the essential capabilities in the knowledge society. However, the investigation located very few innovation support measures targeted especially for networks. For instance, in most cases each business has to submit a separate application even if the support is intended for network based R&D projects. Given the importance of network development there is a clear need for new types of support tools.

Initially network focus was on promoting business-to-business and business-to-research linkages. More recently the benefits of networking between government support organisations has also been realised. This development has now been manifested in different types of sign posting activities to available public supports, and in the efforts to co-ordinate various public sector agencies. As for the business sector, many R&D network projects seem to last only as long as they receive support from the public sector. The best way to ensure continuity of such projects seems to be the bottom up approach where networking activities are designed to bring added value to each participating businesses. Careful case by case tailoring and preparation is essential for the success of networking activities. Much of the value of R&D networks seems to come from the gains of those businesses that are initially less developed than the leading participants within the network. Hence, networks can be an effective way to diffuse management and R&D related capabilities.

Exhibit 35 provides an overview of the support needs that networks have and some instruments aimed at catering for these development needs. Network development instruments offer mainly financing and some management support for setting up network based R&D projects and co-operation. Typically, programs promote networks which include research establishments and private enterprises. Some support is also available for networks which consist of small and large enterprises. A need for additional financial resources is common to networks as well as to individual firms. There is some financial support which specifically targets networks. Nevertheless, in most cases available financing will be allocated to individual businesses.

Support for limited R&D capabilities is essentially same as in the case of individual businesses. These measures have already been discussed in connection with new R&D performers. The same applies to the last set of needs related to limited access to knowledge. Also in this area the support instruments are by and large the same as in the case of individual firms.

11.3.1 Network specific issues

Networks have a number of unique dimensions which can play an important role in many different ways. Be it co-operation between businesses, businesses and research community, or, co-ordinated activities between support agencies. Bavaria and Lorraine provide good examples of networking between public sector organisations, in particular, effective sign posting and joint efforts in regional development. It seems that regional focus facilitates co-ope-

Exhibit 35. Support for R&D networks.

Need for support	Supply of R&D support	F	D	Irl.	NI	Kor	Si	Swe	UK
<i>Network development</i>	Specific programs for networks		x		x	x		x	
	◆ Business – research establishments		x	x	x	x		x	x
	◆ Large firm – SMEs			x	x			x	x
<i>Lack of financial resources</i>	R&D tax breaks					x			
	State-subsidised R&D programs			x				x	x
	R&D loans					x		x	
	R&D grants			x	x	x		x	
	R&D loan guarantees					x			x
<i>Limited R&D capabilities</i>	Industrial design assistance					x		x	
	Manufacturing consultancy			x	x	x		x	x
	Placements of qualified personnel, e.g. graduates		x			x	x		x
	R&D management courses		x		x		x		
	Packaged support for R&D			x			x	x	x
<i>Limited access to knowledge</i>	Mentoring		x					x	
	Assigned contact person / consultant		x	x		x		x	
	Regional contact point		x	x	x	x		x	
	Linkage to EU programs/financing		x	x	x			x	x

ration because at such level it is easier to find common goals and development priorities than, on the national or international level. Promotion of such regional level networking (between support agencies, educational institutions and other public sector agencies) could be one tool in national agency's innovation promotion portfolio. Networks that operate on the regional level can be seen as primary networks that have a key role in the innovation process. These primary networks link together numerous smaller networks, typically groups of locally based companies which operate within the region. On the region a number of primary networks build up to a critical mass which is capable of joining international co-operation and knowledge transfer.

- Primary networks consist of a small number of businesses and other regional actors that work together. These networks are often industry specific groups (e.g., electronics, software, car industry or bio-technology companies), or businesses benefiting from horizontal co-operation, or vertical supplier networks
- Regional networks are made up of one or more primary networks. By joining together the regional forces these networks are capable to join international networks and knowledge transfer. For instance, by linking regional networks to foreign research establishments.

11.3.2 Good practice in supporting R&D networks

Bayern Innovativ has many good practice elements. It recognised the importance of R&D networks and co-operation between companies and the science base. Therefore, innovation networks are actively promoted. There are a number of platforms aiming at bringing the different actors of the innovation system together and creating synergies between them. Bayern Innovativ is especially active in developing and implementing platforms for joint R&D and technology-transfer acting as multipliers in the region.

Also in Ireland R&D networks are supported, although the support is limited to companies and universities based in Ireland. The Innovation Partnership Program offers grants to higher education institutions that undertake research and development projects in collaboration with one or more industry partners. New collaborative relations are particularly encouraged. These projects should be commercially viable and private enterprises must demonstrate their confidence by making significant financial contributions to the project. Specific Programs in Advanced Technology have also been established to develop the knowledge base in certain key technologies. These programs are focused on advanced manufacturing, such as bioresearch, materials, power and electronics, optronics, software and telecommunications. The aim is to help industry to access new technology, improve the competitiveness of existing production and to move into new higher value areas.

The Dutch case illustrates many good policy practices. Clustering and co-operation has been one of the key elements in Dutch innovation policy since 1997. Clusters are seen as 'value chains' where firms collaborate with their supplier network, with knowledge carriers and other partners to create value-added products and services. The three key elements of cluster policy will encourage the State to

- Ensure better framework conditions for specific clusters and thus act as a facilitator to improve competition and innovation
- Act as a broker and facilitator for cluster development. This is done by providing strategic information on clusters and sectors and by bringing stakeholders together in various platforms and projects
- Act as a sophisticated public customer. Procurement policy will actively stimulate networking between contractors.

A wide variety of programs are aimed at stimulating clusters and co-operation. Netherlands is in this respect perhaps closest to a good practice case among the investigated eight countries.

The UK is a rather typical case in terms of supporting R&D networks. The support system offers some support through a number of initiatives. However, there is only one program targeted directly at R&D networks. The main focus of the LINK program is in promoting collaboration between the research community and businesses and pre competitive research rather than product development. LINK is now a well-established instrument and the main way the Government supports partnerships between research and industry. LINK supports programs that cover specific technologies or markets and usually last between three and six years. Multinational companies can participate in the programs provided they have a significant manufacturing and research operation in the UK, and the benefits of research are exploited in the UK or within European Economic Area. Foreign university status has not been specifically addressed but the rules concerning multinationals can be applied also to them.

Singapore is the only country where international collaboration element is commonly mentioned in connection with network support programs. There is a distinct culture of encouraging the flow of expertise from overseas firms and academic institutions into the country. However, this is often carried out by transferring knowledge and know-how via individuals rather than at the corporate or institutional level. International collaborative projects appear to be funded on an 'individual' basis, as University departments see fit; partially depending on their field of research, strength of networks or national research agreements. There is no national collaborative RTD scheme in Singapore.

In Sweden we identified two programs which recognise networks as entities eligible to apply support, typically a

group of local businesses and research institutes/universities. The key objective of the network activities is to increase connections between SMEs and research establishments. There is no mentioning of foreign participants, support is mainly targeted to Swedish organisations. Swedish support for networks includes:

- Financial support to local business networks which develop their technical capabilities together with research establishments
- Support for projects which involve 1–2 technical institutes, 1–2 higher education institutes and 6–15 enterprises which work actively together over a three year period

Finally, Sweden is building a network of certified consultants who are capable to advice companies in the region. Such brokers can develop to an essential ingredient of the regional development.

The Swedish R&D support system has clearly recognised networks. However, it is difficult to see a clear strategy that would direct network development efforts. The field seems to be fragmented and increased co-ordination could make the approach more effective. This situation is likely to improve after the organisational changes in support system have been completed.

Recently established and developing innovation support instruments

Enterprise culture cultivation within research communities, individually tailored support packages, mentoring, strengthening the local delivery of innovation supports, and R&D tax breaks are among the more recently adopted innovation support instruments.

Business plan competitions and pre-seed funding are instruments which are becoming increasingly important in promoting commercialisation of research outcomes. The aim of these measures is to promote enterprising culture within research community and pick up an increasing number of research based innovations. Tailored support packages can meet the needs of an individual business and they are becoming increasingly popular. Typically these packages include a management development element and some financial support for R&D. The assumption is that such capability development packages are effective and can have a long-term impact on the business performance. Mentoring and increasing emphasis on regional support delivery system are also focus areas. This development relates to the popularity of tailored support packages which require closeness to the business population. Finally, on financing side R&D based tax breaks and loan guarantees represent relatively new instruments which are gaining momentum in some of the investigated countries (Netherlands & UK). A reason for this development is that tax breaks can cut down the administrative burden around innovation support activities. Even if the rules for R&D tax breaks tend to be

rather detailed in nature, they can be mostly handled within the already existing auditing procedures.

Towards integrated support for business and innovation development

At present the innovation system development addresses a much wider range of issues than pure R&D matters. The aim is to increase innovation capability by developing a fertile environment for creative and novel solutions. This development is based on the rationale that successful innovation promotion needs to address all stages and elements of the process. Hence the entire chain from research based invention until the market entry needs to be secured. This process includes a wide range of functional areas ranging from science and technology issues to working life development.

Anvar offices across the France seek to tackle a wide range of technical, commercial, financial and human challenges of innovation. In Bavaria, IHK München provides advice on feasibility studies, technology transfer, finance, networking as well as training. Similarly Fraunhofer management can offer assistance in financing, training and recruiting as a part of its innovation support service. Bayern Innovativ has also support available for the businesses participating German and international trade fairs. Enterprise Ireland can offer many types of management development and training aimed at supporting innovation at business level. Business Partner programme is set up for helping Irish and overseas businesses to develop mutually beneficial R&D related alliances. In the evolving Korean innovation system the emphasis is on regional level measures such as raising manpower skills needed in the development of technologies. There is also an educational programme for provincial government officials about regional innovation systems.

Fiscal policy measures are used to stimulate R&D in the Netherlands. The tax reduction is designed to alleviate the wage burden of the businesses which are investing in R&D. The aim is to strengthen the competitive position of the industry and hereby guarantee the continuity of production and employment. UK is another country where businesses can make use of an R&D credit scheme. In addition, SMART scheme offers assistance in a wide range of issues such as business planning, marketing, design and R&D. Various industry specific best practice clubs are also being promoted in the UK. In Singapore PSB Corporation is an export oriented development unit which helps businesses to achieve excellence through people, products and processes. Finally, in Sweden innovation related activities incorporate special activities for women, & youth, environment issues and creative working methods. On the grass root level these issues are being developed by SUF. On the national level Vinnova is a recently established organisation which promotes both technology and working life development. Both of these fields are seen as key areas of innovation promotion.

Appendix A

Internet resources

EVARISTE is an official web site of the French Ministry of Industry (MEFI), focused on innovation and technology transfer. It provides a starting point and access to numerous web sites, databases and links to research establishments (www.evariste.org/aides/).

On the web-page of **Bayern Innovativ**, a lot of information can be found on start-ups. Under the link “Innovation Network Bavaria”, (www.innovations-netz-bayern.de/theme/ger/) all major actors and support schemes can be accessed either on an institutional or on a thematic basis

Enterprise Ireland has a website which provide well organised information on available services (www.enterprise-ireland.com and www.etradebusinessireland.com).

The *design resource website* (www.D2ireland.ie) provides an interactive information and training resource for the design profession.

The Korean government is constructing a cyber-community for promoting regional science and technology by setting up an interactive web site (<http://www.most.go.kr>) that has a discussion room, web-mail and a database of policy documents.

Ministry of Economic Affairs (EZ) plays a key role in the **Dutch technology policy** (www.EZ.nl). It has recently launched ‘Dreamstart’. This web-site (www.dreamstart.nl) provides a clear and consistent overview of all the information and knowledge that is useful for setting up a business, from specifying an idea until writing a business proposal, and facilities that exist to support start-ups. Dreamstart also supports starters in establishing contacts with coaches and other experienced entrepreneurs. Syntens network is administered by the Ministry of Economic Affairs. The network has its own web-site (www.syntens.nl) which gives an overview of the services offered by Syntens and the projects that are being carried out at the national level. The web-site contains sign posting and links to other useful organisations, e.g. Twinning, Dreamstart, the Ministry of Economic Affairs, Chambers of Commerce.

Business Links signpost telephone service or from the website (www.businesslink.co.uk). The available help covers many other aspects such as financial and business planning, marketing, innovation & technology, design and intellectual property. However, Business Links may charge for these services and such costs are not eligible for support.

The UK government has a specific innovation website (www.innovation.gov.uk)

In **Singapore** PSB offers a first-stop service for SMEs. This serves as the first point of contact for SMEs via a phone call or email: firststop@psb.gov.sg (www.psb.gov.sg).

In **Sweden** the financing data base offers an easy access to information on available financing for development activities. It can be accessed via internet and it provides information on a wide range of available financing (<http://www2.nutek.se/finans/sok/sokstart.taf>). The service has a simple user friendly interface which offers a range of search alternatives for all types of SMEs and start-ups .

Government innovation support for commercialisation of research, new R&D performers and R&D networks

Appendix material from
France (Lorraine), Germany (Bayern),
Ireland, Korea, Netherlands,
United Kingdom (England),
Singapore and Sweden

Jari Kuusisto (Ed.)

TECHNOPOLIS



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1 France

Appendix A

Start-up competition

The winners obtain a sum of FF 300,000 (EUR 45 000) in order to finance up to 70% of the costs associated with the start-up. Once the enterprise has been created, innovation projects can be supported up to FF 3m (EUR 450 000), financing up to 50% of project costs. In addition, special prizes are given to the three best projects of the year (ranging from EUR 4000 to 8000) as well as to the two best projects conceived by PhD or Master's students (EUR 4000 each).

Applicants have to present their applications to the regional delegation of Anvar by a certain date. The proposal has to contain the following elements

- Detailed description of the project
- Business and financing plan, detailing the amount of debt and/or equity needed
- Description of partners (if any)
- Market and feasibility studies (eventually technical and financial expertise).

In each region, the regional research delegate and the regional representative of Anvar nominate a jury of five to fifteen qualified persons. Technical, legal and financial expertise can be commissioned to outside experts. The selection of proposals is based on the following criteria

- Economic viability of project
- Solidity of business plan
- Innovative character
- Technological and scientific qualities
- Quality of team.

Appendix B

Anvar assistance for young researchers

The project can be done alone by one or more researchers or in collaboration with an existing company or a university based research institution. Furthermore, the project can involve partners from other regions or even different countries. In all cases, the applicants have to appoint a tutor (e.g. a university professor, an entrepreneur) who will approve and supervise the project.

The application process is very simple and unbureaucratic and consists mainly of the preparation of a proposal specifying technological, commercial, legal, and financial aspects of the project and a presentation of the project to Anvar.

Appendix C

ADI financing support

Application procedure

The application process has two stages. First, the SME has a meeting with Anvar where it presents the proposed project. It has to provide

- General information on the enterprise (activity, staff, targets)
- A project description with special emphasis on its innovative character
- Coherent proposal with the general strategy of the enterprise
- Expected competitive advantage (price, quality, time)
- Expected economic objectives (sales, return on investment)
- Critical success factors.

The first screening happens on this basis. Many enterprises do not make it through this first stage for a number of reasons (for example, their project is not feasible technically, or they may not have enough equity capital). Others decide that it is not worth continuing the process and withdraw. For those who make it to the second stage, a proposal is put together, and it will be submitted to the final round.

The preparation of the proposal takes a considerable amount of time from both Anvar and the enterprise. Therefore, ANVAR makes sure in the first screening that complete proposals will be prepared only for well-conceived and promising projects. The percentage of enterprises rejected in this phase is therefore relatively low. For the proposal, SME has to fill out forms on their financial position (balance sheet from the last three years, future cash flow expectations), the financial needs in each of the project phases and expected outcomes. Anvar offers assistance in filling out these forms.

Selection criteria

- There are no clear and coherent selection criteria, and they differ from the first to the second stage. In the first stage, the most important features of the project are
- Innovative idea
- Competitive advantage/USP
- Sufficiency of equity
- Technical feasibility
- Commercial rentability
- Professional competence of applicants
- Internal competences of company.

In the second stage, the most important criteria are the judgements of technological and financial experts. Such experts are sent to the company to assess both the financial and technological feasibility. Experts can be external or internal, depending on the complexity of the subject. If the experts give green light, financial help is approved and the project can start.

Procedures after selection

Once the proposal has been accepted and the experts have given green light to the project, the first payment will be made. The payments are usually made at each project phase, with an assessment at the end of each completed stage. If the project does not achieve the expected results, Anvar can terminate the further payments.

The success or failure criteria for projects are not very clear. In general the failure can be technical or commercial in nature. Technical failure is relatively easy to determine – something just does not work. Commercial failure can be hard to determine, especially if the project is still in the planning or development phase. An example of commercial failure is a case where a product/process does not give the company the desired competitive advantage in the markets.

Since there are no clearly defined indicators – success or failure is usually determined in a discussion with the case officer. Sometimes a controller is sent in to determine if the company has spent too much money in a particular phase, and if the money has been spent appropriately. Sometimes SMEs themselves admit that project has been a failure.

2 Germany

Appendix D

GründerRegio

The focus areas of the program are

- The creation of a start-up culture at universities
- The design of a program to educate students and scientists in an entrepreneurial spirit with knowledge in key business areas
- The build-up of an infrastructure within and outside universities
- The radical increase of start-ups at universities
- The continuous supply of support from start-up to initial public offer (IPO).

Members of GründerRegio include the Munich Chamber of Commerce, various start-up centres at universities and business associations. GründerRegio tries to teach students and scientists the way to economic success. Multiple courses are offered on the risks and opportunities of founding a company, and the necessary practical steps that follow the set up of the business. The Ludwig-Maximilian-University (LMU) has a continuous supply of classes accessible to all students on business planning, accounting, financial planning, customer acquisition, legal and tax issues. These classes are not MBA-classes designed for business school students, but aim at teaching students and researchers of all subjects the basics of business administration. Students and researchers of other universities can also join these courses.

Steps in Business Plan Competition.

Steps	Name	Description	Price
Step 1	Business idea	Idea and customer benefits	10 x 1.000 DM
Step 2	Draft business plan	Concept for commercial exploitation of business idea	10 x 2.500 DM
Step 3	Detailed business plan	Implementation of business concept and assessment of financial need	1. prize: 50.000 DM 2. prize: 40.000 DM 3. prize: 30.000 DM

Appendix E

The business plan competition

The competition has three steps and in each stage the business plan has to become more detailed. Successful candidates are offered a prize as reward. The three steps are shown in the table below.

Participants are coached throughout the process in all stages of the business planning. A jury composed of successful entrepreneurs and venture capitalists offers authentic feedback. In addition, there are plenty of information events and opportunities for networking. Crash courses as well as classes on business planning are offered. Everything is free of charge, and participants bear no risk.

The Competition is aimed at students, university graduates, scientific staff and professors as well as entrepreneurs, business employees, inventors and developers. All branches are considered, although there is an emphasis on high-growth start-ups.

In addition, there must be a real and imminent financial need for setting up or expanding business – whether the business has already been established or is yet to be set up. Business ideas already funded by other investors are not eligible to enter the competition.

Each participant can enter at any of the three stages of the competition. The prizes in stage 1, however, are reserved

exclusively for business ideas originating from members of universities and research institutions. This special rule has been introduced in order to compensate for differing starting points in terms of practical experience and to encourage participants from the university sector to take part in the contest.

People interested in participating the competition need to order a manual for DM 20, which explains the process, gives detailed information on business plan writing, and sets criteria for presentation of the business plans at the competition (e.g. financial information has to be given in table format, the business plan for stage one must not exceed seven page etc.). The selection criteria are the soundness of the business idea and its future market potential.

The business plan competition for 1999/2000 has proven successful. There have been 204 business plans in step one, constituting a 74% increase from the previous year. 153 business plans have been presented in step two, a raise of 80%. Equally, a record was achieved in step 3 with 153 business plans. In total, there have been 386 participants, 48% coming from universities and research organisations, and 52% from a business background.

During the recent years the distribution of industry sectors has changed. Whereas in previous years business plans were mainly about products, ideas coming from the service sector dominated last year's competition. Typically a large percentage of applications comes from the information technology sector, amounting to 63% last year. After ICT, the life science sector (18%) and machinery (6%) have been the most important sectors. Since its inception, more than 180 companies have been founded by participants. They have been financed by more than DM 160 mill by the competition and venture capitalists.

Appendix F

Flügge support for start-ups

The applicants have to come up with an innovative idea with future market potential. A business plan has to be prepared, explaining the idea, customer benefits, stage of development, market potential and risks involved. One or more professors have to act as coaches for the management team. Founders are permitted to use university facilities free of charge for the first six months. After that, an appropriate fee has to be paid.

Applicants have to fill out a simple form, which can be downloaded, from the Internet. Documents to be provided are

- CVs of founders
- Detailed business plan
- Declaration of approval from the coach

- Declaration of approval from the university
- Contract for usage of university facilities.

Applications are processed by the technology transfer department of the respective university. The decision is made by the Bavarian Ministry for Economics, Transport and Technology based on the judgement of a committee composed of entrepreneurs, consultants, financial and tax experts, as well as university professors. There are two application rounds each year.

Appendix G

Venture capital

The first step to obtain business angel support is to apply to the FNT by filling out a simple form which can be downloaded from the Internet. A short description of the company as well as the product is required. Soon afterwards, the founders receive a note confirming the reception of the application and a signed declaration of confidentiality. At this stage the founders send their business plan by e-mail. The business plan is reviewed by the business angels, this should not take longer than ten days. Selection criteria are

- Formal compliance with business angel (BA) procedures
- The team must consist of a technical and a business expert
- Market potential of business idea
- Plausibility of business plan.

Successful applicants receive an invitation to present their business plan to the Screening Committee. These presentations are held once per month, and the invited teams are given the opportunity to present themselves and their project in a period of twelve minutes plus eight minutes for questions. If their presentation is convincing, they will be invited to meet the entire Business Angel Network of Munich. In preparing this second presentation, founders can draw on the support of the members of the Screening Committee. If MBAN expresses an interest in the project, an investment deal is concluded between the founders and the business angels.

Appendix H

Bayern Capital

Financial assistance is granted up to a period of ten years and is dependent on the sum invested by the lead investor. The matching principle forms an additional leverage and makes it easier for private VCs to invest in the high-risk companies. The company has to pay BayernKapital a one-time fee of 1% of the amount of the investment. In addition, the company has to pay back a fixed amount of the invested capital per year, which at the moment stands at

6.75%. Furthermore, a profit-related fee has to be paid throughout the project. At the time the financial assistance by BayernKapital expires, the company is required to “pay an exit fee” dependent on the development of the company during the project. The exact details of the payback are specified in the contract, which is negotiated on a case by case basis.

One of the particularities about BayernKapital is that assistance is granted already in the planning phase of a new product, and is available in all subsequent stages of the business process. Bayern Kapital supports firms in the following phases of the project

- Preparation and conception of the R&D project up to the inception of R&D activity
- Development of a new service/product/process up to the production and testing of prototypes
- Preparation of production and market entry of new products/services/processes.

Applicants have to comply with the following conditions

a) The project

- Has to be implemented in large part by the applicant itself within the state of Bavaria
- Has to comprise a technological challenge with calculated risk
- Has to be relevant to the economic success of the applicant.

b) The applicant

- Only companies with up to 250 employees are allowed to participate
- Annual turnover must not exceed EUR 40 million, or total assets must not exceed EUR 27 million
- The applicant company must not be owned by more than 25% by companies which do not fulfil those requirements.

The application process starts by requesting an information form and filling it out. The application form together with a declaration of approval from the lead investor have to be sent to Bayern Kapital, which might require further documentation.

Key features of Bavarian SME Credit Program.

	Duration/years without payback	Interest	One-time fee	
			LfA	Bank
Without exemption	8/2	4%	0.1%	0.1%
40%-exemption	8/2	4.2%	0.1%	0.1%
70%-exemption	8/2	4.35%	0.1%	0.1%

Appendix I Debt financing

The table below shows the conditions attached to each of the scenarios.

Overhead, personnel and marketing costs are not being covered. For those costs, companies are encouraged to apply for equity finance. All other costs relevant to the foundation of a company can be covered, including

- Acquisition of property
- Rent
- Construction/renovation of facilities
- Acquisition of machinery and equipment, hard and software
- One-time franchise-fees
- First-time inventory
- Patents and licenses.

In the beginning of the process the founder prepares a business plan and delivers it to the bank. The bank reviews the plan, and sends it to LfA, which reviews the application and makes an offer to the bank. Finally the bank concludes the loan agreement with LfA and pays the money to the founder.

Start-ups which have received support under the above Bavarian SME Credit Program can apply for additional financing from the LfA together with the amount obtained through the Bavarian SME Credit Program, financing can be provided up to 100% of the project costs. The minimum amount granted is EUR 25.000, minimum project costs have to be EUR 42.000.

Appendix J

Technology Transfer-Net (TT-Net)

Members of TT-Net include

- Bayern Innovativ
- Bayern Kapital
- Bavarian Ministry for Economy, Transport and Technology
- Most relevant universities and RTOs (e.g. Fraunhofer, Max Planck Society...etc.)
- Technology transfer centres
- Start-up advice centres
- Industry support organisations
- Chambers of Commerce...etc.

TT-Net has set up its own web-page, accessible as well through the web-page of Bayern Innovativ, enabling companies to search online. The search can be done by institutions or by regions. In that way, companies can have easy and quick access to all the technology-transfer providers in Bavaria, be it government institutions, RTOs, universities or business support centres. For every organisation listed, there is a short profile, including area of expertise, services provided, contact names and addresses, as well as a link to the relevant web page. It seems that although the network is dense and every organisation has its own TT agents, informal networking is important albeit encouraged by formal networking activities and joint agreements.

Appendix K

Bavarian institutions offering support in the conception phase

- Technology Transfer Institutes
 - OTTI (The East Bavarian Technology Transfer Institute)
 - WETTI (The West Bavarian Technology Transfer Institute)
- Universities with technology transfer centres
 - Ludwig Maximilians University
 - Technical University Munich)
- Fachhochschulen with technology transfer centres
 - Fraunhofer Institutes
 - Fraunhofer Society Technology Transfer Unit
 - Fraunhofer Institute for Solid State Technology
 - Fraunhofer Institute for integrated switches
 - Fraunhofer Institute for food technology and packaging
- German Aerospace Centre
- Association of German RTOs (AIF).

Appendix L

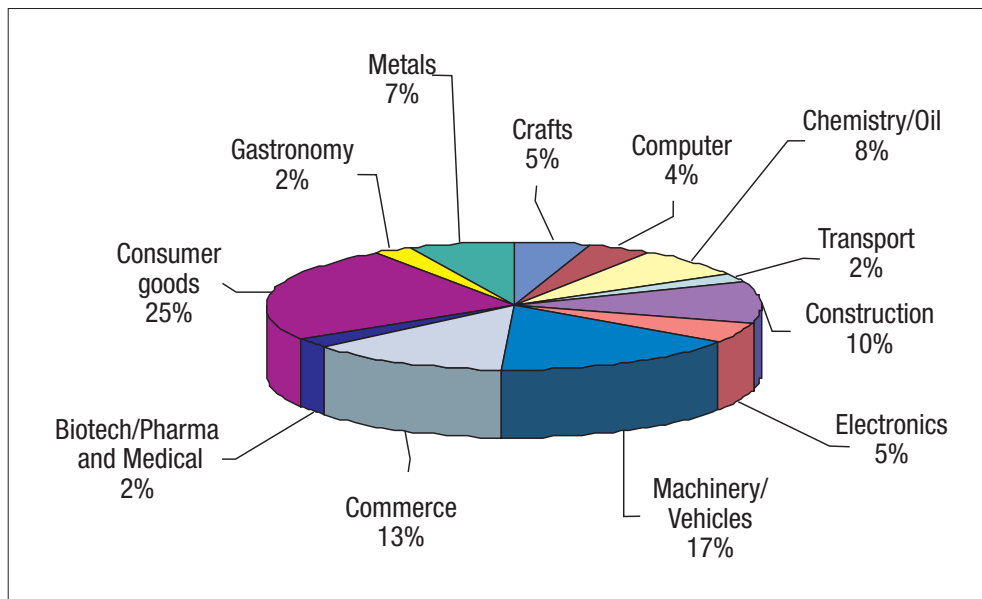
Bayrische Beteiligungsgesellschaft (BayBG)

The process usually starts with a telephone call arranging a first-time visit. During this visit, the prospective candidates lay out their business idea and hand in a business plan. A crude first assessment about the feasibility of the project is undertaken by BayBG, and sometimes candidates are rejected right away if the business idea seems unrealistic and impossible to commercialise for lack of market potential. If a project passes the “first screen” test, the business plan is examined in more detail. The business plan has to show the following elements

- A convincing unique selling proposition (USP)
- A clear and achievable strategic vision (where does the company want to be in three years?)
- Future cash flows
- Description of management team: For BayBG, team approach is crucial, for it is unlikely that one person alone unites the management as well as technological skills necessary to carry out an innovation project. Equally, the business plan has to show that the relevant positions are filled with competent people
- Estimates of the amount needed as well as purpose of use.

To assess the future growth potential of the innovative product, BayBG disposes of an internal market research department consisting of experts on different industry sectors. These experts conduct market research studies and make forecasts about the market potential of the innovative product the applicant company is proposing to develop, and check whether forecasts made in the business plan are realistic. In addition to a solid and realistic business plan the company has to have a sound financial track record, measured by its EBIT over the last couple of years. The performance of the company is evaluated by using balance sheet analysis and benchmarking techniques. On-site visits are sometimes done including interviews with staff and management. Other documents that are being looked at are insurance policies, patents, staff certificates and company contracts. Out of the more than 1000 business plans that are being examined by BayBG every year, roughly 5% are successful. As the percentage of companies being rejected at the “first screening” is relatively low, this suggests that most SMEs do not have a convincing unique selling proposition, or their business plan is unrealistic.

BayBG does offer support for SMEs in writing the business plan. However, a veritable “business plan culture” has developed in Munich, fostered by venture capital events, trade fairs and business plan competitions. Knowledge on



Portfolio of Industry Sectors of BayBG (Total = DM 448 mio).
Source: BayBG Annual Report 1999

how to write a proper business plan has therefore greatly improved among Bavarian SMEs in the last couple of years. More detailed description of this “business plan culture” is presented in case study 1. Once the company has qualified for support, a financing model is developed in conjunction with BayBG. BayBG is involved in SME development through various funds: as silent partners or through the temporary acquisition of limited liability capital, but always as minority shareholders. All costs relevant to the innovation project are covered, according to prior specification of usage through the SME. The conditions are negotiated on an individual basis, depending on the opportunities and risks of the business involved. They usually consist of four elements

- A 2% initial fee
- Fixed payback rates
- Share of profits
- Share of value-added.

At the end of the contract, shares can be either bought back, sold to third parties, or sold in an IPO. The maximum amount of the participation is DM 5m, and can be extended only in conjunction with other VC/equity providers (“co-venturing”). The support is generally granted for a period between six and ten years, and can be renewed for another ten years. The contract can be terminated by the SME at any time. Currently, BayBG has invested DM 448 m in companies of all industry sectors. Consumer goods, machinery and vehicles are receiving the most support. The exhibit below shows the split of BayBG’s portfolio.

Debt financing

Another way to obtain financing is the LfA, a bank owned by the Bavarian State and expressly designed for SME development. In close co-operation with banks, ministries, chambers of commerce and business associations it offers support and finance to innovative businesses. In general, LfA supports all SME projects which are economically independent and based in Bavaria, whether they are start-ups or established businesses.

The conditions for obtaining LfA financing are:

- Development projects are only supported in companies with less than 400 employees
- Projects are only supported in companies with no more than 250 employees, annual turnover of 40m Euro maximum or total assets of not more than 27m Euro.

Projects eligible for support must

- Be of considerable technological and economic risk which will be born by the SME
- Contain economic growth potential in the medium term
- Be impossible or difficult to implement without public support
- Not be supported by any other financial support program.

The procedure is again relatively simple. The applicant conceives a business plan and gets an application form from the innovation support centre in the Bavarian Minis-

try for Economics, Transport and Technology. The technical aspects of the application are examined by the ministry, the financial and economic aspects by LfA. Together they decide on the eligibility of the company and on the amount to be loaned. Once a decision has been reached, LfA negotiates the details of the loan with the bank of the SME, and both come to a final agreement. The SME draws the loan from its own bank. If necessary, the liabilities of the lending bank can be reduced by 50–70%.

On a national level, similar loans are offered by the Credit Society for Reconstruction (*Kreditanstalt für Wiederaufbau – KfW*) and the *Deutsche Ausgleichsbank (DtA)*, the two German banks created for the support of creation and growth of SMEs. The principles are the same: loan interest rates are below market rates, coupled with long payback periods and the possibility of partial exemption of the on-lending bank’s liabilities.

Conditions for loans.

	Conception Phase	Development of prototype	Application
Interest	0.0% in the first four years, 3.5% from year five	First and second year 2%, from year three 3.5%	3.5%
Duration	10 years	10 years	10 years
Percentage of cost being financed	80% max.	80% max.	80% max.

3 Ireland

Appendix M

Campus Companies Program

Apart from business development assistance, there is provision of financial support in the form of a CORD (Commercialisation of Research & Development) feasibility grant. The main purpose of the grant is to assess the commercial viability of a project. Grants of up to €30,000 (EUR 38,092) are available for market research, prototype development, and the development of a business plan, product trials, networking with potential joint venture partners, cost analysis and financial projections. Applicants who qualify for grants include

- Campus Companies (status conferred by college)
- Academic Entrepreneurs
- Research Associated with the Programs in Advanced Technology (PATs) and the Technology Centres Program
- Non-academics interested in forming a Campus Company.

Level of Funding in terms of grants can be up to 50% of the feasibility study. Each case will be individually assessed by the Campus Companies Manager. Eligible expenditure includes wages/salaries to be agreed with Enterprise Ireland, consultancy fees, prototype development, travel & subsistence, overhead charges and sundry expenses.

The applicants can apply support by contacting Campus Companies Program Manager at Enterprise Ireland or Industrial Liaison Office on college or campus. The process progresses in stages so that initially the applicant and Campus Company manager discuss the outline application. After this the applicant completes and returns the relevant application form with supporting documentation to the Campus Companies Manager at Enterprise Ireland or to the Industrial Liaison Officer on the college campus. It may also be the case that the applicants need to have a second meeting with the Campus Companies Program Manager to discuss the application. The payment of the balance of the CORD grant (assuming an interim payment) will be made on receipt of a final report on the project.

Mentoring for start-ups

Typically mentor is assigned to pay 8–10 separate visits to a company. Also several mentors can work for the same start-up business. However, when two or more Mentors are involved, the overall total of 8–10 Mentor days is still the

maximum permitted per assignment. Many companies, which engage a mentor, wish to continue and develop the relationship on a more formal basis. Mentor Network prohibits individuals from serving simultaneously as a mentor and as a paid consultant to a company. Her or she may however resign from serving as mentor and accept the appointment as consultant on terms agreed between the parties. A new Mentor may then be assigned to the company if necessary.

Appendix N

Research & Development Capability Initiative

Typical applicants are companies, which are committed to aggressive growth targets (for their sector) and are expanding their R&D activity to be a key driver of that growth. The purpose of the R&D Capability funding is to assist companies with that expansion, particularly where a company is significantly changing its strategy for R&D. The application should relate to significantly enhanced R&D capability, rather than simply funding for R&D projects. The Initiative offers support for additional resources in terms of R&D staff, equipment and facilities - along with a program of R&D projects. The investment should

- Be an integral part of the strategic development plans for the company
- Lead to a sustainable and substantial increase in R&D spend as a % of sales
- Normally be completed within two years from date of approval.

Maximum grant rates will vary between 25% and 45% of eligible expenditure. R&D capital items can be funded at up to a maximum rate of 25%. The support is targeted at three categories of companies

- *Large companies* – Typical companies supported in this category will be making a substantial first time investment in an R&D facility, and committing expenditure of over £1 million over a two-year period. It is expected that this will lead to the employment of at least 5 full time R&D staff and/or a substantial investment in equipment or facilities. The proposal must include at least one R&D project and normally not more than three R&D projects to be conducted over the two-year investment period.

- *SMEs* – current R&D performers who are either establishing a permanent R&D function or significantly expanding an existing one. Typically firms in this category will be expected to commit in excess of £500k total costs over two years which will be additional to existing levels of R&D expenditure. This investment would be expected to lead to the employment of at least three additional full time R&D personnel and a substantial investment in capital equipment. Companies must commit to the maintenance of these new posts for a significant period after the completion of the grant period. The proposal must include at least one R&D project and normally not more than three R&D projects to be conducted over the two-year investment period.
- *Technology Based Start-ups* – starting off in a new technology area, needing funding to support a program of R&D projects. This category is aimed at start-ups and early stage companies, which are founded on R&D and which have the potential to grow rapidly. They will often be high-risk companies, which are required to carry out R&D at a substantial level to establish and grow the company. These investments will relate primarily to staff costs assigned either part time or full time to the R&D function.

In each case the Development Advisor will work closely with the company over the two-year investment period with the aim to ensure that the full benefit is gained from the investment. This involvement also includes monitoring of the progress of the R&D projects. (Appendix RDCguide22.doc).

Appendix O

Research Technology & Innovation (RTI) Competitive Grants Scheme

The grants are mainly for high quality, risk intensive R&D projects, which are essential for companies to establish or to maintain their overall competitiveness. Projects can relate to either product or process development and should

- Be an integral part of the strategic development plans for the company
- Represent an advance in the level of technical innovation relative to the company's current products/processes
- Be designed to help the company meet market requirements especially in the area of higher value added products
- Normally be completed within two years from date of approval
- Lead to full commercial exploitation, typically within one year after completion of the project.

Maximum grant rates will vary between 25% and 45% of eligible expenditure depending on the size of the company and its location. The maximum amount of grant for any application will not exceed £350,000 (EUR 440,000). The RTI initiative is co-funded by EU Structural Funds. (See riff_ass.doc and rif_app.doc).

Appendix P

Innovation Partnership Program

Enterprise Ireland may provide grants from 35% up to 75% of Third Level Institution total eligible costs only, subject to a maximum contribution of IR£150,000 (EUR 190,450). The participating company (-ies) will be expected to cover the remainder. Company contributions to Third Level Institution costs should be normally in cash. In special circumstances the company may make an in-kind contribution, of equipment or materials only, as part their total contribution to the Third Level Institution costs. (See Ip_guide.doc and ip_propform.doc)

Proposals will be subjected to a technical and a commercial evaluation by experts in Enterprise Ireland and / or by external evaluators. This will be processed in strict confidence. The objective is to ensure that the project is feasible, can be completed in the time available and with the resources requested and will have identifiable benefits for both the company and the Third Level Institution. The results from the Assessment will be circulated to the proposer, who will be invited to respond. A dialogue may take place between the proposer(s) and the evaluator for the project. The program manager facilitates this dialogue by handling all written communication between the two parties.

The following types of activity will be considered for possible funding

- Applied research or experimental development with industry participation
- Participation is particularly encouraged from young researchers who have not previously been assisted under the program.

Also the following considerations will be taken into account in relation to a project

- while the project should aim at strengthening present links between industry and the Higher Education sector, it should especially encourage new linkages
- it should promote interdisciplinary and inter-Institutional team work
- it should also enhance – and not replace – existing industrial support for science and technology

- it should help in the development of special skills and enterprise
- it is important that the expertise resulting from the work can be applied commercially in industry.

In addition, the project should not duplicate work already known to be in progress in Ireland, or duplicate work already performed in other countries when the results can be obtained effectively in other ways.

Reporting and intellectual property right agreements. All Technical and Financial Project reports will be submitted to the Program Manager in Enterprise Ireland. The Finan-

cial Report will be approved and signed by the Finance Office of the Third Level Institution. Both the cash and in-kind contribution of the industrial partner should be clearly stated in the reports. As part of its contract with the company, the Third Level Institution should have a prior agreement concerning the exploitation of Intellectual Property. The Third Level Institution should encourage the company to manufacture any new or improved product, developed in the course of the project, in the Republic of Ireland. Where it would not conflict with conditions set out above, the Third Level Institution should publish the results of the research work in accordance with academic practice.

4 Korea

Appendix Q

Venture capital in Korea

Current Status of informal venture capital markets

	1999	2000/10
No. of Angel Funds	11	41
No. of Angel Investors	1,059	19,661
No. of Investment Deals	123	187
Total Investment Amount (US\$ m.)	49	103

Source: Korea Venture Capital Association, SMBA

Current Status of Venture Capital Investment

	1997	1998	1999	2000.10
No. of Venture Capital Firms	61	72	95	148
No. of Venture Funds	79	92	144	267
No. of Investment Deals	1,872	1,782	2,457	4,778
New Investment Funds (US\$ m.)	588	745	1,095	1,665
Total Investment Amount	1,052	1,091	1,298	2,256

Source: Korea Venture Capital Association, SMBA

The *KOSDAQ* (Korea's NASDAQ) grew very quickly since its formation in 1996 and until its recent decline, provided huge amounts of capital for technology companies. The market capitalisation of the *KOSDAQ* exceeded that of the Korean Stock Exchange (KSE) after some four years of operations. It provided a much-needed exit mechanisms

for venture capital and angel investors, and capital for growing SMEs and technology firms. Listing requirements are less strict than for the KSE. At present, the distribution of firms in the *NASDAQ* is as follows: Venture businesses – 1/3; SMEs – 1/3; Others – 1/3.

Status of *KOSDAQ*

	1997	1998	1999	2000.1-9
No. of Listed Enterprises	359	331	453	589
Market Value (US\$ m.)	5,891	6,577	82,839	186,721
Daily Trading Volume (US\$ m.)	972	1,339	89,006	417,251
Listed Enterprises Fund Raising	180	1,566	4,341	6,110

Source: KSE and *KOSDAQ* data

Appendix R

R&D in Asian countries 1999

R&D Comparisons in Asia – 1999.

	Total expenditure on R&D	Total expenditure on R&D per capita	Total expenditure on R&D to GDP	Business expenditure on R&D	Business expenditure on R&D per capita	Total R&D personnel in business enterprises	Total R&D personnel in business enterprises per capita	Business R&D expenditures to total
	US\$ millions	per capita US\$	% of GDP	US\$ millions	per capita US\$	FTE (1,000s)	FTE per 1,000 people	ratio
Japan	141,694	1,120.0	3.149	94,815	749.47	613.2	4.856	66.9
Korea	10,028	214.0	2.470	5,699	122.74	77.9	1.677	56.8
China	8,201	6.5	0.826	4,067	3.21	350.5	0.277	49.6
India	2,303	2.4	0.588	642	0.67	93.8	0.1	27.9
Singapore	1,567	396.7	1.869	986	249.59	9.7	2.447	62.9
Malaysia	287	13.0	0.396	190	8.57	3.5	0.16	66.2
Indonesia	187	1.0	0.092	n.a.	n.a.	n.a.	n.a.	n.a.
Thailand	147	2.4	0.120	15	0.24	2.4	0.04	10.2
Philippines	51	0.7	0.078	21	0.28	1.7	0.023	41.2

Appendix S

Government plan to develop Korean innovation system

Three key stages outlined are

- Stage 1 (by 2005) – to join the top 12 nations in the world in terms of S&T indicators and move ahead of other Asian nations.
 - Rebuilding S&T infrastructure
 - Reinforcing R&D activities and support
- Stage 2 (by 2015) – to join the top 10 nations in the world in terms of S&T indicators and serve as the centre of re-search in the Asia-Pacific region.
 - Integrate Korea into the global economy
 - Build a new R&D culture
 - Strengthen basic science
- Stage 3 (by 2025) – to join the top 5 nations in the world in terms of S&T indicators by forging ahead in specific sectors.
 - Knowledge creation and diffusion mechanisms
 - National management system based on S&T.

The technical and policy measures to achieve these targets are grouped into five

- Creation of knowledge
- Development of information society
- Enhancement of industrial competitiveness
- Promotion of quality of life
- Enhancement of national security.

Appendix T

Summary of support Policies for Venture Businesses

Manpower	Location	Technology Information	Financing	Marketing
Exemption of military enrolment for R&D persons	Laboratories to support start-ups	SBIR system (see KOSBIR below)	Institutional investors and the KOSDAQ	Favourable treatment for public purchasing
Venture businesses can give stock options to both employees and non-employees	Incubators	Support for technology development	Business angels	Advertising expenses discounts
Researchers and university professors can serve as CEO or an employee of new companies while maintaining their original employment	Venture buildings and venture business towns	Technology security system	Korean venture fund (Public)	Internet home page establishment
Faculty members of national and public research institutes can get sabbatical leave for starting their own venture business or managing one	Techno-parks	Technology Commercialisation Support Centres to transfer technologies from research institutes to venture businesses	Special guarantees for venture businesses	Cyber market mall (SMIPC)
		Venture net	Sales of shares as well as dividends are exempt from capital gains tax, and venture businesses receive a 5-year, 50 percent reduction in income tax	

Specific Package of Government Promotion Policies for Venture Business

- **To facilitate the supply of funds**

- Promotion of additional fund sources for venture enterprise
- Financial support for venture capital firms
- Easing of regulations on direct financing for venture enterprises
- Increasing the versatility of venture capital
- Establishment of venture fund (\$ 8 mil.) for specific business lines
- Promotion of KOSDAQ market for small and medium enterprises and venture enterprises.

- **To Promote technology development and manpower supply**

- Individual technology development support programs by related organisations
- Promotion of the participation of experts with high technology backgrounds in venture enterprises

- Promotion of alliances between technology suppliers and those who need them
- Facilitation of funds needed for technology development.

- **To achieve the efficient supply of factory sites**

- Promotion of venture business industrial estates
- Easing regulations on sites for venture facilities and venture enterprises
- Resolution of problems for venture facilities and venture enterprises
- The establishment of Techno-Parks
- Tax reductions for venture enterprise start-ups in the capital area
- Transformation of the Kuro Industrial Estate into a venture town (ground-breaking in July 1997).

- **Strategy for business and industrial restructuring**

- Market-oriented progress and deregulation policy strategy
- Support for co-operation between larger companies and SMEs.

Appendix U

An evaluation of policies to new technology-based firms¹

The results of a recent survey on the performance of NTBFs and the support policies were recently released. Data was used from the survey undertaken by the Korea SMBA for 4,000 firms registered as NTBFs. The questionnaire covered 600 items, for the period of Sept. 1, 1999–Oct. 20, 1999, and of the 4000 firms, 3693 responded

Government financial support programs. The reliance of NTBFs in 1999 on government financial support was very low turned out to be very low at only 4%. 89% of financing came from family support and self-financing. However, the reliance on government financial support and venture capital shows a rising trend – government from 2% (1996) to 5% (1999), and venture capital from 1% (1996) to 3% (1999). Angel investment just appeared on the sourcing front at 1% in 1999.

Financial & tax incentives. The most popular financial and tax incentive programs were the: R&D Grant Scheme – 48.3% of respondents utilised; the Credit Guarantee – 42.3%; and the Corporate Tax Relief – 37.6%.

Manpower support. The military duty exemptions proved to be the most popular measure among NTBFs; while university professors and research institute scientists made use of the “leave-of-absence” program.

Facilities support. Almost 10% of NTBFs utilised technology business incubators and reported a satisfaction level of 3.11. However, around 50% of the university and GRL spin-offs utilised this facility. 8.4% of NTBFs utilised the venture towns, with a satisfaction level of 2.97.

Other miscellaneous support programs. NTBF’s appeared to utilise education and consulting programs quite frequently. Public procurement and market protection less so.

Overall evaluation. In general NTBF’s evaluations of the government support programs were generally positive.

1 Government Policy for the Promotion of New Growth Industries, Youn, Moon-seob, Yong Soo Kwon and Sungchul Chung, Science & Technology Policy Institute (STEPI). Paper prepared for Joint German-OECD Conference: Benchmarking ISRs. Berlin, October 16-17, 2000.

5 Netherlands

Appendix V

Twinning Initiative

Twinning Seed Fund provides capital for shares, either directly or through a ‘convertible loan’ (which will be turned into shares at a later moment in time). The average financing is EUR 150,000 over the start-up period and a large number of financed entrepreneurs will be located in a Twinning Centre. When the start-up is successful, a second round of capital can be sought to grow. On top of funding *Twinning Growth Fund* can offer companies a Business Partner package focussed on the early growth stage and the Twinning Network. The *Twinning Network* consists of recognised ICT entrepreneurs providing support and advice. The aim of Twinning Centres is to provide a fertile environment for start-ups to prosper by fostering co-operation and by arranging meetings with highly recommended consultants, Business Partners, or other interesting companies. Rents are comparable to market rates and typical duration of stay is between 1–2 years. The Twinning Centres have close links with universities, research institutes and local ICT businesses.

Appendix W

Start-up checklist Twinning

Countless things to do when setting up a business. Little things, big things. It’s easy to forget one and it’s difficult to judge which ones are really important. In order to help you, a start-up checklist has been drawn up. In the eight questions you’ll recognise the elements of a business plan. So, answer them properly (which will take longer than you think) and you immediately have all the issues you need to address in your business plan.

1. What is <Your New Product>?
 - Why do you see a need for <Your New Product>, i.e. what trends do you see that drive the current and future needs of the targeted customers you want to serve?
 - What does <Your New Product> do, and why?
 - What makes <Your New Product> so different, so special?
 - Why would anybody want to buy <Your New Product>, as opposed to the products from other suppliers? (i.e. the same products, or products that perform the same function).
2. What customers and markets do you see for <Your New Product>, and what is it’s potential?
 - Who will be your target customers (grouped per segment), and why? Why do you see these segments, and what are the characteristics most important to your business?
 - What is the estimate size per segment, and how will they develop over time? Why?
 - What is the market potential for <Your New Product> (based on estimate of sales per segment * <Your New Product>-price per unit)? Please include time-lines.
3. What is your business model and how are you going to make money with <Your New Product>?
 - What parts of <Your New Product> will your customers pay for, and how will it develop over time?
 - Will you further develop <Your New Product> yourself, or will you out-source this – if so, what parts and who will be your suppliers? Why and what elements do you pay for? Do you see any opportunities for developing partnerships in this field?
 - Will you market, distribute, sell & service <Your New Product> directly to your customers, or will you use other channels – if so, what channels? Why are these channels best suited to reach your target customers? What about partnerships?
 - Do you see opportunities to enhance the scalability of your business by turning it into an ‘E-business’? If so, what impact would that have on your competitive advantage (4.) / financial mechanics (8.)?
4. Why are you able to beat your competitors on your target segments with <Your New Product> and to attain and build a strong position over a longer period of time?
 - What companies do you know that offer similar products (or products that offer the same function) to your target customers – or are likely to step in to compete in your target segments?
 - How strong are these competitors in each segment, and why do you think you are able to ‘beat’ them with <Your New Product>?
 - How do you think to build ‘sustainable competitive advantage’, that is – how are you going to be better and ‘beat’ your competitors over a longer period of time? (E.g. by creating entry barriers, developing value adding functions over time, patents etc.). Be very clear on this issue!

5. What are the key-issues for you to address to make <Your New Product> a success, and what risks are involved? What overall strategy do you see to cope with these issues / risks and build a defensible market position?

For example

 - Time-to-market of your first product
 - Speed to build your position
 - Anticipated competitors with more power than you (i.e. their present position, lock-in effects of customers / channels etc.)
 - Large investments to finish your product
 - Resource squeezes (e.g. people) with a negative impact on your growth
 - High costs to build your channels, etc.

6. What is the current status of your business (i.e. your current position), and what milestones have you planned for further development?
 - Market
 - Customers / revenues: do you already have launching customers? Or have you already served customers successfully and with what result? What product elements do already generate revenues, and how will this develop over time? Channels: what marketing & distribution channels have you targeted, and how are you going to build them (milestones / timelines)? Do you already have signed agreements with these channels? Marketing / sales. Do you want to develop a brand – if yes, how?
 - What are your strategies and plans for marketing, sales and pricing? Please include goals and milestones over time.
 - Product
 - What is the status of your product, and what milestones have you planned for further development? What sound strategy do you see for your product development? Be clear on goals and milestones over time.
 - Organisation
 - What is the current status of your own organisation and set up of your suppliers? What milestones do you see to acquire the necessary skills & resources over time, and to enlarge a supplier coalition?
 - Infrastructure
 - Do you need an infrastructure to support your activities for development, delivery and service? If so – will you outsource this, or build it yourself? Why? And what (intermediary) goals and milestones do you see?

7. What are the characteristics of the team you need to make <Your New Product> a success?
 - What key-qualities should be represented in your team to successfully market, develop, produce and grow?
 - Who are on the <Your New Product> team now, and what are their qualities? (Please include CV's – and indicate whether they are full-time on the team).
 - In your view, what qualities are missing? (Don't worry – in this stage this is not a reason for rejection)

8. Based on your combined plans - what will be the 'financial mechanics' of <Your New Product>?
 - What investments do you need to develop <Your New Product>, and when?
 - What costs will you make to build your organisation, develop marketing etc., and – approximately – when?
 - When do you expect to bring <Your New Product> to market, and when do you foresee any sales – and how will your sales volume develop over time?
 - What resulting cash flows do you project, in several scenario's – ranging from optimistic to pessimistic?
 - What factors are the strongest drivers for any changes in your forecasts?
 - Are you already financed? If yes – how?
 - In each scenario – what financial support would you need, and when?
 - What is (or will be) the initial shareholder structure?

6 United Kingdom (England)

Appendix X

New measures to promote innovation in the UK

The UK government is about to

- Establish a *Higher Education Innovation Fund* of £140 million over three years incorporating the Higher Education Reach Out to Business and the Community fund to build on universities' potential as drivers of growth in the knowledge economy. This will triple existing funding by the third year, to increase universities' capabilities to work with industry, particularly small firm
- Launch a new *Foresight fund*, initially up to £15 million, to get the best ideas from Foresight 2000 put into action
- Run one further round of the *University Challenge competition*, to provide seed venture funding for knowledge transfer; double the number of new starts for *Faraday Partnerships* from four to eight a year, to link the science base to business networks; and put £15 million more into *Science Enterprise Centres* to bring business skills into the science curriculum
- Create new *Regional Innovation Funds* worth £50 million a year to enable Regional Development Agencies (RDAs) to support clusters and incubators and new clubs of scientists, entrepreneurs, managers and financiers
- Support 20 *Business Fellows* who will lead their academic colleagues in working with business. They will spend part of their time advising companies, particularly SMEs, on their business problems, providing technical and research solutions
- Publish *science and innovation strategies for Government departments*
- Introduce a *Small Business Research Initiative* to open up to small firms R&D procurement worth up to £1 billion, with a target of procuring £50 million of research from them
- *Change the rules for Government funded research*, so that research bodies own the Intellectual Property Rights; issue new guidelines on incentives and risk-taking for staff in public sector research establishments 1; and provide £10 million to commercialise research done in the public sector, including the NHS
- Double the number of *International Technology Promoters* from 8 to 16 and link their work closely with British Trade International and other UK agencies overseas, to help UK universities and businesses make new partnerships across the world. Plan to extend the network of science attachés in embassies abroad.

Appendix Y

SMART scheme

There is a range of different types of support available under the SMART scheme for different types of new R&D performers. All applicants need to be resident in England, and intend to start a business in England, or if the applicant is an enterprise operating in England. Projects can be in any sector other than defense, including traditional as well as "high tech" sectors. However, the European Commission limits support to certain types of projects in some sectors. Restrictions currently apply to the following industries: coal and steel, agriculture and fisheries, synthetic fibres, shipbuilding and motor vehicles and transport. If your project falls into any of these areas, you might wish to check the restrictions with the relevant Government Office for the Region. Further on, projects should reflect the objectives of the Foresight Program.

- *Technology Reviews* helps individuals and small and medium-sized businesses assess their use of technology against best practice in their sector. An award to cover the external review costs, up to a maximum £2,500, is available if the applicant expends the equivalent of the award in terms of their own effort. Projects must involve at least 1 day's paid consultancy. Applicants must have fewer than 250 employees.
- *Technology Studies* helps individuals and small and medium-sized businesses identify technology opportunities, which may lead to innovative products and processes. The awards are meant for an in-depth look at applicant's use of technology, and to help them to identify technological opportunities, which may lead to innovative products and processes. An award of 75% of external study costs, up to a maximum £5,000, is available if the applicant expends the equivalent of the study costs in terms of their own effort. Projects must involve more than one day's paid consultancy. Applicants must have fewer than 250 employees.
- *Micro Projects* helps individuals and very small enterprises ("micro businesses"). Awards are 50% of eligible costs, up to a maximum award of £10,000, for the development of simple, low-cost prototypes of new products and processes, which involve technological advance and/or novelty. The minimum project size supported is £5,000. Applicants must have fewer than 10 employees.
- *Feasibility Studies* helps individuals and small businesses (fewer than 50 employees + other EU criteria for

small firm) assess the technological and commercial prospects for turning innovative technology into new products or processes. The grant covers 75% of eligible costs of the feasibility study up to a maximum award of £45,000. Projects eligible for support must have of at least £30,000 eligible costs, of between 6 and 18 months duration, to investigate the technical and commercial feasibility of innovative technology.

- *Development Projects* helps small and medium-sized businesses develop to a pre-production prototype stage new products or processes involving a significant technological advance. Grants up to £150,000 are offered for small and medium-sized firms (fewer than 250 employees) undertaking development projects. The size of the projects must involve at least £60,000 eligible costs, of between 6 months and 3 years' duration, to develop a pre-production prototype of a new product or process which involves a significant technological advance. For a development project, normally 30% of eligible project costs up to a maximum award of £150,000 (including any award already received for a feasibility study). Higher awards may be available in Merseyside, South Yorkshire, Cornwall and the Isles of Scilly 4 or for certain "exceptional" high cost projects.
- *Exceptional Development Projects* include a small number of exceptional high cost development projects which may attract grants up to £450,000. These are also targeted for small and medium-sized firms (fewer than 250 employees).

As well as the criteria presented at the earlier at paragraphs, the selection process for Smart will take account of

- a) The level of innovation
- b) The likelihood of technical success
- c) The commercial prospects for the end product or process (both the potential commercial benefit to the UK and the European Economic Area, and the proposed means of turning the project results into a commercially successful product or process)
- d) Managerial, technical and commercial expertise within or available to the business;
- e) Applicants business "track record"
- f) Business's financial health
- g) Whether the award is necessary for the project to proceed
- h) Wider aspects, such as environmental and design impact.

Applying the award

Regular competitions are held by Government Offices for the Regions (there are frequent calls for registrations of interest). Awards are made following judging panels, at the discretion of the Small Business Service through Government Offices for the Regions. Smart awards are subject to European Commission award ceilings, which may apply if the applicant has received Smart or certain other types of aid within the past three years. Applications can be submitted all the time but the provision of awards is subject to the availability of funds. However, it is considered that small businesses are rarely in a position to undertake more than one significant research & development (R&D) project at the same time. The Smart guidelines for officials can be viewed on the available literature or from the Smart website (www.BusinessAdviceOnline.org/smart). The application should comprise

- The completed application form
- A separate project proposal
- Accounts of the business. If these are more than three months old, the applicant must also provide up-to-date management accounts. If the business is part of a group, accounts for parent and ultimate holding companies should be provided on the same basis
- Evidence of how the applicant will finance their share of the project (e.g. a letter of support from the bank indicating the existence of sufficient funds of your own)
- If applicable, copies of patents, patent applications, and/or licensing agreements
- CVs for the key personnel involved in the project
- A project timetable
- Forward monthly cash flow projections.

The application may be referred to other Government departments or outside organisations (such as the National Engineering Laboratory, Laboratory of the Government Chemist etc) with sources of technical expertise for help in appraisal.

Complete application to the Small Business Service for a Smart Micro Project, Technology Review or Technology Study award will be processed within one month (30 calendar days). Smart Feasibility Study, Development Project or Exceptional Project award will be processed within two months (60 calendar days). If this is not possible the agency will explain why and gives a date by which the decision can be expected. In case the application is unsuccessful, the applicant will be explained the reasons why. If the applicant feels that the decision was wrong, for example because the appraising officer misunderstood some part of your application, they may seek a review of the decision by countering the reasons in writing.

Appendix Z

Science Enterprise Challenge & Cambridge case study

This section will highlight how the Science Enterprise Challenge works. The first part gives an overall view of the scheme on the national level. This is followed by a detailed case study of the Cambridge Entrepreneurship Centre.

The national Science Enterprise Challenge initiative was launched in February 1999, as a £25 million competition to establish a network of centres in UK universities, specialising in the teaching and practice of commercialisation and entrepreneurialism in the field of science and technology. Eight winning bids, from a short-list of twelve, were announced in September 1999, involving awards totalling £24.7 million. The remaining £0.3 million, plus an additional £3.9 million made available in November 1999, were allocated among the four remaining short-listed bids in February 2000, making a total investment of £28.9 million across twelve centres. Seven of the centres are collaborations between universities, raising the total number of institutions involved to 34. The existing 12 centres are

- The Bristol Enterprise Centre
- The Cambridge Entrepreneurship Centre
- The Centre for Scientific Enterprise
- The Imperial College Entrepreneurship Centre
- The Manchester Science Enterprise Centre
- The Mercia Institute of Enterprise
- The Northern Ireland Centre for Entrepreneurship
- Oxford Entrepreneurs
- The Science Exploitation and Enterprise Centre
- The Scottish Institute for Enterprise
- The University of Nottingham Institute for Enterprise and Innovation.

Objectives

The objective of the Science Enterprise Challenge is the development of a small number of world class centres of excellence, from which others can learn. The broad aims of the challenge are to

- foster the commercialisation of research and new ideas
- stimulate scientific entrepreneurialism
- incorporate the teaching of enterprise into the science and engineering curricula
- act as centres of excellence for the transfer and exploitation of scientific knowledge and expertise.

The centres have substantial international links, involving collaboration and exchange with leading enterprise institutions in Europe, North America and the Far East. Centres work closely with leading research departments within their own institutions, and receive substantial input from business leaders and entrepreneurs. Funding is provided under the Science Enterprise Challenge to enable universities to establish major new activity, but each centre has a business plan to ensure this activity becomes self sustaining within five years. Important sources of revenue include tuition fees, commercial sponsorship, and sales/licensing of products.

Science Enterprise Challenge aims both to raise awareness of the importance of business enterprise at all levels within universities, including both students and faculty, and to legitimise commercial activity as a valid aspect of academic life. It also aims to foster understanding and co-operation between academics and the business world to ensure the commercial exploitation of technological innovation.

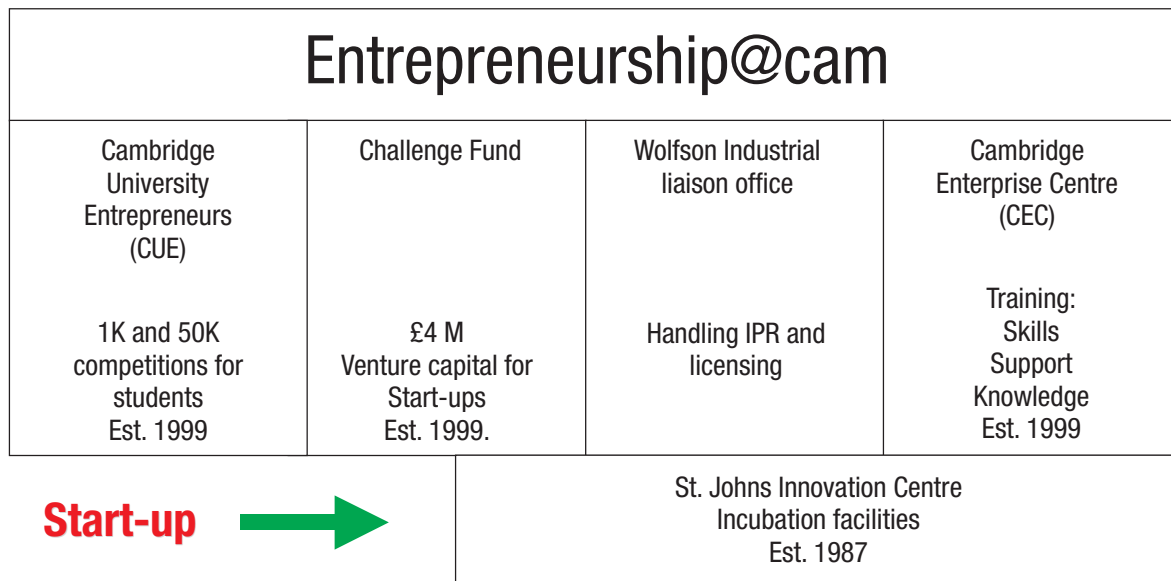
Eligibility

The competition is open to all UK universities. Where the bid is collaborative, partners can include other higher education institutions, but the lead institution (see 'Award of funding' below) must be a university. First round winners are encouraged to bid for further funding to add new members to their consortia, as well as to develop new and additional activities. This will enable the knowledge and experience gained to date to be shared with other HEIs throughout the UK, particularly where there is limited existing capacity in those other institutions. Bids are invited from consortia wishing to establish new centres. However, given the wide geographical coverage of the present centres, an explanation must be given to show the Steering Group why it is not possible for new bidders to join existing consortia.

The Cambridge Entrepreneurship Centre

Cambridge Entrepreneurship Centre (CEC) (<http://www.cec.cam.ac.uk>) has been established with the support of Science Enterprise Challenge program. It has an aim to train, develop and support the people who will make new knowledge-based ventures successful. The support system involves several elements, which are

- Cambridge University Entrepreneurs (CUE), the student organisation
- Challenge Fund, providing venture capital for the start-ups



The organisation of Cambridge Entrepreneurship Centre.

- Wolfson Industrial liaison office specialising on IPR and licensing
- Cambridge Enterprise Centre providing training for (aspiring) entrepreneurs
- St. John's Innovation Centre providing incubation facilities.

The Centre's activities combine educational activities to inspire, build skills and embed through training; advice and mentoring of new ventures and entrepreneurs at early stages of development; and best practice research for the support of successful knowledge-based entrepreneurs. The Centre operates throughout the University of Cambridge and in partnership with the local business community. It has also formed strategic partnerships with MIT's Entrepreneurship Centre (<http://entrepreneurship.mit.edu>) and CERAM – the business school for Sophia Antipolis (<http://www.ceram.edu>). The £65 million link between MIT and Cambridge University will lead to a partnership of enterprise and academic excellence between the two universities, bringing together the UK innovative research base and the American know-how in entrepreneurship. Other universities are now following suit in developing links with US counterparts.

Cambridge University Entrepreneurs (CUE)

CUE was founded in 1999 by students from the University of Cambridge. It organises the '£30k' and '£1k' business plan competitions and supports internship programs for students wishing to work in start-up ventures in vacation

periods. CUE is organised by volunteer students for all members of Cambridge University and their colleagues. In its first year its membership oversubscribed by more than 100%. The huge number of students wishing to join CUE was one of the motivations behind the creation of the 1K competition in January 2000.

In 2001 a prize fund of £50,000 is introduced together with a higher level of contact with entrepreneurs and professionals in the Cambridge region. This has further increased interest among students, university and local business community alike. The 50K training events teach competitors the key aspects of writing a business plan. In addition to this, opportunities to network with other students and hear from top entrepreneurs come in the form of CUE nights open to all members.

The University of Cambridge Challenge Fund

The University Challenge Fund (UCF) helps academics and students to exploit their work commercially by offering funding and advice. This funding opportunity means that an aspiring entrepreneur do not need to put their house on the line in order to be able to commercialise their inventions. The £4 M seed fund for University spin-out businesses received £500,000 from the government, the rest of the £3.5M comes from the University £0.5M, and private sector sponsors; Wellcome Trust £1.5M, and Gatsby Foundation. The UCF is reserved for Members of Cambridge University and the Babraham Institute. Since their fund is

owned by Cambridge University, the applicant is exposed to less risk than when approaching other Venture Capitalists. The fund can offer competitive terms, since the UCF's funds do not have to be repaid to the sponsors. During the first 18 months the fund has invested roughly half of the available £4M. There is a pressure to invest more because the government will review all University Challenge Funds and the further rounds of financing depend on the earlier success of the fund. According to the fund manager, the key problem is that academics are not very keen, nor able to commercialise their research results. However, those academics who have created a considerable amount of wealth provide a role model to an increasing number of academics.

During the year 2000 the fund received 60 applications of which 10 % were successful. However, the fund is keen to follow-up also the less successful applications because quite a few of them can be funded later on as the project becomes more mature and closer to the commercialisation stage. The fund role is to provide equity funding whereas the inventor role is to commit his/her IP and resources to the venture. The inventor will remain the majority shareholder but the University and the Fund get some 25-30% of the company's shares. Close liaison with the Wolfson Industrial Liaison Office (WILO) and the Cambridge Entrepreneurship Centre (CEC) are able to offer entrepreneurs get full support. The UCF and the Industrial Liaison Office are located in the same building and they even share the secretarial services. However the division of labour between them is clear. The first one concentrates on start-ups whereas the Industrial Liaison Office is specialised on licensing technology. Pure research is not funded. Instead UCF offers the following type of investments

- PathFinder funding up to £10K to carry out market and IP assessments, plan marketing strategies etc.
- Applied research funding up to £60K to prove a concept, assess the market etc. This could lead to a licence or to
- Seed funding up to £250K to set up a new company, joint venture or partnership.

Typically the fund is prepared to keep the invested money in the company 3–5 years after which the aim is to sell the shares as soon as possible. The liquidated funds will then be re-invested in new start-ups.

The application process

The UCF representatives make every effort to be very approachable and they are keen to meet any applicant over an informal chat. Applicants can either contact UCF directly or the Wolfson Industrial Liaison Office, WILO. The fund works in close co-operation with WILO which sign posts to the UCF those projects, which require Venture Capital. If

the project is not considered ready for Venture Capital, then the funds tries to find other ways forward. The application form for Challenge Fund investment is attached in the end of this document (see Appendix 1). The applicant can email it back if they are sure it does not contain any confidential information. If the form contains confidential information, they ought to be posted to the University Challenge Fund.

If the applicant already has a business plan, it should be attached with the application, this is all documentation the applicant needs to submit. Discussions are also an important part of the selection process. Each one of the fund's three staff individually fills in their checklist and the application will be scored on that basis. Normally the application process takes 1–3 months depending on the size of the investment. At the moment the board of directors makes the decisions on large investments but there are plans to replace it by an investment committee which can make decisions faster than the board of directors.

Promoting the fund

The Fund is sponsored by the University with the Vice Chancellor, prominent academics and business people on its Board. There clearly is a need for start-up promotion because only small minority of the academics have a suitable idea for commercialisation and are interested to start-up a venture. Hence the fund has to work hard in order to be successful. One common problem area is that academics want to make their research results public as early as possible leaving little time for protecting the intellectual property. To tackle this problem the fund seeks to minimise any delay that might be necessary to first protect the commercial value of the research.

According to the fund manager the key is to stay constantly very alert to any possibilities that may come up. The fund has three part-time staff, fund manager and two technology managers. The technology managers are specialised in biochemistry and engineering – both of them have been working at the university earlier on in their career so they are very well connected within the Cambridge University. The fund manager works also part-time, he divides his time between City based large venture capital firm and the Cambridge fund. The Challenge Fund staff visits departments frequently and they are in the process of setting offices in the key faculties in order to raise their profile. The staff encourages academics to contact them as soon as they suspect their work may have some commercial potential. Any venture capital placements are publicised in the university information bulletins and in the local newspaper. The services of professional PR-firm are used to ensure the quality continuous attention to publicity. Promotional posters are

Sharing the net income of IP.

	Inventor	Department	University
Net income	(%)	(%)	(%)
First £10,000	90	5	5
Next £20,000	70	15	15
Next £20,000	50	25	25
Excess over £50,000	33.3	33.3	33.3

also distributed to all faculties to remind potential candidates on the available funding. E-mail is also a frequently used way to promote the fund.

IP ownership and revenue sharing

The Challenge Fund has clear rules for the ownership of intellectual property right. These rule make it very clear for the potential entrepreneur the following points

1. The IP generated as a result of research grants usually belongs to the University of Cambridge
2. When a company funds research, ownership of the IP depends on the terms of the specific agreement
3. When the Wolfson Industrial Liaison Office, WILO, licenses University IP, the revenues will be split according to well-established rules (see Appendix 2). For revenues above certain thresholds, the “one third” rule applies
4. When the UCF makes a Concept investment – which is funding applied research to demonstrate that the work does indeed have good commercial potential, its share of future revenues will be in proportion to the relative size of its investment
5. When the UCF exploits University owned IP through a Seed investment, usually via a new company, it will negotiate a fair and reasonable equity share.

In order to, “turn good science into good business”, the fund offers help for the applicant in writing the business plan and also in running the business by appointing a non-executive director in the board of the company. After the “seed” investment the fund will also help in raising further funds for the needs of the growing business.

Concluding remarks

It is difficult to find staff who have knowledge of the particular technology and also have business experience. Al-

though the Cambridge University has a complete platform to support start-up companies the different parts of the system do not work very well together – the co-operation could be improved. There are perhaps too many initiatives which makes the situation fragmented. Part-time staff means very limited resources, which is a problem to a certain degree. However, the fund spends already about three percent of its assets on administrative expenses, which is considered the maximum level acceptable for this type of a fund.

St. John’s Innovation Centre

Located on the Innovation Park developed by St John’s College, University of Cambridge, the Innovation Centre provides business support and accommodation for early stage knowledge based companies. The Centre differentiates itself from other property developments by

- providing through an experienced team free advice to tenants on business issues
- supporting tenants and non tenants by engaging in local programs with University Departments and Government Bodies to help promote the creation of wealth in the sub region
- Helping entrepreneurs access funding through organisations such as GEIF, CVG and mensaIQcapital
- acting as a catalyst in promoting technology locally, regionally, nationally and internationally.

The Innovation Centre was opened in 1987, and as well as providing business advice to tenants, it offers them flexible accommodation in leasing terms and the possibility to share communal facilities including conference rooms and a restaurant. Centre tenants are aspirational start-up firms operating in a wide range of leading-edge technologies including neural networks, workflow management software, multimedia, fixed and mobile telecommunications, cryotechnology, biomedical imaging, lasers, chromatography, data communications, instrumentation, films and, increasingly, biotechnology.

The first building, the St John's Innovation Centre, opened in 1987. Intended as a focus of the Park, the Centre is a prestigious building with centralised services and leases enabling tenants to expand their offices according to their needs. To meet the Park's objectives to encourage early-stage technology based businesses, tenants usually fall into the following categories

- Start-up companies researching and developing products
- Young technology based companies of one to five year standing which bring some maturity to the Park and may produce further spin-out companies
- Service companies with a technology bias, which can provide support such as training, marketing and public relations.

The demand for space in the newly opened Centre soon outstripped supply, encouraging the College to commence a second phase, Dirac House, which was completed in July 1989 and a third phase, The Jeffreys Building, completed in February 1990. An extension to the Innovation Centre including restaurant and conference facilities was opened in 1994.

The College exercises control over the type of tenants accepted and the Park has so far been a success, both commercially and in terms of its original philosophy. The Innovation Park is managed on behalf of the College by St John's Innovation Centre Ltd. The Company is wholly managed by the College and its function, in addition to managing the property, is to promote technology transfer and support technology based businesses in the region. In this context St John's Innovation Centre's role as an incubator is in assisting the formation and growth of early stage knowledge based businesses by providing physical space and in-house management support for such companies. Currently there are 50 companies on site, and 100 have graduated. The failure rate over 13 years has been around 15% compared to the 50% that might have been expected. The success rate for companies in their first 5 years is in excess of 85% compared to 50% for similar businesses in the Cambridge area. The Park has already housed a number of successful companies

- S Limited – Technical consultancy, £15m turnover after 7 years, 150 people employed from 5 at the outset and 8 spin-off companies
- T Limited – Satellite communications, £12m turnover after 5 years. The two founders now employ 168 other people.
- M – £15m turnover after 6 years, 60 people now employed.
- M Limited – Computer games company, £15m turnover and 120 people employed.
- A Ltd – Valued at over £1 billion on EASDAQ.

The Centre, however, does not just operate on behalf of tenants. It has links with other support organisations such as the Business Link and is currently working with 400 non tenant businesses per annum assisting with networking, finding finance, business planning and student placements. Support and assistance is given to MBA students working at the Judge Institute and the Centre also assists with outreach facilities for the Institute for Manufacturing, part of the Engineering Department. The Centre also has a web site technology entrepreneurs (www.enterprise-link.co.uk/) which provides on-line access to information on the wide range of resources available in the Cambridge area to support the start-up and growth of technology based businesses.

Wolfson Industrial Liaison Office (WILO)

The Wolfson Industrial Liaison Office exists to promote contacts between the University and industry. It provides advice and guidance on intellectual property, contracts and licensing issues.

The Office acts as a central clearinghouse for external enquiries and can advise on research contracts, consultancies and other forms of collaborative activity. It produces lists of members of staff and their research interests and department-by-department summaries of current research in the University of Cambridge. Wolfson can help to identify ways that industry can benefit from the intellectual and technical resources of the University and how the University can gain from successful collaborations. The Office can help to organise inter-disciplinary projects, which may involve several departments and a number of companies.

The Office is geared to process enquiries but it is expected that companies deal directly with Departments or members of staff once contacts have been made and arrangements agreed. It has a particular responsibility for advising University employees on the commercial exploitation of inventions derived from research funded by the Research Councils and to ensure that this is carried out to the benefit of the inventors, their Department and to the University itself. The Office makes arrangements for protecting intellectual property, it can advise on appropriate routes for its commercial development, including setting up new companies, and can obtain specialist help and resources as necessary. Assistance available includes

- Funding for provisional patent filing
- Use of the University's wholly owned company Cambridge University Technical Services Ltd. as an exploitation vehicle
- Close contact with a number of sources of venture capital including local funds such as Cambridge Research and Innovation, the Cambridge Quantum Fund.

The level of licensing and sales of intellectual property through Cambridge University Technical Services is growing annually, and passed £1m in the last financial year. The activities of the Office have a local, national and international dimension in encouraging links with industry, other universities and Government Departments. Successful collaborations demand realistic assessments of the aims and objectives of the participants and flexible approaches to establishing the bases for co-operation. Against a strong background of individual relationships with companies, the Office is able to assist and encourage new forms of collaboration with industry and other external agencies. It is also exploring the range of possible benefits to industry, academics and the University with the aim to further enhance the University's current standing in teaching and research.

Cambridge Entrepreneurship Centre (CEC)

The Cambridge Entrepreneurship Centre was established in the autumn of 1999 with funds from the U.K. Government. The Centre is seeking further funding from the industrial and private sectors. The Centre is an integral component of the University's three-part strategy for commercial exploitation, comprising

- the University Challenge Fund, which with sources of public and private finance, provides the funds for commercial exploitation
- the Wolfson Industrial Liaison Office, which promotes co-operation between the University and industry, including the provision of information to industry on research capabilities and opportunities for technology transfer
- the Centre for Entrepreneurship, which will inculcate a culture of entrepreneurship within the University, and develop the entrepreneurs and managers who start and grow businesses both within and beyond the University.

The Centre seeks to balance its activities so as to make an impact at four levels

- the University of Cambridge: identifying, building and supporting enterprises based upon University of Cambridge derived knowledge
- the Eastern Region: providing support and advice on entrepreneurship and the management of innovation to the regional business community
- the United Kingdom: contributing to national goals of economic growth, competitiveness and productivity
- internationally: attracting aspiring entrepreneurs from other regions, and participating in an international collaboration, in which the collaborators will learn from each other.

The Centre operates as part of the Judge Institute of Management Studies in partnership with the science and technology faculties, and has been allocated premises at the heart of the University. The core activities of the Centre are

- teaching and training to support innovation and entrepreneurship
- advising and mentoring early-stage entrepreneurs
- reviewing and disseminating knowledge on technology exploitation through entrepreneurial activity.

Partnerships with international centres of excellence in the teaching and support of entrepreneurship will feed into the activities of the Centre. The idea is to strengthen the University of Cambridge's ability to build successful spinout businesses, and in turn will develop the Centre as a resource to support science and technology-based entrepreneurship throughout the Eastern Region. The CEC will also foster links with corporate venture groups in large companies to help start-ups grow into industrial enterprises.

Teaching and training

The Centre is currently offering the following teaching and training courses:

- *Virtual Learning Network – Financing High-Growth and Technology Ventures: Basics of Building a Business:* The course is aimed at graduate students from science and technology departments in the University of Cambridge
- *Summer School 2001*, This course will be developed and delivered with the support of the MIT Entrepreneurship Centre.
- *CUE '£50k' and '£1k' Business Plan Competitions:* CEC works closely with the student organisers of the Cambridge University Entrepreneurs business plan competitions to support their teaching and training activities.

The Centre is also developing other courses for specific audiences.

Advising and supporting

Advice clinics – CEC offers one-to-one advice and guidance sessions for those who are thinking of setting up a business, or who are in the process of setting-up a business. CEC's connections with the local and national business community provide access to a range of support for entrepreneurs.

Reviewing and disseminating best practice knowledge on entrepreneurship

The Centre has formed partnerships with international centres of excellence in the teaching and support of entrepreneurship. The Cambridge Entrepreneurship Centre's activities are developed and delivered through network of partnerships with organisations inside and outside the University of Cambridge. Within the University the Centre operates in close partnership with the Judge Institute of Management Studies and the science and technology faculties.

The Centre works closely with the local and national business communities. These communities provide advice and guidance for the operation of the Centre, and play a key role in the delivery of the Centre's training and mentoring activities. U.K and international entrepreneurship centres - the Centre has formed links with a number of entrepreneurship centres nationally and internationally to ensure the exchange of good practice in the teaching, support and understanding of entrepreneurship.

The Centre is also compiling databases on a range of entrepreneurship-related resources. One of its initial activities has been to support the development of projects such the "Resource Centre for Technology Entrepreneurs". The Centre is also currently undertaking a review of best practice in the teaching and support of entrepreneurship worldwide.

Resource centre for technology entrepreneurs

The Resource Centre is a service for members of the Enterprise Link but it is also available on a trial basis to non-members who have registered for the service. Clearlybusiness *Business Builder* – site provides a range of advice and resources for new ventures. It has been developed by Barclays Bank and Freeserve. 'CamConnect' is a yearly event that brings together final year students and local entrepreneurial ventures. It draws upon the substantial experience of the management team at St. John's Innovation Centre that has assisted many internationally successful technology businesses.

This Resource Centre provides

- Experts' answers to Frequently Asked Questions (FAQs) posed by entrepreneurs setting up or growing a technology business
- Information on the key networks in the Cambridge area whose activities focus on technology-based entrepreneurship
- Courses that are available to help entrepreneurs develop skills needed to set up and grow a technology business
- A library of resources - books, case studies, workpacks - for entrepreneurs, sorted by topic
- Information on working with the University of Cambridge, including student projects, research projects and technical expertise
- An outline of business incubation facilities available locally to help businesses in the early stages of their development
- Links to useful websites for entrepreneurs summarised and reviewed on a monthly basis
- Details on how to give feed back and suggestions for improvement to this site
- A local search engine which helps in finding the information on the site.

Appendix AA

Application for Challenge Fund Investment

Name of Proposers: [include titles]	Department:
Tel:	Fax:
E-mail:	
Short project title:	

Please just complete what you can; we are happy to work with you to work up a proposal. Please give us the essential information and we can then probably arrange an informal meeting.

Please do not include any confidential information if you return this form by email. Please fax or post the form if it contains confidential information.

Please visit www.challengefund.cam.ac.uk for more information

Summary Statement

A statement of the technical innovation, the possible applications for the new technology and their commercial potential. What will be achieved as the result of the Challenge Fund investment?

Funding Requested

The total funds requested from the Challenge Fund. The amount and source of any other funding needed to complete the project.

Management Resources

Who will be responsible for management of the project? Who will undertake the project work? Identify the roles of the key staff, their qualifications and experience.

Intellectual Property

Review of the strength of the IPR position; is the invention patentable [novel, undisclosed, not obvious, commercially applicable]? Summarise patents, trademarks and other forms of IPR protection. Who holds the rights to the IPR? Was the work done in collaboration with others [co-workers, students, outside collaborators etc]? Who funded the research [EPSRC, BBSRC, MRC, charity, commercial/industrial etc]? Was the work governed by an agreement or contract? Was any of the work carried out in a University Department or use any University resources?

Technical Advance

Include a description of the technology advance with a statement of the process and its products. Explain the advantages of the technology compared to current technology indicating expected gains in efficiency, economy, and effectiveness. What plans are there for progressing this research in the next 12 months?

Applications

Set out the range of possible applications particularly those with potential for worldwide exploitation.

Commercial Exploitation

Estimate the market size and value for potential products. Who are the main competitors? What is the structure of the market? To whom will products be sold? Initial thoughts on exit strategy?

SWOT Analysis

A brief review of perceived Strengths, Weaknesses, Opportunities and Threats relating to technology, competition, marketing etc.

Application of Challenge Fund monies

Analysis of expenditure by element such as patent costs, staffing, materials, models, prototypes, overhead charges etc. Provide a Gantt Chart with time scales and activities.

Deliverables

Clear statement of what will have been achieved by the end of the present project the Challenge Fund is being asked to finance.

Send this form to:

Bill Matthews	Fund Manager	wm220@cam.ac.uk	07980 884 374
Dr Nick Slaymaker	Technology Manager	nas1005@cam.ac.uk	07980 884 375
Fax	01223 332 797		
Tel	01223 766 935		
Post	20 Trumpington Street Cambridge CB2 1QA		

Attachments:

- CVs of key staff
- Copies of Patents, published papers etc.
- Independent reviews of IPR (if available)
- Project Costs/Activities Gantt chart
- Market Studies (if available)
- Any Other Background Information

Email only non-confidential information.

Appendix BB

Cambridge – exploiting innovation

Commercial exploitation of inventions funded by
Research Councils:
Notice by the General Board

26 February 1987

In May 1985 the then Chairman of the Science and Engineering Research Council wrote to universities on behalf of all the Research Councils asking whether they wished to assume the rights and responsibilities relating to the exploitation of inventions arising from work funded by the Councils; and, if so, to provide information on the arrangements they had made or proposed to make. This enquiry was made as a result of the abolition of the monopoly previously held by the British Technology Group for arranging the exploitation of Research Council funded inventions. The University's proposals, outlined in a letter dated 17 October 1985 from the Secretary General of the Faculties to the SERC, have now been approved on behalf of all the Research Councils for a period of three years from 23 July 1986. The University is therefore responsible for ensuring that inventions of any kind derived from projects supported by any Research Council are exploited, to the benefit of the inventor and the University.

The General Board propose, in order to fulfil these responsibilities, to require all University officers and unestablished research workers to sign an appropriate undertaking when they accept an offer of a Research Council grant or an offer of appointment supported by such a grant, as the case may be. The undertaking will state that the person concerned agrees to consult the Wolfson Cambridge Industrial Unit on the possibility of exploitation of any invention before disclosing it, and, if requested, to assign his or her rights in such intellectual property to the University or its nominee in return for an equitable share of the proceeds of exploitation. The Wolfson Unit will, in consultation with the inventor(s), arrange for inventions to be offered to appropriate organisations for feasibility studies, market research, and patenting. The Unit has already developed links with a range of such organisations. If a way of exploiting any invention is not found within a reasonable period, the rights will revert to the inventor.

The Board do not propose to make any change in the present policy of the University that it should not itself hold patents. Members of the University may, however, arrange through the Wolfson Unit for patents or copyright to be assigned to the University's company, Lynxvale Ltd. A note on the operation of Lynxvale is attached as Appendix A to this Notice.

The Board believe that it is important that the arrangements made by the University for the exploitation of inventions

should provide a significant incentive to the individual inventor, as well as a financial benefit to the University itself. They therefore propose that income received by the University from commercial exploitation, in the form of royalties, licence fees, etc., should normally be divided between the inventor, for use at his or her discretion, the Department or other institution in which the work was carried out, and central University funds. A proposed division, similar to that recommended by the Research Councils, is given in Appendix B. Income received by a Department would be allocated at the discretion of the Head of the Department, in the same way as income from overheads is at present. The Board intend that a significant part of any additional income received by the University should be used to allow some improvement to be made in the provision for expenditure on equipment, minor works, and other items of research support. The Board expect to keep under review the development of these arrangements and the level of income received, and to give further consideration to the use of such income for specific purposes should it increase to a substantial level.

The Board have noted that the Research Councils expect universities also to undertake the exploitation of inventions made by students (except in the case of those holding industrially-sponsored studentships, where the existing arrangements for exploitation by the industrial partner will continue to apply). Although students do not have the same contractual obligations to the University as employees, the Board believe that it will be helpful in ensuring that students are made aware of the University's responsibility for developing the exploitation of research results if they are invited to sign an undertaking similar to that required from members of staff. The Board therefore request that Heads of Departments should arrange for the necessary form to be given to all Research Council supported graduate students when they take up their awards.

Finally, the Board hope that members of staff and students whose research may produce results having commercial potential, whatever the source of financial support for the research, will seek advice from the Wolfson Cambridge Industrial Unit on the ways in which any invention may best be exploited. In the present financial climate it is increasingly important that no source of income for the University should be neglected. With this in mind, members of the University should ensure that valuable intellectual property is not made worthless by public disclosure before protection for it has been sought.

Appendix A *Lynxvale Ltd*

Lynxvale Limited is wholly owned by the Chancellor, Masters and Scholars of the University of Cambridge. The Company was established to protect the University from liability to tax which might otherwise have arisen as a result of trading activities, such as the sale of computer software

or the collection of royalties arising from the exploitation of inventions. Lynxvale covenants all its profits to the University, which is then able to recover the income tax deducted by the Company from the covenanted profits. The use of Lynxvale also protects against any possible claims for damages associated with the goods traded.

Except where the University has had a direct interest, the use of Lynxvale by inventors has, hitherto, been on an entirely voluntary basis. The typical procedure is for an inventor to assign his or her rights to Lynxvale. In return Lynxvale makes an agreement with the inventor about the way in which income arising from the exploitation of these rights shall be distributed. This usually provides for income to be collected by Lynxvale and then covenanted to the University. Distribution of the covenanted profits is then a matter for the General Board. In exchange for the rights Lynxvale also agrees to take such steps as may be necessary to exploit the invention., This may involve negotiating a licence with a third party or, in the case of software, it may involve only the sale of copies of the program. Lynxvale has no employees and negotiations on its behalf are undertaken by the Director of the Cambridge Wolfson Industrial Unit. He is able to call upon the support of the staff of the central administrative offices as required. In its last financial year Lynxvale covenanted about £275,000 to the University. Although Lynxvale cannot distribute profits until the end of the accounting year, the General Board can make arrangements for Departments to anticipate up to 70 per cent of the money which will eventually be distributed.

The facilities offered by Lynxvale will continue to be available to members of the University on a voluntary basis. However, in the case of inventions arising from work supported by the Research Councils, it is intended that rights to inventions should normally be vested in Lynxvale. The Director in Industrial Co-operation will continue to advise Lynxvale on the most appropriate channel for exploitation in each individual case.

Appendix B

Suggested division of income from commercial exploitation

	Inventor	Department	University
Net income	(%)	(%)	(%)
First £10,000	90	5	5
Next £20,000	70	15	15
Next £20,000	50	25	25
Excess over £50,000	33.3	33.3	33.3

Appendix CC

Summary of Entitlement to R&D Tax Relief

R&D tax credits are not available for all businesses, and not all expenditure qualifies. The most important conditions are

- only companies can claim R&D tax credits. R&D tax relief and the payable R&D tax credit are not available to individuals or partnerships
- the company must be a small or medium-sized enterprise (SME) as defined by the European Commission for State Aid purposes
- the spending qualifying for relief must
- not be less than £25,000 a year
- be revenue expenditure
- be attributable to relevant research and development directly undertaken by the company or on its behalf
- be incurred only on the costs of staff directly involved in carrying out the R&D, the costs of consumable stores used in the R&D effort, and certain costs where R&D is sub-contracted to another person
- the company must be entitled to the ownership rights of any intellectual property arising from the R&D
- the spending must not be incurred in carrying out activities contracted to it by another person
- the expenditure cannot be met by another person. Also, if the R&D project is funded in whole or in part by a State aid such as a Government grant, e.g. Smart and LINK, none of the spending on that project can qualify for R&D tax credits.

Company must own the Intellectual Property in the R&D

R&D tax relief is available for expenditure on R&D provided that the ownership of the fruits of the R&D will vest in the Claimant Company. This does not mean that the R&D must be successful, or that it must result in the creation of intellectual property. Indeed, R&D is inherently risky, and may end in failure. A company can still claim R&D tax relief on its qualifying R&D spending if the R&D is unsuccessful, provided that it would have owned any intellectual property that could have been created had the R&D been successful.

Joint Ventures

Not all companies exploit the fruits of the R&D for the purposes of their own trade. They may turn the rights to account by licensing them to another party. This can happen

at any time during the R&D process. The company can still claim R&D tax relief on its continued research expenditure provided it retains ownership of the intellectual property. Joint ventures and other collaborative arrangements are common between R&D companies. There are various arrangements that R&D companies may adopt but it must be remembered that the relief only applies to SMEs.

Where two or more companies simply collaborate on an R&D project the individual companies may account for their own share of R&D spending in their accounts. The usual arrangement is for each company to become the owner of the intellectual property it generates, but there are cross-licensing agreements to allow the other collaborators to exploit it as part of the larger R&D effort. Alternatively, they could simply share the intellectual property. In these situations, each SME company receives the R&D tax credit on the R&D expenditure it incurs in creating the intellectual property that it owns, or co-owns. Two or more companies might carry out their collaborative R&D through a separate company set up for that purpose. Any intellectual property that is created rests in the new joint venture company and is exploited through that vehicle. In this situation, the R&D tax credit will follow the rules above and to go to the person who owns the intellectual property as it is created - the joint venture company, provided that it is an SME.

For further information see:

http://www.inlandrevenue.gov.uk/r&d/rd_booklet.htm

Appendix DD

The objectives for Faraday Partnerships are

- to promote active flows of people, industrial technology and innovative business concepts amongst the science and technology base and industry,
- to promote the partnership ethic in industrially relevant research organisations, business and the innovation knowledge base,
- to promote core research that will underpin business opportunities,
- to promote business-relevant post-graduate training, leading to life-long learning.

Financial support will be provided to enable *Faraday Partnerships* to

- develop and build on strong and effective networks between academic research and business, especially SMEs; assist industry in defining research needs; commission research; act as a broker in the exploitation and dissemination of research results through demonstration of best practice and movement of people in technology awareness, technology licensing and demonstration of best practice

- carry out research, developed in collaboration with industry, primarily in the form of collaborative research projects
- support the development in business of relevant research-based technologies, leading to new products and processes and; support a program of relevant education and training. This could include provision for supporting training of 'Faraday Associates' at Doctoral level (e.g. through CASE studentships), Masters levels (e.g. through Masters Training Packages/Advanced Courses) and provision for part-time training for people in employment.

Appendix EE

LINK collaborative R&D program

Starting a collaborative project under LINK program

The applicants need to find out first whether there is 'open' LINK program under which the project idea might fit. If an appropriate program cannot be identified the applicants can contact the LINK Directorate for advice. Once the appropriate LINK program has been identified the applicant can contact the Program Manager / Co-ordinator to discuss the idea. The Manager will be able to give advise on eligibility, application procedures and, if necessary, how to get in touch with potential project partners. The following issues will be considered in assessing the proposals

- Is the proposed research pre-competitive?
- Does the project fit within one of the open LINK programs?
- Does the project involve at least one industrial and one academic partner?
- Is Government funding needed for the project to go ahead?
- Is the project original and innovative, coupled with an element of risk?
- Is the scientific or technical content high?
- Are there likely to be significant economic and social benefits from the research?
- Is the project relevant to industry?
- Will the project complement rather than duplicate any other UK or European research?
- Is there a clear exploitation route?
- Do the partners have the track record and resources to carry the project through?

As the application progresses the applicants also need to produce

- A clear business plan and defined management structure
- Testable, challenging but realistic milestones
- Dissemination and exploitation plans for project results.

Each program generates its own networked community of interest, through which participants can share in the program's achievements within a well-defined project management framework. Networking is strongly encouraged so participants can share in the program's achievements, supported by newsletters, seminars, technology transfer clubs and the LINK web site. A collaboration agreement, drawn up by the partners, specifies how the fruits of the research will be shared. CBI/AURIL working group, representing both industrial and academic interests, has prepared a "model" collaboration agreement which applicants can make use of.

Various government departments and Research Councils currently sponsor LINK programs covering a wide range of technology, from food and biosciences to electronics and communication. LINK Program sponsors include

- Department of Trade and Industry
- Ministry of Agriculture, Fisheries and Food
- Department of the Environment, Transport and the Regions
- Department of Health
- Ministry of Defence
- Northern Ireland Office
- Scottish Office
- Engineering and Physical Sciences Research Council
- Biotechnology and Biological Sciences Research Council
- Medical Research Council
- Natural Environment Research Council
- Economic and Social Research Council.

Benefits of collaborative R&D projects

Companies will gain access to high quality research and leading edge science, engineering and technology, which can underpin business strategy and innovation. Collaboration can lead to faster and less costly R&D as well as shared risks, all of which are significant benefits to the industry. For the researchers LINK projects offer a valuable opportunity to work with industrial partners on new areas of research leading to new discoveries, new skills and new opportunities for commercial spin-off. They also give access to more funds and career opportunities. Research base partners also gain significant additional funding from the Government and industry as a result of LINK projects. Thus collaboration with industry increases the scope and facilities available for research.

Scope of the LINK program

LINK programs are sponsored by Government Departments and Research Councils. Program goals are defined by the sponsors, in consultation with industry and the research base and taking account of priorities identified by the Foresight Program. LINK stimulates interdisciplinary research in areas such as

- Sensors
- Medical engineering
- Advanced food science
- New communication systems
- Future vehicles
- Surface engineering
- Catalysis.

Currently running LINK programs fall into five main categories

- Electronics/Communications/IT
- Food/Agriculture
- Biosciences/Medical
- Materials/Chemicals
- Energy/Engineering.

To broaden the scope of the LINK scheme, it has been franchised to other Government schemes run by the Biotechnology and Biological Sciences Research Council (BBSRC), and the Medical Research Council (MRC). As a consequence, these organisations now have the flexibility to fund LINK projects across their own selected research areas. More recently, the Innovative Manufacturing Initiative (IMI) run by the Engineering and Physical Sciences Research Council (EPSRC) has also joined the LINK scheme under a franchising arrangement.

Other government initiatives related to LINK

- The Foresight fund – initially up to £15 million, is aimed to get the best ideas from Foresight 2000 put into action fast.
- The Foresight Program – develops visions of the future to guide today's decision makers
- The Foresight LINK Awards – FLA supports high quality research and business/research partnerships in Foresight priority areas outside the area of coverage of open LINK programs.
- Innovative Manufacturing Initiative – LINK/IMI – high quality strategic and applied research and related training for more innovative manufacturing.
- TCS – Teaching Company Scheme – promoting technology transfer by facilitating the establishment of project-based partnerships between the science base and companies using graduate skills
- EC Framework Program 5 – FP5 – Link projects can involve co-operation with the Commission funded research projects.

7 Singapore

Appendix FF

Technopreneur Investment Fund (TIF)

Started in 1999 this is a US\$1 billion fund. It aims to attract 'top tier' VCs worldwide. It is split into three funds:

- Strategic Fund (US\$250m)
- Broadbase Fund (US\$500m)
- Early Stage Fund (US\$250m).

The entire fund is known in Singapore as the 'fund of funds'. Its publicly stated mission of the fund is to "Assist Singapore-based institutions to participate in venture capital industry. Encourage use of venture capitals as alternative investments". During interview another aim was outlined: To attract overseas venture capitalists to invest in Singapore.

The objectives of the fund are to:

- Gain superior financial returns from investments into globally diversified top-tier venture capital funds
- Arrange co-investments with TIF fund partners into private companies that offer substantial returns (up to 20% of total fund size)
- Make investments into indigenous venture capital funds that have shown excellent potentials (up to 10% of total fund size).

EDB undertook a good deal of research into choosing which VC funds they wanted to attract to invest in Singapore, using a dedicated team which searched globally. They were looking for successful and reliable firms, with a strong track record. The deal was that for every US\$ invested by the VC, EDB would match the funding.

The firms, which have been invested in, have been chosen by the VCs – EDB trust their judgement having investigated their capabilities quite thoroughly. There are no priority areas given by EDB for investment, but those industries corresponding to Singaporean national strengths have benefited – including ICT and biotechnology. The individual firms, which benefit from the scheme, are chosen by the VCs, with no intervention from EDB. The entire fund was spent within 18 months, but there are no public statistics available concerning the number of firms invested in, or what has happened to the EDB investment, although EDB is monitoring this. The strategy is very much a long-term one – 10 years or so – and the exit strategy will be divestment.

A new fund has been announced, worth S\$2bn, which will be for bio-medical start-ups. No program level or statistical documentation on TIF is available. In terms of the provision of direct public-sector support to educational institutions the picture is not clear, as the NSTB is in a period of transition and new schemes have not been officially announced.

Appendix GG

INTRO, CMIT and ITTO

The material arising from a RTD project is shown to Business Development Managers at INTRO who decide whether or not a project should be 'protected' in some way. This could involve patents, licences, or spin-off firms. These activities could involve confidentiality agreements, material transfer agreements (MTAs), and Memoranda of Understanding (MoU). When industrial researchers are employed on projects with University staff, this is also brought to the attention of INTRO. It asks the team whether they will need any IPR management services – and if the project is using University resources, which it usually is, then there is an obligation to register with INTRO, and 'open an account' – i.e. have any IPR 'managed' and the necessary agreements set up.

Once 'agreements' have been signed, then the Business Development Managers have to look for opportunities to maximise revenues. They do this by using databases of contacts, web searching and cold calls, trying to put together potential purchasers of technology with the University suppliers. The sale of licenses is usually done on a non-exclusive basis, and is usually on the basis of an upfront fee, plus royalty payments. In 2000, S\$300,000 was made in revenue. INTRO is starting to build up a wider portfolio of services such as supporting the creation of NTBFs, but the activity is still in its infancy. INTRO has only recently reached 'critical mass' in terms of staffing, and recruiting the requisite skills in-house to help develop business proposals and match with finance opportunities.

CMIT helps staff, students and alumni to set up start up firms, by bringing together financiers and other support professionals to exploit the proposals developed at NUS – but only those which are based on good business sense and sound management. CMIT has little interest in physical incubation facilities, only in human capital and knowledge

networks. Raising awareness about entrepreneurship is seen as a key task – hence the Technopreneurship Minor Program, a course which is available to engineering and business school students to help them ‘fuse’ technological management and business management skills.

In addition, CMIT organises a number of TechnoVenture Forums where well-known and successful entrepreneurs come to give lectures and presentations. This gives the presenters exposure, and a good platform for them to make contacts when looking for future staff. These individuals are often called upon to judge the annual business plan, called Start-Up@Singapore. This is a national scheme open to all students from institutes of higher learning. Contestants are able to tap into a network of VCs, CEOs, entrepreneurs and business angels to obtain guidance, mentorship and maybe even funding. It is jointly organised by CMIT and NUS Business School Alumni Association. It is a well-resourced program, with plenty of free on-line help available to participants together with ‘Boot Camps’ which offer training. Prizes are offered from \$30,000 for first place down to \$500 for ‘best executive summaries’. Only half the prize money is awarded to the major award winners up front; the remainder is given on successful incorporation of a new firm. CMIT is also very keen on providing mentoring services (under the auspices of the Start-Up scheme), and the Associate Director spends about 50% of her time advising staff and students. In addition, one entrepreneur (ex-Silicon Valley) has been hired on a part-time basis, like a ‘consultant’ to help students with their coursework and staff/students with setting up a spin off. He is also involved in promoting CMIT and entrepreneurship to the rest of the University. CMIT would like to hire more on the same basis.

This mentoring is required to help potential spin-offs develop robust plans and strategies, and also to help them raise capital. Many require sums, which are too small to interest VCs (even pre-seed funds), and so business angels and corporate investors are a popular choice. CMIT pro-actively makes presentations to these firms and individuals, and the Director is Chair of a business angel network. Interestingly, he spends time ‘educating’ the angels as well as the potential NTBFs.

Where ITTO and INTRO differ is that the former has a well-established incubator centre, and a ‘TechnoGarage’ for students to develop their projects. Applications for the incubator take 1–2 months to process, then the accepted tenants (who have to meet certain qualifying criteria like being local and accepting that they will work with NTU staff) have access to the physical incubation facilities, which they have to pay for. They also have access to the intangible assets of the incubation centre – i.e. the network of (global) venture capitalists, business angels etc. Legal services are also provided, these are ‘dealt with by the Director’ and outsourced as appropriate. Management training

for the potential new firm entrepreneurs is not available – there is no resource to offer this

There are currently 20 tenants in the incubator – all are start-ups. In 1999 there were 21 tenants, 15 of which were start-ups. Two were University spin offs. One was sold to Hewlett-Packard Singapore. The other signed collaboration agreements with NTU and attracted investment from a subsidiary of the largest engineering company listed on the Singapore Stock Exchange. The 2000 intake are working in the areas of biotechnology, software, IT, materials technology and hardware/product development. In 2000 6–8 businesses were spun-off. During its life, 50 companies have used the innovation centre.

Appendix HH

Kent Ridge Digital Laboratories support delivery process

Researchers approach the Incubator – they are under no compulsion to do so. It attracts 100 researchers, typically in teams of 3 to 5 people – i.e. 20–30 teams per year. Ideas are presented to a Portfolio Planning Team (PPT) located in the IPG Division, made up of VPs and other senior staff. About 60–70% are successful and go forward to present to the incubator. A corporate Business Development Manager is assigned to work with them to develop ideas further. There is also a team of marketing, business intelligence and 2 legal experts available (a corporate resource).

The team then goes forward with a highly developed business plan to the Incubator Board (again a senior team, mostly VPs). They assess the plans very much as a VC would (they are in daily contact with VCs and have a good understanding of how they work, and what they are looking for). They are not bothered about the management potential of the team (that can be bought in). Those ideas, which look good, have to be approved by KRDL’s CEO, then they go to the incubator. As soon as the team is approved for entry to the incubator they are asked to form a company. They are also given some pre-seed funding (around S\$50k) by KRDL in return for equity. The team/new company is asked to license the technology from KRDL (usually non-exclusive). These new firms are known as Bridging Units (BU).

Typically the BU is asked to hire in an experienced CEO – which the incubator will help them source, together with other specific professional expertise such as marketing or Human Resources. In addition KRDL will always take a management position at Board level. The incubatees have a period of 6 months to 1 year to ‘succeed’. This is defined as having signed up a ‘lead user’ – i.e. a major customer. The time period is very short, but purposefully so; to gain first mover advantage and to minimise costs. During this period the new company will seek finance, typically S\$500k to S\$1m.

The incubator has 3 major advantages

- a) it provides infrastructure (i.e. physical space, comms, labs etc) at no charge
- b) it provides access to business services (i.e. accounting, HR, legal, marketing) at no charge
- c) it validates the business model. The incubator is very hands on, the 2 staff work daily with the incubatees, closing deals, raising finance. There is no 'training' as such, the new firms learn by doing with the experienced incubator staff.

Appendix II

PSB Corporation

This first stop shop is described as a 'multi-agency centre-satellite' approach. Two services are offered: information provision and a referral service. Both services use a purpose-built intelligent computer-based telephony system and a team of Customer Service Officers (CSO). They conduct a 'needs-analysis', using structured questionnaires to pinpoint the exact needs of the caller. The information retrieved can be sent to the caller by e-mail or fax directly from the CSO. The referral service works by an Expert Diagnostic System, which has a Case-based-Reasoning (CBR) capability. The CSO finds a match of consultant on-line for the caller and generates an e-mail to make a referral or an appointment, together with all the relevant background information of the caller. And to close the loop, the status of interaction between the caller and the expert consultant referred is monitored by the CSO periodically.

There are several services available from PSB to do with product innovation but they all involve contract product development services being carried out by PSB personnel on behalf of SMEs. PSB has a one-stop design centre offering integrated product design and development services. The centre's expertise covers varied fields such as industrial design, mechanical design and electronic design, software design, prototyping and pre-production consultancy. It has the state of the art facilities and maintains strong links with R&D centres, suppliers and manufacturers. Local companies are encouraged to apply for development support through various incentive programs. However, at the time of writing it is not clear that of these concerns

to upgrade capabilities, or for specific issues and problems relating to productivity, production management, testing and assessment etc.

Appendix JJ

Matched Funding Scheme

Matching funds are provided by NSTB to match the cash contribution from R&D partners collaborating with the RICs, according to the ratios given below:

R&D Partners	Matched Funding Ratio
Locally based Small & Medium Enterprise (SME)	2.0
Locally based Large Enterprise (LE)	1.0
Public Sector Agency *	0.5

* except funding agencies and agencies funded by NSTB

Only the qualifying components of the cash contribution from the R&D partners are eligible for the matched funding. Qualifying components consist of all value-added R&D activities undertaken by the RICs, including the following

- a) expenditure on manpower
- b) expenditure on consumables, materials, and services
- c) purchase of equipment that will reside in the RICs, and not transferred to the R&D partner.

The following items are excluded from the qualifying components

- a) purchase of equipment/hardware that will be transferred to the R&D partner
- b) purchase of technologies through licensing, royalties, etc.
- c) subcontract of R&D and consultancy activities to external parties
- d) fees paid by the R&D partner for consultancy, training, services (such as failure analysis), courses and seminars.

For each industry partner, the maximum amount of matching fund that NSTB will grant to the RIC will be capped at S\$1M per financial year.

There is no information available on application to acceptance ratios, nor on the overall size of the fund disbursed through this scheme.

Appendix KK

NSTB-National Research Council (NRC) Joint Research Program

Preference will be given to projects involving industry co-operation. Applicants were encouraged to have a minimum 30% industry contribution for the project. Project selection criteria include

- Status of Technology Development
- Rationale for Co-operation
- Quality of Scientific and Engineering Research
- Level of Industry Involvement
- Benefits of Project
- Industry Development
- Technology Capability Building
- Manpower Development
- Commercialisation of Research Results
- IP Usage and Ownership
- Budget Requested
- Project Management.

A maximum of S\$300,000 for three years is expected to be provided for the Singapore component of the project, and Can\$300,000 for the Canadian component over the same period. This funding can be augmented by industry or other organisations (e.g. public sector). The management of intellectual property (IP) between the researchers and any external parties involved should be clearly defined after project funding has been approved and before the commencement date of the project. Once an agreement on the management of IP is reached among all participants involved in the collaboration, funds will be released. In terms of confidentiality and publication of results, the NSTB and NRC have the final decision concerning disclosure into the public domain, taking into account restrictions imposed by confidentiality agreements, patents etc.

8 Sweden

Appendix LL

Almi development companies

In total Almi employs 554 staff, of which 20 in the Mother Company in Stockholm and the rest of staff is located in regional companies across the country. The structure of the company reflects the fact that the conditions for business development and managing SMEs vary from region to region. Each one of the 22 Almi companies are familiar with local conditions and plan their activities based on local variations. All regional Almi companies are owned by the parent company (51%) and by the county council in which they are located (49%). This ties Almi's organisation strongly to the regional level while providing full national coverage. Representatives from the Almi parent company, the county councils and the business community form the board of directors of each regional company.

Marketing and customer interface

Almi has adopted a proactive marketing approach to be able to target effectively the Swedish SMEs. Regional companies are developing their service offer independently so that the specific needs of the industrial base can be met in every part of the Sweden. At the moment 2/3 of the customers are service and trading businesses and 1/3 are traditional manufacturing firms. Almi Stockholm has very limited offer of advisory services because private sector can cater these needs effectively within the area. Instead Almi Stockholm is focused on pre-seed and seed financing, for new technology firms which are very important part of the industrial structure within the region. This is typical development in the areas, which have a strong university and research infrastructure. The aim is that Almi offer is complementary to private sector offer and also to the Nutek/Vinnova approach. SMEs are the key client base of Almi whereas, according to Almi, the Department of Industry is the most important customer to Nutek/Vinnova programs. Of all 625,000 enterprises, only 740 employ more than 250 people. 95% of Swedish businesses have fewer than 10 employees, while 443,000 individuals are self-employed. Typical clients have fewer than 20 employees.

Almi representatives meet around 100,000 SME owner-managers and potential entrepreneurs each year. Of these, some 24,000 become involved in the agency's development programs. Almi is also involved in the evaluation of approximately 3,500 new technology concepts and products annually and it contributes financially to some 2,000 innovations. In 1998, Almi extended credit to nearly 2,700 client companies of which 834 were loans for women entrepreneurs, 798 were start-up loans and 1,000 were loans for expanding SMEs. In total Almi handles annually 14,700 loans. Almi also has a significant role in helping start-ups and SMEs in gaining access to third party financing including business angels, banks, venture capital companies.

Almi Financing

There are three main types of loans:

	% of borrowings	% of granted loans
Loans for start-ups	33.0	39.0
Loans for growing companies	58.0	30.5
Loans for female entrepreneurs	9.0	30.5

Having analysed client company's current status, business concept and market potential, Almi contributes approximately 20% of the total funding required. The company's business plan, together with the Almi funding, is aimed to work as a door opener for commercial financing. Ideally the bank gains a good client with growth potential and the SME gains a reliable, commercial bank contact. The leverage effect of Almi financing is significant. Commercial banks benefit from the comprehensive evaluation work that Almi conducts on the potential customers because they can use this information in making their own loan decision. Each Swedish crown borrowed from Almi generates, on average, four additional crowns from commercial banks.

The rejection rate of loan applications is very low because of the planning and preparation work that Almi representatives and customer go through before the application is submitted. The rate of unperforming loans is 7 to 8 % of all borrowings (amount of money). The target is 5 % but it is difficult to achieve this level as long as Almi continues to operate in its current role bearing the highest risk element of customers financing. Regional companies are developing business angel networks within their areas and act as a broker between SMEs and business angels. Currently this third party financing market is not very important but it is growing following the needs of new technology based businesses.

Among many management development services Almi offers:

- management programs,
- business-development consultation,
- advice on how to work efficiently with a board of directors
- an extensive program for international business development.
- regional advisory boards for new technologies and product-development issues, quality- and environmental-assessment
- management mentoring and,
- network building.

The leading principle is that offered services should not compete with existing commercial services. Instead Almi develops and initiates programs on the areas where no commercial alternatives are available. In the event local commercial services begin to emerge, Almi reduces its effort in the field. In general terms, Almi's role is to be a partner for dialogue. It seeks to stimulate, motivate and drive SMEs for growth and development by making the appropriate development tools available.

Appendix MM

Vinnova financing data base

The data searches for available financing can be selected from a number of alternatives such as:

- Searches from risk capital data base
- Financing for a specific type of investment
- Financing for a specific type of business enterprise
- Financing for start-up
- List of available types of financing organisations
- List of available financing in each category
- Regionally based financing opportunities
- Information on the regional support areas
- Some examples of data searches are presented below.

New R&D performer in the capital region.

Du har gjort följande urval:

Projektvärde:	Upp till 1 miljon kr
Syfte:	Teknologi/innovationer/FoU Elektronik/optronik FoU , Utveckling av innovativa produkter/processer/metoder
Företagsålder:	Över 2 år
Antal anställda:	51–100
Årsomsättning:	Upp till 50 miljoner kr
Län:	Stockholms län
Kommun:	Täby
Bransch:	Tillverkning Metallframställning och metallvarutillverkning
Finansiär, Finansiering	Finansieringstyp

NUTEK, Verket för näringslivsutveckling	
EUREKA (bidrag till kontaktresor och definitionsfas)	Bidrag
EUREKA (finansiering mot royalty)	Villkorslån
EUREKA (villkorslån)	Villkorslån
Såddfinansiering/Teknikbaserad affärsutveckling	Garanti, Kapital mot royalty, Villkorslån
Stiftelsen Innovationscentrum (SIC)	
Stöd till kommersiella utvecklingsprojekt	Bidrag, Villkorslån

SME performing R&D in Västerbotten Län.

Du har gjort följande urval:

Syfte:	Teknologi/innovationer/FoU Bioteknik/biomedicin och hälsa FoU , Tekniköverföring/spridning av FoU-resultat, Utveckling av innovativa produkter/processer/metoder
Företagsålder:	Upp till 1 år
Antal anställda:	0–50
Län:	Västerbottens län
Kommun:	Skellefteå
Bransch:	Tillverkning Livsmedels- och dryckesvarufremställning
Finansiär, Finansiering	Finansieringstyp

NUTEK, Verket för näringslivsutveckling	
EUREKA (bidrag till kontaktresor och definitionsfas)	Bidrag
EUREKA (finansiering mot royalty)	Villkorlån
EUREKA (villkorlån)	Villkorlån
Internationellt tekniksamarbete (SMINT)	Bidrag
Såddfinansiering/Teknikbaserad affärsutveckling	Garanti, Kapital mot royalty, Villkorlån
Nordisk Industrifond	
Bidrag till industriell FoU	Bidrag
Nordiska Investeringsbanken	
Lån till miljö, energi, infrastruktur & FoU-Norden	Lån/kredit
Stiftelsen Innovationscentrum (SIC)	
Stöd till kommersiella utvecklingsprojekt	Bidrag, Villkorlån
Svensk-Norsk Industrifond (SNI)	
Finansiering av industriella utvecklingsprojekt	Villkorlån
VINNOVA, Verket för Innovationssystem	
Stöd till forskning	Bidrag

Appendix NN

Swedish innovation policy and regional development

Gemensam skrivelse 2001-05-14

VINNOVA dnr: 2001/04888

NUTEK dnr: 50-2001-1631

Regeringen

Utbildningsdepartementet

Näringsdepartementet

103 33 STOCKHOLM

Nya tillväxtregioner – ett nationellt program för innovationssystem och kluster

NUTEK och VINNOVA för en kontinuerlig dialog om konkret samarbete med utgångspunkt i respektive myndighets uppgifter. ISA, Invest in Sweden Agency, är en viktig dialogpartner i detta sammanhang. Ett antal områden har identifierats som särskilt intressanta och bearbetas vidare. Det råder en gemensam grundsyn främst rörande behovet av ett nationellt program för att underlätta utvecklingen av nya tillväxtregioner. Ett sådant program skall betraktas som en nationell ambition att utveckla en politik med utgångspunkt i behov inom olika sektorer och branscher. Programts konkreta mål, innehåll, omfattning, uppläggning, genomförande och utvärdering skall bestämmas i en dialog mellan företrädare för näringslivet, FoU-institutioner samt ansvariga politiker och myndigheter.

Den traditionella svenska näringspolitiken domineras fortfarande av stöd till enskilda företag och till näringslivsrelevant FoU. En tydligare satsning på innovationssystem och kluster ligger i linje med regionernas preferenser och överensstämmer med de numera utvecklingsledande regionerna i Europa. Ett exempel är att kraftfulla insatser styrs till de bästa förslagen utvalda i konkurrens. I detta sammanhang prioriteras projekt som karaktäriseras av tillväxtpotential, kvalificerad forskningsmiljö samt affärs- och utvecklingsinriktat nätverkssamarbete. Avgörande för framgång i sådana satsningar är att de genereras och drivs av engagerade företrädare för näringsliv, forskning och samhälle.

Jämfört med andra länder ligger Sverige på en låg nivå när det gäller att tillämpa ett systemperspektiv på tillväxt- och näringspolitik. Detta framgår inte minst av erfarenheterna från sju års försök med EU:s strukturfonder. Behovet av ett nationellt program för innovationssystem och kluster i regionerna understryks ytterligare av den nyligen framlagda rapporten om tillväxtavtalen (Ds 2001:15). I rapporten framhålls regionernas utbredda efterfrågan på sådana sats-

ningar. En gemensam fokusering på nya tillväxtregioner – i partnerskapet, näringslivet, högskolan och politiken – som tar sin utgångspunkt i varje regions unika möjligheter att utveckla en global konkurrenskraft kommer enligt VINNOVA:s och NUTEK:s uppfattning att stimulera dialogen mellan den nationella nivån och regionerna. Inte minst viktigt är att en sådan dialog fortlöpande kan innebära en mer dynamisk ansvarsfördelning mellan dessa nivåer. NUTEK och VINNOVA har som ambition att under juni 2001 återkomma till regeringen med förslag om hur ett nationellt program för nya tillväxtregioner bör utformas. Det gemensamma programmet baseras på följande förutsättningar för innovationssystem och kluster

- Företag med gemensamma utvecklingsbetingelser har ett behov av att samverka.
- Samverkan kan ske i geografiskt täta miljöer med regional specialisering eller i geografiskt obundna leverantörsnätverk
- Många organisationer som arbetar med FoU, kompetens och teknikförsörjning ingår i dessa system
- Regional utvecklingskraft genereras i FoU-miljö, industridistrikt och starkast i en kombination av båda
- För att regionala innovationssystem och kluster av detta slag ska nå full kraft krävs emellertid också
- Aktiv medverkan från och samverkan mellan företrädare för offentliga verksamheter på alla nivåer. En särskilt viktig uppgift för statsmakterna är att förstå och främja regionala innovationssystem och kluster
- Statligt stöd genom analyser, kvalitetsgranskning och FoU-finansiering – särskilt till profilerad forskning som kan göras internationellt konkurrenskraftig och aktivt bidra till utveckling av näringsliv och samhälle i regionerna
- De näringspolitiska instrumenten, d.v.s. företagsstöd och projektstöd etc. anpassas i ökad utsträckning till att stödja system.

VINNOVA och NUTEK är angelägna att redan nu markera vikten av att i det nationella programmet bjuda in hela den berörda mångfalden av aktörer, dels inom närings- och arbetslivet, dels inom forskning, utveckling och utbildning, dels inom politiken och den politiskt styrda samhällsförvaltningen. Avsikten är att redan från början ta tillvara aktörsgruppernas drivkrafter och kompetenser i förberedelsearbetet. Därigenom kan programförslaget få en stark och väl balanserad uppslutning. NUTEK och VINNOVA kommer att presentera ett förslag till nationellt program för innovationssystem och kluster som bygger på att statsmakterna ska förstå och ekonomiskt stötta denna satsning. Även om nuvarande näringspolitiska instrument utvecklas mot att vara systemstödande är den preliminära bedömningen att detta kommer att ta avsevärd tid. Initialt krävs därför viss medelsanvisning. Inom befintliga budgetramar kan satsningar av det slag som nu aktualiseras endast göras i mycket begränsande utsträckning.

Appendix 00

Technology Transfer Foundations

Technology Transfer Foundations are a time limited project which acts as catalysts of change. The aim is to develop a fertile ground for the commercialisation of research by developing university administration and other bridging mechanisms. Although the funds operate only a limited time the changes are intended to be permanent, e.g. structural changes within university administration.

Technology Transfer Foundations (TBS) represent a major national initiative in Sweden. Within the limits of their mandate TBS-foundations have a very independent position and they have authority to develop a wide range of activities. For instance, political influence through the budget process is not possible because the foundations own themselves and they have the capital in place until 2007. This means that Foundation for Technology Transfer (TBS) itself is a time limited project. The government enactment runs only until the year 2007, unless the plans are revised later on. After 2007, different regional development strategies for different foundations will be evaluated. (The first government evaluation of the foundations is to be ready during the spring 2001).

The seven regional Foundations for Technology Transfer were founded in 1994 by the Swedish Ministry of Industry and Trade. The foundations work mainly with the universities but also with other local actors promoting regional innovation systems. In total SEK 1 Bill was invested into funds until the end of 2007 when the inflation compensated funds need to be paid back to the government. TBS-foundations are located across the country in the main university areas of Sweden: Gothenburg, Linköping, Lulea, Lund, Stockholm, Umea, and Uppsala. These foundations cover the entire country, e.g., the Technology Transfer Foundation of Stockholm (TBSS) has a capital of SEK 400 Mill. and it operates in the counties of Stockholm, Södermanland and Gotland, with its base in the city of Stockholm.

Besides being a project in itself, all the TBSS operational activities within universities are based on projects of various size and length. This means that universities have a chance to get financing and sparring for a wide range of commercialisation related activities, provided they can present a good plan for the activities. These projects are also owned by the universities and the foundations role is mainly limited to seed money and assistance at the planning stage. One of the leading principles is that the foundation does not want to disturb the markets where they already do exist.

Financing the activities of the Stockholm Technology Transfer Foundation

The mission of each TBSS is to increase the industrial growth in the region by promoting knowledge transfer between industry and academy, including commercialisation of academic research and entrepreneurship among academics. TBSS has a strategic plan divided in three sections. Since the fund was started in 1994 until 1997 the initial innovation promotion were mainly based on ad hoc activities. The current period, very much characterised by project work, started in 1997 and will come to an end by 2002. All the projects will also have a cutting point at 2002, their results will be reviewed and the last five-year period will be started from a 'clean sheet'. Naturally some successful projects may be continued but this is not necessarily the case. One objective of the limited time project funding is to encourage them to seek external funding and to become self-supporting on their own right. All TBSS activities aim at self-supporting structures. The following incentives and policies are used to improve knowledge exchange between academy and industry

- Commercialisation functions for university-based ideas and innovations
- Simple and effective entrance functions for companies into universities
- Defined academic products and processes in line with industry needs.

The TBSS administrates SEK 400 million, given as a loan by the government until the end of 2007. The annual interest, about SEK 30–40 million is used to finance TBSS's projects and administration. The foundation does not engage in operational project activities but it has chosen to focus on the strengthening of the universities own organisations so that they become more capable of commercialisation and knowledge transfer, e.g. by creating links to industry, venture capital funds etc. About half of the annual budget goes to projects organised together with universities or university linked organisations. To qualify for support these organisations need to provide TBSS with a business plan and a strategy, which is in line with its own thinking. TBSS funding is mainly targeted to very early stages of enterprise formation, e.g., pre-seed, seed and applied research are supported.

Most applications that come to the final stage are funded because TBSS works closely with the applicant developing the proposal until it is ready for financing. Most projects meet about 80 % of the set operational targets and will thus receive full amount of the agreed support. Typical project funding is about SEK 500.000 but the projects do vary between SEK 30.000–2.000.000. The length of the support period depends on the needs of each individual project. The fund director can make the financing decisions as long as

they are in line with the strategy of the fund, that is supporting faster commercialisation of the research results. If the amount of applied money is exceptionally large the director will present the business plan for the board of directors, which meets 5 times a year. Typically the financing decisions take about 2 weeks but they can be made in 1 to 2 days if rapid response is required.

Activities of the TBS Stockholm

The Stockholm based foundation supports between 100 and 150 on-going projects financially. In many of the projects TBSS also acts as a discussion partner and advisor not just a grant awarding body. A distinctive feature of the foundation is that it is itself a time limited project and its support activities are also time limited. The foundation avoids setting up permanent structures because they are not seen as a way to promote innovation, which in itself contains an element of change. Large organisations also tend to develop a strong internal logic with its own agenda and resistance to change. Instead, projects create a great deal of flexibility for innovation promotion activities and a wide range of projects can be judged on their own merits.

The economy around Stockholm region is dominated by few large companies and a large number of very small businesses, of which 97 % employs less than 50 staff. At the same time academic competence is spread across several universities, research institutes and colleges. To improve knowledge transfer from the universities to businesses, and entrepreneurship within universities, a number of activities have been set up. Target groups and focus areas of TBSS activities include

- *Business sector* projects involve individual businesses, groups of businesses, industry- or employee organisations. The aim is to create interest and skills, which help businesses to utilise academic knowledge. The support can be in the form of grants, or subsidies that can be used for buying in academic knowledge
- *Bridging organisations* are facilitating the business process and competencies. The TBSS offers project financing and help in setting up new forms of co-operation between various actors. Both higher education and business organisations can be supported under this category
- *Higher education institutes* within and even outside of the region can participate projects under the framework agreements, provided they can offer required type of expertise
- *Information dissemination* is also among key activities of the TBSS. The yearly conference under the theme 'Knowledge from the higher education – engine of growth'. Is just one of the activities which include also regular publications and efforts to disseminate good practise of industry higher education co-operation.

Examples of TBS Stockholm projects

Framework agreements are in place with 9 universities including: Karolinska Institute, KTH, Stockholm University, Mälardalens University College, - Södertörns University College, Gotland University College och University College of Arts. With these agreements the educational institutions prioritise a number of projects which fall into the focus areas: entrepreneurship, commercialisation and co-operation with SMEs. The logic behind 4-year framework agreements is to facilitate long-term efforts in improving and creating new forms of co-operation between industry and higher education. The measures taken place under these contracts include

- Commercialisation of new knowledge
- SME-contact functions (help desks for SMEs)
- Entrepreneurial training of students
- Pre-incubators
- Early stage funding for development of business ideas
- SME-oriented proactive contact and marketing functions
- Technology focused networks between academic institutions and SME's in some areas of importance for the region
- Staff-exchange programs between SMEs and universities.

This so called 'third mission', commercialisation and communication with the wider society is based on the legislation in Sweden. The TBSS has adopted a role where it helps to set up projects, which build universities capabilities on performing the third mission. This happens by initiating structural changes, which can make the university administration more capable to the required tasks. These include:

- projects, which build universities, contact capabilities with the industry and markets; Technology parks, holding companies to handle IPR etc.
- incentives for the university staff and students to commercialise their inventions
- support for projects which help the inventors to develop their management capabilities
- assistance in setting up rules and policies for commercialisation.

The foundation focus is on the strategic level development with the universities. However, universities management capabilities are at an early development stage and hence TBSS is to some extent involved also on the project level management.

- *Competence bridge* is a non-cost matching service between SMEs and higher education institutions. TBSS has allocated SEK 5 Mill for this project. The project staff proactively contacting and visiting SMEs in order to engage them into co-operation with the universities. The

aim of these visits is to assess SMEs capabilities and offer them development contracts with the universities staff and students. So far 100 projects has been started and there seems to be demand for this type of development activities. However, the universities supply of services is still weak and further activities are needed to address this problem. University students are keen for this type of projects and also the management to some extent but researchers and teachers needs to be activated.

- *Grants* for SME employees for studies and research. These activities are tailored according to individual needs of each SME.
- *Network* program for knowledge driven growth. Businesses, especially SMEs, are introduced to the state of the art research, followed by second joint project by the research establishment and the business enterprise.
- *Commercialisation of research* – these projects are operated under the framework agreements jointly by the holding companies set up by the Royal Institute of Technology, Karolinska Institute and, Stockholm University.
- *Early stage business development* from business idea to business plan. This scheme offers grants for students, researchers and teachers for developing and testing their business ideas.
- *Entrepreneurship among academics*. Supports enterprise friendly milieu on campuses, courses on entrepreneurship, business plan development etc. Stockholm School of Entrepreneurship (SSE) is a joint KTH holding company (operates technology parks), Stockholm School of Economics and Karolinska Institutet. SSE offers students and academics courses, meeting point and practical help in setting up enterprises.
- *Support for student projects* on entrepreneurship and co-operation with SMEs.
- *Information*. Seminars and conferences under the theme: ‘Knowledge based growth’. Publishing activities: magazine, information material and research reports.
- *Stockholm academic forum for knowledge* is a joint help desk for businesses. Stockholm Universities are piloting a meeting place for knowledge – Stockholm Academic Forum at Kulturhuset, Stockholm. The participants in Stockholm Academic Forum are six regional Universities: HHS – Stockholm School of Economics, KI – Karolinska Institute, KTH – Royal Institute of Technology, LHS – Stockholm Institute of Education, Stockholm University and SH – Södertörns University College.

One important aim of the above-described activities is to provide SMEs an easier access to the university research. This is a key future development area for TBSS. It will offer more funding and support for this type of SME oriented help desk activities provided an agreement on the development strategy is reached with the universities. The businesses can access the services by phone every working day between 10am and 4 pm. The contact person will then, together

with the client, create a profile for the problem at hand. This information will then be fed into the computer system. After this the customer service agent starts to look for a university researcher or a research group which can solve the problem. The customer will be issued a reference number, which they then can use in tracking the progress of their inquiry from the web service. <http://www.hogskolekontakt.org>. This initial service is free of charge but the university will charge from the further actions. E.g., if a development project is launched as a result of the inquiry. TBSS has limited co-operation with Vinnova which itself is specialised in financing industry related research and research institute activities. Currently the co-operation happens in three main areas

- *Competence bridge* – Vinnova works on certifying SME consultants
- *Network program* – TBSS has set up a competition for researchers who believe they have marketable knowledge. At the first stage TBSS allocated SEK 100.000 to 20 applicants. The most promising one’s are presented to Vinnova for further financing and development
- *Internet marketplace* – TBSS, City of Stockholm, Länsstyrelsen and Landstinget together have invested SEK 200 Mill on Stockholm Innovation Arena. This is an attempt to create a marketplace for innovation support with the help of a website which: lists public and private organisations, has links to other relevant organisations, has tools for matchmaking (financing etc.). Innovators will be issued vouchers, which they can use for buying in support from this marketplace. The key idea is to create market and competition on the supply of innovation support. Vinnova wants to expand this pilot scheme to a national program.

Some outcomes from the TBS initiatives

The program has created a number of outcomes of which the following list highlights the achievements during the year 2000

- *Competence bridge matching service* attracted 450 business customers, which created 110 new projects
- *The joint help desk for businesses* has taken off well and many higher education institutes are already participating into the project
- *Eight higher education establishments* had a joint stand at the BioTech Forum, Competence Fair and Technology Fair
- *Venture Cup business plan competition 99/00* attracted 442 teams. In the beginning of the competition there were 41 new start-ups which employed 159 staff, and had attracted SEK 100 Mill outside financing
- *Around forty projects* took place under the framework project

- Ten new business grants were awarded and they are now going through a development program
- Eight idea grants were awarded and piloted. The same amount of pilot projects were processed by the holding company
- Six pilot projects took place within the Network Program and another six institutions of KI and KTH became involved into phase-1 projects
- The foundation organised four thematic seminars and a growth conference. Magazine and home pages were also used in publicising the activities.

Appendix PP

The Swedish Industrial Development Fund – financing criterias

The risks must be balanced by sufficient remuneration - the greater the risk, the higher the required return of interest - often in combination with royalties. Profitability, market prospects, and risk levels are the most important factors when the Fund evaluates potential involvement. Projects, which are potentially extremely profitable, enjoy a greater chance of obtaining financing from the Fund. In addition,

the project or investment should include an innovative element, for example the application of new technology or new solutions in response to market demands. A link to the current business of the company is advantageous, since this increases the possibilities of reaching the intended market. Other financing criteria include

- The business is seeking growth via new products, processes or markets
- It has no more than 250 employees, or turnover is below SEK 400 Mill (exceptions are possible, e.g. Volvo Trucks and Volvo Aero have received financing)
- Unique business idea or product/process which can be protected by patent or other means
- The leadership and the board of the company must be capable and willing to pursue growth
- No more than 25 % of the shares can be owned by a large firm.

Financing decisions are made by the director of the fund or the board of directors in case of very large financial packages. The application process takes 2–6 months during which the applicant presents a business plan, which will be discussed and possibly revised before the decision. The Fund has legal obligation to retain absolute confidentiality and it can only finance Swedish enterprises.

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