Design measures to promote growth of young ~~research intensive~~research-intensive SMEs and start-ups

Preliminary report of the expert-group on SMEs

Second Cycle of the Open Method of Coordination for the Implementation of the 3% Action Plan

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Main recommendations of the OMC-SME expert group

The 'expert-group on SMEs', operating within the framework of the Second Cycle of the Open Method of Coordination for the implementation of the actions lines of the Action Plan 'Investing in Research: an Action Plan for Europe' (also called the '3% Action Plan'), has formulated a series of recommendations addressing the needs of ~~research intensive~~research-intensive SMEs and high-tech start-ups. The expert group focused its activities on ~~5~~ five topics considered as being key issues for an integrated approach of research and innovation policies in this field:

- Financing issues
- Improving management skills
- Collaboration with higher education
- Technology procurement
- Opportunities for high growth

The main conclusions and recommendations of the expert-group, as reported to CREST, are summarised ~~underneath~~below:

1. The **financing issues** for young ~~research intensive~~research-intensive SMEs are dominated by the worldwide ~~facts~~ reality of an existing "equity and financing gap" in the pre-seed and seed phases of ~~research intensive~~research-intensive SMEs. The private financial sector has good reason~~s~~ to be reluctant ~~for~~ to investing in these phases (€0,1 – €2,5 million euro), as ~~they seem to be, on average, not sufficiently profitable~~, as historical data ~~demonstrate~~ in Europe and in the United States tend to show that they are generally not sufficiently profitable. This "market failure" makes public measures imperative, as an adequate ~~sufficient~~ birth rate of these SMEs is vital for our sustained economic development.
   In p~~P~~art~~ly~~ this objective can be achieved by mobilising private funds, but ~~a~~ major public financing~~al funding in~~ by the Member States is inevitable. This can take different forms: subsidies; guarantee schemes; subordinated loans; equity, etc. Therefore, this implies higher risk taking for this funding but not necessarily a formal subsidy-equivalent, although this is recommendable in the start-up funding phase. The revision of the EU State Aid Rules on R&D, Innovation and Risk Capital are crucial for this context. " De minimis" can be of help in this respect and preferably with a higher amount than the actual allowed maximum of €100.000 subsidy-equivalent. Anyway, public funding has a temporary importance, as in the later stages of financing needs of innovative SMEs the private financial sector has to take over.

   Until now the Commission has been ~~too~~ overly restrictive on the possibilities for public authorities to be active ~~on~~ in providing venture capital. State aid rules ~~should~~ urgently need to be adapted and the possibilities for the EIB/ EIF and national/regional governments ~~to~~ should concentrate co-financing in majority publicly owned venture capital funds for the seed and early stages of young innovative SMEs. This is especially ~~of~~ importan~~t~~ce for the new MS, where a private venture capital sector still has to be developed. European co-funding is also important for cross-border initiatives of risk funding? of young innovative SMEs.

2. Finance is a necessary but not a sufficient condition for success of innovative start-ups. **Entrepreneurial and Management skills** are as vital. In fact ~~they are so~~this is true from the very start of a new SME. As a consequence, this ~~imposes o~~obligesn ~~policies in~~ the Member States to adopt policies of ~~provide~~ providing highly professional coaching

facilities ~~on~~ to develop management skills, as these are critical ~~for~~ to start-up success. In this regard, the opportunity ~~should be investigated~~ of a European academy for entrepreneurship, aimed at "training the trainers" as well as training the e~~E~~ntrepreneurs to world class level, ~~,~~ should be investigated.

Most important, policies should offer an **integrated approach** on both financing and coaching of management skills. Even more, in most cases, financing should be conditional on~~ed by~~ the acceptance by the start-up? of adequate coaching and the acceptance of an inevitable learning curve on a whole ~~diversity~~ range of management skills. The development of an innovative start-up has to ~~go through~~pass well-defined milestones. An integrated approach implies both the need ~~of~~ for ~~an~~ adequate coordination of policy levels ~~as well as~~and the need ~~of~~ to ~~streamlining~~ streamline the supply of competent advi~~c~~se and coaching services.

3. Open innovation, as the way of working together in **collaborative networks,** is the current challenge ~~of today~~ in the field of innovation practice. ~~Especially the r~~Research-intensive SMEs, in particular, can gain a lot by working together in collaborative networks with research institutes and other, mostly bigger, companies. Besides these ~~research intensive~~research-intensive SMEs, collaborating networks are also valuable for other types of innovative SMEs. In the policy design, it will be important to make? an appropriate **segmentation** of the SMEs, and adapt the ways of linking these SMEs to the knowledge world in a suitable way. For some segments it will even be necessary to build up the capacity for knowledge absorption as a prerequisite for collaboration.

In the preparation of R&D Programmes it is also recommended that ~~in a~~the preparatory phase should include a market and technology scan or **a foresight activity** ~~is included~~, where ~~also~~ SMEs are also participating actively in the process, in order to address their specific needs.

Important in this perspective is also the support for **demand-driven** knowledge platforms, where enterprises, research institutes and, in some case~~s~~, also public bodies can work together on strategic issues, with distinct societal or economic purposes. These generic knowledge platforms are the essential building blocks for the development of the core technology and the core business, which are crucial for creating a competitive economy in the MS, and hence also in the European Union. Support schemes for these platforms should impose clear conditions on the demand-driven approach.

However, between the wish to foster these collaborative networks, which should be a cornerstone of each innovation policy, ~~either~~ both in the MS ~~as~~ and in the EU, and ~~the~~ actual practice, there are a lot of hurdles that need to be overcome.

There is the need ~~of~~ to have~~having~~ some **guidelines** in the field of technology transfer, with a special focus on IP issues, building upon the work~~,~~ which has already been done in this field on EU-level. But it is also important that these guidelines ~~will~~ become ~~some~~ formal standards of some kind, ~~as~~ being endorsed by the MS and the EU. ~~Also T~~the establishment of an integrated European Patent can also be very helpful ~~to~~ in this regard.

It is important to align the policy of HEIs, especially concerning their mission towards the exploitation of research results, with ~~the~~ general R&D policy. Universities currently lack incentives to cooperate with SMEs that address~~ing~~ their research needs. By **changing the legal framework in which universities operate**, for example by gearing their third mission towards ~~the~~ societal needs in general, and the needs of industry in ~~specific~~particular, the research needs of SMEs could be better addressed. ~~In~~ From this viewpoint~~this perspective~~, it is also recommended to foster the setting up of professional Technology Transfer Offices at the universities.

Intermediairy organisations can play an important role in the match-making between the needs of the SMEs and the research organisations. However, the governance mechanisms by which the MS are sustaining theseis intermediairies must be kept efficient and effective.

Looking to the value chains of business, it is necessary that for the European Research Area to become as reality and that also for **cross-border** collaborative networks to becould easily be formed and sustained. Therefore, the EU could would be very helpfully to come up with financial incentives for those Member States which really open up their national/regional funding schemes for to cross-border cooperation.

4. **Technology procurement** is important for all innovative companies, but especially for the research intensiveresearch-intensive SMEs. Therefore, technology procurement should go beyond the stage of giving opportunities to new but proven technologies. Procurement should also provide the possibility of developing and demonstrating new technological solutions which are not yet available yet. For research intensiveresearch-intensive SMEs this would not only offer a more attractive financial opportunity that is more attractive than a classical subsidy scheme. It would also propose public authorities as "launching customers" by demonstrating new solutions in real conditions and thus favour the entry of into new markets. As this involves risk-taking, a clear political commitment is necessary.

   In several Member States, attractive and realistic schemes for Technology Procurement are actively being developed. Some are in the pilot phase and one is even actually operational (the SBRI-scheme in the UK). A lot of analysis has also been done on this behalf matter at the EC level if the EC. Networking and mutual learning are more than recommendable, for example by means of a dedicated OMC-Net, are highly recommendable.

   Technology procurement schemes have to be compatible with the new procurement regulations of the Commission. The defence sector of defence is differsent in this that respect, as it is not subjectmitted to the EU procurement regulations, and technology procurement is a well-known approach in the defence sector. There is a potential conflict between the purpose of the procurement regulations (finding the most economical solution) and the goal for stimulating innovation in general and innovative SMEs in particular. Unlike under state aid rules, procurement legislation there arecontains no provisions for innovation or innovative SMEs in the procurement legislation. There is an exception for R&D, but the scope of the exception is unclear. The Commission should take care ofsteps to clarifying and, if necessary, to improving improve the real actual opportunities for technology procurement in relation tounder its general procurement regulations, and especially on behalf of research intensiveresearch-intensive SMEs.

5. Europe is not lacking in inventiveness;, it is lackingbut in innovation. All European Member States support the development of small research intensiveresearch-intensive firms. But that support is often research-related, instead of beingnot innovation-focused, and driven by market needs and high market global growth. Also, it often ends when firms need to cross national frontiers, e.g. to find technology partners or to address larger niche markets.

   Nevertheless, is the **growth issue** is very important, s. Since only growth will bring welfare to the society. Therefore, it is very important to stimulate growth, and also the related internationalisation aspect, by means of the adequate appropriate instruments, which at the moment are lacking, also including aton the European level. All the issues developed by the Expert Group are , in particular, of vital importance for the high-growth

innovative SMEs and for the creation of potential new ones, in particular. However, the Expert Group has beenwas not unable to make clear further recommendations on how to design and implement specific HIGRO policy measures.

Paul Zeeuwts
Chair of the OMC-SMEs expert-group
On behalf on the experts involved

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Abbreviations

HPSU	High Potential Start-Up
SME	Small and Medium-sized Enterprise
HEI	Higher Education Institute
MNC	Multi-National Companies
NTBF	New Technology-Based Firms
NIS	National Innovation System
GDP	Gross Domestic Product
GERD	Gross Domestic Expenditure on R&D
GBOARD	Government Budget Outlays or Appropriations on R&D
BERD	Business expenditures on R&D
TTO	Technology Transfer Offices
PTP	Public Technology Procurement
PPP	Public Private Partnership

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Summary of the report of the OMC-SMEs expert-group

Background and Scope

This report describes the results of the work of the 'expert-group on SMEs' (OMC-SMEs expert-group). The expert-group operated within the framework of the Second Cycle of the Open Method of Coordination for the implementation of the actions lines of the Action Plan 'Investing in Research: an Action Plan for Europe' (also called the '3% Action Plan'), addressing Small and Medium-sized Enterprises (SMEs) and start-ups:

- Create more research intensiveresearch-intensive SMEs under favourable conditions (start-up, breeding, incubation)
- Facilitate their growth and internationalization
- Anchor/consolidate the ownership of these SMEs in local hands so that they can contribute to the national / local socio-economic welfare in a sustainable way
- Strengthen the involvement of these SMEs in R&D and innovation programmes

The OMC-SMEs expert-group of last year (the first OMC cycle) reviewed main developments in countries involved, and identified good / novel / bad practices and obstacles to progress (and the conditions for success / failure).
This year's expert-group aimed at providing 'support-/-guidelines on formulation of policy and programmes for young research intensiveresearch-intensive SMEs on a series of topics, thereby addressing specific problems and their solutions, but also issues concerning transferability'.

This year's expert-group has focussed her its activities on 'research intensiveresearch-intensive SMEs and high-tech start-ups'. It became clear during the initial discussion within the expert-group, that the concept of 'research intensiveresearch-intensive SMEs and high-tech start-ups' differed in the countries involved; policy makers use different terms and definitions when referring to this specific group. However, iIt was decided however not to define a specific description of the target group within the framework of this expert-group, in order in order not to exclude potentially interesting information (policy analysis, instruments) which would refer to a specifically defined group of high-tech SMEs and start-ups.

The topics for analysis and recommendations were identified during the first meeting, based on the experience of the senior policy experts involved in the expert-group. Young research intensiveresearch-intensive SMEs and start-ups play a vital role in the economy. They are a driving force for the development of new knowledge, and they play a key -role in the translation of new knowledge into products and applications. A solid and healthy population of young research intensiveresearch-intensive SMEs improves the competitiveness levels of a country. Therefore, there is a role for research and innovation policies to address the deficiencies in the process of creation of these enterprises. It was decided to focus on issues which hinder research--driven innovation: from the successful development and implementation of an idea into the market by high-tech start-ups, until up to further growth of research intensiveresearch-intensive SMEs: lack of financial resources in the seed and early

stage phase; lack of management skills; limited access to knowledge; high risks involved in research, and difficulties with further and sustainable growth, Therefore, the following issues have been identified as subject for further analysis:

- Financing seed and early stage phase: mobilizing private capital.
- Management skills.
- Collaborative research: links between HE and SMEs.
- Demand-driven R&D: public procurement.
- High-growth framework conditions for SMEs.

Because of the selection of topics identified, conclusions and recommendations are not limited solely to ~~just research intensive~~research-intensive SMEs and high-tech start-ups. They also address less developed SMEs, to "help them ~~'~~up on the technology ladder"~~'~~.

In order to meet the ~~objective of the~~ expert-group's objective, a methodology ~~has been~~was developed consisting of three different phases for each of the topics. For each topic, a specific country identified specific issues / problems concerning formulation and implementation of policy and instruments addressing the topic (presented as a Case), given the characteristics of its innovation system. As a Response, other countries presented their specific issues, but also solutions concerning the ~~identified~~ problems ~~as~~ identified by the country presenting the Case. Based on all this information, the experts in the group formulated recommendations concerning policy formulation and delivery, addressing the specific topic.

The following paragraphs ~~underneath~~ describe the identified problems resulting from market or system failure and some examples of policies addressing these problems. The last paragraph describes recommendations ~~on~~ at national policy level and European level for each of the identified issues, resulting from the analysis by the experts. Recommendations ~~on~~ at national policy level refer mainly to the development of national policy. Recommendations ~~on~~ at European level go beyond the interest of just individual countries, and refer to issues concerning policy formulation and implementation that require a pan-European approach.

Financing R&D intensive SMEs and high-tech start-ups

During their life cycle, starting from the development of an idea up to market introduction and further company growth, R&D intensive SMEs encounter specific problems. A particularly complicated problem which has~~ith~~ a ~~high~~ strong impact on success rate for young ~~research intensive~~research-intensive SMEs is sufficient access to capital. Limited access to financial resources results from market (or system) imperfections on a micro-economic, but also on a macro-economic scale:

- Small and medium sized enterprises in general have a ~~scale~~ disadvantage of scale in accessing the capital market. The costs (risk assessment, legal and administrative costs, supervision) of providing a small amount of finance are practically identical to the costs of providing a large amount.
- Furthermore, the risks of innovative, R&D intensive, fast growing SMEs, and especially start-ups are ~~for financiers~~ much more difficult for financiers to assess ~~when~~ compared to established, conventional and stable companies with track records. In many cases t~~T~~his results in R&D intensive SMEs and start-ups

receiving ~~in many cases~~ inadequate finance, thus decreasing their growth potential.

- Because of the higher risks and the generally long development times of their projects, high-tech start-ups have a problem attracting loans and venture capital for early stage growth. Literature mentions that based on experience, the anticipated Return On Investment (ROI) for these types of firms lies on average below 3%, which makes it rather unattractive for private investors.
- At the same time, venture capital and informal investors ~~experience~~ find that there is a lack of good propositions and management competences ~~at~~ in these companies, which leads to~~causes~~ untapped venture capital available among venture capital for young ~~research intensive~~research-intensive SMEs with interesting business cases.

This mismatch between venture capital supply and demand occurs particularly at the bottom end of the capital market. For instance, for high-tech start-ups an 'equity gap' has been noted between supply and demand that lie~~t~~s roughly between €100~~.~~ 000 and €2~~.~~,5 million per financing round.

The 'equity gap', or more generally the 'financing gap', differs for the different phases of the lifecycle of R&D intensive SMEs. Especially in the pre-seed and seed phases it is very difficult to mobilise capital. R&D intensive SMEs are therefore (throughout their life cycle)~~,~~ dependent on financing from own funds or those of family and friends (known in the business as 'friends, family and fools'), or traditional bank~~ing~~ loans. Analysis indicates that these ~~kind~~ types of funding are insufficient, and that the lack of alternatives is hindering the establishment of new ~~research intensive~~research-intensive SMEs, or further growth of this type of companies, which play an essential role in the revised Lisbon-ambitions of the EU Member States. Especially after the collapse of the technology bubble, the limitations of the venture capital market in providing early~~-~~-stage financing ha~~ves~~ become more pronounced. ~~—~~These types of market or system failure justify government~~al~~ intervention. Until now the European Commission has been (too) restrictive concerning State Aid rules on ~~risk~~ venture capital in relation ~~with~~ to the actual market conditions. This limits the possibilities for public authorities to be active ~~on~~ in mobilising venture capital towards the equity gap.

~~It is clear from h~~History shows that traditional and more generic governmental instruments (~~such as~~ for example, R&D schemes) do not properly address the (financial) needs of young ~~research intensive~~research-intensive SMEs. The public sector has an interest in addressing ~~the~~ market imperfection and therefore a variety of instruments ha~~ves~~ been developed and implemented across Europe which~~that~~ aim to improve ~~the~~ access to finance. These instruments have the following characteristics:

- Public-private-partnerships with financial intermediaries: these schemes mobilise (risk) capital in ~~different~~ various forms: venture capital funds, guarantee/subordinated loans schemes or combinations of these.
- Seed capital schemes are often embedded in 'service packages' that are focusing on facilitating people (i.e. mainly researchers) with promising business ideas to find sources of venture capital.

- The overall budget of these schemes ~~is very diverse~~varies considerably across the Member ~~States~~ States, ranging~~that ranges~~ from €5 million to €142 million, with an average size of about €60 ~~million~~ - €70 million.
- Also, the ~~size~~ level of funding varies a lot across the Member States: start-up projects can receive a funding/subsidy between €0.~~,~~1 million - €0.~~,~~5 million and early stage company financing up to € 2.~~,~~5 million. The funding is generally delivered through a combination of equity investment and second~~-~~-tier loans
- Frequently, regional business incubators ~~are participating~~take part in regional development funds investing in firms linked with public research at early stages that are often located in the incubator.

Management skills

Analysis indicates that young ~~research intensive~~research-intensive SMEs and start-ups are faced not only with problems concerning their financing, but also that they often lack entrepreneurial skills, resulting in the failure of potentially successful ideas and enterprises. Typically, young research-intensive companies are founded by scientists who were mainly (or still are) involved in carrying out research activities, and which have little or no ~~ne or very limited~~ experience in running a business, which requires quite different skills and attitudes. They would need specific support for developing and commercialising their products in the early stages of their life cycle to increase their survival rates.

The problem ~~concerning~~ with entrepreneurial skills is ~~results from~~ the tendency of (~~research intensive~~research-intensive) SMEs to under-invest in new and necessary competence. This may be explained by a number of hindrances and weaknesses found in the competence market, on both ~~on~~ the demand and the supply side. Some examples:

- Lack of capital for investments in competence development (high risk, no mortgage)
- Little awareness ~~and~~ or recognition of competence as a competitive edge
- Lack of information and knowledge about how to acquire necessary competence, and from whom
- Most suppliers in the competence market find larger enterprises and the public sector more attractive as clients than SMEs (who entail higher transition costs)
- The suppliers have often a poor understanding of the real competence need of the SMEs

The different countries analysed ~~offer~~ offer a variety of instruments ~~aimed at~~to address~~ing~~ these problems, targeting ~~at~~ young ~~research intensive~~research-intensive SMEs and start-ups. These ~~mostly indirect~~ measures, most of which are indirect, offer:

- Advice, which includes coaching (active and passive), mentoring, and networking programmes;
- Financial assistance for feasibility studies, market research studies, training, taking part in trade fairs ~~participation~~, etc.;
- Market research to help develop~~ing~~ their market entry strategy, ~~to~~ carry out product benchmarking, etc;

- Assistance with team building, training plans, courses and workshops, etc;
- Technology advice to help find~~ing~~ and adopt~~ing~~ best manufacturing and operations practices, to optimise the benefits of ICTs, etc.

One of the main characteristics~~features~~ of the above-mentioned support programmes is the~~at they are usually characterised by~~ relatively small amounts of support, as they only offer~~ing~~ about €50.000 - €150.000 per project. The average budget of these programmes is about €1 million - €2 million a year or €5 million - €20 million for a period of 3 - 5 years.

Collaborative research: links between HEIs and SMEs

~~An important~~A major weakness of the 'European Innovation System' is the lack of ~~inadequate~~ interaction~~s~~ between public and private actors; especially between SMEs and Higher Education Institutes. The quality of science and higher education is regarded as excellent, but it seems the actors are not able to commercialise the results of these efforts ('European Paradox'). Innovation~~-~~driven economic growth, however, requires optimal co-operation, and analysis indicates that there is plenty of scope~~a lot of opportunities~~ for improvement.

For policy makers, therefore, an important question ~~within the framework of this issue therefore becomes~~is: how can research-intensive SMEs create significant value from the technology, knowledge, and innovation potential of HEIs, and how to define policy guidelines or build public actions that substantially enhance the dissemination~~ffusion~~ of knowledge between business entities and academic institutions. The expert-group believes that, by creating more jobs and well-being, this knowledge transfer process will improve the competitiveness of young research-intensive SMEs and also the competitiveness and attractiveness of nations~~ by creating more jobs and well-being~~.

Collaborative research is defined ~~within the framework of~~in this report as a process of~~n~~ interaction ~~process~~ and exchange of knowledge between HEIs and SMEs in pursuit of a shared, collective, circumscribed~~bounded~~ goal. This definition ~~implies~~ also includes the possibility that individual entities may ~~also~~ have their own separate, unique objectives. The challenges and problems related to collaborative research can be categorized into cultural ~~issues (or in other~~i.e. ~~words~~ social~~social~~ capital~~)~~ issues~~)~~, structural ~~issues concerning structure~~ and human capital issues, ~~as well as~~and policy issues.

In relation to social capital issues, the following problems ~~have identified the~~ with present practices and policies have been identified:

- Lack of common language between academics and business people, ~~thus~~ resulting in an information gap between ~~the~~ researchers and SMEs.
- Lack of entrepreneurial training within higher education programmes
- Lack of innovation awareness ~~within most of the~~in most SMEs, as only a small fraction of SMEs ~~being~~ focus~~ed~~ on research and innovation.
- Lack of measures to foster the mobility of researchers between academia and enterprises.
- Lack of an open innovation culture within SMEs, relying on networks.

~~In relation to~~With regard to human capital issues and appropriate structures to support the collaborative links, the following problems have been identified:

- Lack of enterprise-oriented technology and knowledge transfer units at research institutions and universities, which would be familiar with specific SME problems.
- Inadequate resources for protecting intellectual property and technology transfer in HEIs, and also little expertise in the universities to evaluate inventions.
- Because of a lack of co-ordination, research by HEIs does not address the needs of i~~I~~ndustry. The reason for this 'coordination gap' ~~results from~~is that there is no ~~the absence of an~~ efficient network of well-informed intermediaries, such as business development companies and incubators.
- Lack of efficient public-private partnerships between HEIs, intermediaries, and SMEs.
- Lack of indicators to measure outputs of these intermediaries and to build efficient governance structures when public measures are used to support the intermediary organisations.
- Lack of resources for business development of innovations and weak focus on non-technological aspects in a development of a new product, process or service.

The input of the countries involved has also uncovered ~~problems concerning~~ policy ~~issue~~issuess:

- Limited strategic intelligence at RDTI policy level.
- Lack of industry~~-~~-led thematic actions.
- Lack of incentives for HEIs to address the needs of i~~I~~ndustry
- Challenge ~~to form~~of creating new forms of collaboration and business models.
- Incoherent legal framework of invention within member states, and hence problems ~~thus~~ related to:
  - Ownership of intellectual property rights.
  - Fair return on background knowledge of research organisations.
  - Dilemma of p~~P~~ublication versus protection~~ng~~ of IP ~~dilemma.~~
- Problems related to spin-off creation of academic institutes (especially financing problems, but also business competence problems).
- Internationalisation of national R&D programmes and openness of national clusters and centres of competence.
- Lack of appropriate actions for different segments of SMEs~~)~~.

The interactions between business and science take various forms in different countries, reflecting national specificities in institutional set-ups, regulatory frameworks, research financing, IPR regulation and in the status and mobility of researchers. Different models may work well, but they should be ~~understood~~ seen against the specific background of each ~~in every~~ country~~'s special context~~. The most frequently used instruments supporting collaborative research are: subsidies, fiscal incentives, the legal and regulatory framework and intermediaries.

Certain countries ~~within the framework of~~in this expert-group follow the US model, and are ~~with a strong~~ strongly pushing ~~on~~ for university technology offices and for generating significant revenue from university-industry collaboration. Other countries have strong, partially publicly funded academic laboratories which also operate~~ing also~~ at regional level, co-funded by regional governments. Research indicates that removing~~al of~~ regulatory barriers across the Member States can foster ~~greater~~ increased collaboration and interaction between business and academia, but other types of intervention~~s~~ are also ~~necessary~~needed. This includes supporting of interaction~~s~~ between researchers and businesses, which depend~~s~~s heavily on incentives. A number of European countries have gone ~~further than~~beyond deregulation and have launched programmes to address di~~e~~sincentives to human resource-based business-science interactions.

A r~~R~~ecent study shows that the share of ~~promotion~~ programmes to promote ~~fostering~~ collaborative research in the EU ~~as a percentage of government R&D financing varies~~ranges ~~within the EU from~~between 2% ~~to~~ and 11%~~.~~ of government R&D financing. Contract and collaborative research financed by industry for public research organisations is ~~at the~~ highest, at around 15 %. The ~~highest~~ largest share of contract and collaborative research for higher education institutions ~~lays~~ is around 10%.

Demand-driven R&D: public procurement

A major~~n important~~ factor hampering ~~barrier for~~ SMEs ~~to perform~~in carrying out R&D is the lack of resources to cover the risks of a research-oriented innovation process. Figures indicate that the bigger players on the market ~~perform~~ account for the largest share of R&D by i~~I~~ndustry. The outcome of an innovation process is difficult to manage and highly uncertain, resulting in a possible lack of resources to allocate~~d~~ for research. Within the scope of this expert-group, Public Technology Procurement has been discussed as an important instrument to increase efforts in R&D by SMEs by addressing the perceived risks involved, based on the results of the work of another EU expert-group. This group~~,~~ ~~which~~ identified Public Technology Procurement as the most powerful weapon in the armoury of policy instruments to achieve the Barcelona ~~3%~~ target for R&D of 3% ~~as a proportion~~ of GDP by 2010.

Technology procurement can be used in many ways. It can address a need on the part of the procuring organisation itself, other users or both. In all cases, however, the point of departure of technology procurement is an underlying socio-economic problem or need that ~~is~~ has not yet been resolved. In this way, technology procurement gives the possibility of developing and demonstrating new technological solutions that are not yet available ~~yet~~.

By means of PTP, a government will cover the costs for R&D ~~by the SME~~ performed by the SME ~~within the framework of the~~under the heading of procurement. Besides grants and loans, public technology procurement can be a powerful instrument to stimulate innovation. Technology procurement is important for all innovative companies, but especially for ~~the research intensive~~research-intensive SMEs. It allows ~~for~~ procuring organisations to ~~perform~~ act as 'launching customers' by demonstrating new solutions in real conditions, ~~and~~ thus ~~favour~~ favouring ~~the~~ entry into~~of~~ new markets. For ~~research intensive~~research-intensive SMEs it can therefore

offer a more attractive financial opportunity than a classical subsidy scheme. However, widespread structural commitment is required at the highest policy level. Using technology procurement means shifting from old and comfortable habits to a new method. Without this backup, it is difficult to get achieve the desired change in attitude.

A contract throughvia procurement has several advantages over the traditional subsidy. With a contract it is possible to fully fund the necessary R&D, regardless of whatthe phase of the research project is at (fundamental, industrial or pre-competitive), while state aid rules mean that a subsidy is always bound tied to a maximum percentage due to the state aid rules.
A contract is a two-way obligation. Subsidisation Subsidies involves fewer obligations and therefore provides less certainty make it less certain that the result will indeed in fact be achieved.

But However, as a consequenceresult, procurement contracts must comply with the procurement Ddirective 2004/18/EC on procurementG, and this restricts the possibilities scope for using PTP as an instrument for to stimulateing innovation.

Based on the experience from the countries participating in the Case, and also based on the literature, the following key -features can be identified for PTP schemes:

- Socio-economic needs are translated into performance or functional output-based criteria.
- As a basic IPR-concept, the supplier is assigned full ownership of IPR IPR, while the contracting government has the right of use rights.
- Offers obtained within the framework ofBids received as part of a PTP are not only be selected on the basis ofbased on their price alone;, but issues like such as stimulation ofng research and innovation within SMEs are also considered.
- PTP allows for the parallel development of different solutions addressing the identified needs to develop in parallelat the same time. In such cases it is preferable to communicate (long-term) government needs Early communication to the market of (long-term) governmental needs is preferred in that caseat an early stage. This allows the use of time to be used as a risk- controlling strategic parameter.
- A survey of market status and trends should be carried out survey and market evolution using foresightsight techniques should be carried out, for instancee.g. by means of a feasibility study.

The current practice of PTP indicates that problems / bottlenecks hindering the successful implementation of such a scheme are due not so much to the technology, the ideas or getting SMEs involved, but tothe European legislation. The main factor isMainly the uncertainty surroundingaround the public procurement directive: what is the status of contracts falling under the R&D exception and what are the possibilities for innovative SMEs?

The Ceurrent European procurement legislation is unclear on this point, and might require special provisions for research intensiveresearch-intensive / innovative SMEs. Such a policy would thean be in line with the objectives of the European Ceommunity and the Lisbon strategy. The argumentation for preferential treatment of SMEs under

the Community Framework for State Aid for research and development can similarly be applied ~~in relation~~ to the procurement regime.

Conditions supporting high ~~-~~growth of SMEs

Within the framework of the OMC-SMEs expert-group on SMEs, ~~also high growth~~ framework conditions for high growth of SMEs have also been discussed, as a logical next step in the development of ~~research intensive~~research-intensive SMEs and high-tech start-ups. However, due to limited resources (time), this issue has simply been ~~merely~~ introduced to the expert-group, ~~as~~ to stimulate~~an introduction to~~ further discussion, possibly within ~~the framework of~~ other expert-groups.

The weakness of economic growth in Europe suggests the need to look~~ing~~ for new ways of reinforced support especially for SMEs with high growth and innovation potential. This problem ~~demands~~ calls for new concepts of SME support. Limited resources ~~raise~~ give rise to the need for ~~an~~ effective and efficient use of public support instruments. ~~Under~~ From this perspective the group of high growth~~-~~-potential SMEs (HiGroSMEs) should be a very important target group for new innovation-related support instruments in Europe. ~~Unfolding~~ Rolling out the full potential of HiGroSMEs in Europe could be just the ~~appropriate~~ answer to the lack of growth and innovation in the European common market. ~~Such a~~A targeted 'pick-the-winner' approach of this kind also promises a better return ~~-~~on ~~-~~investment for public funding ~~in the field~~ of R&D ~~-~~policy.

Current research indicates that fast growth is ~~not only~~ an issue not only for young companies including start-ups (baby gazelles), but also for middle market companies (gazelles). P~~p~~olicies should address both target groups and take into account the specific and often different nature of problems affecting both types of companies. Concerning the first group, existing instruments should be improved in order to focus on those companies with a real growth potential. For the second group, ~~for~~ which have clearly identifiable ~~actual~~ problems related to growth ~~can be clearly stated~~, specific new support measures will have to be designed.

Supporting R&D will ~~remain~~ continue to be a central policy ~~subject~~issue, even if not all types of (potential) growth companies are affected and not always ~~and in~~at the same time ~~affected~~. However, consolidating the R&D basis of companies is crucial for future product development~~s~~. R&D activities ~~are to be considered~~should be seen as strategic investments and ~~should~~ therefore be ~~a subject of~~considered for support. As in many cases, the primary obstacles ~~of~~ to growth (and caused by growth) ~~only~~ are only in part caused ~~partially consist of~~by technological problems~~;~~, policies should also ~~include~~ consider~~also~~ financing, management skills, access to knowledge and investment~~s~~ in research. As innovation and the growth of companies are to a large extent determined by 'broader' conditions within and outside the company, the case for~~it should be assessed whether (further to project funding)~~ indirect support instruments (including fiscal incentives) in addition to project funding will have to be assessed.~~should be applied~~.

On the other hand, problems and support needs of HiGroSME seem to arise in different areas (or basic business functions) and at different stages ~~in~~ of the company life cycle. Therefore, it is necessary to~~must be~~ evaluate whether~~d if~~ the typical support

programme design (targeting a defined problem at a ~~defined~~specific ~~time point~~ moment in the company's development) is suited to~~able for~~ fast-growing companies.

Discussions in the OMC-SMEs expert-group have indicated that the problems ~~concerning~~ with high-growth framework conditions are apparent throughout Europe, and seem to be generic. However, the expert-group has not been able to ~~identify~~ come up with recommendations to further strengthen the position of HiGroSMEs, and therefore suggests additional analysis and research on the specific nature of the support needed by this ~~specific~~ particular group of SMEs.

Recommendations ~~on~~ at national policy level:

Based on the input from the experts representing the different countries involved in this expert-group on ~~research intensive~~research-intensive SMEs and high-tech start-ups, the following recommendations can be formulated which refer~~ring~~ mainly to the development of national policy.

Generic

- Addressing the needs of young ~~research intensive~~research-intensive SMEs and high-tech start-ups ~~requires~~ calls for an integrated approach, covering different kinds of areas ~~like~~such as: access to finance~~s~~, R&D support, coaching of management skills, use of incubators, etc.
- An 'integrated approach' requires co-ordination between the organizations involved not only in policy formulation, but also in policy delivery.
- Policy should be based on a thorough analysis of the system, addressing specific market failures, and referring to specific strengths and weaknesses.
- Clear goals and targets should be set for policy delivery and impact.

Financing

- When designing or evaluating ~~a publicly funded fund~~government funding schemes ~~aimed at~~to supporting R&D intensive SMEs and start-ups, ROI should not be the main consideration. Governments should consider the spill-over effects ~~to~~ on the economy as a whole.
- The specific role of the government is to address the market imperfection ~~,~~ the so-called equity gap - which lies between €100.000 and €2.500.000.
- Financial support from a government should focus on the early stages of the life cycle of the R&D intensive SME. The 'financing burden' must be transferred ~~in the run of~~during the life cycle of the SME~~,~~ towards the private sector.
- The private sector should be involved in the process of assessing investment opportunities resulting from a project proposal.

Skills

- Successful entrepreneurs should be ~~stimulated~~ encouraged to share their experience with young ~~research intensive~~research-intensive SMEs and start-ups as role models in specific training / coaching programmes.

- To secure a successful transfer of competence ~~transfer~~ to SMEs, qualified and trained trainers (coaches) should be used as 'change agents' and driving forces in ~~the~~ project implementation.
- Support should not be ~~limited~~ confined to providinge funding. Specific project milestones should be identified, and performance should be ~~evaluated~~ evaluated againstbased on these targets.

Research collaboration

- It is recommended that national R&D Programmes should enhance the different forms of collaboration in their programmes, with a special focus on the group of different segments of SMEs, ~~because of~~for~~f~~ additionality reasons.
- It is recommended that national R&D Programmes ~~should~~ be designed ~~in such a way that~~so as to ~~they~~ target the right group of SMEs. A better insight into the needs of the final clients of the programme, through segmentation of the target population, is recommended.
- Public intervention should be aimed at removing ~~try to lower~~ the barrier between SMEs and academia, taking into account the administrative burden of the public intervention in itself.
- In ~~the~~ preparingation ~~of~~ national R&D Programmes it is recommended that, ~~in a~~at the preparatory phase, a market and technology scan or a foresight activity is included, where ~~also~~ SMEs are also participating actively in the process.
- The active involvement of enterprises in collaborative research projects is very important and should be mandatory in stimulating partnerships. Adequate monitoring systems should be developed to follow~~-~~up this participation.
- It is important to align the policy of HEIs, especially concerning their mission towards the exploitation of research results, with the general R&D policy. Universities currently lack incentives to cooperate with SMEs addressing their research needs. By changing the legal framework in which universities operate, for example by gearing their third mission towards ~~the~~ societal needs in general, and the needs of industry ~~in specific~~in particular, the research needs ~~by~~ of SMEs could be better addressed. ~~In~~ From this perspective, it is also recommended ~~to foster~~that the setting up of professional TTOs at the universities should be fostered.
- There i's a clear need to facilitate the supply of qualified staff to support Innovation in SMEs, e.g. by introducing ~~such as the introduction of~~ mobility programmes to support postgraduates, PhD students, engineers, technicians carrying out innovation and R&D projects for SMEs as well as ~~provide~~ to cover staff costs. G~~-g~~rants are needed to allow SMEs to hire qualified staff, ~~on a time-limited basis~~for limited periods, ~~for~~ to undertak~~e~~ing innovation projects.
- It is recommended that ~~to set up~~ appropriate intermediary systems be set up to close the gap between the HEI and the enterprises. It is important to look carefully into the efficiency and effectiveness of this intermediary system. Therefore, the appropriate governance mechanisms have to be developed.
- In the design of the national programmes ~~take into account~~ the mechanisms ~~of~~ for opening~~-~~ up the programmes ~~for~~ to foreign participation need to be taken into account.~~.~~

Public Technology Procurement

- Widespread structural commitment is required at the highest policy level. Using technology procurement means shifting from old and comfortable habits to a more risk-taking approach. Without this backup, it is difficult to get the desired change in attitude.
- Legislative barriers thrown up by national procurement regulations should be ~~taken away~~removed. A very restrictive national procurement policy limits the possibilities of technology procurement and can lead to unnecessary administrative burdens

Recommendations on European level

Based on the input from the experts representing the different countries involved in this expert-group on ~~research intensive~~research-intensive SMEs and high-tech start-ups, the following recommendations can be formulated concerning policy formulation and implementation that require a pan-European approach.

Generic

- The Member States could learn from each other's solutions by means of further exchange of practices / policy learning.
- EU instruments should also provide an integrated approach towards ~~research intensive~~research-intensive SMEs and high-tech start-ups.

Financing

- The functioning of the EIF as a 'fund ~~for~~ of funds' on behalf of the EC is too limited ~~when where it refers to~~ funds with public co-investment are concerned, especially in the seed and pre-seed phase. These types of funds should also be included. Co-intervention and stimulating pan-European approaches by the EC are recommended
- Typically the area of financing of young ~~research intensive~~research-intensive SMEs is ~~typically~~ international, and national solutions are therefore often ~~sub-~~less than optimal. Stimulation ~~on~~ at EU level could address this problem by additional funding of the national instruments. This should allow the funds to operate (when needed) on an international level.
- Additional funding to top up~~of~~ funds initiated by national instruments also generates ~~furthermore~~ a higher volume / critical mass of the fund size, which improves its success rate and could lead to harmonisation~~s~~ of schemes and less market fragmentation.
- The regulations for SME investment, risk capital and guarantees are still not sufficient to address the 'equity gap'. State aid rules should be ~~modified~~ adapted to the actual market circumstances and be more flexible. Especially the widening / volatility of the equity gap, from €100.000 up to €2.~~,~~5 million nowadays, should be addressed.
- As aid to small innovative companies has little effect on international trade, the Commission could design much simpler state aid rules.

- The ‘de minimis’ regulation now allows ~~now for~~ support up to €100.000. ~~It~~ This figure should be adjusted, and allow for support up to the appropriate level of funding needed, especially for risk capital.

Skills

- The different Member States offer different solutions to address the lack of management skills and the demand for coaching of young ~~research intensive~~research-intensive SMEs and start-ups. The Member States could learn from each other’s solutions by means of further exchange of practices.
- The m~~M~~odern economy is globalising further and further, and so are the young ~~research intensive~~research-intensive SMEs and start-ups. Their specific needs for coaching or skills might no longer be met by the available knowledge / resources in their specific Member States. Therefore, the Member States could support the exchange of specific talents / competences, or even opening up of their programmes to young ~~research intensive~~research-intensive~~s~~ SMEs and start-ups. This requires however additional support / resources from EU programmes on entrepreneurship.
- As a consequence, this ~~imposes o~~demands ~~n~~ that policies both at Community level and in the Member States ~~to~~ should provide highly professional, ~~and~~ world-class coaching facilities on entrepreneurial and management skills, as these are critical for start-up success. ‘Training the trainers’ and training the entrepreneurs to world class is a key part of this objective. In this regard, the opportunity~~st~~ for creating a European A~~a~~cademy for Entrepreneurship should be investigated.

Public Technology Procurement

- The European Commission should clarify and, if necessary, improve the real opportunities for technology procurement ~~in relation to~~as part of its general procurement regulations concerning research, innovation and SMEs.
- The Member States and the EC have done a lot of analysis on technology procurement. Networking and mutual learning is therefore more than recommendable. The Member States would like to continue their efforts, for example by means of a dedicated OMC-Net on this topic.

High-growth framework conditions for SMEs

- Analysis indicates that problems concerning conditions for HiGroSMEs are generic throughout Europe. The expert-group has not been able to identify recommendations to further strengthen the position of HiGroSMEs, and therefore recommends additional analysis and research on the specific nature of the support needed by this specific group of SMEs.

Introduction

This report describes the results of the work of the 'expert-group on ~~research intensive~~research-intensive SMEs and start-ups'. The expert-group operates within the framework of the second cycle of the OMC-SMEs expert-group on the implementation of the action~~s~~ lines of the Action Plan 'Investing in Research: an Action Plan for Europe' (also called the '3% Action Plan'), addressing the needs of these specific SMEs and start-ups.

Background

The Lisbon Summit in 2000 introduced the 'Open Method of Co-ordination' (OMC) as an instrument for achieving convergence and trans-national learning in policy making in the EU. Following that, the Spring European Council in March 2003 (on~~after~~ a proposal ~~of~~ from the Competitiveness Council) ~~asked for the application of~~called for the OMC to be applied in order to support the achievement of the Barcelona goal ~~-~~(increase investment in research to 3% by 2010).

The Action Plan identifies a wide range of on~~-~~going and new actions that will contribute to the 3% Barcelona goal. Three core instruments ~~of~~ for implement~~ation of~~ these actions can be distinguished: (a) legislative measures or regulatory action by the Commission, (b) the Open Method of Coordination (OMC) and (c) awareness and stimulation actions undertaken by the Commission.

The Action Plan identifies 25 Actions where the OMC is to be applied. In this context, CREST has provided an operational interface to define and oversee the implementation of these actions. ~~Different~~ Various expert-groups have been established to support CREST, involving policy makers and experts of the different Member States, Associated States and Candidate Countries, ~~thereby~~ supported in this by the European Commission (EC), ~~whicho held~~ provides the secretariat.

Scope

The different expert-groups each address a selection of specific actions from the Action Plan. This report covers the results of the expert-group addressing specific actions aimed at SMEs:

- Create more ~~research intensive~~research-intensive SMEs under favourable conditions (start-up, breeding, incubation)
- Facilitate their growth and internationalization
- Anchor/consolidate the ownership of these SMEs in local hands so that they can contribute to the national / local socio-economic welfare in a sustainable way
- Strengthen the involvement of these SMEs in R&D and innovation programmes

The expert-groups involved in the implementation of the 25 Actions by means of the OMC operate in ~~a~~ one-year cycles. The expert-group addressing SMEs ~~of last year~~in 2005 (the first OMC cycle) reviewed the main developments in countries involved, and identified good/novel/bad practices and obstacles to progress (and the conditions for success /failure).

This year's expert-group aimed at providing 'support / guidelines on formulation of policy and programmes for young ~~research intensive~~research-intensive SMEs on a series of topics, thereby addressing specific problems and their solutions, but also issues concerning transferability~~'~~.

The expert-group was chaired by Belgium, represented by Paul Zeeuwts, president of the Institute for the Promotion of Innovation by Science and Technology in Flanders. Belgium was supported as chair by the Netherlands, represented by Jan Dexel of the Ministry of Economic Affairs.
The expert-group was ~~build up~~made up of ~~by~~ experts from the different countries involved (from the Member States, Candidate Countries and Associated Countries). Where~~n~~ relevant, country experts on specific issues were included in the expert-group.

The expert-group ~~has~~ focus~~s~~ed ~~her~~ its activities within the framework of this second OMC-cycle on '~~research intensive~~research-intensive SMEs and start-ups'. It became clear during the initial discussion within the expert-group~~,~~ that the concept of '~~research intensive~~research-intensive SMEs and 'start-ups' differed in the countries involved; Member States use different terms and definitions when referring to this specific group. However, i~~I~~t was decided ~~however~~ not to define a specific description of the target group within ~~the framework of~~ this expert-group, ~~in order in order~~so as not to exclude interesting information (policy analysis, instruments) which ~~would~~ might relate~~refer~~ to a specifically defined group of high-tech SMEs and start-ups.

T~~he t~~opics for analysis and recommendations were identified during the first meeting of the expert-group, based on the experience of the senior policy experts involved ~~in the expert group~~. It was decided to focus on issues which hinder research-~~-~~driven innovation: from the successful development and implementation of an idea into the market by high-tech start-ups, up to~~until~~ further growth of ~~research intensive~~research-intensive SMEs[1]:

- Financing seed and early stage phases: mobilizing private capital
- Pre-seed phase: management skills
- Collaborative research: links between HE and SMEs
- Demand-driven R&D: public procurement / SBIR
- High-growth framework conditions for SMEs

Methodology

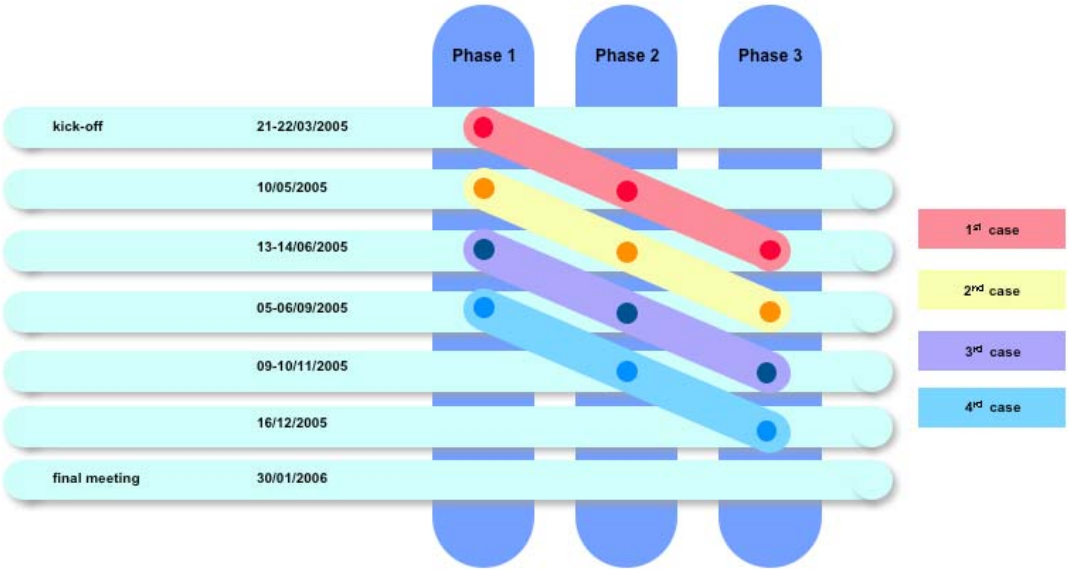
In order to meet the objective of the expert-group, a methodology ~~has been~~was developed consisting of three different phases for each of the topics. For each topic, a ~~specific~~ particular country identified specific issues~~—~~/~~—~~problems concerning formulation and implementation of policy and instruments addressing the topic (presented as a Case), given the characteristics of its innovation system. As a Response, other countries presented their specific issues, but also solutions concerning the ~~identified~~ problems ~~as~~ identified by the country presenting the Case.

[1] Because of the selection of topics identified, conclusions and recommendations are not limited to ~~just research intensive~~research-intensive SMEs and start-ups only. They also address less developed SMEs, to 'help them ~~'~~up on the technology ladder'.

Based on all this information, the experts in the group ~~formulated~~ put forward recommendations ~~concerning~~ on policy formulation and delivery which addressed~~ing~~ the specific topic.

The implementation of the methodology resulted in a series of meetings, ~~which~~ organised according to the following outline:

Figure 1: Methodology of the expert-group



Phase 1: Case presentation

1: Presentation by 'lead-country'

Each Case was introduced by a presentation ~~of~~ by the lead country, according to the following outline:

- Short description of the national innovation system, addressing strengths and weaknesses.
- Identification of a specific problem encountered by (young, ~~research intensive~~research-intensive) SMEs and start-ups in the 'Case-country', addressing a description and analysis of problems faced by SMEs itself (micro-level), and a description and analysis on a macro level: market failure (or system failure)
- Description of the impact of this problem on society (putting the problem 'in perspective'), thereby addressing the importance of SMEs in the economy (number of SMEs ~~in relation tot~~relative total companies; sectors they represent, success rate, etc.)
- Overview of reasons for the government to intervene, with a short description of the current 'policy mix' supporting the innovation system (focus, objectives, etc.), a short description of the current 'policy mix' supporting the young ~~research~~

~~intensive~~research-intensive SMEs and an analysis of why these efforts are not sufficient.

- Description of the actions already taken by the 'Case-country' ~~has already taken~~ to address the problem ~~as~~ described above, giving a description of policies and programmes: target group, methods~~odalities~~ of funding, budget, etc, with their results: impact (micro and macro), number of SMEs participating (as a share of total), etc.
- Description of problems (formulation ~~as well as~~and implementation).

2: Presentation IPTS

A representative of IPTS introduced a series of policies and actions in countries addressing specific issues/problems, based on desk research.

3: Discussion

Based on the previous presentation, the expert-group identified additional issues / problems concerning the Case in their specific countries, and from other countries, as well as 'Response-countries' and good practices for Phase 2

Phase 2: Response

In Phase 2, the 'Response countries' proposed ~~the~~ solutions to the problems as identified in the previous phase by the 'Case-country' and the experts.

1: Presentation of~~n~~ issues/problems by 'Case country'

Each Response started with a short summary of the results of phase 1 on the conclusions of preervious meeting, with a summary of issues/problems

2: Presentations by 'Response-countries'

In their presentation, the 'Response countries' addressed the issues as identified in Phase 1, with a presentation according to the following outline:

- Short description of the national innovation system, addressing strengths and weaknesses. This is to put the Response~~–~~ 'in perspective', to allow for possible transferability~~'~~.
- Short description and analysis of~~n~~ how the problem/issues ~~as~~ identified in Phase 1 play a role in the 'Response-country', thereby addressing problems ~~on~~ at micro-level faced by SMEs and macro-level (system/market failure).
- Short description of the impact of this problem on society, thereby addressing the importance of SMEs in the economy (number of SMEs in relation to~~t~~ total companies; sectors they represent, success rate, etc.), to allow transfer of results.
- Description of actions the 'Response-country' has taken to address the problem ~~as~~ described in Phase 1 by giving a description of policies and programmes: target group, methods~~odalities~~ of funding, budget, etc, and a description of results: number of SMEs participating (as a share of total), impact, etc.
- Assessment of the results of the actions taken by the 'Response-country' to address the problems ~~as~~ identified in Phase 1.
- Overview of 'lessons learned', and recommendations for successful policy design and delivery.

3: Discussion

Based on the presentations, the expert-group identified good practices and their transferability and conclusions and recommendations on support / guidelines on formulation of policy and programmes for young ~~research intensive~~research-intensive SMEs and start-ups.

Phase 3: Report on conclusions and Recommendations

On the basis of the Case and Response, a report is ~~formulated~~ drawn up following a similar outline to that~~as~~ presented above. The reports on each Case were presented in the meetings of the expert-group.

An exception concerning the application of the methodology is Case V on High-growth framework conditions for SMEs. This subject is also addressed in ~~different~~ various European working-groups. Due to the limited time, this Case ~~has been~~was merely introduced to the expert-group, in order to ~~address~~ examine recommendations for further analysis.

This report provides the results of the expert-group~~:~~ and an overview of the reports of the individual Cases, with an additional series of conclusions and recommendations ~~on~~ at national and European policy level.

1 Financing R&D intensive SMEs and start-ups

Young ~~research intensive~~research-intensive SMEs and start-ups play a vital role in the economy. They are a driving force for the development of new knowledge, and they play a key ~~-~~role in ~~the~~ translating~~on of~~ new knowledge into products and applications. A solid and healthy population of young ~~research intensive~~research-intensive SMEs improves the competitiveness levels of a country. It is therefore not surprising that the EU and its Member States are trying to optimise the framework conditions for ~~this type of~~ companies of this type.

During their life cycle, starting from the development of an idea to market introduction and further company growth, R&D ~~-~~intensive SMEs encounter specific problems caused by market imperfections and/or regulations. A particularly complicated problem, which has a significant ~~with a high~~ impact on the success rate ~~for~~ of young ~~research intensive~~research-intensive SMEs, is sufficient access to capital.
This chapter will address the problems concerning financing in the pre-seed and seed phases of young R&D intensive SMEs and start-ups, illustrated by the situation in the Netherlands, and their TechnoPartner Programme. The first phase of this programme was introduced in 2004.

This chapter will also describe the initiatives implemented by other countries, ~~but~~ in particular~~especially~~ Austria and Israel, addressing the issues ~~as~~ identified in the Netherlands' case~~for the Dutch Case~~ in order~~,~~ to improve the conditions for financing. Israel's success in its Venture Capital policies (with Venture Capital defined 'strictly' ~~in the sense of~~as early phase equity-based finance and support of high tech start ups) contrasts with the seemingly weak impact of policies adopted by other countries, including OECD countries[2]. The report covers the four active programmes addressing the financing needs of young ~~research intensive~~research-intensive SMEs and start-ups in Israel. The Austrian Response describes their Seed Financing Programme.

[2] Evolutionary Innovation and High Tech policy: what can we learn from the Israelis'~~s~~ targeting of Venture Capital, Gil Avnimelech, Moris Teubal, March 2005.

1.1 ~~Case of T~~the Netherlands~~'~~ case: TechnoPartner Programme[3]

1.1.1 Background: young ~~research intensive~~research-intensive SMEs in the Dutch NIS

~~T~~The ~~relatively small~~ economy of the Netherlands relatively small, it shows its strength ~~on~~ via indicators such as per capita GDP~~GDP/Capita~~, which has been one of the highest in the EU ~~is, already for quite~~for some years~~, amongst the highest in the EU~~. ~~And~~ Moreover, for most of the period ~~starting~~ from the end of the 1980s until the end of the 1990s, its GDP-growth has outpaced the European Union and OECD average.

The main driver for this economic growth has been the growth of employment / deployment of labour (factor-~~-~~driven growth) resulting from the so-called 'Dutch model' characterised by cost control and wage restraint.

The current global economic cyclical downturn~~rend~~ has hit the ~~Dutch~~ Netherlands economy hard, and ~~a~~ the low or even negative GDP-growth in recent years indicates a slow recovery. The~~is high~~ strong impact of the global economy on ~~the~~ national performance is ~~caused~~ due ~~by~~ to the specific structure and openness of the ~~Dutch~~ Netherlands economy. There are, however, ~~also~~ other more structural problems and developments which threaten the strong position of the Netherlands. This is reflected in ~~the~~ its performance on labour productivity (GDP per hour worked), which is ~~for the Netherlands is~~ among the highest in Europe. However, if we consider labour productivity growth in ~~the last~~recent years, the Netherlands scores on a par with~~amongst~~ the worst of its competitors. Statistics show an average growth in the Dutch business sector for the period 1990 - 2000 of 1.5%, compared to 2% in the OECD countries. Although labour productivity growth increased significantly in the first half of 2004 (3.~~,~~3%[4]), this is still lower than that of its main competitors, and ~~caused~~ mainly due to~~by~~ the fact that industry has rationalised its production process by decreasing its labour force, while ~~the~~ production already has increased slightly, due to initial recovery of the economy.

As a basis for future GDP-growth, factor-driven growth is reaching~~es~~ its limits; deployment of labour cannot be maximised further, especially with an ageing population. Increasingly, GDP-growth will have to be ~~realised more and more~~achieved through improving labour productivity by ~~increasing~~ stepping up efforts in R&D/innovation, and strengthening human capital: innovation-~~-~~driven GDP-g~~G~~rowth.

Analysis indicates that the current status of the Dutch Innovation System allows ~~for~~ a shift in focus to innovation-~~-~~driven growth. The innovative performance of the Netherlands can be regarded as good based on the various~~based on different~~ indicators (input, throughput ~~as well as~~and output): high quality of output of scientific research; high level of patenting, ~~high~~ large share of financing of public research by industry and ~~high~~ extensive use of ICT and access to its applications.

[3] Case presented by the Dutch experts, and Dinand Maas, Ministry of Economic Affairs expert on the TechnoPartner Programme.

[4] CBS statistical data, October 2004.

However, t~~T~~he Innovation System ~~however~~ is also characterised by specific features and (structural) problems that weaken the country's strong innovative performance; these ~~of the Netherlands, and which~~ have to be addressed if the Netherlands is to ~~in order to~~ move ahead from factor- driven growth:

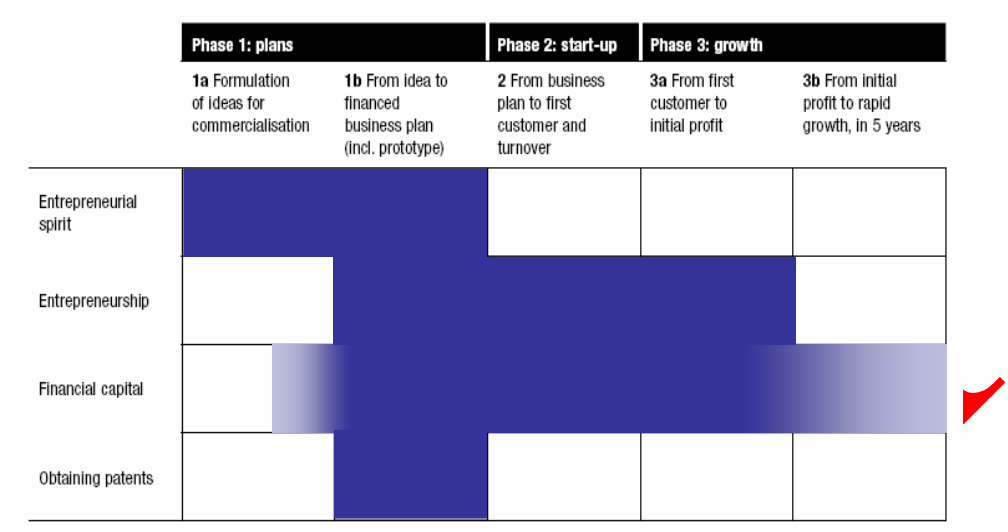
- T~~he~~ total financial efforts in R&D expenditure are stagnating~~.~~; ~~and especially~~in particular, business expenditure on R&D is lagging~~lags~~ behind compared to the main competitors.
- There is a~~n increasing~~ growing shortage of skilled personnel, especially in science and technology, caused mainly by a~~n inadequate~~ mismatch between outflow from education and demand by industry.
- There is ~~just~~ only limited interaction between the actors of the NIS, resulting in inadequate exploitation of research results. Collaboration between industry and public research infrastructure ~~seems~~ appears to be limited; just 5% of innovative firms report co-operation with universities (EU: 8%), 6% mention~~s~~ co-operation with research institutes (EU: 8%)[5].
- The Dutch economy is characterised by limited innovative entrepreneurial activity, as indicated by figures on market entry and exit. Also, the current figure ~~on~~ for~~number of~~ university spin-offs created annually is about 30% to 40% lower than for the main competitors (1.~~,~~95 spin-offs per 1000 employees in the Netherlands compared to 2.~~,~~53 for the main competitors)[6].
- There are problems concerning financing of (the early stages of) innovation. Venture c~~C~~apital, an important condition for successful entrepreneurial activities by starters, is not ~~well~~ readily available in the Netherlands. Indicators show an average score on 'High-tech venture capital investment'[7] (11th in EU-25), and on 'Early stage Venture Capital'[8] (10th in ~~the~~ EU-25). ~~Concerning~~ As for financing of the early stages of the innovation process, the Netherlands is laggings behind its competitors. Just 20% of total venture capital is spent on seed and start-up capital (compared to 34% in the EU)[9]. Much more worrying is the clear negative trend in the figures on financing of early-stage innovation, for all the indicators mentioned. Venture capitalists seem reluctant to invest in so-called high-tech start-ups before their actual product is ready for the market (~~the~~ so-called "second-round financing"). Not only high-tech start-ups, but also other small firms have problems financing the innovation process between 'proof of principle' and 'proven concept'. Financial institutions / sponsors seem reluctant to support single / complete innovative projects.

The problems ~~concerning~~ with financing are reflected in an analysis of the obstacles faced by high-tech start-ups that was conducted by the Ministry of Economic Affairs[10], based on surveys ~~among~~ of a large number of high-tech start-ups, meetings with experts in the field of high-tech start-up support, interviews with providers of

5 Kennis en economie, CBS, Voorburg / Heerlen, (2003), www.cbs.nl.
6 Researchers op ondernemerspad; Internationale benchmarkstudie naar spin-offs uit kennisinstellingen, Top Spin Internationaal (TSI) (2003), EZ-beleidsstudies, The Hague, June 2003.
7 European Innovation Scoreboard, EC, 2004.
8 European Innovation Scoreboard, EC, 2004.
9 Third European Report on Science and Technology Indicators, EC, 2003.
10 Policy Letter 'Action for Entrepreneurs', Ministry of Economic Affairs, 2003.

venture capital, literature research and a benchmark study among knowledge institutes.
The analysis shows that, regardless of the sector in which they operate, high-tech start-ups encounter a number of specific obstacles at a very early stage in their operations. Even before the start-up of the company, the prospective high-tech start-up is confronted with a number of barriers that frequently results in the cancellation of the actual start-up. The figure ~~underneath~~ below lists the obstacles faced by high-tech start-ups against the different phases in the lifecycle of a high-tech start-up.

Figure 2: Obstacles (coloured squares) faced by high tech start-ups, listed by lifecycle phase.

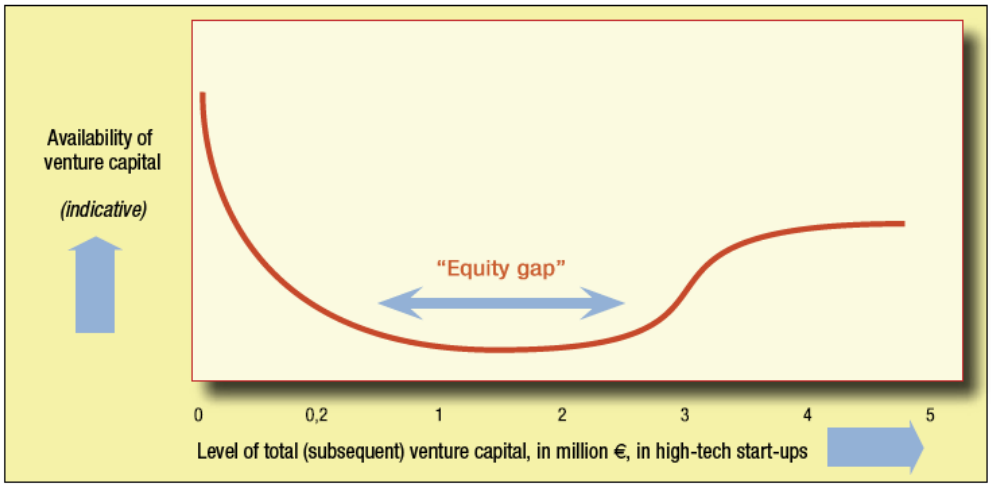


The problems ~~concerning~~ of financing faced by young ~~research intensive~~research-intensive SMEs can be explained by different reasons, resulting from market (or system) imperfections on a micro-economic, but also on a macro-economic scale:

- Small and medium-~~-~~sized enterprises in general have a scale disadvantage. The costs (risk assessment, legal and administrative costs, supervision) of providing a small amount of finance are practically identical to providing a large amount for a bigger company. Providing financial resources for SMEs ~~becomes~~ therefore becomes unattractive for financiers.
- For financiers t~~T~~he risks of innovative, R&D intensive, fast growing SMEs, and especially start-ups, are ~~for financiers~~ much more difficult to assess when compared to established, conventional and stable companies with track records. This results in R&D intensive SMEs and start-ups in many cases receiving ~~in many cases~~ inadequate finance, thus decreasing their growth potential. A Dutch study shows that 20% of (potential) fast growing SMEs get inadequate finance, which ~~results in a~~ substantially ~~decreasing~~ reduces their growth potential. ~~The share of the number of~~ SMEs ~~companies~~ make up over ~~in the Dutch economy is more than~~ 95%~~,~~ of the Dutch economy ~~representing~~ and account for more than 50% of the added value.
- Because of the higher risks and the generally long development times of their projects, high-tech start-ups have a problem attracting venture capital. At the same time, venture capital and informal investors ~~experience~~ are not finding enough~~a lack of~~ good propositions, which means there is still untapped venture capital available ~~among venture capital~~. This mismatch between venture capital supply and demand occurs particularly at the bottom end of the capital market: a ‘gap’ ~~has been identified~~ between supply and demand has been identified that is roughly between €100.000 and €2.500.000 per financing round. This concerns mainly the

first and second financing rounds of a high-tech start-up. As a result, the majority (63%) of high-tech start-ups ~~(63%)~~ must find financing from own funds or those of family and friends (known in the business as 'friends, family and fools').

Figure 3: Schematic representation of the 'equity gap' among Dutch high-tech start-ups.



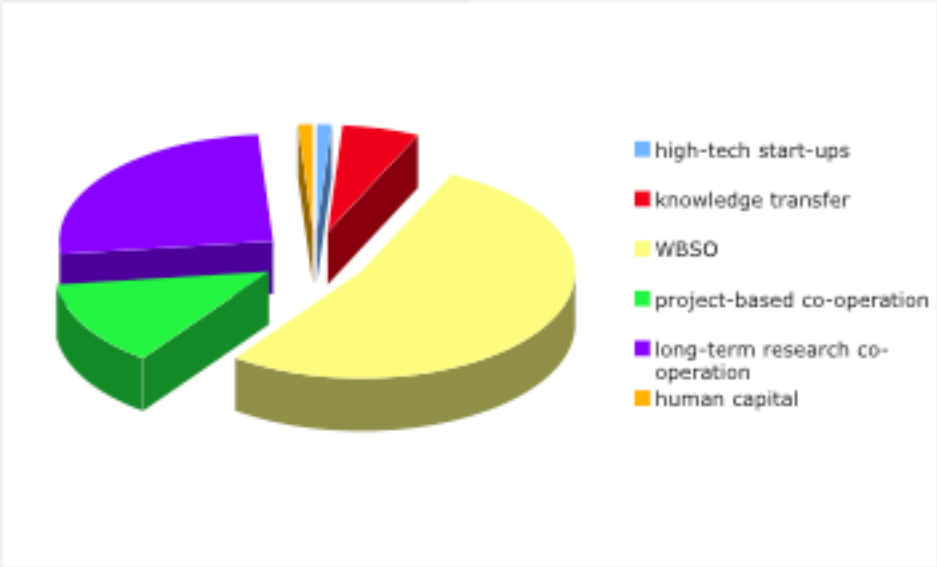
Source: NVP, European Commission and external consultations Ministry of Economic Affairs.

1.1.2 Actions: a long history of supporting high-tech start-ups

The Netherlands supports its Innovation System by means of a wide mix of different instruments, covering all aspects and stakeholders[11]. The instruments supporting industry-oriented innovation are mainly generic, and focus on the 'front-end' of the innovation policy (research, research co-operation, etc.). The biggest instrument is the WBSO, a fiscal measure, which reduces wage taxes and social security contributions (budget €428 million in 2005).

[11] The Dutch policy mix has been identified as a good practice in the 'OMC-expert Group on Policy Mixes' in 2004. This mix can be divided into different building blocks: Framework Conditions (IPR, supply of HRST, venture capital markets, etc.), Business R&D (fiscal scheme, public support to SMEs, R&D collaboration), Industry Science Interface (centres of excellence, long-term R&D collaboration, university spin-offs, focus on key-technologies, etc.) and Science Policy (research excellence, focus and concentration, etc.).

Figure 4: Share per measure of total budget of industry-oriented innovation instruments supporting the Dutch Innovation System[12]



The Netherlands has a long history ~~in~~ of government policy addressing 'Seed Finance', with a strong emphasis on generic SME~~-~~-oriented financing schemes through private sector financing institutions. The first loan guarantee scheme ~~is dated from~~dates back to the beginning of the ~~previous~~ last century, and this particular scheme still exists. The ~~goal~~ purpose of the scheme is to facilitate financing by banks, by providing a 50% guarantee on bank loans to SMEs (with a 3% risk premium in return: guarantees up to €1 million).

In 1996, the scheme was reinforced: a window for innovative companies and for start-ups was added, providing a ~~2/3~~two-thirds guarantee (for start ups, up to €100.000). The innovation window was ~~only~~ used in only a few cases, compared with the ~~on average~~ 2.500 cases per year on average, representing a guarantee amount of €360 million. Most innovative companies use the general scheme. At e~~E~~nd 2004, the implementation of the scheme was improved ~~with regard~~for ~~to~~ innovative companies, leading ~~in~~ to an impressive increase in the number of companies using the innovation window

In 1981 ~~also~~ a guarantee scheme for private equity and venture capital was also launched. The reason was the ~~almost~~ virtual absence of venture capital in the Netherlands at that time. The scheme was closed in 1994. At that time the Dutch private equity sector was ~~in relation to GDP~~ one of the biggest ~~of~~ in Europe in relation to GDP.

Because of the lack of start up and first stage venture capital, especially for R&D intensive companies, other schemes were started based on different approaches. One approach was to set up specialised 'techno-starter' funds. They ~~did not become~~were

[12] Based on figures from 2003 (Innovation Letter), not including BSIK.

not very ~~much of a~~ successful, primarily because they were limited to small investments (up to €500.000).
The other approach was sector~~-~~oriented. Quite a~~A rather~~ large ICT fund was set up ~~that was,~~ followed by the establishment of a biotechnology fund~~ establishment~~. Both funds operated as a kind of "fund of funds" and were part of programmes also addressing incubators, which were partly linked to the funds. The ICT fund started in the ICT bubble period and ~~did~~ performed just as badly as many private sector ICT funds at that time. The investment period is ~~presently~~ stopped at present and the management has been transferred to a private equity company. The Biotechnology fund is still operational.

~~Resulting from~~On the basis of a thorough analysis of the Dutch Innovation system, and a 'streamlining operation' of all the instruments supporting it, the Ministry of Economic Affairs and the Ministry of Education, Culture and Science~~,~~ implemented in the period 2004 - 2005 a dedicated programme for young ~~research intensive~~research-intensive SMEs entitled: 'TechnoPartner Action Programme: From Knowledge to Prosperity'. ~~This~~ The aim of this action programme ~~aims for an improvement of~~is to improve the ~~high tech start up~~[13] climate for high tech start-ups[14]. To realise these ambitions, TechnoPartner comprises an integrated[15] package of interrelated concrete actions:

- TechnoPartner Office will offer information and expertise and will create an ongoing inventory and agenda of the obstacles faced by high tech start-ups. The objective of the TechnoPartner Office is the 'origination and implementation' of high-tech start-up initiatives by ~~laying~~ establishing contacts and distributing information and best practices. The office also ~~executes~~ implements the TechnoPartner Knowledge Exploitation Subsidy Arrangement (SKE) and the TechnoPartner Seed Capital Scheme.
- The aim of TechnoPartner Knowledge Exploitation Subsidy Arrangement (SKE) ~~with its objective of~~is the quicker utilisation of scientific knowledge by high tech start-ups inside and outside the knowledge institutes. The SKE also includes a~~A~~ pre-seed facility that gives high~~-~~ tech start ups the option to put more time and energy into the phase prior to the actual start, and a patent facility that enables ~~an incr~~a more~~eased~~ 'professional' approach ~~of the~~to patents policy within the knowledge institutes, ~~all form part of the SKE~~.

  The starting point of the SKE arrangement is providing space for custom work. Regional initiatives in the area of Knowledge exploitation are given an extra boost. The SKE focuses on public private consorti~~ums~~a~~,~~ in which~~, per consortium,~~ a minimum of one public knowledge institute is represented per consortium; they can submit an application to take the knowledge exploitation in their region ~~on~~ to a higher level. ~~In the context~~ These consortiums can apply for subsidies for a

[13] The Dutch government defines / identifies high-tech start-ups as: new companies, not older than 5 years; founder(s) often has/have a higher level of education; commercialise products, processes or services that they have developed based on their own technological inventions or by means of a new combination of existing technologies.

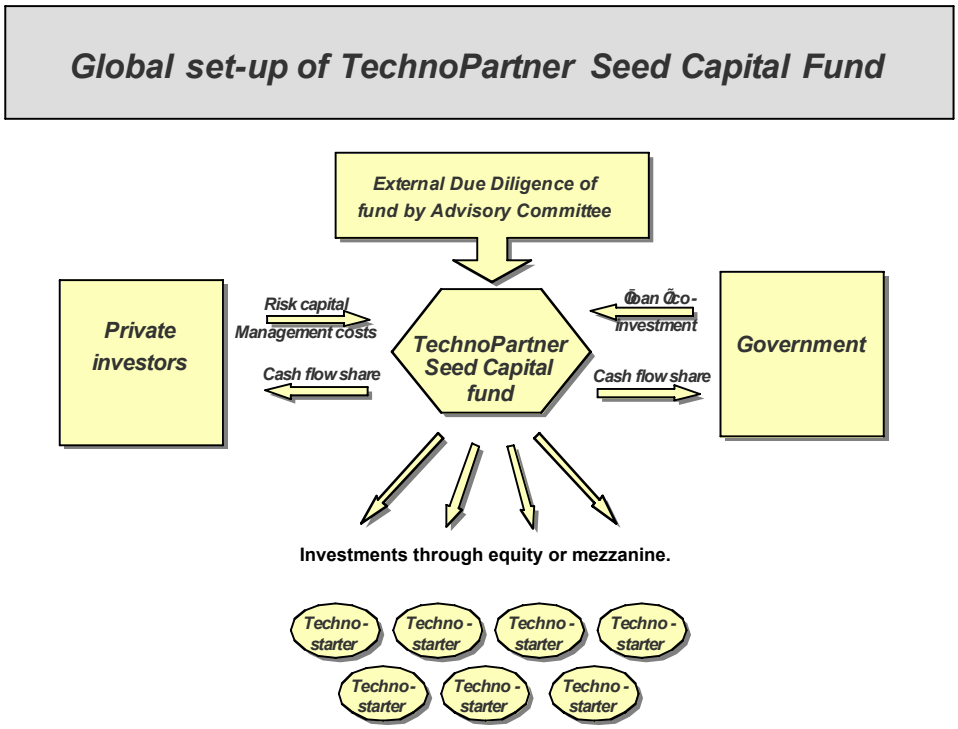
[14] The Dutch government defines / identifies high-tech start-ups as: new companies, not older than 5 years; founder(s) often has/have a higher level of education; commercialise products, processes or services that they have developed based on their own technological inventions or by means of a new combination of existing technologies.

[15] Previous start-up policy measures are integrated into TechnoPartner to eliminate~~d~~ overlap and increase the transparency of the policy.

number of ‘modules’: Screening and scouting, Patents expenditure, hHigh-tech start up support module (coaching, facilities, etc) and Pre-seed (loans for developing business plans - max €100.000)

- TechnoPartner Seed Capital Scheme: a general fund-of-funds venture capital scheme to stimulate and mobilise the bottom end of the Dutch Venture capital market, so that high-tech start-ups can satisfy their capital requirements in the early stage phase. Interest free loans/co-investments are available, providing up to 50% of the investment capital, for high tech funds, which have to pay some kind of results-dependent dividend in return. An amount of €24 million per year is available, for participation bys of those specialised funds, up to €2,5 million per company (€0,8 million on average). The scheme is meant to fill the so-called equity gap.

Figure 5: Global set-up of the TechnoPartner Seed Capital Scheme



The TechnoPartner Seed Capital Scheme is structured as follows:

1 Each yYear a qualification round will take placeis held. Funds (in whatever legal structure and of whatever nationality) that want to be qualifyied as TechnoPartner funds can make an application once a year. A ranking will be made based on the quality of fund management, track record, strategy, reliability, approach etc. As far asAccording to budget is availabilityle, the Ministry of Economic Affairs will commit itself to fund up to 50% of the TechnoPartner fund.

2 The funds are allowed to do make investments up to €2,5 million. The average investment amount should not exceed €800.000. As a result, most investments will be in the range of €100.000 to €500.000. In order to enable funds to participate in the second financing round, funds are allowed to invest amounts of

up to €2,5 million ~~at the~~ maximum.

3 The Ministry will pay at the same ~~moment~~ time as the private parties ~~do~~.

4 ~~The funding of the~~ Ministry funding may only be used for investments in high-tech start-ups ~~only~~, ~~e.g.~~i.e. not for the costs of fund management (those ~~cost~~ will be for the account of private partners)

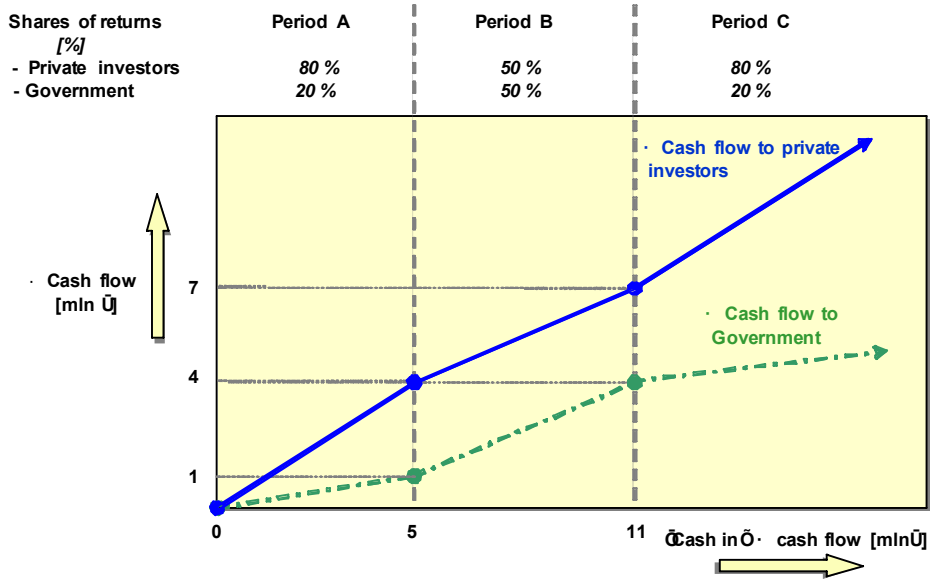
5 High-tech start-ups are companies not more ~~older~~ than 5 years old, that commercialise products, processes or services which ~~,~~ they have developed based on own technology or on a new combination of existing technologies.

6 All returns from high-tech start-ups / companies to the fund will be shared 80-20 by the private parties and the ministry (see figure below: period A), until the break-even point for the private parties with regard to the investment in high-tech start-ups (excluding fund management etc.) is reached.

7 After this break-even point is reached all returns will be shared 50-50 (period B). As soon as the M~~m~~inistry has reached the break-even point, the returns are shared again 80-20 by the private parties and the Ministry (period C).

8 The funds will be closed~~-~~-end funds, ~~with~~ typically with a period of up to 6 years to invest and up to 6 years to disinvest.

Schematic presentation of cash flow of returns
Example of a TechnoPartner Seed Capital Fund of 8 mln Ū:
4 mln Ū private investment and 4 mln Ū Government.



The investment decisions are fully driven by commercial considerations. The fund management is responsible for the investment decisions and there is a direct link between the financial performance of the fund and the remuneration of the fund management.

These operational activities are enhanced by institutional innovations that stimulate ~~the~~ entrepreneurship~~ial spirit~~ in ~~the~~ educational and knowledge institutes. For instance, in order to eliminate uncertainty among the universities about the

valorisation task, a separate budget for valorisation will be allocated in the funding. ~~Next to this~~In addition, ~~we stimulate~~ entrepreneurship in education is stimulated to create an entrepreneurial culture in the Netherlands.

Finally, the improvement of the high-~~-~~tech start-~~-~~up climate is taking place against the background of the internationalisation of the economy. The TechnoPartner Programme will therefore enhance the possibilities for internationalisation of high-tech start-ups.

The total budget for TechnoPartner for 2004 - 2010 ~~equals~~ is €218 million. The SKE facility started in October 2004, with €10 million per year. The Seed Facility started in April 2005 with €12 million in 2005, ~~and~~ and~~as of 2006,~~ €24 million per year as of 2006.

In addition, ~~The~~ the Netherlands is now devising a new guarantee scheme for risk capital to SMEs. It is expected to be of particular interest for existing innovative companies. A 50% guarantee will be made available on amounts up to €5 million for the risk capital financing (shares and subordinated loans) to SMEs ~~will be made available~~. The maximum amount of guarantees per year may not exceed €170 million, corresponding ~~with~~ to roughly 150 companies per year being financed under the scheme.

~~Finally~~Lastly, a fiscal incentive is available for private taxpayers to provide subordinated loans up to €50.000 per taxpayer (~~ea~~ around 20.000 loans per year ~~of in~~ averaginge just ~~below~~ under €20.000).

Apart from this, in some weaker regions ~~also~~ regional development agencies are also engaged in ~~execute~~ venture capital activities.

These instruments deal with t~~T~~he challenges that lie ahead for SMEs to grow and to perform R&D intensive activities ~~are dealt with through the above-mentioned instruments~~. Some instruments are up-and-running; others are recently implemented or ~~still~~ have yet to start. In combination, they address a variety of aspects in order to create a challenging climate for innovative SMEs and high-tech start-ups.

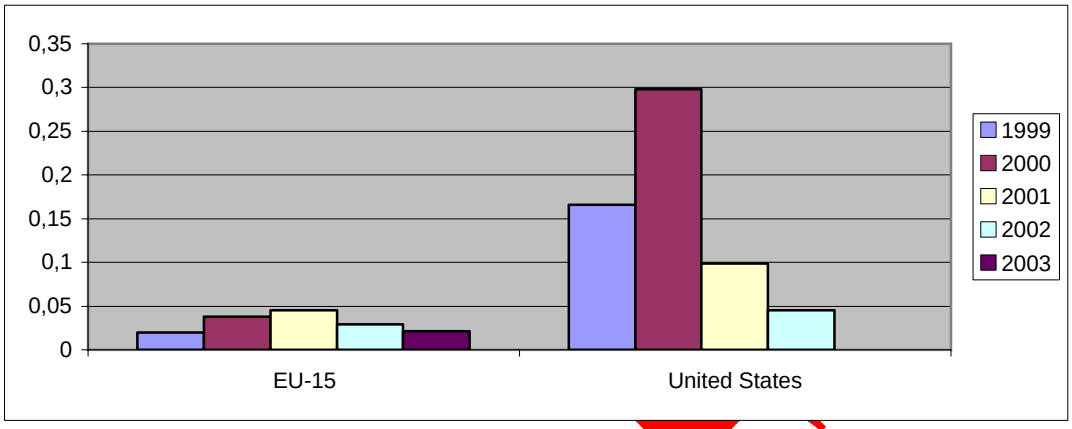
1.1.3 Conclusions: how to address differences with our competitors

The Netherlands is faced ~~by~~ with problems ~~concerning the~~of inadequate financing of (early stages of) innovation by young ~~research intensive~~research-intensive SMEs, which can be considered as exemplary f~~F~~or/ typical of? the rest of the EU.
First of all, the market requires more capital than is available. Problems are caused by the fact that the costs of providing a small amount or a large amount of finance are practically identical ~~to providing a large amount~~, and the risks of innovative, R&D intensive, fast growing SMEs, and especially start-ups are ~~for financiers~~ much more difficult for financiers to assess ~~when~~ compared to established, conventional and stable companies with track records. This makes capital providers reluctant to provide funds to high-tech start-ups.
The mismatch between venture capital supply and demand occurs particularly at the bottom end of the capital market. For instance, for high-tech start-ups a ‘gap’ has been noted between supply and demand that is roughly between €100~~.~~ 000 and €2~~.~~5

million per financing round. This concerns mainly the first and second financing rounds of a high-tech start-ups.

Second, the availability of capital itself in the Netherlands, but also in the other Members States of the EU, lags behind that of our main competitors.

Figure 6: Early stage Venture Capital as a percentage of GNP



This can bise further illustrated further by the situation concerning in the biotechnology industry in Europe compared to the US. With approximately the same number of companies as in the European sector (1_976 companies), the US biotechnology industry (1_830 companies) employs twice as many people, spends approaching nearly three times as much on R&D, raises 3 or 4 times as much venture capital, and has access to 4 times as much debt finance[16].

The Netherlands proposes to distinguish two phases in order to address the problems concerning of financing:

- In the pre-seed phase the young research intensiveresearch-intensive SMEs operate mainly on a regional / local level (small group of people closely linked (also geographically), often to a specific research infrastructure, without geographically spread clients, etc.). Support requires heavy private sector involvement, from close to the habitat of the potential start-ups. This could imply mean trying to involve business angels, and, if possible, specialised Venture capital. A further exchange of good practices amongst the Member states States of the EU, facilitated by the EC, could support actions in this field.
- In the seed and early stage phase, the capital market is hindered by the limited profitability for small investments (low return in a relatively long period for small investments), and addressing this imperfection requires substantial public sector involvement. In Europe, however, we see a wide variety of different instruments in the Mmember Sstates (see inventory results in paragraph. These kinds of instruments also face encounter the geographical constraint that it is only allowed to investment is only allowed in companies located in the country of the supporting government. This asks calls for further coordination of initiatives by the EU members, or even a joint action, initiated by the EIB, EIF, DG Enterprise,

[16] Europe (2004): Raised €940 million in Venture Capital, €1 billion in debt financing. US (2004): Raised €2.9 billion in Venture Capital, €4.3 billion of debt financing.

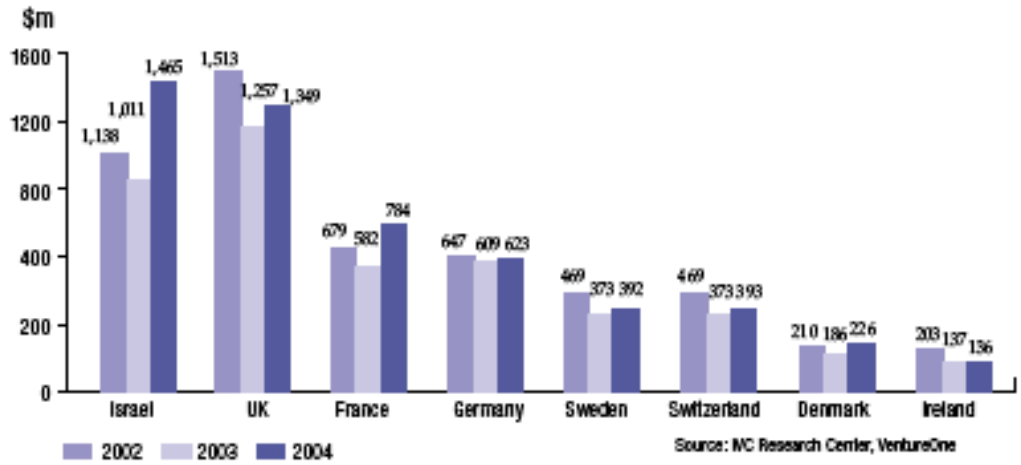
DG Research and DG Competition of the EC, and of course the Mmembers Sstates themselves.

1.2 Response by Israel: mobilizing private capital for innovative SMEs and start-ups[17]

In times of global economic downturn, resulting in increasing financing problems for young ~~research intensive~~research-intensive SMEs ~~concerning financing~~, figures from Israel on availability of ~~for instance~~ Venture Capital, for instance, indicate a positive difference with the EU and its main competitors[18].

	2000	2001	2002	2003	2004
Israel/US	3,26%	5,47%	5,22%	5,34%	7,15%
Israel/Europe	15,10%	20,20%	23,90%	25,40%	33,70%

Figure 7: Capital raised by high-tech companies (Israel vs. Europe)



This paragraph provides an overview of specific actions taken by the Israeli government aimed at mobilizing private capital for innovative SMEs and start-ups, addressing the issues as mentioned in the c~~C~~ase of the Netherlands, thereby providing insight in the factors / background for the success.

1.2.1 Background: the success of young ~~research intensive~~research-intensive SMEs in Israel

One of the main strengths of the Israeli innovation system is the availability of human resources in science and technology (resulting from the influx of well-educated immigrants), which seem to have an exceptional innovative and entrepreneurial spirit. The Israeli innovation system is hampered~~indered~~, however, by the political situation (the instability of peace and terror), the small domestic market and the long distances to most of the global markets (USA, Far East and Europe), as well as the fact that until the 1980s~~,~~ the Israeli economy was mainly focused on traditional industries and agriculture.

[17] Response presented by the Israeli expert and Rina Pridor, Program Director Technological Incubators of Israel, Office of the Chief Scientist (OCS), Ministry of Industry, Trade and Labour.

[18] Israel - IVC Research Centre, US/Europe-VentureOne.

Problems ~~concerning~~ of raising money from the private sector in Israel occur mainly for the pre-seed and the seed stage programmes of the high intensive technologies. There are f~~F~~ewer difficulties ~~exist~~ in raising money when the investment is related to a start-up in the early and ~~the~~ mid stages:

- The figures ~~of~~ for venture capital fund investment by stage in 2003 ~~indicate the~~are as follows~~ing results~~: seed: - 9%; early stage: 39%; mid stage: - 46%; late stage: - 6%.
- Total investment: $421million[19].

Experience in Israel ~~indicates~~ clearly indicates that those programmes are the key for new SMEs contributing to economical national growth.

In Israel, over 90% of the total number of the high-tech companies can be considered as being ~~an~~ SMEs, and their contribution over the years to the economy is remarkable in terms of: balance of payments, trade balance, employment and spill-over effects:

- Over the last ten years, hi-tech exports have tripled. In the early years of 2000, hi-tech exports comprised 42.6% of Israel's industrial exports, over $14 billion.
- Sales of Israeli software have increased by over 700%~~,~~ over the last 10 years;~~,~~ most of them ~~started~~ began as start-ups.

Based on the build-~~-~~up of a Technology Society, MNCs (such as Intel, Motorola and others) have decided to invest in Israel, establish R&D centres ~~in Israel~~there, or acquire companies. (Intel bought DSP Communications for $1.6 billion, HP bought Indigo for $629 million, Lucent bought Chromatis for $4.5 billion).

In 1991, there was just one Venture Capital Fund ~~was~~ active in Israel;~~, while~~ currently, over 60 Venture Capital Funds are active in different sectors: Communications (37%), Enterprise & IT software, (18%), Internet (4%), Life Sciences (15%) and Miscellaneous Technologies (26%).
The impact is also illustrated by the presence of the high-tech industry~~,~~ ~~at~~ in the global investment market (over 100 Israeli companies are traded on the NASDAQ and over 30 Israeli companies are traded on European exchanges).

Based on these indicators, it can be concluded that the Israeli economy could not have achieved such results in a relatively short time~~,~~ without the adaptation of~~ing~~ policy and measures by the Israeli Government~~,~~ to support innovation and R&D programmes.

1.2.2 Actions: Yozma, and the 4 new programmes for young ~~research intensive~~research-intensive SMEs

In the early nineties, the Israeli government identified a series of problems concerning financing of ~~research intensive~~research-intensive SMEs and start-ups:

- R&D intensive SMEs and start-ups, with excellent technology innovation, failed to raise money, to develop and market their products and to achieve meaningful results in international markets.

[19] IVA Year Book, 2004.

- The Israeli venture capital market did not function well, resulting in a growing need for financing by high potential start-ups from different sectors.
- Existing venture capital funds were not commercially successful.

Therefore, the following questions concerning the formulation of national policy were raised:

- What is the proper national policy that will lead to the creation of the critical mass of capital required for the venture capital industry, which will increase essentially the ~~R&D~~ national R&D expenditure ~~s,~~ in which the private venture capital market will play the major role.
- How to increase the commercial success of new start-ups, based on high quality business management skills.
- What will be the best solution in which~~,~~ the government involvement~~,~~ will be limited ~~in~~ to a defined time frame
- How to achieve interaction between Israeli and International Professional V.C Managers, and to benefit from all the merits of ~~foreign~~ experienced foreign partners.

In order to address the issues and policy questions, a series of actions was implemented, with different characteristics:

- Establishment of Yozma Venture Capital Ltd, in 1993, as a ~~fully~~ wholly-owned government company with 100 M$ capital.
- Setting up by Yozma of ten venture capital funds with experienced partners from abroad, like Advent, Walden, Daimler Benz, who raised an additional $150 million (total: $250 million capital; government plus private).
- Nine of the funds could be described as 'Limited Partnership' and 'Closed End Funds'. The remaining one was a public venture capital fund.
- The total government participation in each of the nine funds reached ~~up to~~ $8 million (40% of capital).
- In addition, a $20 million government fund was established, which invested in Israeli high-tech companies: the 'Yozma Venture Fund' (which ~~should be~~is distinct ~~distinguished~~ from the Yozma Programme). Its aggressive investment policy stimulated investments by the other Yozma Funds.
- The Yozma Programme focu~~s~~sed on early stage investments in Israeli high tech start-up companies, and included attracting highly skilled management to be involved in each start-up to strengthen two of the most critical factors for success: management and marketing. Management support by successful venture capitalists was provided ~~till~~ up to the point of achieving ~~business~~ successful business results: a strategic business model, professional monitoring of the R&D programme, global market knowledge, and access to markets.
- The management of the venture capital funds carefully selected the proposed R&D programmes of the start-ups on broad key issues such as: technology used, quality of the team, market potential (volume, rate of growth, competitors, market barriers and potential market competitiveness), ~~possibility of the~~ potential of raising additional money by going public in a lat~~t~~er phase, and potential exit.

- The above criteria have had a very positive impact on entrepreneurship in general, and start-ups in ~~specific~~particular, resulting in high quality and attractive R&D proposals.
- The policy of a limited time frame of government involvement ~~policy~~ was achieved~~,~~ by granting a strong incentive to the private investors, based on a 5-year~~s~~ 'up-side' option, which ~~enable~~ gave them the right to buy government share~~s~~~~,~~ at investment cost~~s~~, plus a low interest rate.

The Yozma Programme ~~provided~~ backed over 200 companies with venture ~~backing~~capital; 20 companies successfully completed Initial Public Offerings; and 10 companies were acquired by large international companies. The Yozma Funds became an example for the design of many other VENTURE CAPITAL companies in Israel. But most importantly, the Yozma Programme ~~changed~~ transformed the venture capital market in Israel.

~~After~~ Since the termination of the Yozma Programme, the actions by the Israeli government addressing financing of young ~~research intensive~~research-intensive SMEs have focused on the pre-seed and seed phases (TNUFA and Technological Incubator Programme), and the 'competitive R&D early stage' (HEZNEK Programme and the Competitive R&D Programme).

The TNUFA Programme is intended for investors, entrepreneurs and start-up companies owned by entrepreneurs, which do not yet have any sales. The fund will contribute toward ~~getting~~ acquiring patents, the construction of a prototype to verify the viability of the idea, preparation of a business plan and the raising of initial capital.
The total yearly budget is about €2 million including the programme management expenses. Projects are funded by means of a grant of 85% of the approved costs up to a maximum of around €37.000.
Every year, 20 companies on average are able to raise private money~~,~~ in order to continue their R&D Programmes. Results indicate that for each Euro spent by the government, the TNUFA Programme creates an added value asset of 7 Euro.

- The Technological Incubator Programme is intended for inventors or entrepreneurs who did not have, or do not ~~get~~receive, any additional support from the government for the dedicated R&D project, under the support of the Incubator (by law the R&D project must be registered ~~by law,~~ as a private company). The programme ~~exists~~ consists of three 'phases'.
- Phase I, (initiated in 1991) entitled 'High level of Government Incentive', provides ~~the~~ entrepreneur~~s~~, in ~~his~~ the initial steps, with a supportive framework that enables ~~him~~them~~,~~ to translate a commercially viable technological idea~~,~~ into a product~~,~~ ~~–~~ that will attract investors from the private sector. The programme supports infrastructures and logistic support adapted for R&D projects; management support; and R&D grants which provide~~s~~ up to 85% of the approved R&D expenditures of the project, for a period of 2 years (~~not exceeding around~~ceiling of around €250.000. The project (company) has to pay back royalties in the ~~case~~ event of success. There are currently~~,~~ 24 incubators spread around the country, of which 13 are privatized. The ~~ac~~cumulative private investments ~~over passed~~have exceeded ~~the~~ government investments since 1998.

~~At present~~The current ratio for 2004 ~~the ratio~~ is 2.~~,~~5. This figure indicates clearly that the basic goal of the policy has been achieved.

- Phase II, entitled 'Privatization of Existing Technological Incubators Programme' was initiated in 2001. After 10 years of success stories, the government goal was~~,~~ to identify new schemes through which~~,~~ more money from the private sector will be raised during the incubator period and thereaf~~lat~~ter. The programme basically refers to privatisation, in which:
  - The private licensee will assume the operating expenses of the incubator.
  - ~~The participation s~~Support ~~of~~ from the Government will be in the form~~by means~~ of a loan that can be converted to shares (convertible bonds).
  - In each company/project the investor has the right to a shareholding of ~~increase his shares~~ up to 70% and not less than 30%, based on direct negotiation between the ~~two: The~~ entrepreneur and the investor. In addition, the investor gets 5% of the shares, of each project / company.
  - The investor will ~~have the right to get a loan from the~~ be entitled to a Government loan of up to 85% of the approved project budget, for 2 years and up to around €330.000.
- Phase III (initiated 01/01/2005) is entitled 'Private Biologic Incubator', which is based on a government tender. Its ~~, and~~ aims are ~~at~~ to increase~~ing financing~~ the financial involvement~~,~~ of the private sector~~–~~, to~~and~~ reduce~~ing~~ government financial involvement and transfer the long term commitment~~,~~ to the private sector. The basic idea is to establish incubators that will be ~~involved~~ engaged solely in biotechnology, as a result of government policy for increased activity in this area. The biotech incubators will provide a respons~~ed~~ to some of the unique aspects of this field, namely the inherently long-term nature ~~inherent in~~of its R&D.

  The period of the agreement between the selected investors group and the government is for 6 years (1/1/2005 to 31/12/2010). The incubator is registered as a legal entity corporation, with a profit-making goal~~the objective of getting profit~~. The corporation is committed to operate the incubator ~~during~~ for at least 6 years ~~at least~~, and to invest ~~in the incubator~~ not less than about $600.000 in the incubator for each of the six years of its operation~~, during the 6 years~~. The government commitment is to give ~~a loan to~~ the incubator a loan for ~~the purpose of~~ capital equipment of up to 50% of the cost. The incubator / corporation will be entitled to have ~~an~~ ownership of the project / company, with up to 70% of the shares.

The key ~~for~~ to the success ~~for~~ of these programmes seems to be the intensive government support, at the pre-seed and seed stages, with ~~a~~ moderate participation ~~of~~ by the private sector.

The HEZNEK Programme supports companies involved in R&D which have been established not more than 6 months before or whose total expenditures have not exceeded around €140 .000. Another condition is that they should not have~~, and which haven't~~ raised money from investors (excluding primary financing for feasibility study). ~~As partner of a project qualify~~ Venture Capital Funds or corporations active in venture capital, high-tech companies investing in similar industries, investors with the ability/~~—~~funding~~,~~ and manpower to guide the management of the new company, can all qualify as partners of the project.

The slowdown of the world economy during 2001 - 2003 ~~has~~ caused a ~~decrease~~ fall in the level of investment~~s~~ in start-up companies and, consequently, ~~a lessening in the number of~~fewer start-ups. ~~formed.~~ In order to encourage investments and increase the number of new companies formed, t~~T~~he Ministry of Industry and Trade established a new and separate instrument to provide a positive signal to investors and create further inducements ~~for~~ to mobilis~~z~~ei~~ng~~ investments for the establishment of start-up companies in the seed stage.

The programme is based on (a) the government matching an investment in a start-up company, proportional to the investment of an investing entity, and ~~on~~ (b) giving an option to the investor to purchase the government shares in the start-up company at the initial price. The government and the investor will put up matching funds. The government's investment will be in return for shares ~~of~~ in the company ~~-~~, up to 5 million NIS (about €900.000) per company per two-year period - that will finance up to 50% of the Approved Work Programme. The expenditures ~~supported~~ borne will be those related to R&D. The Investor will be given an option to purchase the government shares at any time within the first 5 years at the initial price plus linkage and interest.

The Competitive R&D Programme has an action line ~~aimed at~~for the financing of young ~~research intensive~~research-intensive SMEs. The action line covers: start-ups ~~as well~~and ~~as~~ other sizes of companies; different stages~~,~~ of the R&D-based innovation process, including 'early stage', which leads to a product with an 'economic potential', and spill-over effects. Innovation ~~,~~ in the early stage, when the technological risk is very high, is given ~~gets a~~ priority~~,~~ in terms of the incentive rate and the approved budget.

Statistics shows that over 25% of the applicants in the Competitive R&D Programme are in the ~~category of~~ 'early stage' category. The action line is estimated to allocate~~s on estimation~~ 8 - 10% of the total budget of the competitive R&D fund.

The programme ~~aims~~ seeks to~~at~~ support~~ing~~ start~~s~~-ups at the early stage, stimulating and encouraging ~~the~~ entrepreneurs to establish new companies, and increasing the potential of start-ups to raise money from venture capital funds.

The programme ~~supports~~ bears up to 50% of the approved expenditures, depending on the technological risk. The higher the risk, the higher the rate of approval and ~~the~~ size of the budget. When the R&D project results in a commercially successful product, the company is obliged~~dated~~ to pay royalties to the government. The royalties received will, in turn, be used to fund future grants to encourage industrial R&D. Normally, total royalty payments are a specified percentage of the total annual revenues derived from the sale of the developed product.

Since 1990, the high rate of growth of the high-tech industry sector, and the ability of start-ups to raise risk capital, is due to the incentives support given through the R&D competitive fund programme.

1.2.3 Conclusions: mobilizing private capital for innovative SMEs

The examples of actions addressing the financial needs of young ~~research intensive~~research-intensive SMEs provided by Israel, with its specific characteristics (small internal market, long distance from world market, and a relatively young ~~modern history~~country) lead~~s~~ to the following conclusions, and teach~~es~~ us the following lessons / recommendations:

- Programmes aimed at attracting ~~the~~ Venture Capital funds and ~~the~~ Private Equity to invest should be based on~~:~~ technological breakthrough innovation, but which is driven by: global 'market needs', 'market growth', 'market volume', and on a business model which properly defines ~~well~~ the 'market penetration approach' (including the search for a Strategic Partner).

  Projects (proposals) should be assessed on relative advantages in terms of technology performance~~s~~, a market~~-~~ driven approach and ~~on~~ a high level of technological and management leadership.
- The investor's view ~~for~~ on 'exit' should always be considered ~~always~~, because the 'exit' gives the investor a way to get 'leverage' for his financial risk investment. Therefore, when an R&D programme is approved by the decision makers, the basic question is~~:~~ whether at the end of the development phase~~,~~ a competitive product will be presented in the global market and take a reasonable market share.
- Technology programmes in industry can not behave as~~:~~ "stand alones", and can not contribute to the current economical growth. Technology results ~~should~~ must be able to be ~~transferred to~~converted into economic~~al~~ results, either in the short ~~term~~ or ~~in the~~ long term.
- ~~In case when~~Where~~,~~ there is a national need~~,~~ to establish a national technology infrastructure, based on excellence and new human resources, th~~e~~an the majority of the investment should come from the government and the economic~~al~~ considerations should be examined only for the very long term.
- The Israeli technology~~ical~~ incubators programme can ~~represent~~ be seen as a model that ~~can~~ can be adapted to other societies. If ~~the~~ society ~~is lack of~~lacks the technology, the best solution is to locate the incubators close to the universities and R&D institutes.
- When society has the technology, the best place is to locate the incubator in Industrial Parks with a business environment.
- The majority financial participation ~~of~~ by the S~~s~~tate should be mostly at the early stages of the programme, and then ~~while gradually~~ the financing burden must be gradually transferred to the private sector. ~~The p~~Practice proves that within a reasonable time the accumulated investments of the private sector will ~~overpass~~ exceed the ~~state~~ investments by the State.
- R&D p~~P~~rogrammes of young ~~research intensive~~research-intensive SMEs~~,~~ should be supported by the S~~s~~tate, in most of the cases~~,~~ when the t~~T~~echnological advantages of the developed technology or product can achieve market competitiveness.
- The k~~K~~ey to the success of start-ups ~~to~~ in raising~~e~~ risk-capital is when the start-up offers: leading edge technology; market needs for the R&D solution; market competitiveness; management leadership (in technology and business); high Internal Rate of Return (IRR) for the investor; and the potential to go public (IPO).

1.3 Response by Austria: Seed Financing Programme[20]

The Austrian Seed Financing Programme is a governmental programme, especially targeted to at high-tech start up companies and their special needs for financing. The programme offers an active involvement of informed intermediaries, who focus on reducing the information asymmetry between entrepreneurs and providers of financial resources. Therefore, its aims at is to increaseing the pool of available capital for these SMEs.

The Seed Financing Programme was originally established in 1989. Today, it is part of a whole set of measures, taken by the Austrian government in order to facilitate the early stage financing of research-intensive SMEs. This programme is part of a wide range of technology programmes, for which the Austrian Wirtschaftsservice (AWS) is responsible.

1.3.1 Background: the important role of SMEs in the Austrian economy

Austria traditionally has a high percentage of SMEs compared to other countries. Currently 99.6% of all companies can be identified as SMEs, employing 65% of the Austrian labour force (1 598 000 employees). About 86% of these companies are very small (1-9 employees); 11.7% of SMEs have 10-49 employees; 1.8% have 50 - 249 employees and 0.4% have more than 250 employees.

To increase the number of jobs in the high-tech sector, as well as to push further developments in the local high-tech industry, a specific effort was needed in order to increase the number of innovative SMEs in specific high-tech areas, such as Information Technologies, Biotechnology, Nanotechnologies, as well as other innovative technologies. These companies are in high pressing need of financial resources; primarily they need risk money to finish their proof of concepts and their prototype development.

However, venture capital financing for early stage companies is only about 2% of the total amount provided by Austrian Venture capital.

Moreover, bank loans usually are difficult to obtain for these early stage companies, because they lack securityies and because of their a generally high risk-profile of this kind of companies.

In 1989 the Seed Financing Programme was established, in order to assist the mostly science-based entrepreneurs, when in transforming their advanced research activities into products. This programme should is also intended to contribute to increasing Austria's competitiveness in terms of innovative technologies.

1.3.2 Actions: an integrated approach

The solution for financing innovative SMEs was the proposal for a governmental programme, combining funding activities with the function role of a public 'intermediary':

- In this programme, coaches with industrial experience and a technological background co-operate with individual companies.

[20] Response presented by the Austrian expert, and Ms. Felzman, Federal Ministry of Economics and Labour, Austria.

- Governmental risk capital is offered to finish first data?, or even to develop a prototype in order to enable these companies to raise further capital on the private market.

Austrian ministries finance the Seed Financing Programme, thereby ensuring that ~~neutral information is provided for~~ both entrepreneurs ~~as well as for~~ and the financing community receive neutral information. ~~Early~~ At the start of~~in~~ this programme, ~~classical~~ conventional loan schemes were used. Starting in 1995, an improved programme~~-~~ version was elaborated, providing Mezzanine capital and coaching activities. Since then, the new funding instrument has consisted~~s~~ of two parts:

- Mezzanine-capital[21]:
  - Risk capital: no securities necessary.
  - No shares taken.
  - Average of €500.000 per project, payments subject to reaching different milestones.
  - Duration of the profit-dependent loan is approximately 10 years.
  - Payback: capital plus~~, as well as~~ interest~~s~~ have to be paid back only in case of profit.
  - Interest~~s~~ rate capped at 8,5%.
- Active Involvement: coaching/consulting by investment ~~-~~executives with a strong technological background and industrial experience, as well as financial expertise in order to increase and ~~ease~~ facilitate the company's access to financing.

The combination of coaching and financing seemed to be especially important for the research-intensive SMEs, ~~since~~ as the usual recipients were mostly first-time ~~-~~ entrepreneurs, having left university~~ies~~ and ~~rather~~ relatively inexperienced in presenting their ideas to funding institutions.

The capital provided is Mezzanine-capital, an intermediate stage between equity and a ~~classic~~ conventional loan, combining the benefits of these funding instruments. Although these start-ups have a very high-risk profile, this instrument takes no securities and no shares, ~~resulting in the availability of~~ so shares ~~for~~ are available for a transaction with Venture Capital. Payback only ~~occurs in~~ if there are any~~case of existing~~ profits. Seed Financing is a company-focused funding programme, meaning that it can fund not only project-related costs but also overhead costs ~~can be funded~~.

[21] Mezzanine: a hybrid of debt and equity financing. Mezzanine financing is typically used to finance fast growing new companies and the expansion of existing companies, and it is basically debt capital that gives the lender the right~~s~~ to convert to an ownership or equity interest in the company if the loan is not paid back in time and in full. It is generally subordinated to debt provided by senior lenders such as banks and venture capital companies.
Since mezzanine financing is usually provided to the borrower very quickly with little due diligence on the part of the lender and little or no collateral on the part of the borrower, this type of financing is aggressively priced, with the lender seeking a return in the 20%-30% range.
Mezzanine financing is advantageous because it is treated like equity on a company's balance sheet and may make it easier to obtain standard bank financing. To attract mezzanine financing, a company usually must demonstrate a track record in the industry with an established reputation and product; a history of profitability; a viable expansion plan for the business (e.g. expansions, acquisitions, IPO).

The programme aims at innovative high-tech start-ups in the seed phase, including the following characteristics:

- Holding patents, potential R&D-collaboration with universities.
- Applying innovative technologies (e.g. ICT, Life Sciences, Nano-Technology), no 'me too-products'.
- High potential for growth (product USP, market, entrepreneurial management).
- Small cCompanies: fewer than 25 employees and either an annual turn-over, not exceeding €7 million, or a balance-sheet not exceeding €5 million.

The programme has shownsthe following results:
In the periodBetween 1989 to and 2004, 144 high-tech SME participated in this programme. Job- creation and revenues have beenwere measured on a yearly basise. Our aim was to follow these companies as long as we had clear data on whether the research activities were being transformed into successful products and whether profits could be made.
Currently, 71 companies are part of the programme portfolio. The rest either paid back the capital plus interests or failed to reach the market. The overall success rate is about 50%.

	Number	Million EUROS
Companies financed in total	144	39
Direct Jobs created	1735	
Pay back from Exits (37 companies)		6
Current portfolio companies (by end 2004)	71	
Revenues of portfolio companies in 2004:		112
Direct jobs in current Portfolio companies		1015

An recent evaluation of the programme in June 2004 by the Management Institute St. Gallen concluded, that the programme's goals were reached effectively and successfully, and this programme will be continued with some small modifications.
Other governmental programmes, focused on research-intensive Austrian SMEs, are mostly project-oriented funding programmes and have been elaborated for general technology start-up companies, as well as for companies, applying for Seed Financing.

Other Austrian Technology-Funding programmes are:

- Pre-Seed-Funding: grants for individual researchers, up to €100.000 prior to
- Seed Financing.
- High-Tech Double Equity Programme: up to 100% guarantee for loans to double the shareholders equity (up to €1 million).
- Business Angel Agency I2: Connecting companies & Business Angels, taking
- a strategic and financial share in the company.
- Tecma/Uni invent and Tecnet: Support programmes for Intellectual Property Rights and market research/market data.
- Technology Financing Programme (TFP): guarantee for commercial loans for investments in companies (up to €1.,8 million).
- ERP Technology and Growth Financing: subsidised and guaranteed loans for technology-oriented SMEs.
- FFG Programmes (Austrian Research Promotion Agency): up to 50% of total eligible costs of an R&D project, carried out by a company, can be funded.

Funding ~~is accomplished by~~consists of a mix of grants, loans, interests subsidies and loan guarantees.

1.3.3 Conclusions: designing schemes to finance young high-tech SMEs

The existing examples of ~~Austrian governmental~~ actions by the Austrian government to~~,~~ address~~ing~~ the financial needs of young ~~research intensive~~research-intensive SMEs have led ~~lead~~ to the following conclusions/recommendations for a successful Seed Financing Programme:

- Provide for active involvement/coaching by experts who are knowledgeable in the technology/~~- and~~ industry~~- knowledgeable experts~~, in order to ensure monitoring of progress and to build up a knowledge base for applicant~~ying~~ companies. The ratio between companies and coaches should not exceed 3-5 companies per expert.
- Make ~~E~~enough capital ~~for companies should be~~ available for companies - depending on availability of private seed funding - ~~in order~~ to reach the development of a prototype and to enable Venture Capital Financing.
- Select companies in terms of high potential in co-operation with an Advisory Board experience in matters of ~~a~~ technology~~-~~ and economic~~sy experienced Advisory Board~~.
- Additionally, provide an instrument~~,~~ covering the pre-seed developments (€100.~~-~~000 per project).
- Increase the funding instrument's equity position, e.g. by providing a subsidised loan.
- ~~To e~~Ensure the selection of high potential/high-tech companies ~~by~~ via a governmental~~al~~ programme. Allowance has to be made for a~~a~~ failure~~-~~ rate of about 50-60%~~ has to be taken into consideration~~.

1.4 Overview of seed-finance initiatives in the Members States ~~addressing seed-finance~~

The general lack of pre-commercial funding for the commercialisation of research results is a well-documented weakness of national innovation systems. In particular,~~Especially~~, many young research-intensive SMEs have difficulties overcoming the 'valley of death' period[22] in their business life cycle because of the gap in available cash necessary to develop technology to proof of principle, prototype and/or product. These companies usually have difficulties ~~to~~ in attracting private investments~~, mainly for that is mainly due to~~ the following reasons: their low or zero profit margins in the initial years of activity~~, if any~~; the difficulty ~~to~~ of assessing their specific knowledge assets and the potential of the technology and the business opportunity; a lack of financial means and management skills on the part of the entrepreneur; and the fact that investors ~~have~~ usually have limited experience and expertise working with this type of companies.

The analysis carried out by JRC-IPTS affirmed that financial problems of young research-intensive SMEs are well recognised in most of the Member States of the European Union[23]. Information asymmetries in the financial market and positive effects around young research-intensive companies ~~form~~ are important reasons for government intervention. As investors do not consider the positive external effects in their calculations and are confronted with high screening costs, which they ~~should~~ have to cover before the investment decision, government interventions can help stimulate~~ing~~ private investment in early phase projects (i.e. bridge the gap ~~towards~~ on private early stage financing).

According to the European Venture Capital Association, the amount invested in European start-ups reached €2.2 billion in 2004, which is only about 0.5 ~~percentage~~ % of the total venture capital invested in Europe. For start-ups, the average deal size was about €600-700.000 and for the expansion stage it ~~reached~~ rose to €1.2-1.7 million. The total amount invested in seed phase was about €150.000 after the 'peak' of ~~close to~~almost €1 billion in ~~year~~ 2000. In this category the average investment deal size was about €350.000 (EVCA, 2005)[24].

~~Hence, I~~it is not surprising, therefore, that knowledge-intensive enterprises perceive access to financing ~~is of~~as one of the main barriers to growth. Especially in the Southern European countries, self-financing is often the ~~sole and~~ major or even the only method of financing. For instance, 73% of Italian high-tech start-ups had been financed exclusively by the entrepreneurs' personal wealth and only one enterprise had made use of external sources. The majority (76%) of respondents considered it dangerous to issue debt in the start-up phase, because this might~~ay~~ interfere with the

[22] The term "valley of death" refers to the funding gap that exists between (laboratory) research, followed by the development of a prototype or proof of concept and fully commercial business activities.

[23] The overview is based on the analysis of support programmes and measures aiming at young research-intensive enterprises. The information was collected from public sources (e.g. European Trend Chart of Innovation and national ministry web-sites) and should not be seen as a comprehensive synthesis.

[24] EVCA Barometer June 2005, http://www.evca.com/images/attachments/tmpl_27_art_33_att_802.pdf.

future growth of the enterprise. The majority of Spanish innovating activities are also self-financed, although 63% of SMEs believe that enterprises in their sector of activity do not have sufficient funds to generate technological innovation by themselves. Similarly, founders represent the most important source of finance for 56% of ~~the~~ French start-ups (High-tech SMEs in Europe, 2002)[25].

Seed capital schemes are often embedded in 'service packages' (e.g. the Dutch Technostarter, the Portuguese NEOTECH initiative and the Finnish Pre-Seed Finance) that ~~are~~ focus~~ing~~ on making it easier for~~facilitating~~ people (i.e. mainly researchers) with promising business ideas to find sources of venture capital. These service packages aim i) to encourage the birth and to accelerate the early-~~-~~stage growth of new technology based companies; ii) to increase the commercialisation of technology and knowledge from universities and research institutions and iii) to encourage private capital investments for technology-based companies in their early stages.

The overall budget of these schemes ~~is very diverse~~varies considerably across the Member States, ~~that~~ rang~~inges~~ from €5 to €142 million, with an average size of about €60-70 million. In the new Member States, there were just a few initiatives identified in the analysis (in Poland and Slovak Republic) who~~seich~~ overall budget is quite small (about €5 million in the Slovak Republic[26]. A s~~S~~imilarly small budget is available in Portugal (€8.8 million for the NEOTEC initiative[27]). Germany has the highest overall budget: the recently launched 'high-tech start-up fund' started with €142 in 2005 and ~~it is planned~~there are plans to increase the volume available for investment ~~up~~ to €260 million ~~until~~ by 2010.

Also, the size of funding varies ~~a lot~~significantly across the Member States: start-up projects can receive ~~a~~ funding of between €0,1 - €0,5 million. The funding is generally delivered through a combination of equity investment and second-~~-~~tier loan. In most of the cases, the eligibility criteriona is for ~~funding~~ backers to submit a proposal containing an overview of their business plan, technical information on the (planned) innovation and the likely market potential. Proposals are usually evaluated by ~~a~~ project management and technology-specific steering committees.

Frequently, regional business incubators (e.g. in France, Israel, Greece and Sweden) are ~~participating~~ involved in regional development funds investing in firms linked with public research at early stages that are often located in the incubator. In these cases, the incubators engage in the development of business ideas and support companies in the pre-seed and seed stages, where the risk is too high from the ~~perspective of~~ venture capital perspective. The m~~M~~ain characteristics of these incubators are:

- Professional skills in technology, business and management;
- High level of confidence and trust created among the stakeholders and actors;
- Activities and an attitude that promotes the creation and consolidation of value added in the process of commercialisation;
- Contacts with investors.

[25] High-tech SMEs in Europe. Observatory of European SMEs. 2002, No. 6. European Commission, DG ENTRE, Brussels.

[26] See http://www.seedcapital.sk.

[27] See http://www.neotec.gov.pt/.

Finally, it is important to point out the ~~increasing~~ growing number of new initiatives ~~that were~~ identified in the analysis. This trend con~~af~~firms the ~~intention~~ desire of ~~the~~ national governments ~~that they would like~~ to make significant achievements in ~~facilitating~~ helping to bridge the gap towards private, early-~~-~~stage financing by ~~the mean of~~ providing~~sion of~~ pre-seed and seed financing. ~~Among r~~Recent examples include~~, it could be mentioned~~ the Flemish Innovation Fund (VINNOF); the German High-tech start-up fund and the PRIME initiative in Portugal ~~that is~~(the launching of a~~of~~ new 'seed capital' fund for micro- and small firms in 2005).

From the short questionnaire filled in by 11 CREST member countries[28] it appears that quite different approaches and ~~modalities~~ methods are applied. Naturally, t~~T~~his will ~~of~~ be linked to~~course have to do with~~ the typical situation in each member country, but it causes ~~a~~ fragmentation of the European market for seed and first-round financing.

The following table provides an overview of all the replies ~~on~~ to the questionnaire ~~addressing~~ on the financing of young ~~research intensive~~research-intensive SMEs.

[28] The information has been acquired by means of a short questionnaire, ~~set out~~drawn up by the Netherlands in order to gather information to initiate a discussion on conclusions and recommendations concerning financing of young ~~research intensive~~research-intensive SMEs, within the framework of this expert-group.

1.5 Actions ~~on~~ at EU level

~~Within the framework of this Case concerning~~In the context of the financing of young ~~research intensive~~research-intensive SMEs, it is important to address the CIP (Competitiveness and Innovation Action plan)[29] as presented by the Commission ~~at~~ to the Competitiveness Council of 18 April 2005.

The new CIP, running from 2007 to 2013, is ~~foreseen~~ due to become one of the main Community measures ~~contributing to~~helping to generate~~ing~~ economic growth and create~~ing~~ more jobs. It will bring together ~~into~~ within a coherent framework specific Community support programmes and relevant parts of other Community programmes in the fields most critical to boosting European productivity, innovation capacity and sustainable growth, whilst also addressing complementary environmental concerns. The CIP will complement rather than duplicate the other relevant actions, and those conducted by Member States.

CIP brings together several existing EU activities that support competitiveness and innovation. As such, it will be more visible and comprehensible ~~for~~ to the public. It will also ensure continuity of programmes with a proven and successful track record. Many of the components of CIP are familiar.

Three different programmes run under CIP: Entrepreneurship and Innovation programme; ICT Policy Support Programme and the Intelligent Energy Programme. Each of these programmes will pursue its own objectives, benefit its specific beneficiaries and answer to its own stakeholders. Each specific programme will establish its annual work programmes, which in turn will be submitted to a specific management committee composed of the authorities of the CIP participating countries~~' authorities~~.

The most relevant aspect within the scope of this report is the Entrepreneurship and Innovation Programme. This programme will bring together activities that used to be~~were previously~~ dispersed ~~over~~ in the Multi-annual Programme for Enterprise and Entrepreneurship (MAP), activities for Industrial Competitiveness and elements of the existing LIFE-Environment programme. CIP will also build on innovation activities that have been successfully tested and developed under previous Research Framework Programmes.

The CIP mentions that poor access to appropriate forms of finance is frequently quoted as a main barrier to entrepreneurship and enterprise innovation. This problem may be exacerbated by new accounting standards which will make banks more sensitive to risk and lead to a rating culture. The Entrepreneurship and Innovation Programme will address persistent ~~recognised~~ identified market gaps leading to poor access for SMEs to equity, venture capital and loans ~~for SMEs~~, through Community Financial Instruments operated on behalf of the Commission by the European Investment Fund (EIF), the Community's specialised institution for providing venture capital and guarantee instruments for SMEs. Under the MAP, independent evaluations have identified the market-based approach of these instruments and their

[29] COM(2005) 121 final, Brussels, 6.4.2005.

implementation via the EIF ~~of these instruments~~ as a best practice. They will therefore be continued and adapted in the new programme.

The Community Financial Instruments for SMEs will ~~ease~~ facilitate the supply of seed and early~~-~~stage capital for innovative start-ups and young companies. The High Growth and Innovative SME Facility (GIF) will share risk and reward with private equity investors providing important leverage for the supply of equity to innovative companies. The GIF instruments will increase the supply of development equity for innovative SMEs in their early stages and in the expansion phase, leveraging 'follow-on' capital to help them bring their products and services to market and continue research and development activities.

The SME Guarantee Facility will continue to provide counter- or co-guarantees to ~~guarantee~~ schemes operating in eligible countries, and direct guarantees to financial intermediaries. It will concentrate on addressing market failures: (i) in the access ~~of SMEs with growth potential~~ to loans (or loan substitutes such as leasing) for SMEs with growth potential~~)~~; (ii) in the provision of micro-credit and (iii) in access to equity or quasi-equity. A ~~(iv)~~ new securitisation window (iv) will mobilise additional debt financing for SMEs under appropriate risk-sharing arrangements with the targeted institutions.

A Capacity Building Scheme will support the capacity of financial intermediaries to focus on additional investment and technology aspects. Action will also be undertaken to facilitate SME financing in countries where banking intermediation is significantly ~~lower than~~below the EU average.

1.6 Financing: conclusions and recommendations

This paragraph defines conclusions and recommendations for policy concerning the financing of R&D-intensive SMEs and start-ups, based on the Responses of Israel and Austria, as well as the results of the short questionnaire, addressing the issues as identified in the Case presented by the Netherlands.

The report mentions a series of country-specific recommendations for the Netherlands, Israel and Austria, which address the specific characteristics of their innovation system. The recommendations in this paragraph are based on the input of Case and Response, but they are not the same (i.e. not a collection of all the recommendations for the different Member States). The recommendations in this paragraph are generic, and could be applied in different innovation systems.

1.6.1 Conclusions

Young ~~research intensive~~research-intensive SMEs and start-ups play a vital role in the economy. They are a driving force for the development of new knowledge, and they play a key ~~-~~role in the translation of new knowledge into products and applications. A solid and healthy population of young ~~research intensive~~research-intensive SMEs improves the competitiveness levels of a country.

During their life cycle, starting from the development of an idea to gaining market access~~introduction~~ and furthering company growth, R&D-intensive SMEs encounter specific problems. A particularly complicated ~~problem~~issue, ~~with a high impact~~which significantly affects ~~on~~ success rates for young ~~research intensive~~research-intensive SMEs, is sufficient access to capital. Limited access to financial resources results from market (or system) imperfections on a micro-economic, but also on a macro-economic scale:

- Small and medium-sized enterprises ~~in~~ generally have a scale disadvantage. The costs (risk assessment, legal and administrative costs, supervision) of providing a small amount of finance are practically identical to providing a large amount.
- Furthermore, it is much more difficult for financiers to assess the risks of innovative, R&D-intensive, fast growing SMEs, and especially start-ups, as ~~are for financiers much more difficult to assess when~~ compared to established, conventional and stable companies with track records. In many cases t~~T~~his results in R&D-intensive SMEs and start-ups receiving ~~in many cases~~ inadequate finance, thus ~~decreasing~~ reducing their growth potential.
- Because of the higher risks and the generally long development times of their projects, high-tech start-ups have a problem attracting venture capital.
- At the same time, venture capital and informal investors experience a ~~lack~~ shortage of good propositions, which means there is untapped venture capital available ~~among venture capital~~. Literature indicates that, based on experience, the anticipated Return On Investment (ROI) for these types of firms ~~lies~~ is below 3%, which makes it rather unattractive for financiers.

This mismatch between venture capital supply and demand ~~occurs~~ is particularly prevalent at the bottom end of the capital market. For instance, for high-tech start-ups

a ‘gap’ ~~has been noted~~ between supply and demand has been observed that ~~is~~can be ~~roughly between~~from €100.000 up to as much as~~and~~ €2.500.000 per financing round.

The ‘equity gap’, or more generally the ‘financing gap’, differs for the different phases of the lifecycle of R&D intensive SMEs. Especially in the pre-seed and seed phases it is very difficult to mobilise capital. R&D intensive SMEs are therefore dependent (throughout their lifecycle)~~,~~ ~~dependent~~ on financing from own funds or those of family and friends (known in the business as ‘friends, family and fools’), or traditional bank~~ing~~ loans. Analysis indicates that these ~~kind~~ types of funding are insufficient, and thus~~thereby~~ hinder~~ing~~ the establishment of new ~~research intensive~~research-intensive SMEs, or the further growth of ~~this type of~~ companies of this type, which play an essential role in the ambitions of the EU Member States. This type of market ~~/~~-system failure justifies governmental ~~al~~ intervention.

History shows~~It is clear from history~~ that traditional and more generic governmental instruments (~~such as for example~~e.g. R&D schemes) do not properly address the (financial) needs of young ~~research intensive~~research-intensive SMEs. Across Europe, a wide variety of instruments has therefore been developed and implemented. These instruments can be described by ~~means of~~ the following characteristics, which reflect~~ing~~ the most common features:

- Seed capital schemes are often embedded in ‘service packages’ that ~~are~~ focus~~ing~~ on ~~facilitating~~ helping people (i.e. mainly researchers) with promising business ideas to find sources of venture capital.
- The overall budget of these schemes ~~is very diverse~~varies widely across the Member States, ranging ~~that ranges~~ from €5 million to €142 million, with an average size of about €60 ~~million~~ - €70 million i~~.~~ In the new Member States.
- Also, the size of funding varies ~~a lot~~significantly across ~~the~~ Member States: start-up projects can receive ~~a~~ funding between €0.~~,~~1 million - €0.~~,~~5 million. The funding is generally delivered through a combination of equity investment and second~~-~~tier loans
- Frequently, regional business incubators are ~~participating~~ involved in regional development funds investing in firms linked with public research at early stages, and these ~~that~~ are often located in the incubator.

1.6.2 Recommendations ~~on~~ at national policy level

Based on the information provided ~~within the framework of~~on this Case, the following conclusions and recommendations based on best practices / lessons learned can be identified:

- When designing or evaluating ~~a~~ public~~ly funded~~ fund~~ing~~ aimed at supporting R&D intensive SMEs and start-ups, the (possible) Return On Investment (ROI) should not be the main consideration. Besides ROI, a government should consider the spill~~-~~over effects: added value creation and ~~wider~~ broader return ~~considerations~~ considerations, such as new employment, tax, social contribution/savings as parameters. Within funds for early stage companies, the portfolio approach allows for high failure rate ~~on~~ at company level.
- Financial support from a government should focus on the early stages (seed phase) of the lifecycle of the R&D intensive SME. Within a specific instrument / programme the ‘financing burden’ must be transferred ~~in the run of~~during the life

cycle of the SME, towards the private sector. Experience from Israel indicates that within a reasonable time the accumulated investments of the private sector will ~~overpass~~ exceed the state investments.

The role of the government is to address the market imperfection, the so-called equity gap, which lies between €100.000 and €2.500.000 (as identified by the CIP).

The private sector should be involved in the process ~~concerning~~ of making~~the~~ recommendations for investment resulting from a project proposal.

- Addressing the needs of R&D intensive SMEs and start-ups requires an integrated approach; a mix of instruments covering finance~~s~~, R&D support, coaching, use of incubators, etc, to improve the success rate of the governmental ~~s~~'efforts and public resources used.

1.6.3 Recommendations ~~on~~ at European level

The previous paragraph identifies a series of recommendations for policy concerning the financing of ~~research intensive~~research-intensive SMEs and start-ups on national level. However, in order for Europe to meet its ambitions, but above all to create a bigger impact by further harmonizing the efforts of the Member States, the expert-group has identified ~~a series of~~ three main recommendations, as a first step towards an integrated approach addressing the financial needs of these types of SMEs:

- The functioning of the EIF as 'fund ~~for~~ of funds' on behalf of the EC is limited when it ~~refers~~ comes to funds with public co-investment, especially in the seed and pre-seed phase. ~~When it is concluded~~If it is decided that public intervention in this phase is of structural importance, co-intervention and stimulation of~~ng~~ pan-European approaches by the EC are recommended. National initiatives are limited to operating~~e~~ ~~with~~in a national context. However, the area of financing of young ~~research intensive~~research-intensive SMEs is typically international~~;~~, ~~and~~ national solutions are therefore ~~therefore sub~~less than~~-~~ optimal. Stimulation ~~on~~ at EU level could address this problem by additional funding of the national instruments. This should allow the funds to operate (when needed) on an international level, and thus ~~allow~~ lead to a way of operating that is ~~for a~~ more in line with the market ~~conform way of operating~~.

  Additional ~~funding~~ use of funds initiated by national instruments also generates ~~furthermore~~ a higher volume / critical mass of the fund size, which improves its success rate and could lead to harmonisation~~s~~ of schemes and less market fragmentation.

- ~~Public intervention is limited within the context of~~Under EU regulations, especially the state aid rules, public intervention is limited. The regulations for SME investment, risk capital and guarantees are still not sufficient to address the 'equity gap'. State aid rules should be modified to the actual market circumstances and be more flexible. ~~Especially the~~The ~~–~~current widening ~~/ volatility~~ of the equity gap from €100.000 up to €2.~~,~~5 million, ~~nowadays~~and its volatility~~,~~ in particular, should be addressed.

  As aid to small innovative companies has little effect on international trade, the Commission could design much simpler state aid rules ~~concerning~~ for this kind of ~~activities~~activity, also ~~taking care of~~looking into new financing instruments (e.g. mezzanine) which ~~at the moment~~ do not fit within the current state aid rules.

The ‘de minimis’ regulation now allows ~~now for~~ support up to €100.000. It should be adjusted to~~, and~~ allow ~~for~~ support up to the appropriate level of funding needed, especially for risk capital.

- As well as ~~on a~~at national level, ~~also on a European level~~ an integrated approach to address the specific problems and needs of R&D intensive SMEs and start-ups is preferred on a European level too, whereby the financing part should be integrated in a balanced way with the other components in the (technology) innovation process, such as (financial) support for R&D, coaching, use of incubators etc. Therefore, ~~also~~ the EU instruments should also provide an integrated approach towards R&D intensive SMEs and start-ups.

2 Management skills

A lack of finance in the early stages of the life cycle of high-tech SMEs is not the only ~~important~~ major barrier ~~for~~ to successful development. Start-ups also face internal problems ~~like~~ such as the lack of entrepreneurial skills, resulting in the failure of potentially successful ideas and enterprises. Typically, young research-intensive companies are founded by scientists who were mainly (or still are) involved in carrying out research activities, and have little or no~~ne or very limited~~ experience in running a business. High-~~-~~tech SMEs and start-ups need specific support for developing and commercialising their products in the early stages of their life cycle to increase their survival rates.

In general, there is a tendency ~~of~~ for (~~research intensive~~research-intensive) SMEs to under-invest in new and necessary competence. This ~~may~~ can be explained by a number of hindrances and weaknesses found in the competence market, both on ~~on~~ the demand and the supply side:

- Lack of capital for investments in competence development (high risk, no mortgage).
- Little awareness and recognition of competence as a competitive edge.
- Lack of information and knowledge about how to acquire necessary competence, and from whom.
- Most suppliers in the competence market find larger enterprises and the public sector more attractive as clients than SMEs (which ~~o~~ entail higher transition costs).
- Suppliers have often a poor understanding of the ~~real~~ actual competence needs of the SMEs.

This chapter addresses the problems ~~concerning~~ of lack of entrepreneurial skills, resulting in the failure of potentially successful ideas and enterprises of young R&D-intensive SMEs and start-ups, illustrated by the situation in Ireland. ~~This chapter~~It introduces initiatives implemented by other countries, but especially Norway, Greece and Switzerland, to address~~ing~~ this issue.

2.1 Case of Ireland: management skills as a critical success factor

2.1.1 Background: the Celtic tiger

In recent years, the Irish economy has performed exceptionally well by historical standards and by international comparison. Between 1993 and 2004, employment ~~has~~ increased from 1.~~,~~2 million to 1.~~,~~9 million, unemployment ~~has fallen~~fell from 15% to 4.~~,~~3% and the value of exports ~~has~~ increased from €28.~~,~~5 billion to over €110 billion.

Over the period 1970-2004, the population ~~has~~ increased by 35% to over 4 million, while GDP growth is currently running at 5% and is estimated at about €140 billion or €35.000 per capita - second only to Luxembourg in the enlarged EU-25.

This economic success has been driven largely by the performance of the internationally traded goods and services sectors, and in particular by the growth of foreign direct~~s~~ investment. Exports by indigenous enterprises has been less dramatic and grew in nominal terms by 5.~~,~~5% per annum. H~~~~however, within this sector there are some 'shining lights', including Irish High Potential Start Ups (HPSUs)[30] in the ICT and related sectors.

The EU ~~is~~ currently lags behind the US and Japan in research and innovation performance, while Ireland's gross expenditure on R&D - at 1.~~,~~4% of GNP - is below the EU average and lagging significantly ~~lagging~~ behind such countries as Sweden and Finland. This challenge and ~~that~~ the challenge of the Lisbon 2010 agenda ~~is~~ are being addressed by the Irish Action Plan for promoting Investment in R&D to 2010 (BIKE, July 2004) with targets to increase gross expenditure on R&D to 2~~,~~.5% of GNP by 2010
The Irish National Development Plan (NDP) 2000-2006, is investing over €50 billion, including €2.~~,~~5 billion in Ireland's Science, Technology and Innovation System (STI). Enterprise Ireland, as one of the most important organisations involved in policy delivery in Ireland, has a specific responsibility to accelerate applied research and commercialisation, leading to increased rates of HPSUs and regeneration and scaling of Irish SMEs for sustainable exports to w~~W~~orld markets. For example, as part of the 'BIKE' R&D Investment Plan, Enterprise Ireland ~~is charged~~has been given ~~with~~ specific targets to increase significantly ~~by 2010~~ the number of indigenous companies engaging in R&D by 2010. As part of its mandate, Enterprise Ireland has carried out an analysis of all the 470 High Potential Start Up Businesses (HPSUs) it has supported ~~by it~~ over the past 15 years.

The analysis of the HPSUs supported over the period 1989-2004~~,~~ found that total employment in the surviving c~~C~~ompanies was approx 7.500 and total annual sales

[30] A High Potential Start-Up (HPSU) is defined as:
- A Company that manufactures or trades services internationally.
- Products/services are based on Technological Innovation.
- Likely to achieve significant growth within 3 years.
- Achieve sales of €1.0million+ and employment more than 10.
- Export oriented.
- Le~~a~~d by an experienced management team.
- Irish owned and located in Ireland.

had reached approx €1 billion, with a key focus on export ~~focus~~. The analysis also showed:

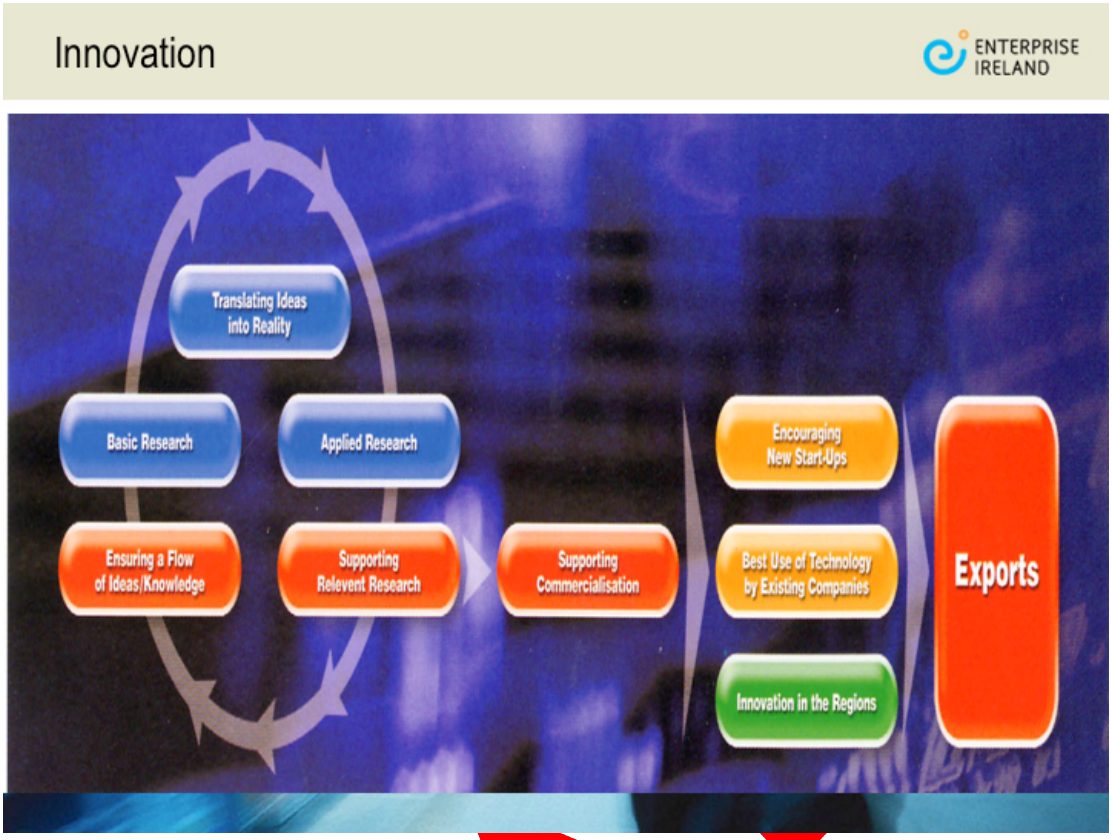
- A failure rate of 20% over the period
- 52% of failures occurred within the first 3 years
- 35% failed to employ ~~greater~~ more than 10 people
- Only 11% of surviving HPSUs achieved sales ~~greater than~~of more than €5million
- Achieving ~~a~~ sales ~~scale~~ of ~~€~~5-10 million takes 6 years+
- Years 0-3 are critical (pre-seed, seed and early stages: 'valley of death' period)

The study also revealed the key characteristics of scale for s~~S~~uccessful HPSUs ~~of scale~~:

- A strong and experienced management team, (frequently led by or supported by serial entrepreneurs) with a background in the target industry
- A product offering that is based on clear technological advantage
- A team of experienced and dedicated sales and marketing professionals.
- Having s~~S~~uccessfully built a close strategic alliance with one or more key target customers
- Well funded or with access to substantial equity funding from the outset

These findings present some key insights into entrepreneurial pre-seed management skills requirements and other factor conditions required for the establishment and growth of successful research-~~-~~based SMEs. They form the basis for some key actions in the Enterprise Ireland Strategy 2005-2007, entitled~~,~~ 'Transforming Irish Industry'. The presence of these key factors increases the probability of success in the Irish experience and analysis, while the absence of a number of such key factors increases the risk of failure.

Figure 8: The Innovation Chain



Much has been written world~~-~~wide about the characteristics and dynamics for successful Entrepreneurship (which we do not intend to ~~it is not intended to~~ review ~~this~~here). H~~-~~however, empirical evidence and experience~~tial evidence~~ suggest~~s~~ that well developed and balanced pre-seed entrepreneurial skills are essential for the establishment of successful HPSU businesses. For some, these skills come naturally while for others, the~~yse skills~~ can be developed, honed, augmented and balanced. These are also key challenges for Ireland in the drive to accelerate the establishment of HPSU Businesses.

Irish industry is at a crucial point in its economic development. What is ~~now~~ needed now is high-value knowledge-intensive activities that can support high-value jobs and relatively high wage rates. The c~~C~~ompanies that provide these jobs are intensely market-focused and innovative firms, providing new and sophisticated products and services at competitive international rates.

~~While~~ Although Ireland has begun this journey, future Irish economic success lies in the research, commercialisation, production and sale of higher value~~-~~-added products and services to worldwide markets.

To be successful in this new competitive environment, companies will have to embrace a new type of business model where market knowledge and innovation will increasingly determine success in export markets. Growth in Irish national and regional prosperity depends, now more than ever, on the performance of the indigenous sector. This is a key challenge for Enterprise Ireland.

The analysis, discussed earlier, of the 470 HPSU Businesses supported over the period 1989 - 2004 and the identification of key success characteristics (and indeed failure characteristics) provides a basis for accelerating the quality and quantity of High Potential Start-Up Businesses and for exchanging best practice in the areas of pre-seed management and other skills. Within this context Enterprise Ireland has set itself a target to support the creation of 210 new HPSUs nationwide by end 2007[31]. The essence of the Enterprise Ireland Strategy is the assignment of a Development Adviser (linked to a holistic Support Network) to each Entrepreneur or Team-- it is needs-- based with a key focus on 'doing what it takes' to build successful Entrepreneurial Teams and Projects.

The Enterprise Ireland analysis shows that incremental change and service innovations over the period have not resulted inled to anyno appreciable increase in failure rates, but have resulted in a substantial increase in the volume of start-ups. Therefore, the policy in of achieving ever more challenging stretching targets for the future is must be based onthat of a combination strategy that, combines the followingnamely:

- Accelerating and enhancing a number of existing measures
- Introducing new measures to provide additional assistance to Pre-Seed and embryonic Companies in identifying key skill and management development requirements, with Enterprise Ireland taking a very active role in the identification of suitable solutions
- Scanning World Best Practice, and implementing those measures, which have proven successful, can show additionalitly, value for money (VFM) and are transferable in an Irish context

2.1.2 Actions: many different programmes addressing skills

Ireland has implemented the following series of programmes, which address in some one way or another the lack of skills of young research intensiveresearch-intensive SMEs and start-ups:

- The Enterprise Platform Programme (EPP) delivered by the Irish Institutes of Technology in partnership with Enterprise Ireland, which provides screening of entrepreneurial teams (academic and non-academic) and project ideas to ensure maximum success rate and 'bankable' pre-seed business plans. For potentially high quality pProjects, Enterprise Ireland pays up to 50% of the eEntrepreneur's salary plus the cost of a mMentor. The one-year programme includes tutoring in key business and innovation strategy modules, plus one-to-one mentoring based on entrepreneur-/-project needs and exposure to Seed and Early Stage Venture capital. It is an important source-/-pipeline for HPSU projects.
- Pre-Seed Feasibility Study Programme plus strategic Business Skills Consultancy (Enterprise Ireland pays up to 50% of the cost) provides the opportunity for entrepreneurs to research the market and commercial potential of technology based ideas, supported by the Enterprise Ireland's overseas offices and strategic

[31] Enterprise Ireland, as part of its Strategy to address the R&D/Innovation deficit, has set key targets to for the period up to 2010 to:
- Double the number of indigenous Companies (from a base of 525) with minimum scale R&D (in excess of €100,000).
- Increase the number of indigenous Enterprises (from 26 to 100) performing significant R&D (in excess of €2million).

consultants to ensure bankable pre-seed business plans and balanced entrepreneurial teams.

- Business Angels Support Programme offering enlisting of Business Angel support by entrepreneurial teams to provide some cash, but most importantly to provideing specialists in business and technology management and skills.
- Technology Management Skills providing funding support for the establishment of the National Institute of Technology Management (NITM) at University College Dublin linked to MIT and a Master's Programme at the University of Limerick. SME, MNC personnel and entrepreneurs participate in under-graduate and post-graduate programmes (some by e-distance learning).
- Mentor Network providing one-to-one mentoring and Multi-skilled Mentor Panels. The role of the Mentor is to listen and advise, to suggest options and help the Entrepreneur to prioritise actions, requirements and opportunities. Entrepreneurs can choose one-to-one mentoring or avail of the advice of a multi-skilled mentor panel (typically up to three mentors). Mentors are experienced and successful business people and volunteer their services for a nominal fee. Enterprise Ireland has a Panel of over 200 active mentors and the service is free to the entrepreneur.
- Export Sales and Marketing Skills plus key customer reference sites. A range of action based training programmes aimed at upskilling SMEs and entrepreneurs, supported by executives in Enterprise Ireland Overseas Offices, and connecting to export markets and achieving key Reference sites; a critical milestone with seed and early stage businesses.

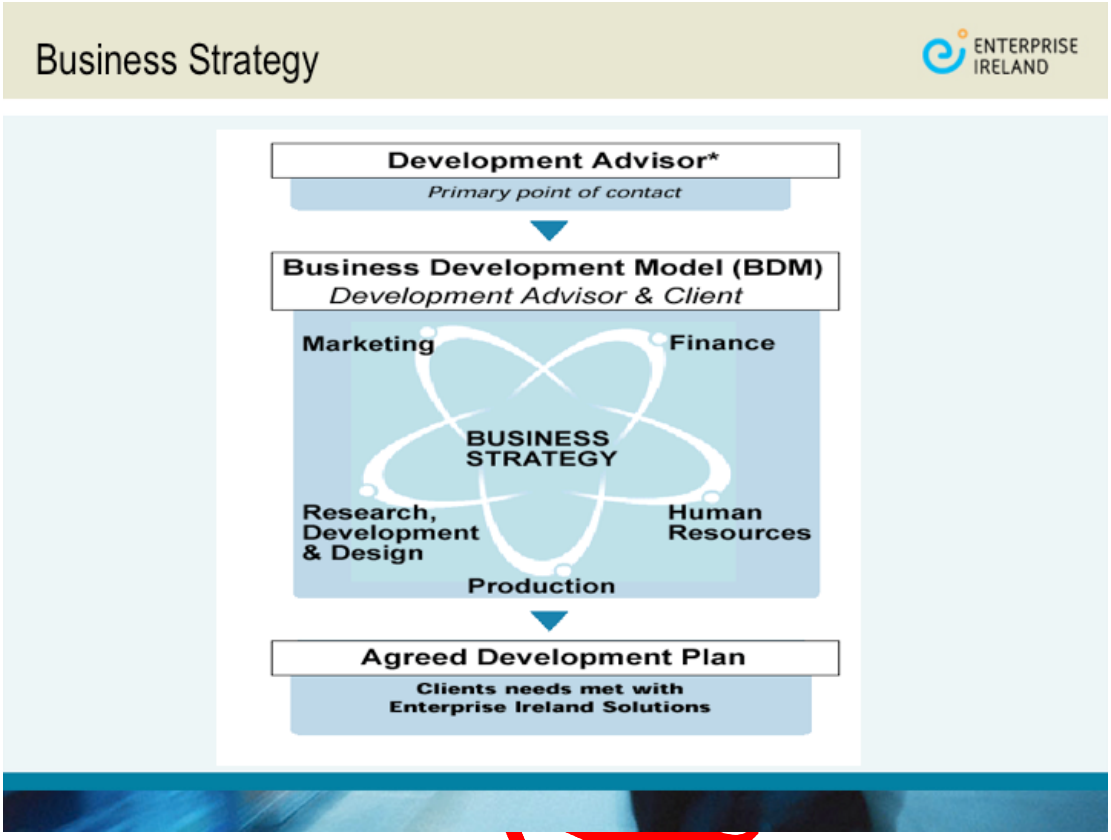
The Irish government has, through Enterprise Ireland, introduced the following measures:

- Increased prospecting for and selecting experienced managers and entrepreneurs in SMEs, MNCs, and Services in Ireland through regional events and on an international level through targeting Irish and other ex-pats in the UK, USA, mainland Europe and the Gulf States.
- Increased prospecting and selecting of academic and post-graduate teams to work in campus incubators / innovation centres (UCD-Nova, DCU-Invent, Regional Incubators) supported by business and technology coaches and mentors and exposed to seed and early stage Venture capital. Plan also for inclusion of 'Creative Mavericks'.
- New Enterprise / Venture Start Programme. This programme draws on the experiences of the Entrepreneurial School at Babson College (Boston) and is intended to provide training for executives and managers, who are currently in employment that and wish to establish their own business, and also have a potential business idea. The course, which is modular and part-time, is delivered over a six--week period at regional venues and deals with the entrepreneurial mindset, the entrepreneurial process; it, is learning--centred, action--oriented and delivered primarily by experienced and successful entrepreneurs. A key output is the preparation, presentation and negotiation of a business plan and business deal to a 'Third Party Investor'.
- International Sales and Marketing Mentors. This programme is designed to provide pre-seed and early stage companies with the tutoring, skills and expertise of a successful international marketer, thus shortening the connect and access time

and cost to key international reference sites and key customers. A pilot programme is currently underway and a database of verified mentors is being prepared.

- The 'Sales Star' programme. This is a management development and sales skills programme aimed at entrepreneurs and CEOs (technically oriented) which Enterprise Ireland organises in conjunction with the Irish Software Association (ISA). It is a key learning and action orientated programme involving international market planning and sales (USA and Europe)
- Champions of Innovation Programme. This programme builds on earlier Enterprise Ireland programmes in the Innovation Management series and is designed to assist entrepreneurs and other managers to develop the tools and skills essential for successful R&D and innovation. The programme consists of short, intensive, action-based workshops delivered by world-class innovation practitioners and tutors.
- Further Development of the Coaching Process. Enterprise Ireland, having studied best practice particularly in Europe and the USA, is currently formulating a more intensive coaching strategy and panel to support pre-seed and early stage entrepreneurial teams.

Figure 9: Support to HPSUs



2.1.3 Conclusions: how to further support the Irish HPSUs

Enterprise Ireland, in its quest to develop further pre-seed management and other skills~~,~~ as a basis for accelerating the quality and quantity of world class ~~research intensive~~research ~~-~~intensive and successful HPSUs, continues to seek out alternative and complementary approaches in other countries, which demonstrate real success and impacts, additionali~~t~~ly and value for money with transferability in an Irish context.

Based on the analysis ~~within the framework~~ of this c~~C~~ase, the following conclusions can be drawn:

- In recent years, the Irish economy has performed exceptionally well by historical standards and by international comparison.
- However, this economic success has been largely driven by the performance of the internationally-traded goods and services sectors, and in particular by the growth of foreign direct investment. Nevertheless, ~~— however~~ there have been some 'shining lights' in the indigenous sector, including High Potential Start Ups (HPSUs) in the ICT and related sectors.
- Irish Industry is at a crucial point in its economic development, and growth in Irish national and regional prosperity depends now more than ever on the performance of the indigenous sector. This is a~~s~~ key challenge for Enterprise Ireland.
- An analysis of 470 HPSU b~~B~~usinesses supported by Enterprise Ireland over the period 1989-2004 identified a number of key success characteristics (and indeed

failure characteristics) and provides a basis for accelerating the Programme and the target of supporting 210 new successful HPSUs by end 2007.

- The analysis showed a failure rate of 20% over the period, 52% of those failures occurred over the first 3 years, 35% of surviving companies failed to employ ~~greater~~ more than 10 people, and only 11% achieved sales figures ~~greater than~~over €5 million. It takes six years or more to achieve a sales bracket ~~Achieving a sales scale~~ of €5-10 million ~~takes 6+ years~~. Years 0-3 are critical (pre-seed, seed and early stages; 'valley of death' period).

The keys to success identified from the Irish experience include:

- Strong and experienced management teams;~~,~~ product/service offerings based on clear technological knowledge;~~,~~ experienced and dedicated sales and marketing professionals;~~,~~ close strategic alliances with one or more key target customers and being well funded or with access to substantial equity funding from the outset. Absence of these characteristics~~,~~ leads, in the Irish experience, to increased risks of failure and a key question is: 'How do we minimise these risks, including those of inadequate pre-seed management skills?'.
- Well-developed and balanced pre-seed entrepreneurial skills are essential for the establishment of successful HPSU Businesses. For some, these skills come naturally, while for others~~,~~ these skills can be developed, honed, augmented and balanced. A key question is: 'How do we do this successfully and what is best practice in this area?'.
- The essence of the Enterprise Ireland Strategy is the assignment of a Development Adviser (linked to a Holistic Support Network) to each Entrepreneur or Team; needs-based with a key focus on 'doing what it takes' to build successful entrepreneurial teams and projects.
- The policy in achieving ever more ~~stretching~~ ambitious targets for the future is ~~that of~~ a combination strategy, namely: accelerating and enhancing a number of existing measures, introducing new measures to provided additional assistance to pre-seed, embryonic and growth companies, and scanning for world best-practice which can be successful and transferable in an Irish context.

2.2 Response by Norway: FRAM and FORNY

2.2.1 Background: a changing economy

~~As~~ Since the main income source in Norway (~~the oil~~petroleum production) will be reduced gradually in the years to come, a 'value creation gap' is very likely to emerge. In 2020 much of the value creation must come from enterprises that do not even exist~~ing~~ today. As ~~the~~ Norwegian exports of technology-based products/services have remained relatively low for many years, and ~~the~~ R&D expenditure ~~in~~ as a percentage of GNP is well below the OECD average, it is easy to see that competence-based and viable start-ups will be an extremely important factor in the Norwegian economy during the next 20 years. This is one of the main reasons why the Government has proposed to raise the total R&D investment in Norway from the current 1~~,~~,75% to 3% of GDP by 2010. Like the EU Barcelona objective, ~~the~~ public funding is expected to be increased to 1%, while the private sector and others (e.g. foreign sources) will be responsible for the remaining 2%. As the Norwegian business structure is based to a large extent ~~is based~~ on raw materials (oil & gas, fish, metals), and also ~~consists of~~comprises a very high proportion of SMEs (99~~,~~,4% of all 450.000 enterprises have ~~less~~ fewer than 100 employees, representing 53% of the total turnover), it will no doubt be a challenging task to reach the 2% goal for private R&D funding by 2010.

However, the starting position for value creation is good: The economic platform is solid and stable, ~~the~~ unemployment is low, and the level of higher education is very high. The main challenge is to convert general knowledge intensity to industry; and here R&D is needed.

The national research & innovation system consists of ~~3~~ three sectors: ~~the~~ industry, ~~the~~ research institutes and ~~the~~ higher education, which contribute roughly 50, 25 and 25% respectively to ~~the~~ R&D expenditure in Norway. A characteristic feature of the Norwegian R&I system is the large number of research institutions outside ~~the~~ of higher education. ICT is the largest R&D area, followed by offshore technology, materials and marine R&D.

Having in mind the increased global competition and the 'value creation gap' mentioned above, it is a major challenge to improve ~~the~~ productivity in ~~the~~ Norway's~~egian~~ industry, exposed as it is to international competition. However, various surveys and findings suggest that ~~the~~ Norwegian industry during the nineties was less innovative than the average European innovation performance. Furthermore, a high level of entrepreneurial activity will be decisive. According to the 2004 GEM (Global Entrepreneurship Monitor) report ~~2004~~, the level of entrepreneurship in Norway has been stagnating over the last 5 years. The main problem here seems to be reduced access to financial capital (equity, loans and public support). Lack of motivation to start one's own business is still a problem in Norway, although ~~the~~ attitudes are ~~is~~ changing~~improving~~. There is also a lack of competence in entrepreneurship.
On the other hand, education and physical infrastructure have~~s~~ improved. ~~But~~Yet, although the number of new start-ups may be ~~judged~~ regarded as high, only 0,5% of these are technology-based enterprises with international ambitions. The important

challenge is to support this particular group of enterprises, where the main growth potential lie~~i~~s.

A recent analysis of high-growth SMEs in Norway does not give ~~an all~~an altogether~~-~~ clear picture of the common characteristics. It is difficult to pick the winners, as they are present in most businesses/branches~~,~~ and they are not a stable group. Many of them, however, offer differentiated products in niche markets, often in international competition. It is also evident that the ability to survive the critical first years and ~~to~~ succeed in the challenging international market environments~~s~~ will ~~is~~ depend~~ing~~ on improved management skills.

Young R&D~~-~~-intensive SMEs are often strong on technology, with good innovation capacity. However, i~~I~~nnovation ~~is, however, much~~ depends a great deal ~~ing~~ on the ability to develop and employ own competence and skills. A serious barrier to success, which is frequently seen, is the lack of ~~insufficient~~adequate 'strategic skills': knowledge about markets and competition, IPR, and financial matters. A start-up in a pre-seed phase does not normally ~~have~~ feature a management team with complete management skills. This competence gap and lack of business experience may be partly overcome by using external expertise and / or expertise within the Board of Directors. However, most immaterial resources, like skills and competence, cannot be bought in the external market, but must be developed and maintained internally in the enterprises.

In general, ~~there is a tendency of~~ SMEs have a tendency to under-invest in new and necessary competence. This ~~may~~ can be explained by a number of hindrances and weaknesses found in the competence market, ~~both~~ on both the demand and the supply side. Some examples:

- Lack of capital for investments in competence development (high risk, no mortgage)
- Little awareness and recognition of competence as a competitive edge
- Lack of information and knowledge about how to acquire necessary competence, and from whom
- Most suppliers in the competence market find larger enterprises and the public sector more attractive as clients than SMEs (who entail higher transition costs)
- The suppliers have often a poor understanding of the real competence need of the SMEs

2.2.2 Actions: IN and RCN

Because new, innovative enterprises represent an increasing part of ~~the~~ job and value creation, the Norwegian government gives high priority to supporting start-ups with growth potential. Competence development has become a key issue in this respect. As the lack of management skills in SMEs (as described above) is perceived as a market / system failure, business competence enhancement should be facilitated and encouraged by means of public support measures. ~~–~~During the last 10 years, competence enhancement in enterprises has been an increasingly important element in most of the public business support programmes.

In order to obtain a simpler and more user-~~friendlier~~ friendly business support system, a major reorganisation took place as of 1 January ~~01/01/~~2004. The two main agencies

in the innovation system are today Innovation Norway (IN) and the Research Council of Norway (RCN).

- IN provides, connects and releases knowledge, networks and capital, using the following measures: Financing (grants, loans, guarantees), advisory services, measures to improve business competence, building of networks and innovation systems, promotion of Norwegian trade and industry abroad.
- RCN ~~are~~ mainly deal~~sing~~ with basic research (science), large research programmes (strategic priorities), innovation, and the EU framework programmes. The key tasks are to finance and stimulate public and private R&D, also by creating arenas and networks for cooperation and knowledge dissemination.

In addition to the two main agencies - IN and RCN~~, -~~ - there are a number of regional organisations (universities/higher education, various intermediaries)~~,~~ which together form the national innovation system. Both IN and RCN run programmes (including some~~some are also~~ joint programmes) to develop and strengthen the national and regional innovation system.

In spite of the importance attached to the development of competence-based start-ups and high-growth SMEs, there ~~is~~ are no Norwegian programmes/schemes exclusively designed to stimulate R&D/innovation activities in SMEs. However, c~~C~~onsidering~~, however, the fact~~ that most of the participants in business support programmes are SMEs, and that the competence factor is strongly present in most of ~~such~~ these programmes, the ~~achieved~~ SME effect achieved is~~is~~ nevertheless quite clear to see~~obvious~~.

There are two ~~most important~~major programmes/schemes that are enhancing management skills and competence directly or indirectly, with a particular emphasis on early-phase activities. They ~~,~~ are:

- **FRAM (‘Focused, Realistic, Accepted, Measurable’)**

  This is a management and strategy development programme run by IN, designed to help small enterprises. ~~The~~ It is mainly targeted at ~~person is the~~ ~~SME~~ general managers of SMEs, and the focus is on development of management competence and intellectual capital. Company workshops with 10-15 participants and tailor-made company development projects with professional individual coaching are run ~~during~~ over a ~~period of~~ one and a half year period, with clear profitability objectives. FRAM is module-based with a simple but well refined tool-kit. ~~Yearly~~Each year, 400 - 500 enterprises in ~~all~~ branches all over Norway are participating in the programme, which was introduced ~~already in~~back in 1992. The budget for 2005 is €3 million.

  A special version of the programme, FRAM Entrepreneur, has been running since 2002. This ~~is a~~ programme is especially targeted ~~on~~ at technology-based start-ups, where the focus is on innovation and change management. Main issues/targets are: Improved profitability, better functioning of the board of directors, strategic planning, international cooperation/networking, and improved innovation (new products, improved processes, new business models/working methods).

  FRAM was developed on the experience gained from the comprehensive programme BUNT (‘Business Development Using New Technology’), managed by RCN during 1989-92. The main focus here was to give the 320 participating

SMEs an improved ability to link the use of new technology/competence with strategic planning. To achieve this, a specially developed tool-kit and trained consultants (‘change agents’) were used ~~during~~ to run in-company ~~internal~~ development projects lasting 8 - 12 months. Total public (RCN) spending during the 4-year programme period ~~of 4 years~~ was € 9.~~,~~4 million. The BUNT concept was later adapted in Spain (Bizcaya), Austria (through WIFI) and Finland.

- **FORNY (‘Renew’)**

  FORNY ~~is aiming~~ aims to~~at~~ exploit~~ation of~~ research-based business ideas conceived at universities and research institutes, and the projects are thus in the ‘pre-pre-seed phase’. The target groups are individuals, ~~like~~ e.g. researchers, managers and students with good business ideas. The business competence is provided through special commercialisation units at, for example, science parks and similar institutions, and competence building among the individuals in the target groups is an important element in the programme. The ~~yearly~~ annual FORNY budget is about €10 million, and ~~during~~ in the recent years FORNY has been among the ‘budget winners’ ~~in~~in ~~the~~ Norwegian enterprise policy. Since 1995, FORNY has evaluated more than 2500 business ideas, and has created more than 350 start-ups or licence transactions. ~~The estimated v~~Value creation is estimated to be equal to 8 times the public funding of FORNY. The programme is managed by RCN in cooperation with IN.

Development of competence on innovation and commercialisation / internationalisation is integrated in most of IN’s schemes and services. In 2004, 27% of the total number of grants and loans given by IN is expected to lead to competence enhancement in the supported companies. The various measures/programmes are to a large extent adapted to the different regional needs and conditions.

A new concept is now being developed by IN for a new generation of ‘competence products’, ~~with~~ focusing on SMEs and start-ups. As for schemes and services for SMEs with growth potential and ambitions, experience and best practice is gained from (among others) Enterprise Ireland, PERA, Innovation Angels / Yorkshire Forward, and Syntens (NL). Pilot projects are ~~foreseen~~ scheduled to be run in 2006, with ~~a~~ public spending of €2.~~,~~4 million.

One example of an IN scheme now being tested is ‘Innovasjonskompetanse’ (iVEL) (Innovation through growth, change and learning). The objective of iVEL is to increase the innovation capacity of SMEs, and to improve the innovation competence of consultants and organisations offering innovation services to these enterprises. This is done by means of a three-step seminar and coaching programme for selected SMEs.

In addition to the national and regional programmes, IN also offers coaching and advisory services of various ~~nature~~types, such as:

- Idea assessment and patent screening, early phase project development
- Support to inventors ~~regarding~~ on IPR ~~matters~~issues, licensing / negotiations
- Entrance strategies in international markets

As these services mainly target s~~The target group for these services is mainly s~~tart-ups and high-growth SMEs, ~~which makes~~ the competence transfer/development effect of these services is therefore particularly important.

One competence programme of particular interest to pre-seed managers is called Take-Off, which ~~is a~~involves cooperation between IN and SINTEF / The Norwegian University of Science and Technology (NTNU). Entrepreneurs with good business ideas are invited to develop and commercialise their ideas by using relevant and needed competence found at SINTEF / NTNU, through a coaching process.

It is interesting to note the high importance that Enterprise Ireland is attaching to the development of specific skills in international marketing. Considering the importance of developing the international side of the indigenous sector in Ireland, this seems to be the right policy to follow. It is m~~M~~ost likely that~~,~~ Norway, too, would be better off by ~~by giving~~placing more importance ~~to~~ on this particular competence. International sales and marketing is perhaps not a particularly strong feature of the Norwegian side. However, 'Norges Eksportskole' (the Norwegian Export School; a department of IN) is~~, however,~~ offering a number of courses, ranging from comprehensive international management development programmes ('Eksportkandidatprogrammet') to short practical courses developing specific skills. SMEs are normally offered discounted rates.

2.2.3 Conclusions: offer a combined approach

As regards innovation and commercialisation of R&D results, knowledge is the fundamental resource, and learning is the most important process.

The experience gained from leading business support programmes in Norway over the last 15 years may be summarised as follows:

- Financial support (loans, grants, guarantees, etc.) is more effective when accompanied ~~with~~ by competence transfer and/or access to networks.
- To secure a successful competence transfer to SMEs, qualified and trained trainers (consultants) should be used as 'change agents' and driving forces in the project implementation.
- 'Best practice' business development programmes must have a proactive project management, capable of adapting the programme to the real needs of the participants.
- There is a growing acceptance for giving priority support to SME HiGros and start-ups with the best potential and qualifications. The old-fashioned focus on 'rescuing the failures' is apparently being abandoned.

2.3 Response by Greece: EPAN

2.3.1 Background: difficulties in creating ~~research intensive~~research-intensive SMEs

The Greek Innovation System consists of ~~3~~ three major stakeholders: u~~U~~niversities and h~~H~~igher education institutions; public research and technology centres; and the private sector. The level of research in the institutes varies from excellent to average, with about 50% of the total approaching good to excellent ~~with~~ according to international standards. ~~-~~The main problem of the Greek research system is the low level of public expenditure ~~in~~ on research~~:~~; about 0.62% of ~~the~~ GNP, with the private sector contributing only 30.~~,~~68 % of the total expenditure, compared with the ~~55%~~ EU average of 55% (latest available data for 2003).

The ~~2010~~ national target in quantitative terms for 2010 is ~~the~~ to increase ~~in~~ R&D expenditures to 1.5% of GDP (with a contribution from the private sector of 40%), compared with the EU target of 3% by 2010.

The disappointing results for the creation of high technology companies ~~in respect~~compared ~~with the Case~~to the example of Ireland can be ~~explained~~ attributed to the absence~~by the lack~~ of key characteristics of High Potential start-up (HPSU) to achieve scale, i.e.

- Products with clear technological advantage
- Funding
- Secure international market
- Close strategic alliance with at least ~~a~~ one target customer
- Lack of a strong and experienced management team including sales and marketing professionals
- Lack of appropriate intermediary mechanisms and experts facilitating the identification and exploitation of research results

Another important factor in the slow progress ~~till today~~ towards HPSU up to now is the ~~low~~ weakness of the link ~~existing~~ between the educational sector of the country and the economy ~~sector~~. This is especially true for the u~~U~~niversities, which still ~~today~~ concentrate on outdated curricula that are quite often unrelated to the needs of a modern economy.

In Greece, an SME is defined as a legal entity employing ~~at most~~not more than 100 people and with an annual turnover of not more than €2.~~,~~5 million. Greece is litera~~r~~lly based on an SME economy, since 99.8% of the enterprises employ ~~less~~ fewer than 100 people and ~~on a national basis~~nationally they employ 60% of the total workforce ~~on a national level~~ in both the secondary and tertiary sectors of the economy.

Greek SMEs have strengths and weaknesses. The major weakness is their low productivity, which is due to the low technology absorption in their operation. Specific weak areas include: l~~L~~ack of new technologies in their production systems, slowness to adopt~~ion of~~ modern management practices and marketing techniques. Their total dependence ~~to~~ on short~~-~~-term debt financing and suppliers' credit makes them unable to undertake long-term risks such as supporting ~~of~~ research and

development. It is ~~a point of~~ interesting to note that only 3% of Greek SMEs participate~~s~~ in EU-~~-~~supported R& D programmes. As a result of the lack of systematic R& D, the major source of technology is through purchase of equipment.
Strengths include~~ among others~~: The versatility and ease of adjustment to market system changes, the custom~~er~~ization of their production to niche markets, the connection to regional small economies. These characteristics lead to a high degree of innovativeness in the Greek service~~s~~ sector. However, this is a ~~fact resulting~~consequence of ~~from~~ non-technological innovation.

Because t~~T~~he national research policy has ~~recognized~~ acknowledged these difficulties~~,~~ ~~and for this reason~~ there are now a series of programmes trying~~ies~~ to support SMEs to solve some of the chronic problems. For example, the research policy of the Ministry of Development is trying~~tries~~ to encourage SMEs to participate in research programmes in cooperation with laboratories from research centres and u~~U~~niversities, with the expectation that this will promote innovation and increased competitiveness in the SME sector.

Realizing that SMEs are the backbone of the Greek economy, the creation of HPSUs / SMEs is considered a strategic priority for the country. Moreover, with the encouragement of entrepreneurship, such crucial issues as the employment of young scientists and graduates can be addressed.

2.3.2 Actions: support by the EC

The main policy tool~~,~~ which supports research and technology in Greece~~,~~ is the Operational Programme 'Competitiveness' ('EPAN'), whic~~ thath~~ is largely funded by the 3rd Community Support Framework. Within 'EPAN' Priority Axis 4: 'Technological innovation and research' contributes ~~with~~ nearly €100 million ~~for~~ to the creation of HPSU ~~through~~ via the following options:

- Firstly with a pre-~~-~~seed funding scheme (PRAXE A), in which individuals can submit proposals for funding up to € 44.000 for scooping a new idea and developing a business plan prior to being considered by a venture capital fund.
- Secondly, by submitting a mature business plan to a publicly supported scheme in one of three different ~~distinct~~ ways:
  - Submission of a business plan to a specific programme (PRAXE B) run under the auspices of EPAN with ~~the~~ provision for maximum funding of €1 million.
  - Submission of a business plan for funding to an incubation programme (ELEFTHO), with financing drawn ~~by~~ 50% from the private sector and ~~by~~ 50% from EPAN.
  - Submission of a business plan to a privately run venture capital scheme with 50% of assets ~~drawn~~coming ~~by 50%~~ from a public fund (TANEO).

A distinct characteristic of option 2 is the creation of infrastructures~~,~~ where start-ups can begin their operation.
The main objective of these ~~above~~ schemes is to promote the market exploitation of research results by

- Creating permanent mechanisms to drive the results to market.
- Cultivating an entrepreneurship mentality among researchers and university graduates.

- Promoting collaboration between research centres, institutes~~,~~ and private firms.

About 226 projects were funded with up to €44.000 under the PRAXE A programme, ~~with~~ making a total of €9 million ~~were funded under programme PRAXE A~~. Fifteen of these projects ~~m~~ applied to the second stage of HPSU support (PRAXE B) and they are already delivering their first products to the market.
More spin-off projects are currently raising private capital in order to apply also for the ~~he~~ second stage of HPSU support. Four new Business Incubators have been created under the ~~programme~~ ELEFTHO programme and 40 new companies have entered the incubators. The incubators invested in 21 ~~new~~ companies out of the 40. Buildings were financed as permanent infrastructures ~~were financed~~ for ~~2 out of~~two of the ~~4~~ four Business Incubators.

2.3.3 Conclusions: the first changes are visible

For the first time, seed capital was allocated to a considerable number of research projects in order to ~~ease~~ allay the scepticism of the Greek private financial sector ~~to~~ about ~~consider~~ these potential opportunities.
Universities have ~~displayed~~ shown a certain ~~degree of~~ reluctance to the spin-off cultural change, while research centres are more focused on the exploitation of research results. One of the difficulties ~~faced, consists of~~is the lack of experience of IPR issues on the part of ~~the~~ researchers and ~~the~~ academic staff in general~~., on IPR issues.~~ A certain conservatism ~~was~~ has also been detected ~~as well~~, ~~together with~~as well as a limited entrepreneurial spirit.
~~-~~Privately-run b~~B~~usiness incubators tend to avoid risk, such as ~~for example~~ innovative ~~projects~~ technology-based ~~projects~~on ~~technology~~, which ~~implies~~ suggests an aversion to even a ~~medium~~ degreemodicum of technologicaly~~-~~ and financial risk.

It is believed that the existing situation is the result of failing to connect ~~that~~ the ~~several~~ various programmes promoting research and innovation ~~were not connected~~ together~~,~~ so that synergiessms could be ~~developed~~ developed, leading to the establishment of HPSUs.

The fundamental conclusion is that a number of promising HPSUs are finally emerging in Greece. This can be seen as a first sign that the collaboration among universities, research centres and private financial sector ~~can~~ is capable of delivering results. However, this new reality is not yet totally accepted and the stakeholders of the Greek National Innovation System should continue and accelerate their contribution. A possible complementary step is to connect private incubators with public Technologyical Parks that could provide ~~national funds~~ pre-seed funding for national funds, and support ~~to~~ new ideas ~~prior to~~before they are mature enough~~ing~~ for venture capital funding. A new national scheme could be developed based on central coordination, with 13 regional centreers providing specialized support, ~~in a~~ similar ~~way~~ to what countries like Ireland, Finland and Israel have developed.

Additionally, ~~on a~~at national level, ongoing efforts ~~should continue in~~ to develop~~ing~~ personal skills through revision of u~~U~~niversity curricula in fields required by the national economy should continue. Although a start has been made ~~such an effort has~~ recently ~~started~~, the ~~existing~~ inflexibility built into the management of the u~~U~~niversity system ~~makes~~ means that progress is slow. ~~-~~Instead, the emphasis should ~~concentrate~~

be on life-long training programmes, especially ~~in~~ developing all the ~~required~~ skills required by~~for~~ young entrepreneurs.

2.4 Response by Switzerland: no direct financial support for SMEs

2.4.1 Background: economy dominated by service sector

Switzerland has a population of about 7,3 million people, with an overall employmented rate of in total 57% of the total population[32]. Only 3,7% of the labour force is unemployed.

The Swiss economy is dominated by the service industry[33] [34]. Bankings and pPharmaceuticals are the main sectors as far as concerning productivity is concerned. The mMost important sectors concerning in terms of exports are chemicals and pharmaceuticals, and machinerys and electronics.

Switzerland continues to retains maintain its solid position for continued strong international competitiveness[35] [36]. The most recent WEF Growth Competitiveness Index, which measures a country's ability to generate sustainable growth, shows that Switzerland is among the leading group of most competitive nations (in 8th position).

As a result of joint efforts between by the public and private sectors, Switzerland has become an ideal platform for micro and nanotechnologies. Furthermore, the Swiss micro and nanotech industries take advantage of the country's knowledge-based services and high-tech manufacturing experience. The growth rate in the biotech sector has levelled off. The While the number of companies in Europe as a whole is stagnating, i. In Switzerland, however, the figure increasednumber of companies rose by 7% compared with the previous year.

Switzerland offers an extensive network of academic research institutes (2 Swiss Federal Institutes of Technology, 10 Universities and 7 University of Applied Sciences Regions) generating knowledge to be taken further. Note that Switzerland invests about four times more into basic research (Swiss National Science Foundation) than into R&D, which is handled by the Innovation Promotion Agency CTI (ca. CHF 400 million Swiss Francs as opposed to compared to ca. CHF 100 million Swiss Francs).

According to the OECD, Switzerland ranks higher than the average as far as total investment into R&D is concerned (2,57% GERD, but GBOARD only 0,65% (OECD in Figures, 2004)), and has one of the highest research (investment) to output (publications) ratios. There is a high density of patent issuing and Nobel Prize winners.

Switzerland has not yet fully completed the transition to a 'knowledge-based-society' as it would be required in an open / global economy. The commercialisation of

[32] Gross Domestic Product (GDP) per person employed: US$74.033 (2003).
[33] Percentage of GDP: Agriculture / Industry / Services: 2 / 29 / 69.
[34] Percentage of total employment: Agriculture / Industry / Services: 4 / 24 / 72.
[35] Main economic indicators, compared to 2004: GDP Growth: 1,3%; Exports: 1,9%; Imports: 2,3%; Consumer prices: 1,0%.
[36] Exports of goods and services (year 2003): US$133.3 billion, per capita: US$18.260. Most revenues of Swiss exports come from exports to the EU (with Germany leading).

science and technology needs to be further optimised. ~~In comparison~~Compared to ~~other country's~~ funding entities in other countries, the CTI budget is still underrated. Furthermore, early stage financing is obviously a ~~great~~ big challenge for start-ups.

Switzerland has a very high percentage of SMEs[37], and up to 99.~~,~~7% of all companies have ~~less~~ fewer than 250 employees:

- 88% m~~M~~icro companies (~~less~~ fewer than 10 employees)
- 9,9% small companies (10-49)
- 1,8% medium-sized companies (50-249)
- 0,3% large companies (more than 250)

2.4.2 Actions: coaching and labels

For ~~Swiss~~ national policy reasons,~~—~~ as a general principle neither the main organisation involved in RTDI policy delivery - ~~called~~ the Innovation Promotion Agency (CTI) - nor any other governmental entity~~, as a general principle~~ is ~~not~~ allowed to directly finance Switzerland-~~—~~based companies (there are marginal exceptions ~~according to~~under CTI regulations)[38].

CTI's support to the companies is indirect. In short, companies can ~~profit from~~take advantage of CTI by attending free courses in entrepreneurship and, in the case of start-ups, by receiving free professional coaching. CTI enables access to an investment platform to ~~get~~ obtain seed money. The companies may also initiate private-public partnership projects on the basis of their technological research requirements by involving researchers from academia, whose wages are paid by CTI.

CTI and its activities are ~~implemented within the framework~~covered by the ~~of~~ 'Orde~~r~~onnance on the Federal Contribution for the Promotion of Technology and Innovation' ~~dated~~ of December 1982, which is based on the 1946 Federal Law on the Preparation of abatement of crisis and the procurement of work ~~dated 1946~~. A revised legal basis is in preparation.

The current CTI strategy, which includes the promotion of entrepreneurial spirit / management skills, is based on studies and policy documents[39]. The Swiss Parliament allocates ~~its~~ the budget for CTI and ~~that of the different~~for the various measures.

For the ~~years~~ period 2004-2007 t~~T~~he Innovation Promotion Agency CTI ~~was attributed~~received EUR 255 millions ~~of Euros~~. Its activities are listed as follows:

1 **Venturelab (www.venturelab.ch)**

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37 In total 316.441 SMEs (2001).

38 It should be mentioned that the 26 cantons of Switzerland have their own independent specific promotion measures, involving loans, networking events, sometimes tax benefits, and attracting foreign companies. Contrary to the CTI programmes, not all cantonal company support measures may have a focus on high-tech / research-intensive companies.

39 Swiss Science and Technology Council (which peer-reviewed The Swiss Innovation System in 2002); the report by the Department of Economic Affairs called 'Switzerland in the Global Innovation Race'; the Action Plan of the Federal Department of Economic affairs for the Promotion of Innovation and Entrepreneurship called 'InnoNation Switzerland' (June 2003).

National practice-oriented entrepreneurial education and training programme offer~~ing~~ 15 different course modules for students and other interested parties. Financing ~~foreseen~~ earmarked for 4 years (2004-2007): €11 million.

Main characteristics of the programme:

- Participants since May 2004 (start of programme): about 2.500 (more than anticipated)~~;~~ ~~with a tendency to increase~~the trend is upwards.
- 24 start-ups originating from this programme are now in the CTI Start-up process, applying for free professional coaching. Nine of these have received the actual Coaching Acceptance, and two have been awarded the CTI Start-up label. Most of these start-ups come from the ~~course module~~ 'Venture Training' course module (relevant for ~~first~~ initial access to CTI Start-up Coaching), which was conducted for the first time and ended in January 2005. ~~First inscriptions~~Enrolment for CTI Start-up ~~were~~ was in February 2005. The numbers are growing rapidly ~~increasing~~ and every month there is a new status report on the ~~effects~~ impact of the courses, which started in 2004.

2 **CTI Start-up (www.ctistartup.ch)**

Professional coaching for technology-based start-ups (NTBFs) including final qualification, and CTI Start-up Label. Financing 2003: €2~~.~~3 million (for coaching and communication issues). CTI Start-up works in collaboration with, for example ~~e.g~~. 'economiesuisse' (the largest umbrella ~~-~~organization representing the Swiss economy, having the support of more than 30,000 businesses of all sizes) and SECA (The Swiss Private Equity & Corporate Finance Association). Financing 2004: €3 million, 2005: €3 million, 2006: €3 million (for coaching and communication issues).

Main characteristics of the programme:

- Currently there are ~~ca.~~around 130 start-ups in the coaching process.
- Since the start of this programme in 1996, about 122 Labels have been awarded.
- 105 of these CTI Start-ups are still in business (86%). About 13 of the~~se~~ 105 have merged or undergone~~went~~ trade-sales. Bankruptcy is not the only r~~The r~~eason for dropouts ~~is not only bankruptcy~~; another reason is~~, but also~~ a 'conscious decision to cease the Start-up project'.
- ~~Since 1996, a~~About 5000 ~~jobs were created~~ (direct and indirect)~~.~~ jobs have been created since 1996.
- Results for 2003: 18 labels were awarded and 123 direct jobs were created. Risk capital invested: €67 million. ~~There was an involvement of the~~ CTI start-ups were involved in 112 CTI projects (cooperative research).
- Results for 2004: 23 labels were awarded and 120 direct ~~work places~~jobs were created. Risk capital invested: €60 million. ~~There was an involvement of the~~ CTI start-ups were involved in 83 CTI projects (cooperative research).
- Results for 2005: 17 labels were awarded.

Entrepreneurial Teams' Background / Profiles, Experience / Skill mix on entering the programmes:

- About 50 % are spin-offs from Higher Education (academia). The people involved have a strong technology and research background, but mostly ~~ly~~ lack business experience.
- The other 50% come from industry (spin-offs, ~~'~~ decision to found one's own company). Most (but not all) of t~~T~~he people involved ~~mostly (but not always),~~ have experience in R&D in a certain technology area and a reasonable business (marketing) background. Therefore, the coaching approach may be less intense, ~~however~~ although sometimes it may have to be~~even~~ corrective.

Performance in general (of the 105 CTI Start-ups which are still active):

- Employment development: more or less follows the ~~prospects~~ forecasts outlined in the business plans.
- Business development: 25 - 30% of the objectives outlined in the business plans are ~~reached~~attained.
- Internationalisation: CTI start-up has been active in this field for two years. The CTI start-up~~spers~~ are coached and supported in accessing the US m~~M~~arket and the relevant networks.
- Sustainability: CTI has a Sparring-Partner-Model (only for Label CTI start-ups). Experienced s~~S~~enior e~~E~~xecutives from specific market fields/industrial sectors support the CTI Start-ups in the business- and market scaling-up phase. ~~During~~ For 6 - 12 months they look after a CTI Start-up, meeting up maybe once every month. CTI has a portfolio of 50 sparring partners.

~~A 'successful start-up' is considered by CTI as~~ A~~a~~ start-up~~,~~ which obtains~~gets~~ financing~~,~~ ~~can~~ reaches break-even and at least maintains~~s~~ its size over a period of time ~~may~~ can be considered by CTI as a 'successful start-up' ~~'successful'~~. However, about 10% of the ~~mentioned~~ 105 CTI Start-ups are considered as 'high potential' by the CTI Coaches, i.e. they have an above-average growth potential, ~~they have smooth~~easy access to VENTURE CAPITAL financing (indicator: ~~ca.~~around €3~~,~~5 ~~-~~ ~~million to~~ €10 million per financing round) and their management structure is adequate (e.g. they have acquired an experienced senior CEO).

3 **CTI Invest (www.cti-invest.ch)**

This is a~~A~~n example of Private-Public-Partnership. The goal of the CTI Invest is to bring together business ventures, entrepreneurs, investors (including~~.~~ f~~F~~oreign investors) and their respective networks. CTI is a Premium Partner.

This private~~ly held~~ association fosters entrepreneurial thinking and ~~acting~~behaviour, and assists entrepreneurs who~~, which~~ are in the CTI Start-up coaching process or who already have the CTI Start-up Label. The association acts as a platform~~,~~ where entrepreneurs may find seed and early stage capital and also access ~~to~~ the experience and the network of the members during the foundation and business ramp-up in Switzerland and abroad. The Association currently has 34 Investor~~s~~ Members ~~today~~ (~~also~~ plus 7 foreign investors). CTI Label Alumni: also companies with the label can become Alumni members and benefit from networking events (CEO Day, Alumni Events). So far, half of the Label Companies are Alumni Members.

Indicator	2003	2004	2005	2006	Cumulative
Swiss Venture Days	3	4	4	-	11
Presented companies	16	15	19	-	50
Venture Days abroad	n.a.	n.a.	2	-	2
CEO DAYS	n.a.	1	1	-	2
Alumni Events	n.a.	n.a.	2	-	2
Financing volume (million EUROS)	3,2	5	15	0,6	24
Investor Members	19	22	31	34	34
• Swiss Institutional	-	-	14	15	15
• Business Angels	-	-	10	10	10
• Foreign Institutional	-	-	4	7	7
• BA Clubs	-	-	3	2	2
Alumni Members (CTI Label companies)	-	-	39	39	39

4 **CTI project promotion (www.kti-cti.ch)**

Funding of private-public partnership projects (R&D). CTI pays the salaries of ~~the personnel~~staff employed at the non-profit oriented research institute ~~of~~ up to a maximum of 50% of the total project costs. The industrial partner(s) have to contribute at least 50% (including a cash contribution to the research institute). The promotion areas are: Life Sciences, Engineering Sciences, Micro- and Nanotechnology and Enabling Sciences. Start-ups are also involved ~~too~~ and receive ~~adequate~~ appropriate treatment. Budget: 2003: €65 million, 2004: €47 million, 2005: €50 million, 2006: €50 million. In 2004, 448 companies collaborated in 227 CTI projects of which 342 (76%) were SMEs (less than 250 employees). In 2005, 459 companies collaborated in 251 CTI projects of which 363 (79%) were SMEs.

5 **CTI Discovery Projects.**

In R&D projects, CTI's financial share in academic partners is equal to the portion of the total project costs borne by industry. However, i~~I~~n the very preliminary stages of innovative research projects, ~~however~~ (and in particular for start-ups) this rule can become an insurmountable obstacle in many cases, as major project risks ~~keep~~ deter potential industry partners and investors from making a commitment at this stage. With this scheme CTI is also ~~seeks~~ seeking to encourage ~~also~~ radical innovation. Requirements on Discovery Projects include: e~~E~~xtremely high innovative value (radical innovation)~~,~~; unusually 'high-risk'~~,~~; future-oriented technological field~~,~~; v~~V~~ery high economic potential~~,~~; p~~P~~roject team with proven expertise and clear realization~~,~~; and commitment. It must be credibly demonstrated that economic implementation with an industry partner is ensured in the event of success. The industry partner should be assigned exclusive rights of use in its market (segment). Particular rules: industrial investment not compulsory, cash contribution by industry not compulsory, very close guidance by experts. Budget: 2005: €5 million, 2006: €4 million. Seven Discovery Projects ~~were~~ have been awarded~~granted~~, two of which do not yet have an industrial partner ~~yet~~.

6 **Not part of CTI's budget: SSF (SOFI) (www.sofi.ch/global/seco/).**

The administration of the fund was delegated to the Swiss Organisation for Facilitating Investments (SOFI). The early phases of investment in developing and transition economies involve business risks beyond those generally encountered in Western countries. The aim of the SSF is to share these costs and risks with the investor. It does so by (i) facilitating and supporting systematic preparation of private investment projects (studies) through feasibility studies and

business plans, and/or (ii) co-financing the initial investment phase (up to 3 years after start of operations). Financing by the SSF is in the form of a loan that must be repaid within 5 years from the signing of ~~time~~ the loan agreement ~~is signed~~. The projects must be commercially viable and meet recognised environmental and social standards. Administration of the fund: € 300 ~~'~~000 ~~Euros~~ per annum, circa €2 million for approximately 8 projects (maximum of €334.000 per project).

Possible new measures include:

1 Seed: It is being debated~~liberated~~ whether to create a revolving fund ~~should be created,~~ to which anyone~~body~~ could contribute in order to counteract~~mbat~~ the lack of seed money. This might include tax benefits. However, ~~with~~ in the current legal framework, ~~a~~ direct financial involvement ~~of~~ by the Swiss S~~s~~tate will be ~~practically~~ impossible. The ~~respective~~ relevant aspects of the Swiss legal system would first have to be changed ~~first~~.

2 The Swiss Council received a~~n~~ parliamentary mandate[40] to reposition the Swiss Innovation Promotion Agency CTI by introduc~~applying~~ing changes to the Swiss Research Legislation and ~~e.g.~~ enabling steps towards ~~realizing~~ the creation of a revolving fund by reinvesting money originating from economically successful CTI projects (point 4).

3 ~~It is planned~~There are plans to introduce an 'SME Voucher' (including start-ups): selected SMEs will receive a CTI project-voucher (see point 4). They will ~~address~~ approach the Universities, Federal Institutes of Technology and Universities of Applied Sciences with their specific technological problem or request, and thereby procure various offers. The research institute with the best-quality offer will be chosen and together they will apply for a CTI grant (the CTI criteria have to be fulfilled in any ~~case~~event).

2.4.3 Conclusions: the impact of coaching on performance

Performance objectives of CTI Start-up look as follows:

- The financial ~~investment into~~investment in start-ups should be around €67 million per year.
- 25-30 start-ups should receive the CTI Start-up Label every year.
- Every year at least €14 million of seed money should be generated via CTI Invest.
- CTI Start-up ~~has the aim~~aims to create 120 direct ~~working places~~jobs per annum.

CTI Invest, together with CTI Start-up, has been very successful. ~~Via~~ Through CTI invest, CTI managed to organize €15 million of seed capital in ~~the year~~ 2005 for CTI Start-up companies holding the CTI label. This may have been made possible ~~because there was a~~by the signs of high success potential ~~visible~~ and because ~~the~~ investors ~~have the possibility~~can ~~to~~ stay close to the development by 'knowing the company team' (network attended by CTI). ~~The i~~Investors might have also been relying on the special entrepreneurial assets of these companies, which were acquired in the CTI Start-up process (for instance, these company representatives were ~~e.g.~~ also well trained by CTI Invest in how ~~in~~ to present~~ing~~ their case ~~in front of~~ to potential investors).

[40] German: "Motion Noser" issued by R. Noser from the Swiss National Council.

~~Furthermore t~~There is also substantial indirect investment in~~to~~ SMEs via the other CTI measures (CTI (Discovery-high risk) projects). ~~According to a~~A KOF-survey[41] ~~it was shown~~showed that SMEs~~,~~ which are involved in CTI projects~~,~~ have a better capability to innovate than SMEs that are not involved in CTI projects. These ~~thereby involved~~ start-ups gain experience in private-public partnership projects through which they can acquire technological expertise, and hence increase their market value. Furthermore, they are monitored and coached by CTI experts and CTI Start-up coaches (who have a research and business background) - if in the corresponding Start-up process - in the course of the project. In t~~T~~his way, they also gain~~et~~ access to the relevant technological and financial network. With such a background, these start-ups are more likely to ~~raise~~ arouse interest in potential financers.

Lessons learned on a programme level:

- Sensitisation, training and coaching of entrepreneurship is absolutely essential (Venturelab and CTI Start-up). Venturelab, which was launched only recently, is already yielding very promising results ~~resp.~~and ~~perspectives~~prospects for the future. The CTI does not give money but provides know-how; the customer's motivation may therefore not be purely financial.
- As in the CTI Start-up coaching programme, it can be recommended to ~~attribute~~ award some kind of a 'prestige~~ious~~' label, i.e.~~being~~ accreditation ~~ed~~ only comes after the successful completion of the coaching process. The label should serve as a proof of quality, which raises the companies' attractiveness to venture capital.
- Any financing for specific private-public partnership projects should be conditional on the acceptance by the young start-up of adequate coaching e.g. a CTI coaching process.
- The coaches should have an up-to-date and international training level, and a business as well as scientific background.
- All in all, we ~~can~~ recommend ~~to~~ coordination of~~e~~ all the ~~offered~~ programmes offered: customer attends Venturelab, applies for coaching acceptance, ~~reaches~~ gains the label, engages in a CTI project, joins CTI invest to look for Investors, etc (integrated approach).
- It turned out that CTI Invest's regular get-togethers / networking and matchmaking events le~~a~~d to an improved relation~~-~~ship between the Investors, ~~which~~ conducive to~~entail~~ a positive investment and deal-flow (e.g. co-investments). This regular and sustainable exchange is indeed leading to an enhanced awareness / knowledge capital and joint-efforts. It has been learned~~t~~ that the companies presenting at the CTI Invest events must be ~~diligently~~ carefully selected by CTI Start-up and ~~that they must~~have to receive intensive coaching on how to ~~hold~~ give investor-oriented speeches.
- Sensitisation and training must ~~not only~~ come not only from the state and the cantons, but also from the enterprises themselves ('intrapreneurship'). Furthermore, these measures may even be started at primary or ~~respectively~~ secondary school level. In this respect, the results of the 'Young Entrepreneurs - Israel, the Company Programme' are quite intriguing.

[41] 'Effectivity of the project promotion of the Innovation Promotion Agency CTI' conducted by the Swiss Institute for Business Cycle Research, Swiss Federal Institute of Technology, Zurich, March 2004.

- Seed financing can only be ~~done~~ given on the basis of~~considering other~~ values other than profitability, which will yield profit at a later stage, ~~like~~ such as entrepreneurial and technological assets mentioned above, and also references/recommendations by professionals (directly) involved in these start-ups. The CTI label has turned out to be a decisive factor here (quality insurance~~, that~~ means that the start-up is qualified for seed capital/VENTURE CAPITAL).

Lessons learned on a policy level:

- The State has to ~~engage in~~become involved in some way ~~or another into~~in establishing a revolving fund for seed, run by professionals (role model: Ireland).
- There ~~should~~ needs to be an improvement of the legislative, structural and fiscal context for investment companies, which have specialized in Seed and Start-up financing or innovative companies (Best practice: 'limited partnership' in the UK).
- Experts have~~It has been~~ long recommended ~~by experts to~~ investing more pension fund money ~~originating from pension funds~~ into innovative entrepreneurial projects, ~~however~~ but only into *promising* ~~CH~~ Swiss business sectors[42].

[42] GEM Global Entrepreneurship Monitor, Swiss Executive Report 2003, Report on entrepreneurship in Switzerland and worldwide, Swiss Institute for small and medium sized companies, University of St. Gallen, Switzerland.

2.5 Overview of Member State initiatives ~~in the Members States~~ addressing management skills[43]

Typically, young research-intensive companies are founded by scientists who ~~were~~ have been mainly (or still are) involved in ~~carrying out~~ research activities. They ~~have~~ therefore have a strong scientific and/or technological background, but ~~they~~ usually have ~~none or~~ very limited, if any, experience ~~in~~ of running a business, which requires quite different skills and attitudes. Another issue is that young research-intensive companies are mainly engaged in the development of a single product or a few products, based on highly complex research ideas or results. Compared to the traditional, non-technology-based companies, ~~for these small entities~~ , it is often difficult, and especially time- and resource-~~-~~consuming, for these small entities to develop their ideas or research results into marketable products. Furthermore, their business plan usually relies on a completely new technological approach and a long development process with a highly uncertain outcome; therefore, they are usually risky to finance. They would need specific support in the early stages of their life cycle to increase their survival rates.

The analysis carried out by JRC-IPTS ~~affirmed~~ confirmed that the ~~above detailed~~ problems described above, which are being faced by young research-intensive SMEs ~~are facing~~ in their early stages, are ~~well~~ indeed recognised in most of the Member States of the European Union. Yet, there are ~~only a~~very few programmes ~~exist in~~ that specifically address~~es~~ the needs of young research-intensive companies.

~~Based on T~~The information collected~~, it can be said~~indicates that across the Member States there are five main types of public support measures targeting ~~at~~ young research-intensive companies. These, mostly indirect, measures offer:

- Advice, which includes coaching (active and passive), mentoring, and networking programmes.
- Financial assistance for feasibility studies, market research studies, training, participating in trade fairs ~~participation~~, etc.
- Market research to help develop~~ing~~ their market entry strategy, to carry out product benchmarking, etc.
- Assistance with team building, training plans, courses and workshops, etc.
- Technology advice to help in finding and adopting best manufacturing and operation practices, to optimise the benefits of ICT, etc.

One of the main features of the above-mentioned support programmes is that they ~~are~~ usually involve~~characterised by~~ relatively small amounts of support, offering about €50.000 – €150.000 per project. The average budget of these programmes is about €1 - €2 million a year or €5 - €20 million for a period of 3 - 5 years. ~~Some n~~Notable exceptions ~~are~~ include the German Futour 2000 programme[44] (€150 million in the

[43] The overview is based on the analysis of support programmes and measures aiming at young research-intensive enterprises. The information was collected from public sources and should not be seen as a comprehensive synthesis.

[44] The Futour 2000 programme promotes technology-oriented start-ups in East Germany. http://www.futour.de/.

period of 2000 - 2005) or the Swedish ALMI programme[45] with a budget of about €280 million during the period of 1986 - 2004, but thiswhich however aims at promoting growth in general.

It should be also be highlighted that usually these measures and programmes usually do not only target not only research-intensive SMEs, but also other categories of enterprises or organisations. In some cases, they target all types of SMEs, and alsoas well as higher education institutions, research institutions, technology and innovation centres and individual scientists and researchers.

The greatest partbulk of the support is in the form of a grant, covering a certain percentage (generally 50-70%) of the eligible costs (generally 50-70%). In some cases the support can be restricted to purchasing consulting services. Subsidised loans are also available, but that is not a typical instrument in the pre-seed stage. The support could be used for financing labour costs, small investment or equipment, training (including study trips), paying for external expertise (consultants, studies, etc.).

A large number of agencies are involved in the implementation of these support programmes, ranging from ministry departments, investment promotion agencies, regional development agencies or funds, funding agencies, research councils, or technology and innovation agencies.

To conclude this brief overview, the observed key elements of success of these measures attributed areto the following key elements the followingwing:

- FirstAbove all, a strong governmental vision and commitment from. government.
- A precise assessment of the situation and a definition of the specific needs of start-ups and how to meet them.
- A coherent model in order to avoid fragmentations of actors and support programmes.
- Consistency of support programmes addressing different stages of the life cycle of a company.
- Active coaching as part of effective support ‘packages’.

[45] ALMI's mission is to stimulate growth and development for small and medium-sized companies and innovators. (http://almi.se/almi_in_english.html).

2.6 Management skills: conclusions and recommendations

This paragraph ~~defines~~ sets out conclusions and recommendations for policy ~~concerning~~ to deal with the ~~f~~lack of entrepreneurial skills ~~of~~ in R&D intensive SMEs and start-ups, based on the r~~R~~esponse ~~of~~ from Norway, Greece and Switzerland, and addressing the issues ~~as~~ identified in the Case presented by Ireland.

While t~~T~~he recommendations in this paragraph are based on the input of Case and Response, ~~but~~ they are not the same (i.e. not a collection of all the recommendations) for the different Member States). The recommendations in this paragraph are generic, and could be applied in different innovation systems.

2.6.1 Conclusions

Analysis of 470 HPSU Businesses supported by Enterprise Ireland ~~over the period~~between ~~–~~1989 and ~~–~~2004 resulted in the following figures on success and failure~~: ~~. The~~a~~ failure rate ~~of~~ was 20% over the period~~;~~, 52% of those failures occurred ~~over~~ in the first 3 years, 35% of surviving companies failed to employ ~~greater~~ more than 10 people, and only 11% achieved sales ~~greater~~ of over~~than~~ €5 million. Achieving ~~a~~ sales ~~scale~~ of €5 - 10 million takes more than six years. Years 0 - 3 ~~are critical~~ (the pre-seed, seed and early stages), known as the 'valley of death' period~~,~~ are critical.

The analysis in Ireland ~~indicates~~ points to ~~as a key success factor~~ strong and experienced management teams, product/service offerings based on clear technological knowledge, experienced and dedicated sales and marketing professionals, close strategic alliances with one or more key target customers and with ~~well~~ sufficient funde~~d~~ or with access to substantial equity funding from the outset as the key success factors. Absence of these characteristics~~,~~ leads, in the Irish experience, to increased risks of failure. Hence ~~and~~, a key question is: How do we minimise these risks, including those of inadequate pre-seed management skills?

Young R&D~~–~~intensive SMEs are often strong on technology, with good innovation capacity. However, i~~I~~nnovation greatly ~~is, however, much~~ depends~~ing~~ on the ability to develop and employ own competence and skills. A serious barrier to success, which is frequently seen, is ~~insufficient~~ the shortage of 'strategic skills': knowledge about markets and competition, IPR~~,~~ and financial matters. A start-up in a pre-seed phase does not normally have a management team with complete management skills. This competence gap and lack of business experience may be partiall~~l~~y overcome by using external expertise and/or expertise within the Board of Directors. However, most immaterial resources like skills and competence cannot be bought ~~in~~ on the external market, but must be developed and maintained internally in the ~~enterprises~~firms.

In general, ~~there is a tendency of~~ SMEs have a tendency to under-invest in new and necessary competence. This may be explained by a number of hindrances and weaknesses found in the competence market, ~~both~~ on both the demand and the supply side~~s~~. Some examples:

- Lack of capital for investments in competence development (high risk, no mortgage)

- Little awareness and recognition of competence as a competitive edge
- Lack of information and knowledge about how to acquire necessary competence, and from whom
- Most suppliers in the competence market find larger enterprises and the public sector more attractive as clients than SMEs (whichо entail higher transition costs)
- The suppliers have often a poor understanding of the ~~real~~ actual competence needs of ~~the~~ SMEs

Well-developed and balanced pre-seed entrepreneurial skills are essential for the establishment of successful HPSU Businesses. For some, these skills come naturally, while for others~~,~~ these skills can be developed, honed, augmented and balanced. A key ~~-~~question ~~thereby~~ here is: 'How do we do this successfully and what is best practice in this area?'

Experience in Switzerland indicates that companies participating in programmes aimed at supporting skills tend to be more successful.
According to a KOF-survey entitled 'Effectiveness~~ity~~ of the project promotion of the Innovation Promotion Agency CTI' conducted by the Swiss Institute for Business Cycle Research, Swiss Federal Institute of Technology, Zurich (March 2004), it was shown that SMEs which are involved in CTI projects ~~have a~~are better ~~capability~~ able to innovate than SMEs that are not involved in CTI projects.

2.6.2 Recommendations on national policy level

Based on the information provided ~~within the framework of~~in this Case, the following conclusions and recommendations based on best practices / lessons learned can be identified:

- Addressing the needs of young ~~research intensive~~research-intensive SMEs and start-ups requires an integrated approach~~' of~~ to support, covering all key ~~-~~elements for success of the entrepreneur: access to finance~~s~~, R&D support, coaching of management skills, use of incubators, etc. Support to young ~~research intensive~~research-intensive SMEs and start-ups should be offered by means of a kind of 'one~~-~~stop shop', acting as an interface between, ~~on the one hand~~ the entrepreneur with his specific questions~~-~~/~~-~~problems~~,~~ on the one hand and ~~on the other hand~~ the different programmes offering the specific solutions~~-~~/~~-~~support on the other. An entrepreneur should have a single dedicated contact point throughout the life cycle of his company at this 'one~~-~~stop shop'.
- An 'integrated approach' requires co-ordination between the organisations involved in policy formulation, but also in policy delivery. The policy and programmes supporting young ~~research intensive~~research-intensive SMEs should be part of a wider mix of instruments supporting the innovation system. In this way, support in the later stages of the lifecycle of the SMEs and start-ups is also guaranteed.
- The policy and programmes supporting the innovation system should be based on a thorough analysis of the system, addressing specific market failures, and referring to its specific strengths and weaknesses. Clear goals and targets should be set for policy and the instruments supporting it, ~~concerning~~ in terms of both policy ~~delivery, but also concerning~~and ~~-~~impact. Provision should be made~~This should allow~~ for continuous evaluation of the policy.

- Young ~~research intensive~~research-intensive SMEs and start-ups applying for support should be evaluated on the quality of ideas / people: potential for growth / success (“backing winners”). ~~–~~Support should not be limited to providing resources / funding. Specific project milestones / targets should be identified. Performance should be evaluated against~~based on~~ these targets.
- To secure a successful ~~competence~~ transfer of competence to SMEs, qualified and trained trainers (coaches) should be used as ‘change agents’ and driving forces in implementing the project~~ implementation~~. The quality of the people involved in providing support is a critical success factor. ~~-~~This ~~refers to~~involves training the trainer, but also ~~to~~ providing the appropriate team with specific skills and critical mass.
- Successful entrepreneurs should be ~~stimulated~~ encouraged to share their experience with young ~~research intensive~~research-intensive SMEs and start-ups. They could act as role ~~-~~models in specific training / coaching programmes, to ‘fire and inspire’.

2.6.3 Recommendations ~~on~~ at European level

The previous paragraph identifies a series of recommendations for policy concerning the financing of ~~research intensive~~research-intensive SMEs and start-ups ~~on~~ at national level. However, in order for Europe to meet its ambitions, but above all to create a bigger impact by further harmonizing the efforts of the Member States, the expert-group has identified a ~~series~~ set of three recommendations, as a first step towards an integrated approach that addresses~~ing~~ the financial needs of these types of SMEs:

- The different Member States offer different solutions to address the lack of management skills and the demand for coaching of young ~~research intensive~~research-intensive SMEs and start-ups. The Member States could learn from each other’s solutions ~~by means of~~through further exchange of practices.
- The m~~M~~odern economy is becoming increasingly globalise~~ding further and further~~, and so are the young ~~research intensive~~research-intensive SMEs and start-ups. Their specific needs for coaching or skills might no longer be met by the available knowledge / resources in their specific Member States. Therefore, the Member States could support the exchange of specific talents / competences, or even opening up of their programmes to young ~~research intensive~~research-intensive~~s~~ SMEs and start-ups. However, ~~T~~this requires ~~however~~ additional support / resources from EU programmes on entrepreneurship.
- ~~As a consequence~~In turn, this ~~imposes on~~means that policies both at Community level and in the Member States must~~to~~ provide highly professional and world-class coaching facilities on entrepreneurial and management skills, as these are critical for start-up success. ‘Training the trainers’ and training the entrepreneurs to world class is a key part of this objective. In this regard, the opportunities~~st~~ for a European A~~a~~cademy for Entrepreneurship should be investigated.

3 Collaborative research: links between higher education institutions and SMEs

According to some recent literature, innovation is defined as a collaborative or even collective process, involving firms, universities, supporting services and public agencies. Within this perspective, it is of vital importance for the economic development of a country that its actors in the innovation system cooperate. A major~~n important~~ weakness of the 'European Innovation System', ~~is~~ however, is the inadequate interaction~~s~~ between public and private actors. The quality of science and higher education is regarded as excellent, but it seems that the actors are ~~not~~ unable to commercialise the results of these efforts ('European Paradox'). Innovation-~~-~~driven economic growth requires optimal co-operation, and analysis indicates that there are plenty ~~a lot~~ of opportunities for improvement.

Europe does not have a tradition of intense interaction between the ~~actors of~~players in the innovation system. Research efforts by universities could take more account of the knowledge needs of industry / society. Interaction is hindered by several factors, such as mono-disciplinary layout of research at universities, and lack of incentives for universities to co-operate.

But ~~also~~ companies, too, seem to disregard the knowledge of Universities and Research Institutes when innovating. Analysis indicates that as a source ~~for~~ of knowledge, firms rely heavily on their specific sector / partners in the production chain (own company, competitors, suppliers, clients etc.) or external sources (professional literature) rather than the public research infrastructure. Collaboration between Industry and public research infrastructure seems limited; just 8% of innovative firms in the EU report co-operation with Universities. Similarly, only 8% mention ~~Also 8% mentions~~ co-operation with Research Institutes.

The problem, however, is not just that Industry does not profit optimally from knowledge and output from the public research infrastructure; ~~also~~ u~~U~~niversities, too, seem unable to commercialise the results of their research by creating spin-offs. Measured b~~B~~y number and turnover of spin-offs, the performance of European universities is considerably ~~lower than~~below that of ~~in~~ other countries. Also, patenting activities by universities are limited compared to the main competitors.

Interaction between Industry and the public research infrastructure can also be established by mobility of Human Resources. Data on mobility ~~is~~ are not (yet) available, but a recent study indicates that researchers at universities tend to spend their career within the public research infrastructure. Relatively few ~~-~~change to~~wards~~ a career within Industry (or vice versa). Positive developments are the increasing number of part-time university ~~-~~staff as well as the number of doctoral degrees taken in co-operation with Industry.

Increased research interaction between the public research infrastructure and Industry will ~~evidently~~ obviously lead to relevant innovation and commercialisation of results, together with more research mobility and spill-over of research.

The EU Member States have acknowledged the problems ~~concerning~~ of inadequate interaction. Co-operation has been identified as one of the main issues for innovation policy, resulting (~~amongst others~~inter alia) in specific actions and instruments, ~~referring to~~ for example by boosting~~increasing~~ the role of Public-~~-~~Private Partnership in research.

~~Within the framework~~In examining ~~of~~ this Case, we focus on the specific question: how can research-intensive SMEs create significant value from the technology, knowledge, and innovation potential of Higher Education~~s~~ Institutions (HEIs)?~~.~~ Is it possible to define policy guidelines or build public actions that substantially enhance the dissemination~~ffusion~~ of knowledge between business entities and academic institutions? We believe this knowledge transfer process will improve the competitiveness of young research-intensive SMEs, and also the competitiveness and attractiveness of nations, by creating more jobs and well-being. We also believe that this interaction does not interfere with the quality and level of science and education in HEIs.

We define collaborative research ~~within the framework~~ for the purposes of this Case as an interaction process and exchange of knowledge between HEIs and SMEs in pursuit of a shared, collective, ~~bounded~~circumscribed goal. This definition implies that individual entities may also have their own separate, unique objectives. The task of u~~U~~niversities ~~have the task~~is to educate, and they aim at ~~achieving~~ scientific excellence. Companies pursue growth, competitiveness and other business goals.

This chapter addresses the initiatives aimed ~~to~~ at enhanc~~ing~~e the collaborative links between HEIs and SMEs in three countries, namely ~~in~~ Finland, Belgium~~,~~ and Estonia. Finland has a long and successful tradition of public agencies and actions aim~~ed~~ing at improving the national economic competitiveness by supporting the ~~industry-academia~~ collaborative R&D links between industry and academia. We review the successful policies and actions, as well as the challenges faced by research-intensive SMEs and high-technology start-up companies. We compare the Finnish experience~~s~~ with the ~~Response~~ analysies of responses from Belgium and Estonia and conclude by making recommendations that can be adapted to the needs of different member countries.

3.1 Case of Finland: research collaboration in a successful Innovation System

3.1.1 Background: high expenditure on R&D and Innovation

Finland is one of the leading EU countries ~~within EU~~ investing in R&D. In 2004, t~~The t~~otal R&D input in Finland was ~~in total~~ €5.,3 billion, or 3.,5% of GDP[46] ~~in 2004~~. R&D expenditure as a share of GDP has been rising continuously in Finland since the early 1980s. The public sector invested €1.,6 billion in R&D in 2004 and it plays an important role in the Finnish innovation system. Finland does not have preferential tax treatment of R&D. Instead, ~~Finland~~ it has a range of policies and organisations ~~aimed~~ directly aimed at enhancing the performance of the Finnish innovation system. The agencies have focused tasks such as research and development, invention, venture capital finance, and internationalisation.

Increasing investment in R&D is part of the industrial policy adopted ~~already~~ as early as~~in~~ the 1980s and reshaped in the early 1990s. In the early 1980s, ~~the~~ policies began to favour R&D. Industrial R&D activities started to grow faster and universities were encouraged to collaborate with industry. TEKES, the Finnish Funding Agency for Technology and Innovation, was established in 1983 to enhance collaboration between industry and universities and research institutes. When the first national R&D programmes were launched. At thatis time, policy focused on industrial restructuring from low-technology industries to high-technology industries, and information technology was considered to be a key technology. Since the mid-1990s, the Finnish economy has been growing ~~fast~~rapidly, mainly due to the growth of export-based high-tech industries, especially ICT.

According to European Innovation Scoreboard index 2005[47], Finland and Sweden are innovation leaders within EU in terms of R&D input, number of patents per head of population, and the percentage of population with a tertiary education. Finland ranks first within the EU for both innovation demand and innovation governance indicators. The major challenge is to change the fact that 55% of the Finnish firms do not innovate (7th in EU). The remaining firms are concentrated among the 'creative innovators' and a smaller share of firms ~~is~~ are ~~among~~ adoptingers ~~of~~ new technology. The percentage of SMEs participating in co-operative innovative activities is ~~considerably~~ high~~-~~, at~~with~~ 18.,6%.

According to a recent evaluation of the Finnish innovation support system[48], the strengths ~~in~~ of the national innovation system include: the high ~~number~~ percentage of the population with a university~~tertiary~~ degree, high investments in R&D both from public and business sector actors, and a high level of high-tech patenting as well as internet-penetration. The ~~observed~~ weaknesses identified ~~consist of~~are the ~~a~~ small number of innovative SMEs and low employment in medium-tech industries.

[46] GDP 2004: €150 billion, with a growth rate of 3,7%. GDP per capita 2004: €28.590. Annual inflation in 2004: 0,2 %. U~~A~~nemployment 2004: 8.8%. Source: Statistics Finland.

[47] European Trend Chart on Innovation, EC, 2005.

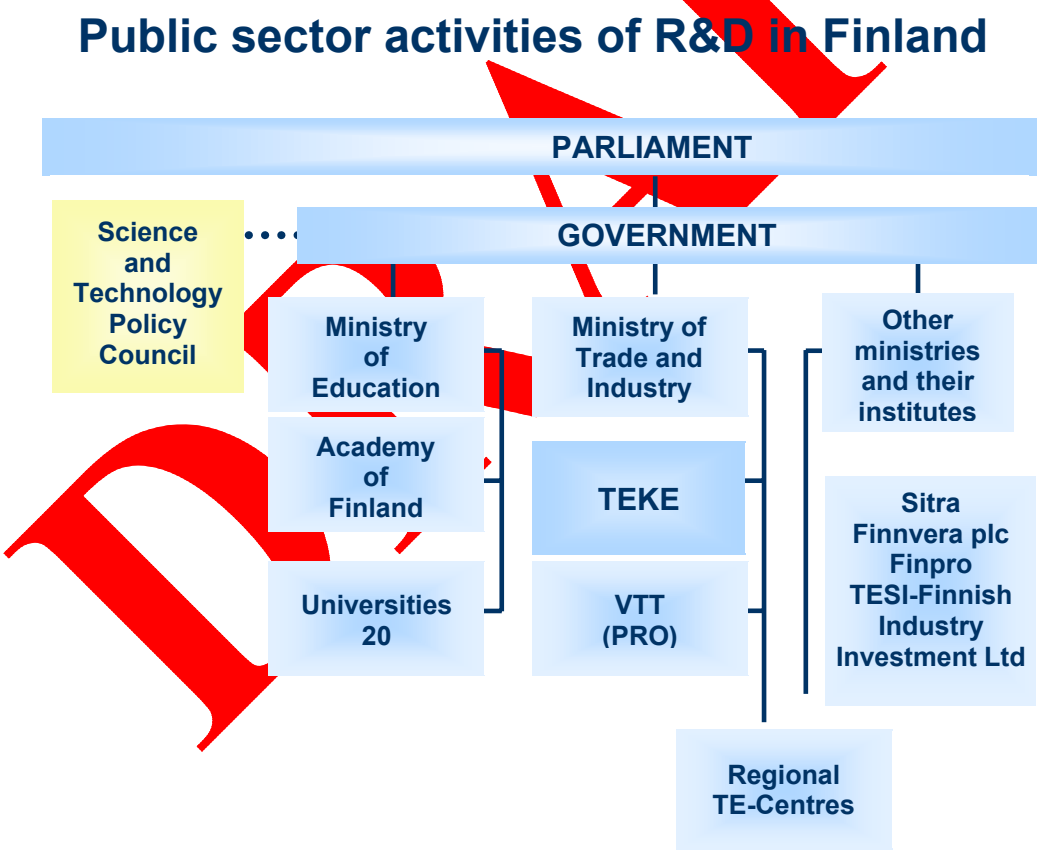
[48] Evaluation of the Finnish Innovation Support System, Georghiou, L. Smith K. Toivanen, O. Ylä-Anttila P., Ministry of Trade and Industry Finland, Edita Publishing Oy, Helsinki, 5/2003.

Finland, ~~as well as~~like other EU countries, needs to adapt its innovation policy in order to deal with the opportunities and threats posed by globalisation and other technological and economic developments. The rapid development of rising economies and the enlargement of the EU bring new challenges to manufacturing and services. Competition between environments ~~for the attractiveness~~to attract ~~for~~ R&D is also increasing. Finnish firms have internationalised their activities very ~~fast~~ rapidly since the early 1980s: starting with ~~first~~ production, then finance and R&D. Today, the largest Finnish industrial companies are among~~st~~ the most internationalised firms originating from small economies. Approximately one third of Finnish firms' R&D is conducted abroad. This is, however, significantly less than their share of foreign production.

3.1.1.1 Actors within the governance system

Organisations in the public sector of the national innovation system of Finland are ~~schematically~~ shown schematically ~~underneath.~~below

Figure 10: Public sector organisations in the national innovation system of Finland



The Science and Technology Policy Council ~~has been~~was established in 1987 ~~as a~~to take over ~~continuation of~~ the tasks of the Science Policy Council founded in 1963. The Council is chaired by the Prime Minister, and members include seven other ministers, and other members representing various organisations in science and

technology, as well as the two sides of industry~~employers and employees~~. The Council ~~is an advisory body to~~advises the government and its main tasks are dealing with the overall development of scientific research and education, and issuing statements on the allocation of public funds for science and technology to various ministries and fields.

In the public sector, the two important ministries in the NIS are the Ministry of Education and the Ministry of Trade and Industry. ~~In~~ Covered by the administrative system of Ministry of Education are the universities (20) and the Academy of Finland, which is composed of national research councils. The Academy is the central financing body in basic research.

TEKES, the Finnish Funding Agency for Technology and Innovation, is ~~in the~~ administered by~~rative field of~~ the Ministry of Trade and Industry. Its primary objective is to promote the competitiveness of Finnish industry and the service sector by assisting in the creation of technology and innovation. The main instruments of TEKES are industrial R&D grants and loans to firms and grants for applied research for public organisations (universities, public research organisations, and polytechnics) along with various expert services for business development and internationalisation. TEKES has an annual budget of about €400 million, a source of funding for more than 2 200 projects. TEKES' funding focuses on SMEs: in 2004, 55% of the funding for companies' projects was allocated SMEs and three-quarters to companies with less than 500 employees[49].

Finnvera plc, a state-owned financing company, aims ~~at provision of~~to provide risk financing (mainly loans and guarantees) and other financial products (such as export guarantees) particularly for small and medium-sized enterprises. Finnvera's funding focuses on the later phases in the growth cycle after the innovation and R&D phase.

Finnish Industry Investment Ltd (FII) is a state-owned investment company, whose aim is to improve~~ich aims at improving~~ the venture capital market. FII's primary instruments are equity stakes in Venture Capital and regional funds, as well as direct investments in specific firms and in seed and growth-stage enterprises together with private investors.

Finpro, is a service organisation aimed at internationalisation of Finnish firms, with activities ranging from international marketing services to innovation networking.

The Foundation for Finnish Inventions, (FFI), supports early-phase activities related to innovation: inventions, legal services related to patenting and other IPRs, market exploration and commercialisation, etc. The FFI agencies offer innovation financing instruments and support services.

Sitra, the Finnish National Fund for Research and Development, is an independent public foundation. Sitra's activities are financed by the yield from its own endowment capital and the return on its venture-capital investments. The Fund was set up in conjunction with the Bank of Finland in 1967 in honour of the 50th anniversary of Finnish independence. The Fund was transferred to the Finnish Parliament in 1991.

[49] TEKES Annual Review 2004, see http://www.TEKES.fi/eng/.

Sitra's tasks include providing research information on Finnish society ~~for~~ as ~~the~~ a basis ~~of~~ for decision-making, organising innovative operations to create new cooperative networks and models, organising training for decision-makers, media representatives and professionals, as well as providing corporate funding for the technology companies in ~~the~~ their early stages of existence, regional enterprises with a promising future and for commercialising innovations. It also makes investments in international venture-capital funds concentrating on the high-tech field.

Employment and Economic Development Centres (T&E Centres) are regional centres ~~offering~~ jointly offering the public services of three ministries, namely the Ministry of Trade and Industry, Ministry of Agriculture and Forestry, and Ministry of Labour. TEKES services can be obtained via these T&E Centres (15 in number) along with other public services for SMEs.

It is important to note that there are active operating links between the organisations. The TE-Centres, for example, provide regional access points for TEKES~~'~~ services; Finpro's networking activities have TEKES as a major partner; and also TEKES and Sitra have major co-operation processes.

3.1.1.2 Finnish innovation policy

During the last half-century~~ennial~~ Finland ~~has~~ has undergone~~experienced~~ a swift transformation from an agrarian into an industrialised society. In the 1980's the national policy supported applied research in HEIs and ~~simultaneously~~ at the same time gave subsidi~~e~~aries ~~for companies carrying out R&D,~~ instead of tax incentives ~~for~~ to companies carrying out R&D. The strategy was adopted to create a solid basis starting from basic research (discovery phase and technology platform development) moving on ~~further~~ to applied research, industrial R&D, and finally resulting in manufacturing and international marketing of technology-based products. In the 1990's the structural changes ~~have~~ progressed towards a knowledge-driven economy. The indigenous high-tech industry has been the primary focus, ~~differing for instance,~~unlike ~~from~~ Ireland or Singapore~~,~~ for instance, which ~~have been~~ support~~ed~~ing the flow of FDIs and talents into these countries by using tax incentives and thus inviting foreign manufacturing operations.

To implement the chosen industrial policy it was an important step for Finland to develop an efficient and high quality educational system. The Finnish innovation strategy also ~~demanded~~ called for increasing input into R&D ~~also~~ from public funding sources. This policy has been implemented consistently.

In 2003 there were ~~in~~ a total of 228 ~~.~~400 companies in Finland. According to the EU definition of SMEs, the total number of SMEs in 2003 was 224~~.~~ 100 ~~in total~~, of which only 3.100 companies are medium-sized enterprises. Annually, 10% of starting companies in Finland ~~die~~ cease trading and 7 - 8% of the companies develop into so-called 'growth companies', which have the highest impact on deployment of labour[50].

The ~~low~~ small number of innovative SMEs, low success rate of new companies, ~~as well as~~and ~~low~~ small number of growth companies are problems ~~of~~ for the

[50] Indicators of enterprise dynamics; Some conceptual and methodological aspects, Olavi Lehtoranta, Statistics Finland.

innovation system in Finland. Annually, ~~about~~ between 500 to 2000 ideas or embryos for innovative start-up companies are identified, but a very small fraction of them develop into companies.

The Finnish innovation system is focusing on technology and ~~–~~/~~–~~or IP based innovations and less emphasis has been put on developing knowledge-intensive services. However, f~~F~~or the competitiveness and productivity of the national economy it is~~, however,~~ critical~~,~~ to also enhance ~~also the development of~~ the research and development carried out by the service sector.

New technology companies are important for the national economy as they utilise ~~effectively~~ new technology effectively, and grow and employ quickly. TEKES' strategic goal is to increase the number of new technology companies and to speed up their growth and internationalisation. Special attention has been ~~given~~ paid to actions aimed at~~ing to~~ supporting the creation of new technology companies by the public sector. Early stage financing is a considerable problem when establishing new technology companies. Also, almost half of the growth companies in Finland ~~declare~~ mention financing as ~~a~~ the main obstacle ~~for~~ to growth[51].

[51] Aloittavien innovaatioyritysten siemenrahoituksen ja palvelujärjestelmän uudistamisstrategia (AISP-strategia) KTM Julkaisuja 28/2004, Paasivirta, A. and Valtonen, P., Edita Publishing Oy, Helsinki 2005.

Figure 11: Funding and supporting services for new technology companies in Finland

Taking new products from research to market ~~demands~~ requires ~~for~~ collaborative networks ~~of~~ to have multiple skills and capabilities, not ~~only~~ just in the fields of science but also in manufacturing technologies, business administration, strategy, marketing, financing, and law, etc. There are not enough services available for the further development of embryonic innovations emerging from research. A l~~L~~arge ~~part~~ proportion of the innovation potential residing in HEIs thus remains unused. The embryonic innovations are too immature for SMEs to be able to ~~take the~~ risk ~~to take~~bringing them into the company's R&D portfolio. There is a need for an efficient network of intermediaries, which can bridge the gap between research and SMEs, for instance in supporting the proof-of-principle and feasibility studies, or helping to plan ~~a~~ R&D projects for SMEs.

3.1.2 Actions: several programmes for co-operation

The ~~primary~~ main actions for promoting collaborative research in Finland are carried out by TEKES, the Finnish Funding Agency for Technology and Innovation. Since its founding~~tarting from its founding~~ in 1983, TEKES' task has been to ~~was given the task to~~ support the development of applied research and technology ~~development~~ in Finland, while~~ere as~~ the task of the Academy of Finland is to fund ~~the~~ basic research performed in HEIs. TEKES funding for both universities and public research organisations, as well as for companies, ~~enables~~ makes it possible to build targeted thematic actions (technology programmes), enhancing the promotion of chosen industrial sectors according to a national industry policy. The priorities have been based on technology scan and technology strategy reports (~~sort~~ a type of a technology foresight~~sight~~ activity~~ies~~) compiled by TEKES.

3.1.2.1 Public funding of applied research projects in HEIs

TEKES provides funding for the research projects of universities, research institutes and polytechnics. The goal of the funding is to build technological competence. The funding is aimed at projects launched within technology programmes, individual research projects, or international projects and their preparation~~s~~. Within TEKES, public project~~s~~ researchers are encouraged to build partnerships with companies. SMEs' contribution to the projects can be either as direct funding or as support in the form~~s~~ of materials or labour. All companies supporting the project are invited to participate in the project steering group. The s~~S~~teering group ~~is~~ guide~~sing~~ the project, receive~~sing~~ reports of the results, and give~~sing~~ expert opinions ~~to~~ on commercialization aspects. Steering group meetings are the means for close interaction between researchers and companies. The administrative and financial burden ~~for the~~on SMEs ~~to~~ participatinge in TEKES public research projects has been ~~made~~ kept very low.

3.1.2.2 National technology programmes

Technology programmes are a targeted set of projects~~,~~ which are managed along with value-added services such as training, excursions and multi-client market studies. They are used to promote development in specific sectors of technology or industry, and to pass on results of the research work to business in an efficient way. Programmes have proved to be an effective form of cooperation and networking for companies and the research sector.

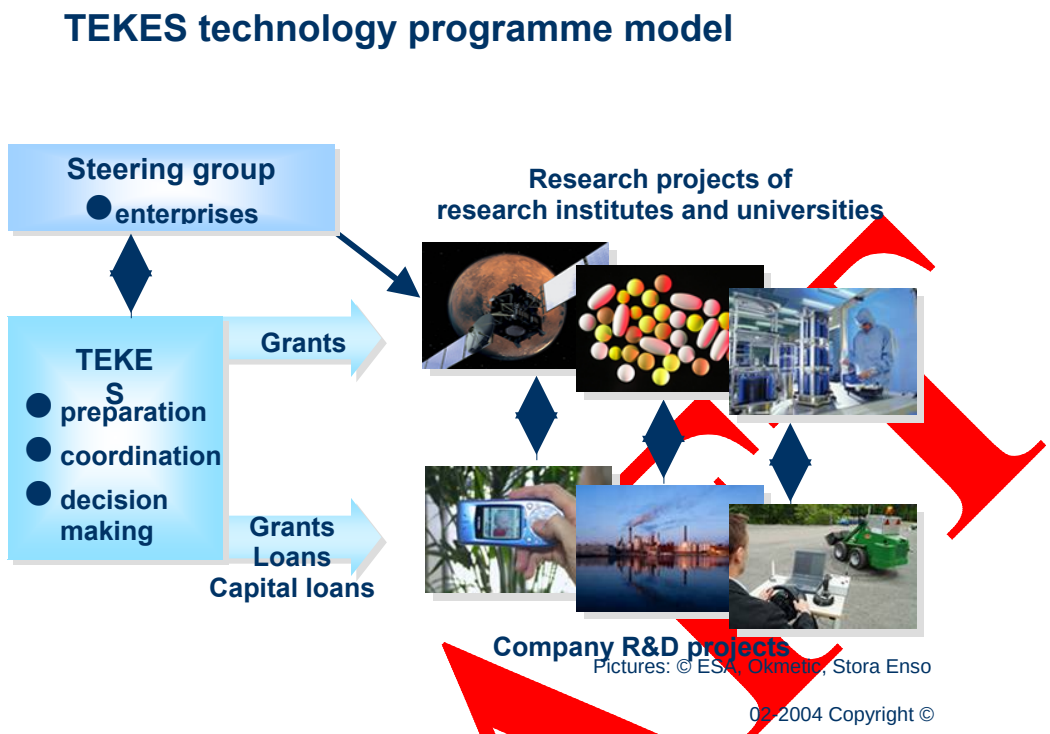
In ~~the~~ autumn 2005, a total of 22 extensive national technology programmes were under way ~~by~~ in TEKES. In 2004, TEKES provided €171 million to finance~~ing~~ technology programmes. There were 1 ~~,~~846 company participations in technology programmes and 537 participations by research units. Approximately two ~~-~~thirds of the company projects in technology programmes were ~~projects~~ carried out by SMEs.

The aim of the programmes ~~are aiming~~is to respond to a specific market need during a time span of 3 to 6 years. Implementation of the programme concept includes:

- Programme drafting: identifying market needs and using technology scan and foresight activities together with the industrial partners (bottom-up approach).
- Programme selection and initiation: TEKES board (top-down approach).
- Coordination and implementation: full-time programme managers and steering groups.

- Reporting in published forms: TEKES publications.
- Objective third party evaluation: TEKES evaluation report.

Figure 12: TEKES Technology programme concept



3.1.2.3 Tuli Research to Business Programme

The basic challenge of the 'Research to Business - TULI ~~Programme' Programme'-~~ is that the commercial potential of publicly funded research is not ~~in~~sufficiently known and its commercial potential is ~~also~~ not ~~in~~sufficiently capitalised. The programme ~~searches~~ seeks out and identifies research-based business ideas from ~~the~~ publicly funded higher education~~s~~ institutions and public research organisations. Tuli services are offered ~~in order~~ to analy~~s~~sze and further develop the commercial potential of these ideas. Funding (upper limit €10.000 for each case) is used to buy external expert services in order to carry out market and patenting studies, partner searches, etc, or even to prepare a preliminary business plan.

Following the TULI service activity, either a new company will be established or the innovation will be commercialised by licensing or by some other ~~way~~ method of technology transfer~~,~~ or, in cases where business potential is not sufficient, the idea is either rejected or sent back for further development in the research 'pipeline'.

Tuli activities have been carried out in Finland since 1993 and were reshaped into a four-year national programme in 2002. The Tuli programme is operated via a network of local technology parks and the total budget of the programme in 2005 was approximately €2~~,~~5 million. Annually about 500 to 650 business ideas are identified. During the 3½~~,5~~ year period of the programme ~~altogether~~ about 100 companies in all

have been started and 75 licensing agreements have been ~~made~~ concluded as a result of the Tuli activity~~following the Tuli activity~~.

3.1.2.4 Tupas Programme

The Tupas Programme provides grants to SMEs to cover ~~the~~ expenses up to €15 ~~.~~000, or 70% of the total costs of a technical project. The aim is to bring together the best experts available to solve the small, but technologically challenging problems facing SMEs~~;~~, to encourage SMEs to exploit more research services, and to bring SMEs and research organisations into ~~a~~ closer and more active cooperation. Research services are provided by research organisations, which market and carry out technology projects in cooperation with the SMEs.
The service is organised into separate themes according to the needs of the regional technology strategies, TEKES technology programmes, research organisations that have gained a lot of new know-how, and the gaps in SME's know-how ~~concerning~~in certain technologies~~y~~.

3.1.2.5 Science parks, business incubators, and technology transfer offices

There is an extensive network of~~n~~ intermediary organisations (other than funding organisations), such as technology and science parks, local or regional business development companies and business incubators. The association of Finnish Science parks - TEKEL - has 22 members, and additionally there are other innovation centres (40), local or regional business development companies (100 - 160, including 60 incubators), business incubators (100) and university technology transfer offices or companies (in 12 to 14 universities)[52]. These organisations ~~work~~ operate as intermediaries between the producers and users / appliers of new knowledge, research results, and technology. They are either private or public entities, and they perform a variety of tasks on a regional basis and according to their funding base. ~~There have not been any~~No ~~actions~~ steps have been taken to measure the impact or to evaluate the quality of the intermediary organisations.

The aim of the YRKE business development programme ~~aims at~~is to develop~~ing~~ the capabilities, processes and services of business incubators and to~~s well as~~ enhance~~ing~~ the development of new start-up companies. YRKE is a joint~~ed~~ national effort by the Ministry of Trade and Industry, Sitra, (coordinator), TEKES (financier), and regional Employment and Economic Development Centres (financier). It was started in 2004 to ~~match~~ meet the needs of the internationalization of ~~the~~ technology and knowledge- based companies. The p~~P~~rogramme ~~is carried out during~~runs from 2004 to~~-~~ 2007 and ~~the~~ its objectives are to increase the number of innovative ideas, to increase the number of technology and knowledge- based companies, to improve the business competence of companies and to improve the VENTURE CAPITAL possibilities of the companies. The p~~P~~rogramme is operated by 12 science park incubators, which are publicly owned and-/-or non-profit.

3.1.3 Conclusions: questions to be analysed

[52] Välittäjäorganisaatiot – moniottelijat innovaatioita etsimässä, Koskenlinna, M., Smedlund, A., Ståhle, P., Köppä, L., Niinikoski M-L., Valovirta, V., Halme, K., Saapunki, J. and Leskinen, J., TEKES publicatieons, 168/2005.

The Finnish experience indicates that supporting collaborative links between HEIs and Industry has a significant impact in the NIS, and that it should ~~be~~ continue to be supported ~~further~~. The participation rate of SMEs in collaborative thematic programmes has been fairly high, and over the~~n a~~ long term the programmes have shown that companies can really build competitive advantages based on knowledge transfer from HEIs. However, there remain challenges and problems that require further attention. In relation to social capital issues, the following problems with present practices and policies have been identified:

- Lack of common language between academics and business people, ~~thus~~ resulting in an information gap between the researchers and SMEs.
- Lack of entrepreneurial training within higher education programmes.
- Lack of innovation awareness within most ~~of the~~ SMEs, with only a small fraction of SMEs ~~being~~ focus~~inged~~ on research and innovation.
- Lack of measures to foster the mobility of researchers between academia and enterprises.
- Lack of an open innovation culture within SMEs, relying on networks.

In relation to human capital issues and appropriate structures to support the collaborative links, the following problems have been identified:

- Lack of enterprise-oriented technology and knowledge transfer units ~~at~~ in research institutions and universities, which would be familiar with specific SME problems.
- Inadequate resources for protecting intellectual property and technology transfer in HEIs, and also little expertise in the universities to evaluate inventions.
- Existence of a 'coordination gap' between the research individuals and the firms, with the result~~so~~ that they are not able to work together for common goals. Thus, there is ~~a lack of~~no efficient network of well-informed intermediaries, such as business development companies and incubators.
- Lack of efficient public-private partnerships between HEIs, intermediaries, and SMEs.
- Lack of indicators to measure the output of these intermediaries and to build efficient governance structures when public measures are used to support the intermediary organisations.
- Lack of resources for business development of innovations and weak focus on non-technological aspects in the~~a~~ development of a new product, process or service.

TEKES technology programmes have shown that ~~the role of~~ programmes clearly have a role in activating companies to launch innovative projects ~~is evident~~. Programmes promote interaction between researchers and SMEs, but long-term programmes are needed in order to build trust and understanding. Companies ~~are in~~ favour ~~of~~ shared market surveys and technology scans, and the importance of SMEs' involvement in the preparative phase of the programmes is obvious. Also, the consortium structure involving both large and small-to-medium size enterprises is seen as fruitful. However, the technology programmes ~~are not able to~~cannot convince less -innovative SMEs to take part in the programmes, and ~~therefore~~ so targeted actions are needed in order to enhance their participation ~~are needed~~. The challenge remains: How to get SMEs involved more in research projects?

~~According to e~~Experience~~s~~ and the findings of technology programme evaluation reports indicate that~~,~~ ~~the~~ researchers in HEIs are not fully aware of the commercial opportunities created in ~~the~~ projects. Also ~~, commercial utilisation of~~ the research results ~~is mainly done by participating companies,~~ are mainly used commercially by the participating companies themselves ~~but neither by~~rather than ~~~~ through spin-offs ~~nor~~ or technology licensing.
A s~~S~~ignificant ~~part~~ proportion of the research results of the programmes is not transferred ~~n~~either to the industry ~~n~~or to spin-offs. Higher education programmes include only a limited amount of entrepreneurial training, and therefore academics and business people seem to lack a common language. Thus, there is an information gap between the researchers and SMEs. Researchers lack expertise in evaluating commercial opportunities and market value, but also in presenting their results in ~~such~~ a form in which~~,~~ ~~that~~ SMEs ~~would be able~~can absorb and evaluate the information ~~for evaluation~~. The Tuli programme is partly filling the gap, but ~~the Tuli~~its services ~~are not enough~~cannot ~~to~~ ~~fill~~ meet all the needs.

In Finland, ~~the~~ national IPR legislation ~~concerning the~~on university research ~~has been~~is being ~~re~~prepared ~~to change according~~modelled on ~~to~~ the general principles of Bayh-Dole Act in the USA. The new law has ~~not~~ not been approved yet ~~yet~~ (due in February 2006). The resources for protecting intellectual property and technology transfer in HEIs are ~~low~~ few and there is little expertise in the universities to evaluate inventions. The Helsinki University of Technology (HUT) represents ~~a~~ best practice in Finland. HUT has a long tradition of industry collaboration and started the Otaniemi International Innovation Centre, based on a one-stop-shop concept, in 1998. Its tasks include introduction of the most qualified research liaison, contract management, recruiting, alumni and business services for HUT, search and preparation for new technologies, and international technology transfer.

Knowledge is transferred not only via patents or technology but ~~with~~ through people. There are ~~not any~~no programmes or specific actions in Finland to promote mobility of people between industry and academia. Therefore, the knowledge and skill transfer processes may be too slow and inefficient.
In relation to enhancing knowledge and technology transfer processes, the following questions are identified as key issues to be analysed:

- How to build good partnership structures in collaborative research?
- How to facilitate the process of technology transfer from HEIs to SMEs?
- How to promote transfer or exchange of skills and people between HEIs and SMEs?

There are significant regional variations in the role of technology and science parks, and technology transfer organisations in Finland ~~varies regionally a lot~~, and their resources are not optimally planned. When the new IPR legislation comes in force, there will be a greater~~n increased~~ need for ~~a~~ closer links between HEIs and the intermediary organisations in order to enhance the collaborative links to industry. At present, t~~T~~here is ~~presently~~ a coordination gap, so that the research individuals and the firms are not able to work together for common goals, but ~~they~~ need intermediaries. Also, at the moment there are no quantitative indicators of licensing activities; nor are there any ~~are missing and also, there is no~~ quantitative data on how

many research projects lead to licensing or selling technology, or to new start-up companies. If the public actions are to enhance the resources and capabilities of technology transfer organisations or business incubators, there is a clear need ~~for the development of~~to develop quality indicators and governance mechanisms. The challenge related to this coordination gap ~~raises the question~~is: How to develop the role of intermediary support organisations in collaborative networks?

In ~~the~~ the fairly small economies, such as Finland's, various industrial sectors or some specific scientific fields ~~are not very abundantly present~~do not have a very significant presence ~~thus having~~and so have too little ~~a~~ critical mass for building particular networks or ~~excellence~~ centres of excellence. ~~It will be an i~~Important ~~question~~issues, also for regional development, will be: H~~h~~ow to create cross-border collaborative links, and ~~also~~: How to open up regional or national collaborative schemes internationally?

The questions raised in this Case will be further analysed by comparing with the experiences of Belgium and Estonia.

3.2 Response by Flanders: building up a new structure

3.2.1 Background: the need to change the structure of the NIS

3.2.1.1 Characteristics of the Flemish innovation system

The Flemish economy is characterised by a diversity of sectors, but is still mainly dominated by ~~companies operating in~~ manufacturing companies: ~~there are located~~ four big car-manufacturing plants are located in Flanders; near the port of Antwerp, there is a very ~~big~~ heavy concentration of chemical industry; and in the western part of Flanders, there is a concentration ~~in~~ of the more traditional industries: textiles, food processing and ~~machine constructi~~mechanical engineering~~on~~. For the future, the challenge is to ~~take the turn~~move towards a more knowledge-intensive economy. Three main drivers will underpin these ~~transformations~~changes:

- Taking full advantage of the unique location of Flanders as ~~an access~~a gateway to access the European market, and remain a ~~main~~ major player in value added logistics.
- Exploiting the creativity and innovative capacity of ~~the~~ traditional ~~industry~~ industries to become a dominant player in niche markets.
- Developing a well educated workforce and attracting the necessary~~eded~~ skills.

Concerning R&D and innovation, the Flemish region is performing somewhat above the European ~~mean~~average, climbing upwards and striving to be ~~in the~~among the top ~~of the~~ European regions: GERD: 2,18% (€3.353 million), GBOARD: 0,7%, BERD: 1,52%. Concerning the Lisbon targets, ~~the~~ government expenditures are on track to reach the 1% ~~goal~~ target in 2010. BERD is diminishing, which is a general trend in Western Europe. ~~But~~ However, for Flanders~~,~~ this trend has to be ~~followed up~~monitored very carefully, ~~since~~as ~~the~~ R&D is concentrated in a very limited number of enterprises.

Spending ~~money~~ on R&D ~~is however~~ is not the ultimate goal, however. The goal ~~is~~ is the creation of welfare and employment. Concerning output of innovation, the following indicators show a rather good performance:

- Patents (EPO: 156~~,~~2 recognitions per million inhabitants). Flanders is performing at the EU average ~~within the EU~~.
- Innovative companies: 58%, which is above average.
- Creation of new products: ~~average~~ 20%, around the EU average.
- Concerning the risk capital market: 0~~,~~042%, which is not so ~~well~~good. The Flemish Government ~~will~~ intends to ~~under~~take a large number ~~of~~ of new initiatives to stimulate the risk capital market (VINNOF, Arkimedes-fund, Friends Loan, etc.)

The IWT (Institute for the P~~p~~romotion of Innovation by Science and Technology in Flanders) was established in 1991 by the Flemish government as a regional public institution to provide R&D and innovation support in Flanders. For this purpose, IWT has several financial tools and an annual budget of EUR 240 million ~~EUR~~ (in 2004) available to support projects. In addition to direct funding, a variety of services is

provided to the local industry in the field of technology transfer, partner search, information about international subsidy options, etc. IWT has also an important co-ordination ~~mission~~role, aim~~ed~~ing at ~~a~~ strong co-operation between all organisations in Flanders~~,~~ offering technological innovation services to companies. Over the years IWT has expanded to become~~into~~ the knowledge centre for R&D and innovation in Flanders.

IWT offers different types of support to strengthen the innovation system in Flanders:

- Financial support to companies, research institutes ~~&~~ and individual researchers.
  - Companies are provided with financial support ~~for~~ to ~~executing~~ conduct industrial research and development projects. Special attention is given to SME~~'~~s ~~due~~ because of~~to~~ their specific characteristics and needs. For them, there are formulas called 'innovation studies and innovation projects', ~~with huge~~in which attention ~~for~~ to administrative simplification is a prime concern.
  - Applications for RTD-support can be introduced continuously, and co-operation with universities or other research institutes is not mandatory. The decision to award a grant is taken by IWT's Board of Directors.
  - Research institutes (universities, high schools, research centres) can apply for projects in strategic basic research, collective research and technology transfer. Support for strategic basic research projects of industrial relevance is applied for by universities or other research institutes in the framework of specific action programmes. Projects for strategic basic research in specific RTD-programmes with industrial relevance ~~receive a subsidy of 100%.~~are fully subsidised.
  - Individual researchers can apply for support in their doctoral and post-doctoral (Master's) research projects. Post-graduate grants and post-doctoral fellowships are fixed allowances.
- Innovation promotion by offering several services. ~~–~~The objectives for these services with regard to technology transfer and innovation in general can be summarized as follows:
  - Support for the ~~valorisation~~ exploitation of research results, not limited to ~~valorisation~~ exploitation within the company itself~~,~~ but including opportunities for technology transfer in Flanders.
  - IWT is also the Innovation Relay Centre (IRC) of the European Commission for Flanders and can support Flemish companies for technology transfer in Europe.
  - Assistance to companies to participate in research programmes initiated by the European Commission. This assistance specifically includes:
    - Periodic distribution of relevant and specifically adapted information related to those programmes;.
    - Logistic support, where necessary, in drawing up the application.
    - Support in finding suitable partners in the other European countries.
  - The co-ordination of all organisations involved in technological consultancy, subsidized by the government of Flanders

3.2.1.2 The intermediary system in Flanders

The Flemish Innovation network, ~~the~~ an assembly of all the intermediaries active in delivering services in the innovation field towards SMEs, is a ~~very~~ highly decentralised and heterogeneous group of actors. The main actors are the people~~,~~ executing the projects financed by the CIN-programme 'Cooperative Innovation Networks' or working in the Technology Transfer Offices of the University.

3.2.1.3 Rationale for setting up the 'Cooperative Innovation Networks

The reasons for setting ~~-~~up ~~of~~ a programme ~~for~~ to financ~~eing~~ ~~the~~ Flemish innovation c~~C~~o-operation~~s~~, the so-called VIS-programme, ~~can be motivated~~are as follows. Fro~~or~~m the point of view of an enterprise, technological innovation ~~-~~, defined~~termined~~ as the use of (technological) knowledge with the aim of obtaining a positive economic return ~~-~~, can only be successful ~~only~~ if:

- There is a locus in the enterprise for innovative activities and there is an entrepreneurial spirit and culture.
- There is the availability of technological knowledge in the enterprise, ~~either~~ coming either fro~~or~~m own research, or ~~coming~~ from technology transfer activities.
- The availability of sufficient ~~means,~~ financial and human resources~~,~~ to activate the process of innovation.
- The presence of non-technological skills, which are necessary to convert technological capacity into ~~concrete~~ actual new products, processes and services.

In general, e~~E~~nterprises have ~~in general more or less~~ the above-mentioned abilities to a greater or lesser extent. However, ~~SMEs, due to~~because of their ~~scale~~size, SMEs cannot have all these skills under one roof. Therefore, they need assistance in this process. ~~Due to the fact that~~Because access to the appropriate knowledge is becoming~~es~~ more and more difficult, the innovation process is ~~becomes indeed more and more~~increasingly multidisciplinary and complex, and collaboration with knowledge institutes ~~becomes~~ is more and more important. I~~-~~ntermediation is ~~for SMEs~~ becoming~~es~~ very important for SMEs. Therefore, the Flemish government created a policy instrument to foster ~~the~~ knowledge exchange between knowledge organisations and SMEs. The key component of this instrument is the setting~~-~~ up of a distributed network of intermediaries.

These intermediaries ~~have as~~ focus mainly on ~~focus~~ ~~the~~ stimulating~~on of~~ technological innovation in Flemish enterprises, ~~by~~ through promotion and incentive~~s~~ mechanisms~~,~~ ~~to~~ lowering the thresholds for access to (technological) knowledge~~, ~~, to~~ and facilitating~~e~~ and ~~to~~ sustaining the use of knowledge in the ~~own~~ specific context of the SME in order to ~~come up with~~produce concrete results ~~of~~ from the innovation project.

IWT ~~does~~ not only has~~ve the duty to be~~ responsibility~~le~~ for the process of selection, monitoring and evaluation of these ~~several~~ CIN-projects, but it also has ~~also~~ a broader task. Since IWT has no intention ~~to built~~of significantly building up own services ~~towards the~~to enterprises ~~very deeply~~, it relies on these intermediaries to deliver th~~o~~ese services towards the SMEs. IWT will intervene o~~O~~nly when there are ~~justified~~ good reasons to ~~centralise~~ group these services at central level in Flanders.~~, IWT will take care off~~. In the case of international cooperation, IWT is the ~~access~~ point of access to these EC-initiatives for these Flemish intermediaries ~~towards these EC-initiatives~~, e.g. IRC-Relay Network, NCP ~~towards~~vis-à-vis the FP. Therefore, ~~the~~

relations between IWT and these intermediaries are complex. On the one hand, IWT has a formal role with these players, since it has to ~~control the execution~~supervise the implementation of the contracts, ~~which~~ and thus determines the conditions for financing these projects. On the other hand, IWT is a business partner of these organisations.

3.2.1.4 Cooperative Innovation Networks

Cooperative Innovation Networks are defined as follows: 'It is a structural cooperation between (in general) Flemish companies, ~~in case~~sometimes together with knowledge organizations (universities, R&D centres, ...) with the aim ~~to~~ of organis~~z~~inge activities of collective research~~—~~, technological advice and/or technological innovation stimulation. These project-s can be seen as the counter-part of support to individual companies.

The network must have a formal ~~juridical~~ legal ~~entity~~ personality with at least 20 member companies or be~~ing~~ a network ~~organization on~~ based~~is~~ on ~~of~~ a consortium agreement, with a main contractor or a de facto CIN organization (collective research organization, federations, etc.). These networks can propose ~~to IWT~~ four types of projects to IWT:

- ~~Projects of~~ Thematic Innovation Stimulation (TIS):
  - Target group of companies with a common technological need.
  - Must cover the whole Flanders region ~~of Flanders~~.
- ~~Projects of~~ Sub regional Innovation Stimulation
  - Target group of companies in a geographical region.
  - All (industrial) sectors.
- ~~Projects~~ Technological Services to offer technological (innovative) solutions and opportunities.
- ~~Projects~~ Collective Research from strategic long-term research to cooperative technology transfer projects.

For these activities, the following subsidy percentage is used: Innovation Stimulation: 80%, Technological Advice: 80%, Collective Research: 50%. The eligible costs are personnel costs and a fixed working cost of €37.500 FTE per year. The duration of the projects ~~have a duration~~is up to 2 x 2 years.

3.2.2 Actions

~~In order to address cooperation between SMEs and the HEIS, different~~ Various initiatives have been implemented by IWT in Flanders to address cooperation between SMEs and the HEIs:

3.2.2.1 Partnerships between HEIs and SMEs

~~A lot of~~Numerous ~~different~~ partnerships between HEIs and SMEs in Flanders are stimulated. In nearly all the instruments there are incentives to foster ~~the~~ collaboration between HEI and enterprises, especially SMEs. The TETRA-projects are a~~A~~ very interesting example ~~is the TETRA-projects~~. In these projects HEIs ~~are~~ apply~~ing~~ for knowledge transfer projects ~~especially~~ dedicated specifically to~~wards~~ SMEs. These SMEs are actively involved in the project, being members of a steering committee

that has to ~~do the~~ follow ~~-~~up ~~of~~ the project. These SMEs need also to give a limited financial contribution in cash to the project (7,5% of the total budget)
IWT has budget of about €6 million for these programmes, and about 25 projects a year on~~f~~ all kinds of topics (ICT, Life Sciences, Mechanics, etc.) are taken into account. Over time, more than 1 000 SMEs have been involved in one way or another in these projects

3.2.2.2 Incentives for SMEs to participate in collaborative research

The incentives for SMEs are the following:

- SMEs get ~~extra~~ additional funding of 10%.
- In the selection process, projects where ~~the~~ cooperation is ~~higher~~ greater than 25% ~~in~~ of working time are considered as priorit~~ar~~y projects (~~in case of a~~where the budget is limited, ~~limited budget~~ priori~~i~~t~~ar~~y projects will be given preference ~~overget funded in stead of~~ non-priorit~~ar~~y projects for funding).
- The orientation towards the SME as a target group is a basic selection criterion in most ~~of the~~ IWT programmes ~~of IWT~~.
- The basis for calculating the eligible costs is higher if there is~~n case of~~ cooperation between at least 3 companies (of which two are SMEs, and - 20% overheads).

3.2.2.3 IP system

In the policy of IWT, ~~there is freedom to~~ the project partners are free to agree ~~amongst about the~~on IPR rules, inter alia. ~~Of~~ Naturally,~~course~~ there must be compliance with the general legal framework.
In the enterprise ~~-~~projects, the enterprise must be the owner of the project results. Concerning the background knowledge of the RTOs involved, there ~~needs~~ has to be an agreement with these RTOs beforehand.

In the universities, there is a law ~~that~~ stipulati~~nges~~ that the university (and not the researcher) is the owner of the results. The exploitation of the portfolio of university IPR is handled by the Technology Transfer Offices (TTO's) of the universities. The University of Leuven has already a long-standing tradition in this~~ese~~ area, and ~~has~~ is also ~~an~~ internationall~~y~~ -recognised~~tion~~ ~~as being~~for best practice in the field, ~~with the creation of~~having set up Leuven R&D. Although IWT is not a shareholder of TTO and Incubators, ~~but IWT~~ every year it gives €1,5 million the TTOs of the Flemish Universities (they have decided how to split the funds among themselves). The TTO are free to use the funds as they wish (patenting, spin-offs, management costs, etc.) but they have~~d~~ to provide a '~~plan of~~ development plan' and ~~they have to act accordingly~~must follow it. There is a review process every two years and plenary meetings at IWT to discuss/~~-~~coordinate the activities of the Flemish TTOs.

~~In some cases, the I~~interaction~~play~~ between the interests of the researchers, the TTO and the enterprise is not always easy. Therefore, IWT has ~~set u~~launched~~p~~ a debate between all the ~~important~~ major partners involved ~~in the debate~~, to come up with ~~some~~ guidelines to facilitate these negotiations.

3.2.2.4 Transfer of skills

Although there ~~exist~~ are no specific measures to foster the mobility of researcher between academia and enterprises, the system of the research mandates ~~functions~~ indirectly performs this function~~such a mechanism~~.

The purpose of r~~R~~esearch mandates ~~aim~~ is to assist researchers in the commercialisation of scientific results. Three types of mandates are managed by IWT:

- Type 1 mandates support researchers from a Flemish university or research institute who ~~aim at~~want to validate~~ing~~ their research results by creating ~~through the creation of~~ a spin-off; (transfer from academia towards a spin-off).
- Type 2 mandates ~~aim at the~~ transfer ~~of~~ basic research from a research institute to an existing enterprise (including spin-offs), with a view to ~~the later~~ subsequent effective ~~valorisation~~exploitation/implementation by the company. Research takes place essentially within the enterprise of the industrial promoter (can be used more or less as ~~a~~ sabbatical leave).
- Type 3 mandates target exclusively researchers ~~that~~ who ~~conduct research to~~want to deepen their research results and prepare their implementation ~~of these results~~. (classical path).

Activities supported for type 1 and type 2 mandates are broader than mere research ~~only~~ (they are focused~~sing~~ on the economic ~~valorisation~~ exploitation of the research results and not mere~~on~~ly on deepening basic research), although the research activities are the main part of the project. Postdoctoral research mandates (type 3) were introduced in~~exist since~~ 1992, but they enjoyed only moderate success ~~of these mandates was moderate~~ (25 applications~~demands~~/year). Therefore, two new types of mandate~~s~~ ~~have been~~were introduced in 2003 and ~~the~~ Type 3 is going to be ~~dismissed~~abolished.

The measures consist ~~in~~ of Grants to the researchers ('tax-free salary ~~free of taxes~~' and funds to pay consultants) co-financed by the private sector.

3.2.2.5 Technology foresight~~sight~~

There is no dedicated programme for the technology foresight ~~ical foresight~~ in Flanders.

However, ~~within the context of the preparation of the set-up~~as part of the setting up of a competence research centre, it is ~~an obligation~~obligatory to ~~do some~~conduct a foresight study on the topic concerned. ~~Eg in the establishment of the~~For example, at the Flemish Food Research Centre, ~~there has been executed~~ two studies have been carried out: one on the technological evolution in functional foods and ~~the~~ its impact ~~of it~~ on the industrial ~~tissue~~fabric, and a second~~ly a study~~ on the future trends of socio-economic change~~s~~ in the sector. This practice is more or less in line with the TEKES approach for their technological programmes.

A regular instrument that can be used to undertake foresight studies is the feasibility study. These are run as part of~~ies within the framework of~~ the Cooperative I~~i~~nnovation Networks. In these studies, branch~~e~~ organisations can undertake activities relating to~~of~~ technology watch, technology forecasting, trendwatch seminars, company visits, ~~and need~~ identification of needs etc.~~, and so.~~

3.2.2.6 International collaboration

Foreign partners can participate in~~In many~~ many of the IWT measures.~~ of IWT the participation of foreign partners is possible.~~
In some cases, these foreign partners even ~~get~~ receive funding~~funded~~.
This is certainly the case for foreign research institutes that bring ~~in~~ their knowledge into a project, and thereby benefit ~~where~~ the Flemish SMEs~~ can benefit from~~.

Also foreign enterprises can be funded ~~as far as their~~provided there is enough potential for exploitation and ~~valorisation~~ optimisation of the research results in the Flemish economy.

One of the big challenges is to ~~create this openness of~~make existing measures and programmes open to~~for~~ foreign participation in all the Member States, ~~because then~~as this makes funding of inter-firm cross-border cooperation ~~can easier~~be more easily ~~funded~~. Therefore, IWT is very active in the different ERA-Nets involved.

3.2.3 Conclusions: innovation and collaboration political priority

One of the strengths of the Flemish Innovation System is the consensus ~~on~~ about the growth ~~growth path towards~~path towards achieving the Lisbon target of ~~,~~ spending 3% of GNP on R&D.~~ of the GNP.~~ This growth path is formalised in an Innovation Pact, which was ~~under~~signed by all the stakeholders involved: government, business representatives and universities and academic institutes.

Another interesting point is that Innovation Policy is on the agenda. Some years ago, RDTI policy was not at the centre of social ~~in the core of the societal~~ debate. Nowadays, it is. Some time ago, the Socio-Economic Council and the Science and Policy Council ~~organised~~ together organised a workshop ~~around~~ on ~~the topic:~~ how to establish an integrated Innovation policy to foster growth and employment (see the example of Science and Technology P~~p~~olicy Council in Finland). However, there is still plenty of scope for improvement.~~many things can still be improved.~~ Above all, ~~there is a limited~~ strategic intelligence at RDTI policy level in the Flemish region is limited (see example of TEKES and Finland). The Flemish Region is still young and a lot of knowledge has to be built up. Therefore, the focus lies on the development of instruments and on learning by doing. Of course, in the ~~next~~ coming years, a more strategic approach will be developed. A more thorough approach needs to be taken to t~~T~~he following issues ~~need to be tackled more thoroughly~~:

- **Establishment of a well-adapted policy mix**

  One of the main challenges is to create a well adapted policy mix in RDTI-policy in the Flemish Region, by combining different kinds of measures (risk capital, grants, procurement). To develop some of these instruments, the Flemish Region is dependent ~~of~~ on a cooperation agreement with the Federal State.~~.~~ Recently, there ~~is~~ has been progress on this front.

  A recent exa~~a~~emple is a measure~~,~~ which is ~~under development~~being developed at State-level ~~that will~~to allow ~~reducing the~~ wage costs for R&D-personnel to be reduced~~,~~ for ~~these~~ enterprises that are working in collaborative projects with research institutes and hence stimulating the collaboration between knowledge institutes and enterprises.

- **Stimulation of an open innovation culture**

The culture of the Flemish enterprises is not so open, and working together within business clusters needs to be stimulated. Several instruments (such as the CIN-programme) ~~are~~ have been developed to tackle this problem ~~(like the CIN-programme)~~. The establishment of the policy Framework on Competence Research Centres and Strategic Research Centres is also an important step in this direction. Not only does it stimulate ~~the~~ cooperation between enterprises and knowledge centres, ~~is stimulated~~ but it also ~~it is the aim to~~tries to direct research more ~~make research more oriented~~ towards the needs of ~~the~~ enterprises and hence contributes~~ing~~ more to social welfare (see also TEKES programmes).

- **Broadening of the scope**

  Up to now, policy instruments were mostly used to foster the use of technological knowledge. However, the non-technological aspects in ~~a~~ the development of a new product, process or service are ~~even~~ just as important. Therefore a lot of attention needs to be given to the other aspects of innovation. On the instrumental level, this means the use of a broader definition of innovation, which will also involve~~ke~~ a lot of new players in the innovation policy arena. ~~What's m~~Moreover, the innovation policy needs to become more horizontal and integrated. Also, in other policy fields like logistics, human health, etc~~…~~ innovation policy needs to be introduced.

  This will also ~~introduce~~ bring the challenge ~~to form~~of creating new forms of collaboration and business models.

- **Exploitation of RTD results**

  Another important issue is the exploitation of RTD-results, the so-called innovation paradox. ~~Also, in Flanders, we have~~While the ~~a very well performing~~ scientific community in Flanders performs very well, ~~however it becomes more difficult when transforming~~ converting these scientific outputs into commercial activities is a more difficult proposition.

  ~~Since 1995, there exist already~~ There has been a legal framework in existence for the exploitation of RTD-research by universities since 1995. Therefore, there is already some practical experience of~~e in~~ setting-up specialised technology transfer offices in the universities. (Leuven R&D, the TTO of the Catholic University of Leuven is recognised as good practice in this context). Since the reform ~~in~~ of higher education ~~environment~~, due to the Bologna process, and the emergence of competence research centres, the debate has become~~s~~ more complex.

  IWT facilitates the dialogue between the different partners. Difficult topics include~~are~~ ownership of intellectual property rights:

  - Fair return on background knowledge of research organisations.
  - Publication versus protecting of IP.
  - Spin-off creation of academic institutes.

  For SMEs this process is even more difficult since they lack the skilled personnel to be partners in such negotiations with, for example, the TTO-offices of universities. Here a~~A~~gain, intermediation can be a solution.

- **Internationalisation**

  As t~~T~~he knowledge market is becoming increasingly~~es more and more~~ international. ~~Therefore~~ the Flemish region is also very active in international projects and R&D Programmes. Most of the IWT programmes ~~of IWT~~ are already open ~~for participation of~~to foreign partners, even with financial aid.

IWT is convinced that fostering international collaborative networks with the participation of SMEs is very important, since knowledge and business markets have become global. ~~The a~~Access to the~~se~~ traditional instruments used to~~to~~ foster ~~this~~ international collaboration, such as the Framework Programme of the European Commission and Eureka, has become very difficult for SMEs. ~~Therefore~~ So IWT is investing heavily~~s a lot~~ in setting up new mechanisms for ~~fostering~~ promoting these networks. This is mainly done in the context of the ERA-Nets. A lot of attention is also ~~given~~ being paid to ~~the~~ collaboration with the Netherlands and North Rhine Westphalia, to test out new models and schemes.

3.3 Response by Estonia[53]: a changing economy

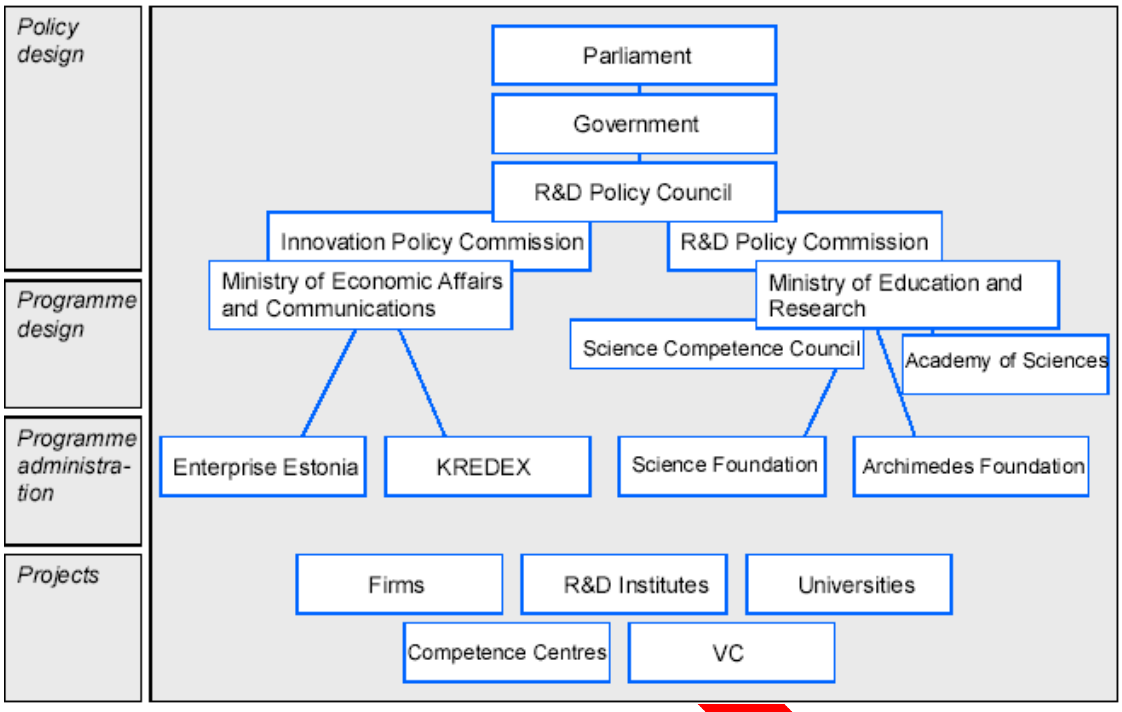
3.3.1 Background: limited efforts in R&D and innovation

~~Estonian~~ Estonia's national innovation system has been rapidly evolving over the past few years ~~ever since the early years of 2000~~ from a position where this field of policy are was given low priority to one where the objective of a 'Knowledge Based Estonia' ~~was~~has been ~~adhered to~~embraced by the ~~broader~~ wider political and economic establishment. Two key strategic documents form the backbone of ~~the~~ Estonia's current~~n~~ research, technology development and innovation (RTDI) policy ~~today~~:

- Knowledge-~~-~~Based Estonia: the Estonian Research and Development Strategy 2002-2006 (KBE, adopted by the Estonian Parliament in 2001). The strategy sets out two main objectives:
  - Updating the pool of knowledge through 'raising the quality and level of scientific research' notably in three key fields of technology: biotechnology, user-friendly information technologies and materials technologies. A main pre-condition was improving the number~~s~~ and quality of highly qualified specialists.
  - Increasing the competitiveness of enterprises: the precondition being to develop an integration mechanism between research and the business sector.
- Whatever ~~the~~ limitations ~~that~~ can be ~~pointed out~~identified with hindsight, KBE can be considered as a watershed in Estonian RTDI policy. It contributed to shifting the attention of policy-makers from a 'laissez-faire' (free-market) approach to economic policy towards the need to invest ~~significantly~~ far greater public and private resources in boosting higher value-~~-~~added activities.
- National Development Plan (or Single Programm~~em~~ing Document, SPD, for the Implementation of EU Structural Funds) for the period 2004-2006. The overall objective of the RTDI measure of it is ~~defined at~~ 'to increase the RD&I capacity in existing businesses and stimulate the creation and growth of new technology-based businesses'.

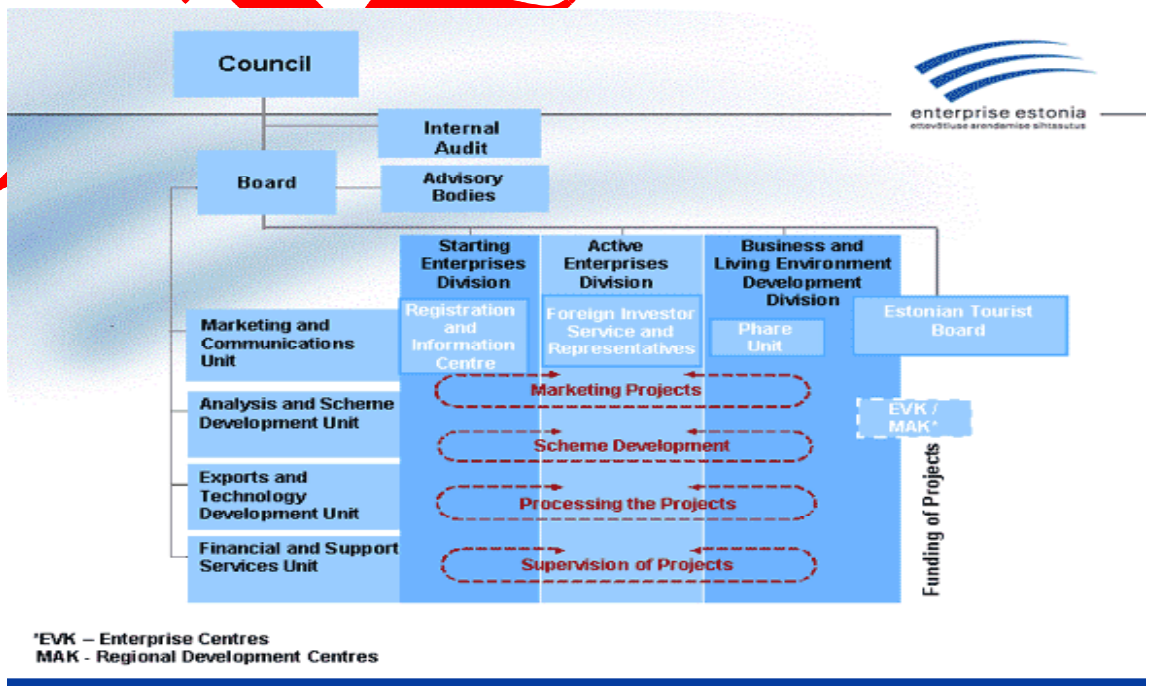
[53] The views and opinions expressed here are based on two documents: (1) Evaluation of the design and implementation of Estonian RTDI policy: implications for policy planning, Interim Report by Technopolis Consulting Group Belgium SPRL, Oct 2005; (2) Final Report for Phare Project Preparation, Training and Management Facility: Estonia by Dr Jim Ryan, the CIRCA Group Europe Ltd, July 2005.

Figure 13: Organisational chart of the innovation governance system



The implementation of the R&D and innovation policy in Estonia is the remit of essentially two ministries and one government agency: ~~the~~ Enterprise Estonia (EE). This agency~~EE~~ is responsible for administering funding for the RTDI support measures with a budget of €52 million for 2004 - 2006.

Figure 14: Organisational chart of Enterprise Estonia



The key problems of the Estonian national innovation system, as highlighted by the key documents, have been and to a large extent still are:

- The low relative intensity of R&D expenditure (as a share of GDP, 0.~~,~~83% in 2003) allied to a modest growth rate in total expenditure (4.~~,~~3% annually).
- Very low levels of expenditure in the business sector on R&D and extremely low rates of employment of researchers and engineers in Estonian enterprises. Only a small number of companies actively conduct in-house R&D. It is ~~An~~ estimated that, altogether, there are about ~~of~~ 200 companies ~~is considered as having~~with R&D capacity ~~altogether~~.
- The dominant position of the public sector as a funder of R&D (approximately ~~2/3~~two thirds of total R&D expenditure). Government expenditure has been focused largely on basic research (half of total expenditure, with only 15.7% going to technological development).
- A decline in human resources for science and technology, allied to an age pyramid of researchers~~,~~ which was skewed towards the over-~~fifty~~ 50 age group. These problems are compounded by a mismatch in terms of specialisations ~~with~~ and a lack of highly qualified engineers.
- The major performers of R&D are the universities, which are regarded as the major source of technology expertise, and of research capability. University researchers are mainly funded through government programmes, which are evaluated on academic criteria and therefore provide little incentive~~s~~ for researchers to be concerned about the applications of their research ~~applications~~.
- Poor links and low levels of co-operation between the HEI sector and enterprises. Commercialisation of high-quality research in certain fields of science in Estonia is not assured, as indicated by ~~with~~ the low patenting rates ~~of patenting being an indicator~~.

The key problems ~~from the point of view of~~for SMEs in Estonia are the following:

- M~~ajority of~~ost of the government SME RTDI support measures tend to focus on a small group of higher technology companies and there is no provision for~~are no~~ explicit sectoral actions ~~foreseen~~. This is ~~of~~ particularly important~~ce~~ given that those differences in sectoral innovation systems are increasingly being considered as important and often ~~demand~~ require significantly different approaches in terms of support mechanisms.
- Lack of support ~~to~~ for developing SME capability to conduct R&D and, as a result, low level of absorption capacity across SMEs to transform innovative ideas into products and services ready for market. Indeed, there is no innovation funding~~, which~~ that is exclusive to industry. A~~ll~~ such funding is also accessible to universities, ~~and the~~who ~~latter~~ traditionally have much higher success rates in ~~grant~~ applying for grants~~ication~~.
- Lack of qualified staff both within SMEs and R&D institutions to support innovation in SMEs
- Even though programmes to make university expertise available to industry form a significant part of national efforts to develop industrial RTD, there is a lack of enterprise-oriented technology and knowledge transfer units at R&D institutions and universities, which would be familiar with specific SME problems.
- Even ~~if~~ where ~~those~~ such units are in place, they are mostly concerned with 'technology push' activities and ~~a very large~~the bulk of SMEs remain outside ~~of~~

their coverage due to the low level of technological sophistication of the ~~latter.~~SMEs.

One should ~~keep~~ bear in mind that the expectation of a rapid rise in private expenditure on R&D by enterprises both in relative share of total R&D expenditure and in absolute terms should take account of the structure of Estonian industry and its current market orientations. Firms are not interested in increasing R&D expenditures just for the sake of it, but because they expect that the new or improved production processes, technology concepts, or new products responding to market needs emerging from these activities, will improve their efficiency and hence their long term competitiveness. If at all possible, firms will try to license/purchase technologies or, alternatively, outsource at least part of the most expensive knowledge investments.

From the perspective of a small open economy ~~perspective~~ such as Estonia in an increasingly global knowledge economy framework, the question needs to be raised whether a knowledge investment target has any real economic significance. With increased globalisation, the relevant R&D which will act as driving force in a country might well come from abroad; at the same time, domestic R&D activities might have little impact on the domestic economy in which such R&D activities happen to be located. Strategies generally tend to ignore t~~T~~his aspect of the innovation system ~~remains relatively ignored by any strategies that~~ and remain essentially linear in approach (the underlying hypothesis being that increasing research funding will automatically lead to increased growth and competitiveness in the country).

3.3.2 Actions: 3 programmes

T~~oday t~~he support measures now in place, which were designed in particular to support linkages between HEIs and SMEs in Estonia, ~~are the following~~are of three ~~ones~~types. ~~Even~~ Although it is still ~~relatively~~ rather too early to analyse the results of those measures in any meaningful way, some conclusions ~~at this stage of the programmeming cycle~~ can already be drawn even at this stage of the programming cycle.

- **R&D financing programme.**
  This p~~P~~rovides funding for a wide range of research stages, from validation of new research findings to final product development, both strategic and applied R&D. Receives applications from industry and from universities / R&D institutes (the latter counting for approximately 20 - 40% of total applications per year) with obligations for ~~partnership~~ research-industry partnership. Estonia considers it too early to judge results since most projects are not completed. H~~, h~~owever, already today ~~a~~ there are signs of a significant leap in demand for financing both from enterprises and universities ~~can be traced~~. Considering that 2001 was first year of operation of the scheme and that until 2003 the programme was based on a mix of loans/grants (depending on the nearness ~~-~~ to ~~-~~ the ~~-~~ market principle), the funding of projects in enterprises has picked up steadily, growing from €1,9 million in 2001 to €2,5 million in 2003. T~~, t~~he total number of companies receiving support during the period 2000 - 2005 ~~being~~ was about 110. A problematic issue is that, in financial terms, the top 20 projects (which were awarded to 20 different companies) consumed 57,~~,~~7% of the total programme funding (or roughly €7 million) during~~in~~ these years.
- **Spinno programme**

Launched in 2001 with a budget of €2.,3 million for universities / public R&D institutions and other HEI-s to develop better relationships with industry, create networks within their institutions and hence support the commercialisation of the IP generated in the public sector. Seven three-year projects ~~of three years~~ were selected in 2004 for a total funding of €3.,9 million.

- **Competence Centres programme**

  This was l~~L~~aunched in 2004 to increase the number of firms with 'minimum capability' to the stage where they become 'technologically competent' firms', ~~with~~ subject to the~~as~~ ~~precondition the~~ establishment of~~ment of~~ consortia of industry and university researchers to conduct research of relevance to groups of companies in specific sectors (such as Food, Materials etc). Five projects are currently underway for a total funding of 2.,7 MEUR in their first year.

3.3.3 Conclusions: changing the attitude of SMEs and HEIs

The fundamental principles for government action to support linkages between HEIs and SMEs in Estonia in the coming years will be the following:

- ~~The majority~~Most of the economically relevant knowledge for Estonian companies to compete internationally will be produced elsewhere;, therefore the success of the Estonian economy depends heavily on the capability and willingness of companies to ~~search~~look for, adapt and, utilise knowledge and technologies produced outside Estonia.
- Technology transfer is really a problem of learning and, apart from ~~next to~~ financial resources, requires managerial competence within the SMEs.
- The vast majority of SMEs both in Estonia and in the EU ~~mostly~~ generally do not engage in research in a formal sense. ~~By contrast~~On the other hand, the vast majority of SMEs do innovate. They improve their existing products and services, usually in small step-by-step ways (i.e. incremental innovation). More rarely, they take a major risk and introduce new products and services (i.e. radical innovation). The new knowledge required for innovation comes sometimes from research. However, more frequently it comes from listening to customers and suppliers, observing competitors, talking to potential customers, experimenting with ~~present~~ existing products and services, etc. It is important to realise that innovation in SMEs is mainly motivated ~~mostly~~ by the almost daily struggle to survive rather than by any long-term strategic development plan. Time horizons are short, resources are lacking, and solutions have to be practical and quick. The propensity of SMEs to engage in R&D and technological innovation is highly variable, and in order to come to practical grips with this diversity, a convergen~~ting~~, policy-~~-~~relevant typology is needed. We need to segment the public support mechanisms according to the different categories of SMEs, helping individual SMEs become more innovative in terms of improving their internal learning and managerial capacity as well as their capacity to collaborate with R&D institutions in bringing to the market new or improved production processes, technology concepts, products and services.

3.4 Overview of initiatives in the Member~~s~~ States addressing research collaboration[54]

3.4.1 Context for collaborative research

Businesses around the world are changing their approach to research, development (R&D) and innovation. For sound commercial reasons, companies everywhere are cutting back their corporate laboratories and building collaborative research programmes with other partners, mo~~st~~ particularly with universities. Over the past decade, there has been a marked change of culture in many European universities. They have cast off their old "ivory tower" image~~,~~ academic researchers are increasingly sharing ideas and best practices with their industrial counterparts and are playing a much more active role in the regional and national economy[55].

Empirical evidence shows that the flow of R&D results into economic exploitation is not without obstacles. A better comprehension of business-science links has figured high on the policy agenda in most of the Member States that are trying to address what has been called the 'European paradox'; that is, trying to make good the European weakness in transforming research of the highest standard into industrial development and this, in turn, into commercial results.

The business-science links refer to different types of interactions between the business and the R&D sector that are aimed at the exchange of knowledge and technology. One of the formal ~~forms~~ methods is collaborative research that typically involves ~~typically defining and conducting~~ R&D projects being defined and conducted jointly by enterprises and research institutions, either on a bilateral or on a consortium basis.

3.4.2 Diversity of collaboration models in Europe

The interactions between business and science take various forms in different countries, reflecting national specificities in institutional set-ups, regulatory frameworks, research financing, IPR regulation and in the status and mobility of researchers. Different models may work well, but they ~~should~~ must be understood in ~~every~~ the ~~country's~~ specific~~al~~ context of each country.~~.~~

The United Kingdom follows the US model with a strong ~~push~~ emphasis on university technology offices and ~~for~~ on generating significant revenue from university-industry collaboration. The main common characteristic~~s~~ of the German, French and Italian model~~s~~ is that they all have strong, partially publicly funded academic laboratories (e.g. Max Planck Gesellschaft, CNRS, INSERM and CNR) and national networks of technology development organisations (e.g. Fraunhofer Institutes, INRA) operated at regional level, co-funded by regional governments. For example, the Fraunhofer Institutes take on parts of the role of the innovation agency and they are the best ~~-~~known entry point for industry and ~~they~~ carry out some of the brokering to more suitable scientists.

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[54] The overview is based on literature review and should not be seen as a comprehensive synthesis.

[55] Lambert Review of Business-University Collaboration, December 2003. http://www.hm-treasury.gov.uk/media/DDE/65/lambert_review_final_450.pdf.

The 'Nordic' model (especially the Finnish and Swedish) is particularly cohesive, with an innovation agency (TEKES, VINNOVA) as its cornerstone. Intermediaries (i.e. science and technology parks, technology transfer institutions, technopoles) play a strong role in knowledge and technology transfer. While Finland has a national technology development organisation (VTT), Sweden has competence centres at universities (NUTEK) promoting collaboration between university researchers and those in firms.

One policy implication of this brief overview is that there is no point in looking for a single model of university-industry collaboration and the highly diverse landscape across Europe should be maintained. It is likely that similar results could be achieved through different measures, which fit well into the national context.

3.4.3 Main aspects of collaborative research

Companies are increasingly motivated to collaborating with research institutions in order to cope with the complexity of research; to share R&D costs and to reduce risk. According to the Lambert Review mentioned above, the benefits to business of collaborating with universities can involve the following:

- Access to new ideas of all kinds
- Achieve excellence across a wider range of disciplines and through a much larger intellectual gene pool than an individual business could hope to create on its own
- Spot and recruit the brightest young talent
- Spread the risk and widen the research horizon

The 2002 Community Innovation Survey found that companies which use universities and other higher education institutions as a source of information or as a partner tend to be significantly more successful than those that do not. They are more likely to have increased their market share, improved the quality of their goods and services and lowered their costs.[56].

Proximity matters when it comes to collaboration, especially for SMEs. Informal networks cannot easily be sustained over long distances. Even large companies find it more efficient to work with R&D departments in their own locality. In this respect, R&D intensive companies are vital components of clusters of innovative firms formed around universities, and are the most effective champions of the benefits of business research, because they understand better than anyone else the commercial possibilities of the science base. However, it should be pointed out that the largest share of the revenue originating from industry-university collaboration comes from collaboration between large (multinational) companies and world-class universities. These collaborations are not only on a larger scale than partnerships between SMEs and universities, but they are also longer-term.

Above all, it is above all trust and stability, not the contract, which provide the conditions for establishing programmes that meet partners' needs. This is the reason

[56] Innovation in Europe. Results for the EU, Iceland and Norway, EUROSTAT, 2004

why the recently published *Report on responsible partnering*[57] found that collaborative research delivers the greatest benefits within long-term partnerships. Public measures, therefore, should foster the establishment of long-term partnerships.

3.4.4 Promotion schemes fostering collaborative research

The 2002 OECD report 'Benchmarking industry-science relationships'[58] found that the share of promotion programmes fostering collaborative research as a percentage of government R&D financing varies from 2% (Italy) to 11% (Ireland and Finland). Contract and collaborative research financed by industry for public research organisations is ~~among~~ at its~~the~~ highest in Ireland, Finland and the UK (15.4%, 14.0% and 11.9% respectively). The b~~B~~usiness sector finances the highest share of contract and collaborative research for higher education institutions in Belgium and Germany (10.6% and 9.7% respectively).

The ~~most frequently used~~ instruments most frequently used to support~~ing~~ collaborative research are: subsidies, fiscal incentives, the legal and regulatory framework and intermediaries. As the OECD report points out, removal of regulatory barriers across the Member States can foster greater collaboration and interaction between business and academia, but other type of interventions are also necessary. These~~is~~ include~~s~~ supporting interactions between researchers and businesses, which depends heavily on incentives. A number of European countries (e.g. Austria, France, the Netherlands, Portugal and the UK) have gone further than deregulation and have launched programmes to address di~~e~~sincentives to human resource-based business-science interactions. The OECD report mentions the following examples:

- Austria maintains mobility promotion schemes such as 'Scientists for the economy' and the mobility of junior researchers is promoted ~~through~~.~~.~~
- France: fostering training in a research company by subsidizing up to half of the corresponding salary costs to the firm; subsidies for young researchers without industrial experience employed in SMEs.
- The Dutch scheme that promotes the movement of S&T personnel to SMEs (KIM); SMEs are allowed a tax deduction for the labour costs of R&D staff
- Portugal runs a programme to help the placement of new PhDs in firms ~~through~~ by subsidising their ~~subsidisation of~~ salaries for two years.
- The Faraday programme in the UK promotes a continuous flow of industrial technology and skilled people between industry, the universities and intermediate research institutes.

It can be concluded, as also confirmed by the Lambert review, that the best form of knowledge transfer comes when a talented researcher moves out of the university and into ~~the~~ business, or vice-versa. Therefore, the most successful measures encourage academics and business people to spend more time together and to support building formal and informal networks among researchers, thus setting the stage for further collaboration.

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[57] Responsible Partnering. A guide to better practices for collaborative research and knowledge transfer between science and industry, EIRMA, January 2005. http://www.eirma.asso.fr/f3/local_links.php?action=jump&id=796.

[58] Benchmarking Industry-Science Relationships, OECD, 2002. http://www1.oecd.org/publications/e-book/9202051e.pdf.

Good examples identified:

1. The LINK Collaborative Research scheme (UK)

LINK is promoted as the UK Government's principal mechanism for promoting collaboration in pre-commercial research between industry and the research base. It provides a framework enabling Research Councils and government departments jointly to stimulate innovation and job creation through managed programmes of collaborative research. Funding is available up to 50% for core research projects, 75% for feasibility studies, and 25% for nearer-–market development projects. Priority fields of the programmes are: Electronics/Communications/IT; Food/Agriculture; Bioscience/Medical; Materials/Chemicals; Energy/Engineering.

Further information: http://www.ost.gov.uk/link/info.html

2. The Industry-College Collaboration Scheme (Norway)

The main objective of the Industry-College Collaboration Scheme (*Næringsrettet HøgskoleSatsing*) is to promote change at the institutional level within the state university colleges, thereby enabling these institutions to become more active partners and knowledge suppliers for companies seeking to increase their R&D efforts. The scheme operates with two main types of instruments:

- **Bridge-building projects**
- **Instruments promoting increased mobility.**

A typical project under the scheme consists of one or more *bridge-building projects* in which the educational institution enters into specific collaborative projects/activities with companies and other development actors, and in which *instruments to promote mobility* are used to augment the project(s).

3.5 Research collaboration: conclusions and recommendations

An important weakness of the 'European Innovation System' is the ~~inadequate~~ lack of sufficient interaction~~s~~ between public and private actors. Although t~~T~~he quality of the science and higher education is regarded as excellent, ~~but it seems~~ the actors seem to be~~are~~ ~~not~~ unable to commercialise the results of these efforts ('European Paradox'). However, i~~I~~nnovation~~-~~-driven economic growth ~~however~~ requires optimal co-operation~~,~~ , and the analysis ~~indicates~~ points to a lot of opportunities for improvement.

Europe does not have a tradition of intense interaction between the actors of the innovation system. Research efforts by universities could take more account of the knowledge needs of industry~~-~~/~~-~~society. Universities also seem ~~also~~ unable to commercialise results of their research by creating spin-offs, and patenting activities are limited. Interaction with Industry is hindered by several factors such as mono-disciplinary layout of research at universities, and lack of incentives for universities to look for contact and cooperation.

But ~~also~~ companies, too, seem to disregard the knowledge of Universities and Research Institutes when innovating. Analysis indicates that, as a source ~~for~~ of knowledge, firms rely heavily on their specific sector / partners in the production chain or external sources such as professional literature, rather than the public research infrastructure.

Within the framework of this Case, we focus on the specific question: ~~h~~How can research-intensive SMEs create significant value from the technology, knowledge, and innovation potential of Higher Education~~s~~ Institutions (HEIs)?~~.~~ Is it possible to define policy guidelines or build public actions that substantially enhance the disseminat~~ffus~~ion of knowledge between business entities and academic institutions? We believe this knowledge transfer process will improve the competitiveness of young research-intensive SMEs and also the competitiveness and attractiveness of nations by creating more jobs and well-being.

We define collaborative research ~~within the framework~~in the context of this Case as a process of~~n~~ interaction ~~process~~ and exchange of knowledge between HEIs and SMEs in pursuit of a shared, collective, ~~bounded~~ circumscribed goal. ~~T~~It is implicit in this definition ~~implies~~ that individual entities may also have their own separate, unique objectives.

This paragraph defines conclusions and recommendations for policy concerning cooperation between SMEs and HEIs, based on the Response of Belgium and Estonia, addressing the issues as identified in the Case presented by Finland.

The recommendations in this paragraph are based on the input of Case and Response, but they are not the same (i.e. not a collection of all the recommendations for the different Member States). The recommendations in this paragraph are generic, and could be applied in different innovation systems.
The issues concerning cooperation are also addressed by other OMC expert-groups, in different OMC-cycles.

3.5.1 Conclusions

As indicated in the report, the challenges and problems related to collaborative research can be categorized into cultural issues or, in other words, social capital issues, structural and human capital issues, ~~as well as~~and policy issues.

In relation to social capital issues, the Case and Response countries have identified the following problems with present practices and policies:

- Lack of common language between academics and business people, ~~thus~~ resulting in an information gap between the researchers and SMEs.
- Lack of entrepreneurial training within higher education programmes
- Lack of innovation awareness within most of the SMEs, as only a small fraction of SMEs ~~being~~ are focused on research and innovation.
- Lack of measures to foster the mobility of researchers between academia and enterprises.
- Lack of an open innovation culture within SMEs, relying on networks.

In relation to human capital issues and appropriate structures to support the collaborative links, the following problems have been identified:

- Lack of enterprise-oriented technology and knowledge transfer units at research institutions and universities, which would be familiar with specific SME problems.
- Inadequate resources for protecting intellectual property and technology transfer in HEIs, and also little expertise in the universities to evaluate inventions.
- Existence of a 'coordination gap' between the research individuals and the firms, preventing them from working~~so that they are not able to work~~ together ~~for~~ towards common goals. ~~Thus~~As a result, there is ~~a lack of~~no efficient network of well-informed intermediaries, such as business development companies and incubators.
- Lack of efficient public-private partnerships between HEIs, intermediaries, and SMEs.
- Lack of indicators to measure output of these intermediaries and to build efficient governance structures when public measures are used to support the intermediary organisations.
- Lack of resources for business development of innovations and weak focus on non-technological aspects in a development of a new product, process or service.

The input ~~of~~ from the countries involved has also uncovered problems concerning policy issues:

- Limited strategic intelligence at RDTI policy level.
- Lack of industry-~~-~~led thematic actions.
- Challenge to ~~form~~ devise new forms of collaboration and business models.
- Incoherent legal framework of invention within M~~m~~ember S~~s~~tates, ~~and~~ leading to problems ~~thus~~ related to:
  - Ownership of intellectual property rights.
  - Fair return on background knowledge of research organisations.
  - The dilemma of p~~P~~ublication versus protection~~ng~~ of IP ~~dilemma~~.

- Problems ~~related to spin-off creation of academic institutes~~ (especially financing problems, but also business competence problems)~~.~~ related to the creation of spin-off academic institutes.
- Internationalisation of national R&D programmes and openness of national clusters and centres of competence.
- Lack of appropriate actions for different segments of SMEs (also noted in a recsent EURAB report on SMEs and ERA).

Based on the information ~~as~~ presented in this chapter, the following issues can be identified as needing~~,~~ ~~which to~~should be addressed when designing policy for cooperation between SMEs and HEIs:

- **It i~~'~~s difficult to involve SMEs in research projects**

  A typical feature of SMEs is the lack of a well-elaborated and developed organisational structure, where the different components can be considered as ~~own~~ individual business units. In ~~a~~ SMEs ~~a lot of~~many functions have to be combined ~~together~~. Therefore the SME has to rely to a great extent ~~much~~ on ~~external~~ outside sources of knowledge.

  One of the ~~possibilities~~ ways to overcome this lack of scale is to work together in networks. By doing so, they can gain a lot of knowledge ~~can gained~~ from other companies and/or research institutes without them needing to build up all of these~~is~~ competences themselves.

  The integration of SMEs, especially research-intensive SMEs, in collaborative networks is very important.

  Also looking ~~to~~ at the issue ~~form~~ from the point of view of the additionality of public intervention, it is clear that public money will have more impact when SMEs are the target group and ~~there is~~ the necessity ~~build in the public measure~~ to work together in collaborative programmes is built into the public measures.

- **SMEs are not a homogeneous group, but have different research needs**

  SMEs in different member countries do not represent a homogeneous group. ~~The~~ R&D intensity and awareness of the opportunities that academic research can offer~~,~~ vary~~ies~~ ~~a lot~~widely. Therefore, it is recommended that, in the national policy mix, a set of actions is chosen according to the SME segment structure. Segmentation of SMEs is important; a~~,~~ proper set of public actions should be designed for a certain segment of companies. Also, ~~the~~ companies from the traditional industries should be a target segment (compare the ~~experience~~ Belgium/IWT experience).

  The different forms of enterprises will also alter the mechanisms of integration in collaborative networks. More ~~research intensive~~research-intensive SMEs will be able to participate in research projects, even as a coordinator of a research project. SMEs with some R&D capacity can also be introduced into R&D p~~P~~rogrammes~~-~~, either as first user or leading technology user. SMEs with little or no R&D capacity of~~n~~ their own~~,~~ can be incorporated into steering groups of R&D ~~-~~projects or~~f~~ can gain from more collective research schemes.

- **SMEs are reluctant to participate in public measures when regulations are stringent, or compliance is difficult ~~to meet~~.**

  In many public R&D funding programmes there ~~exists~~ are obligations or strong incentives to build or participate in partnerships and networks, including HEIs, SMEs ~~as well as~~and also large corporations.

However, in practice, SMEs may ~~experience~~ feel that these contacts with ~~these~~ HEIs involve ~~with~~ a ~~lot of~~heavy administrative burden. Public support should be used to lower the threshold ~~of~~ for SMEs ~~to~~ collaborating~~e~~ with the HEIs. Also ~~the~~ public support in itself should not ~~bring ext~~add to the~~ra~~ burden, so that the main targets can be reached, i.e. creating more and new cooperative networks between the SMEs and the HEIs.

- **Addressing the research needs of SMEs requires foresight activities when designing a programme**

  The topics and themes of collaboration frameworks should be designed according to the needs of SMEs. Also, the preparation of thematic actions should involve the SMEs ~~already in~~as early as the preparatory phase. It is preferable to adopt a~~A~~n industry-lead approach ~~should preferably be used~~. When designing national R&D Programmes, it is recommended that, in a preparatory phase, a foresight exercise is included~~,~~ where ~~also~~ SMEs too can play an active part~~are participating actively~~ in the process. This is a very important aspect in the sense that it is beneficial~~ry~~ for all the partners.

  - Programme designer adapts~~gets~~ the programme more ~~adapted towards~~closely to the needs of ~~the~~ all the partners, including SMEs.
  - ~~Capacity of s~~Strategic intelligence capacity of the partners involved is enhanced.
  - Interaction between all the partners is stimulated.

  TEKES technology programmes (Finland) are an example. TEKES programmes have an embryonic or drafting phase (identifying market needs) and a preparation phase (creating a programme strategy and action plan) to which companies ~~are~~ contribute~~ing;~~ ~~and also~~ industrial associations can also bring ideas to TEKES (demand-led programmes).

- **Enterprises need to play a prominent role in a collaborative research project**

  Another important issue~~s~~ concerning co-operation is the partnership structure. In order to build trust and understanding between the HEIs and SMEs, thematic R&D programmes should have a sufficiently long time-~~s~~ scale ~~long enough~~. ~~Various~~ Different forms of partnerships should be accepted~~,~~; for example, less R&D-~~-~~intensive companies could learn from high-tech companies ~~due to~~through spill-over effects. The c~~C~~ollaboration model should also include the idea of shared risk.

  The effectiveness of the partnerships should be monitored with quantifiable variables, such as companies' work time spent in the strategic research areas, or the HEIs could monitor the number of partnership contracts with companies (and SMEs). Public funding should be used to promote collateral work using measurable indicators as an implementation guideline.

  The obligation of setting -up user groups ~~in~~ at a very early stage to steer the research activities ~~in a way~~ so that the exploitation of the results ~~are~~ is fostered, is very important. These user groups must be representative ~~for~~ of the whole target group of possible beneficiaries from the research project.

Good Example Identified

Competence Research Centres (Estonia)

A good practice in setting up collaboration can certainly be learnt froorm the Estonian rResponse in setting up Competence Research Centres. This way method of working togethercollaboration between large enterprises, research intensiveresearch-intensive SMEs and academia, had foundhad its origins in the US in the mid-1990 nineties.

Since then a lot of countries have put brought into practice this form of long-term collaboration into practice, aiming also to have an influence on the culture of academia. Examples are Sweden, Hungary, and Austria.
In the Multi-Actors Multi-Measures Programme 'MAP'-project under the 5th Framework Programme, a group of countries studied in detail this programme in detail.s. As a final result they came up withThe outcome was a handbook designed to foster this type of instrument. More details can be found on the website www.map-network.net.

- **Current rules addressing on IPR in collaborative research seem to hinder cooperation**

  The IP legislation in the Member States can be very different considerably in terms of how it fostersing the collaboration between the universities and the enterprises. In some countries, the IP rights belong to the universities, in other countries the professors or researchers get the ownership to inventions. Universities should be encouraged to have a technology transfer or innovation strategy that is implemented by technology transfer professionals with adequate resources. This would decrease reduce friction in the negotiations to the preparatory toion of the partnership agreements between the HEI and SMEs.

Good Example Identified

Spinno Programme (Estonia)

A good example from Estonia is a Spinno Programme (Estonia, 2001 - current), which is a framework for technology transfer for universities and carries thegranted with a prec condition that the university must have a technology transfer strategy.

Public support is needed to develop a code of practice and support training for Technology Transfer Offices in: identifying new business ideas, protecting IPR, evaluating and negotiating IPR and consortium agreements.

- **The transfer or exchange of skills, knowledge, and people between HEIs and SMEs is limited**

  The rationale behind giving a special attention to the mobility of skilled personnel as an essential part in of knowledge transfer is based on theories of tacit versus codified knowledge and on a modern view of the systemic character nature of innovation.

  In the academic world, the public research system works against the mobility: the majority of public research establishments have an incentive system resting based on publications and peer reviews systems, which do not easily incorporate nor value experiences in of working with industry. On the demand side, too, there are

disincentives to collaboratinge with the science sector: the difference in language and work practices and consequent difficulties ~~to~~ of communicatione~~,~~. An even ~~but~~ more ~~simply~~basic obstacle, however, is~~,~~ the lack of demand for R&D ~~on the side~~from ~~of~~ SMEs. ~~constitute a blocking factor. In SMEs~~, Ithe innovation capacity in SMEs in general is low and the strategic planning of development (incl. technology strategy) is starting to take its first steps~~making its first steps~~ owing~~due~~ to the gradual increase ~~of~~ in awareness and competitive~~ness~~ pressure.

- **SMEs do not know their way ~~in~~ around the public research infrastructure**

  To help ~~cross~~ bridge the gap between ~~the~~ enterprises, especially SMEs and the HEI, it is important to develop the necessary ~~intermediaries~~ systems of ~~that can help to overcome this gap~~. intermediaries.These ~~intermediaries~~ can help with:

  - Distribution of information ~~over~~ among the different research actors, and making contact with the knowledge institutes for the SMEs.
  - Fostering ~~the~~ networking and clustering between HEI and SMEs.
  - Providing technological advice to the SMEs.
  - Setting up and accompanying collaborative projects.
  - Bringing ~~into contact~~ enterprises into contact with business angels and the venture capital world.

  Efficient networks of technology and science parks, and technology transfer organisations ~~may~~ can facilitate the innovation process at the HEI-SME interface. Regional or local infrastructures should be managed and resourced in an effective way in order to create a nationally coherent innovation structure. The governance of these organisations should be market-oriented and output indicator-driven.

- **National Programmes do not address the globalising environment of ~~research intensive~~research ~~intensive~~ SMEs and high-tech start-ups.**

  In order to foster international collaboration, it is recommended that national authorities open their national R&D p~~P~~rogrammes ~~for~~ to foreign participants.

  There ~~exist~~ are several mechanisms ~~to~~ for opening up ~~the~~ national schemes:

  - Admitting ~~the participation of~~ foreign participants ~~on~~ at their own cost, without~~in~~ any preference in the selection process.
  - Admitting ~~the participation of~~ foreign participants ~~on~~ at their own cost, but with a preference in the selection process.
  - Admitting ~~the participation of~~ foreign participants, and ~~to~~ funding them~~,~~ only if they are research organisations working for the benefit of the ~~own~~ programme's national/regional partners.

  ~~In the case~~If all ~~the~~ countries ~~are~~ were using the same mechanisms ~~on~~ for opening-up, it would be easier to develop international collaboration projects ~~should be developed easier.~~.

3.5.2 Recommendations ~~on~~ at national policy level

~~Based on~~From the information provided ~~within the framework~~in the context of this Case, the following conclusions and recommendations based on best practices / lessons learned can be identified:

- It is recommended that national R&D Programmes should enhance the different forms of collaboration in their programmes, with special focus on the group of different segments of SMEs ~~because of~~for reasons of additionality. ~~reasons.~~

- It is recommended that national R&D Programmes should be designed ~~in such a~~so as to ~~way that they~~ target the right group of SMEs. A better insight into the needs of the final clients of the programme, through segmentation of the target population, is recommended.
- Public intervention should try to lower the barrier between SMEs and academia, taking into account the administrative burden of the public intervention in itself.
- In the preparation of national R&D Programmes it is recommended that, in a preparatory phase, a market and technology scan or a foresight activity ~~is~~ be included, where ~~also~~ SMEs are also participating actively in the process.
- The active involvement of enterprises in collaborative research projects is very important and should be mandatory ~~in~~ as a way of stimulating partnerships. Adequate monitoring systems should be developed to follow ~~-~~up this participation.
- It is important to align the policy of HEIs, especially ~~concerning~~ as regards their ~~mission~~ task of exploiting~~towards the exploitation of~~ research results, with ~~the~~ general R&D policy. Universities currently lack incentives to cooperate with SMEs that address~~ing~~ their research needs. By changing the legal framework in which universities operate, for example by gearing their third mission towards ~~the~~ societal needs in general, and the needs of industry in ~~specific~~particular, the research needs ~~by~~ of SMEs could be better addressed. In this perspective, it is also recommended to foster the setting up of professional TTOs ~~at~~ in the universities.
- There i~~'~~s ~~a~~ clearly a need to facilitate the supply of qualified staff to support Innovation in SMEs, ~~-~~such as the introduction of mobility programmes to support postgraduates, PhD students, engineers, technicians carrying out innovation and R&D projects for SMEs as well as provide staff costs. G~~-~~grants are needed to allow SMEs to hire qualified staff, on a time-limited basis, ~~for~~ to undertak~~e~~ing innovation projects.
- It is recommended to set up appropriate intermediary systems to ~~close~~ bridge the gap between the HEI and the enterprises. It is important to look carefully ~~into~~ at the efficiency and effectiveness of this intermediary system. ~~Therefore~~Hence, ~~-~~ the appropriate governance mechanisms have to be developed.
- ~~In the design of the national programmes take into account~~ T~~t~~he mechanisms of opening-up the programmes ~~for~~ to foreign participation should be taken into account~~.~~ in the design of the national programmes.

4 Demand driven R&D: public procurement

Figures indicate that the largest share of R&D by Industry is performed by the bigger players on the market. There areis has many reasons for this, and the main ones , of which the most important once already have already been discussed in this report: lack of financial resources (especially in the early stages of the developingment of an idea into a product), lack of strategic skills, lack of scientific knowledge to develop these ideas, and no means to access the knowledge infrastructure, etc.

A majorn important barrier preventingfor SMEs to from performing R&D is the lack of resources to cover the risks of a research-oriented innovation process. The outcome of such a process is difficult to manage and highly uncertain, resulting in a possible lack of resources. Within the scope of this Case, Public Technology Procurement has been discussed as an important instrument to increase efforts in R&D by SMEs by addressing the perceived risks involved.

An EU expert-group has identified Public Technology Procurement as the most powerful weapon in the armoury of policy instruments to achieve the Barcelona 3% target for R&D as a proportion of GDP by 2010[59]. Not many European countries have experience with PTP, but the example of the UK Small Business Research Initiative indicates is showing promising results[60].

The UK SBRI (http://www.sbri.org.uk) is designed to increase the success of smaller businesses in obtaining contracts from Government bodies to conduct research and development. The initiative, implemented in 2000, is open to all businesses. However, it is particularly suited to SMEs. The SBRI aims to:

- Provideing opportunities to those existing small firms whose businesses are based upon providing R&D - by increasing the size of the market.
- Encourageing other smaller businesses to increase their R&D capabilities and capacity - to exploit the new market opportunities.
- Createing opportunities for starting new technology-based or knowledge-based businesses.

The R&D procurement programmes of Government Departments and the Research Councils are being made more accessible to smaller businesses. The Government Departments involved will aim to buy at least 2.5% of their R&D requirements from smaller businesses. The Research Councils will move to meet the same targets over time. The target is for £50 million worth of Government research to be bought from smaller firms.
The Small Business Service is co-ordinating the Small Business Research Initiative on behalf of the Research Councils and Government Departments.

[59] Public Procurement in the EU is worth approximately 16% of GDP. Source: A report on the functioning of public procurement markets in the EU: benefits from the application of EU directives and challenges for the future (03/02/2004).

[60] Within the framework of the Case, Ron Downing, DTI, presented the UK SBRI programme.

Government Departments and Research Councils participating in this initiative ~~are amongst others~~include the Biotechnology and Biological Sciences Research Council, Department of Trade and Industry, Office of Science and Technology, etc.

This chapter describes examples of PTP in the Netherlands and Flanders, and identifies conclusions on the characteristic~~s~~ barriers ~~of~~ to such ~~an~~ instruments, and recommendations to address these issues, based on the introduction of the Case by Sweden, and taking into consideration the results of the recently published report of the EU expert-group on ~~technological~~ technology procurement[61].

[61] Public Procurement for Research and Innovation, Report of an Expert Group on measures and actions to assist in the development of procurement practices favourable to private investment in R&D and innovation, September 2005.

4.1 Case of Sweden: design of a public procurement policy[62]

4.1.1 Background: the Swedish NIS has high potential

The Swedish innovation system is well known for its high level of investment ins on R&D. Ever since the 1980s Sweden has been among the countries that have invested the most in R&D in relation toas a proportion of GDP. In 2003, only Israel invested more. The figure for Sweden was just below 4% of GDP, which was in fact down was decline by 0.,3% compared to 2001.

The Swedish innovations system as a whole whole has the followingis characteristicsed as follows:

- High level of R&D investments, but although public support is decreasing.
- Small sector of research institutes.
- Long tradition of cooperation between university and large companies.
- Decentralized policy implementation (small ministries and fairly independent agencies).
- Dependence on about 10 multinational companies.
- Small home market for global actorsplayers.
- Company R&D concentrated to some fields (pharmaceuticals, communication and transportation).
- A large public sector with highly competent people.

MostThe majority of of the R&D activities is takentake place in the business sector, and this holds for most countries, but especially for Sweden. Around 75% of the R&D-expenditures is performed within the business enterprise sector. Almost all R&D outside the business sector is performed within the higher education sector.

According to Swedish statistics, 20% of R&D within the country is performed among in firms with less than 250 employees[63]. R&D activity in the SME sector is concentrated in a few industries: about 70% of total R&D is performed within the electrical and optical equipment industry, the business services sector and in the R&D-organisations. A substantial amount of R&D in the latter industry is performed by the industrial institute sector.

According to a recent analysis made by Eurostat regarding of business demography in Europe, Sweden has the lowest entry rate among the countries studied. In 2002, the number of new enterprises amounted to 6% of all active enterprises. The average size of the new enterprises is not higher bigger in Sweden than in the other countries.

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62 Case presented by the Swedish Expert, and Helen Andreasson, VINNOVA.

63 Data should be handled treated with care:

- Many countries do not survey the smallest firms, which means that their R&D-share in the smallest size class is underestimated.
- Swedish figures on R&D do not include firms with less than 50 employees.
- Industrial research institutes in Sweden are classified as firms and most of them are small, which means that the R&D-share among the small and medium-sized firms in Sweden are is over-estimated compared to many other countries also for this reason too.

According to the Global Competitiveness Report (2005-2006), Sweden remains strong on drivers of microeconomic growth potential, b~~. B~~ut shows significant weaknesses on the microeconomic foundations of competitiveness ~~Sweden shows significant weaknesses~~:

- Strengths are: company sophistication, the strength of clusters, the formal openness of the economy to competitions, the neutrality of government, and the strong innovative capacity.
- Weaknesses are apparent in: the educational system, the efficiency of the legal system, the incentive effects of taxes, and the actual intensity of competition on domestic markets.

There are, however, clear indications that Sweden's microeconomic business environment ~~imposes~~ causes problems for small and medium-sized companies. Swedish SMEs are especially worried about the quality of the education~~al~~ system, including management education, and the effectiveness of the legal system. SMEs in Sweden face specific problems, which are ~~characteristic~~typical ~~for~~ of many countries with a similar innovation system:

- Low entry rate of new firms, growth problems.
- R&D heavily concentrated ~~to~~ in large firms: 80% of all business R&D performed by large firms.
- SMEs are often service firms which~~o~~ generally have a lower R&D-activity compared to manufacturing firms.
- R&D in SMEs is concentrated ~~to~~ in a few industries / sectors.
- R&D-activities are costly and often include ~~large~~ high fixed costs.
- SMEs are not ~~to the same degree as larger firms~~ involved in co-operation with research institutes and higher education~~.~~ to the same degree as larger firms.
- Litigation costs deter patenting in SMEs and may also deter entry.

4.1.2 Actions: supporting Swedish SMEs

In order to maintain economic growth, Sweden needs more growing companies. As many jobs in large companies move offshore, it increasingly needs an ~~increasing~~ injection of new jobs. This can only come about through more new business start-ups, more companies growing larger and companies employing new staff. Sweden has a disproportionately large number of both small and large companies. There are t~~There are t~~oo few small companies ~~that~~ growing into medium~~-~~-sized companies. Only one of Sweden's 50 largest companies was established in the past 30 years. Sweden also has a low rate of business start-ups. Only 4% of Sweden's working population ~~are in process of~~is in starting companies. The average turnover in these companies is less than €10.000 and their~~. The~~ growth potential ~~of these companies~~ is rather limited.

Achieving an increase in enterprise requires not only significant~~large~~ investment~~s~~ but also long term investment~~s~~. Investment~~s~~ in entrepreneurship, R&D, networking, knowledge supporting are ~~only~~ just some of the ~~actual~~ current needs.

In order to address the needs of SMEs, the Swedish government has ~~analysed~~looked at ~~the~~ how it can ~~possibility to~~ implement a public procurement policy. In the past, public procurement has been used as a tool directed at~~addressing~~ SMEs[64]. Since 1990 t~~T~~he Swedish Energy Agency ~~of Energy~~ has ~~since the beginning of 1990~~ initiated, co-financed and participated in 55 different technology procurements to improve the development towards more energy effective products and systems. Agency, producers and the ~~demanding~~ requesting group involved in the procurement have invested ~~quite some~~ considerable resources (both in money and time).

In the US, the procurement procedure is more developed than in Europe, especially within the SBIR-programme. Collaborations within procurement, including ~~and~~ how to use the instrument ~~towards~~ for SMEs and R&D ~~is a~~is a big issue. A Swedish study entitled 'Småföretag och offentlig upphandling – Hinder och möjligheter för småföretag att delta i offentliga upphandlingar' ('Obstacles and possibilities for SMEs to participate in public procurement', Nutek R 2005:21) has identified the following obstacles to~~for~~ SMEs ~~to~~ participat~~ing~~e in public procurement:

- High costs and lack of time to ~~formulate a tender~~draw up tenders.
- Heavy demands on the companies.
- Different purchasing units use different models for evaluation.
- Tender might be ~~neglected~~ rejected on formal ~~reasons~~ grounds that ~~do not have any~~are not ~~importance for~~relevant to~~r~~ the goods or services that are going to be procured.
- Companies have to ~~keep~~ abide by~~to~~ the tenders, which may ~~force~~ oblige~~the~~ SMEs to maintain~~have~~ full resources for a long time without being sure of getting a contract.
- ~~There seem to be a distrust of t~~The knowledge and the integrity of ~~the~~ public procurement staff seem to be doubted.

Sweden has a law on public procurement, which includes all purchases made by government~~al~~ agencies, municipalities, county councils and other public organizations. This law (Lagen om Offentliga Upphandlingar (LOU)) builds mainly upon EU directives ~~from EU~~, but contrary to the EU ~~regulation~~ rules (and regulations in other Member States), ~~the~~ Swedish law ~~is applicable for~~applies to all public procurement, not just ~~that~~ contracts above~~over~~ a certain ~~amount of money~~value.

In Sweden there are 552 independent government~~al~~ agencies, 290 municipalities, 18 county councils and a large number~~lot~~ of municipal companies. All of these~~m~~ must ~~follow~~ abide by ~~the~~ Swedish Law (LOU). ~~And~~ The actual number of procuring ~~the amount of~~ units ~~that make procurement~~ is even ~~more~~ higher, since ~~there might be several units at~~ one agency may comprise several procuring units~~that make procurements~~.

4.1.3 Conclusions: further analysis of public procurement

[64] Public Procurement in the field of: lighting public areas, industrial doors, vehicles (hybrid / biogas), mining ventilations, IT in sawmills, supervision for foundries, electric motors~~al engines~~, supervision for rolling mills, cooling compressors, pneumatic compressors, water heaters, new cookers, washing machines, dryers, refrigerators, freezers, dish-washers, systems for electrically heated villas, and copy machines.

By the time this Case on Procurement was launched, Sweden was in the process of developing a Public Procurement Scheme aimed at SMEs, focus~~s~~ed on R&D. Due to internal politic~~sal;,~~ the design of such an instrument has been stalled temporarily. By participating in a possible OMC-Net project on Public Procurement, the Swedish government ~~tries~~ is trying to collect additional information on the set-up of such a scheme.

4.2 Response by Flanders: the Environmental Innovation Platform

4.2.1 Background: the Flemish policy mix

Belgium has a federal constitution and, over the years, more and more responsibilities ~~were~~ have been transferred to ~~the~~ regional level. In 1988, ~~the~~ innovation policy ~~turned into~~became ~~a~~ the responsibility of the ~~regional~~ Flemish region. ~~responsibility.~~ In this context the Institute for the Promotion of Innovation by Science and Technology in Flanders (IWT) was set up by decree in 1991. Between 1991 and 2000, IWT directed ~~exerted~~ its innovation~~-~~ stimulating activity ~~directed~~ towards industry, almost exclusively through grants.

The characteristics of the Belgium (Flemish) innovation system ~~are~~ were described in detail in the previous chapter.

From 2001 onwards, IWT started to explore the potential offered by a policy mix approach as ~~expressed~~ proposed by the EU Policy-Mix expert-group in 2003[65]. This approach ~~consists of~~comprises four~~4~~ groups of instruments:

- Direct financial R&D measures
- Indirect fiscal R&D measures
- Risk capital measures
- Loan and equity guarantee measures

This set of instruments should be underpinned by a holistic policy approach comprising clusters, technology platforms, labour market flexibility, innovation stimulating standards and regulations, entrepreneurship, IPR, human resources, public research and EU competition policies. Besides grants and loans, the group of direct financial R&D measures also comprises Public Technology Procurement as an instrument to stimulate innovation. Based on the fact that public procurement in the EU is worth approximately 16% of GDP[66], the EU expert-group considers Public Technology Procurement as the most powerful weapon in the armoury of policy instruments to achieve the Barcelona 3% target for R&D as a proportion of GDP by 2010.

The EU ~~-~~expert ~~-~~group is also of the opinion that, if the EU is to match the R&D funding levels of the USA as a proportion of GDP, industrial restructuring is required, with the balance shifting from economies dominated by low~~-~~ to medium-tech SMEs to ones in which global MNCs interact with a rich mix of research-oriented institutions and R&D-intensive firms of different sizes in new and rapidly expanding lead markets.

[65] Improving the Effectiveness of the Mix of Public Support Mechanisms for Private Sector Research and Development: Report to the European Commission by an Independent Expert Group (2003).

[66] A report on the functioning of public procurement markets in the EU: benefits from the application of EU directives and challenges for the future (03/02/2004).

The aAbove guidelines were translated adapted toto the Flemish context by the introduction of a variety of measures. To start with, it was felt that R&D in iIndustry in Flanders was too much concentrated in a few large MNCs. To remedy this situation a specific SME innovation programme was launched in 2001: the programme consists of feasibility studies (60% subsidy rate) and prototype development (35% base subsidy rate with an absolute ceiling of €200.000). Under this, Annually, yearly on average about 250 SMEs benefit from this SME innovation programme on average. Besides this specific SME innovation programme SMEs can apply for subsidies in other existing schemes for industrial research (prototype development, basic industrial research and mixed research) to which all companies have access.

Since 2001, Under all afore-mentioned programmes SMEs have since 2001had access to subordinated loans as a complementin addition to to a subsidy of up to 80% of the project budget under all of the abovementioned programmes. An IWT-subordinated loan is granted to SMEs at commercial interest rates (4% above the EC state-aid reference interest rate, without securitiessecurity) and after subject to a positive financial evaluation of the commercial potential of the project and the resulting cash flows that enable the SME to service the loan (maximum nominal value of €800.000 per SME).
A scheme for tax-deductible loans by from friends (with up to a maximum of 50 000k EUR per person) for start-ups is also under preparation: this loan will be launched in 2006 and will be available for all start-ups in the Flemish region.

Fiscal matters are still a dealt with at federal level responsibility in Belgium. In 2003, universities, HEIs and Research Institutes keep 50% of the withholding tax in respect offor their researchers, so at universities, HEIs and Research Institutes remains with these bodies such that the salary costs for researchers are reduced bydecreases with about 10%. In 2005 this measure was extended to researchers in private companies working together on R&D projects with afore-mentionedthese organisations; eventually in 2006 this fiscal measure may will be applicableapply for to researchers in all private companies. In order to stimulate encourage shareholders to strengthen the equity base of their company, a notional tax-deductible interest on equity will also be operational from 2006 onwards. This notional interest cost can be carried forward, so that innovative start-ups can also benefit from this fiscal measure.

The Flemish Government has taken two major actions steps with regard to risk capital: measures: iIn 2005 the Arkimedes fund was started as a SBIC-equivalent (€1 public money for each Euro €1 of venture capital money) for (early stage) investments by Venture capital certified by the Arkimedes fund. The first call raised €110 million of public money that which, after applying resulted via the one-to-one lever, made in a total amount of €220 million available for investment. In eEarly 2006 the VINNOF-fund will become operational: €75 million will be made available for investment in the pre-seed and seed stages of starting innovative companies through loans, equity and quasi-equity. Start-ups can access the VINNOF-fund via three different routes: via a certified seed capital fund whereby VINNOF automatically matches the venture capital investment in a one-to-one ratio up to €500.000;, via direct investment by the VINNOF-fund up to €500.000 upon positive assessment by VINNOF, or via IWT through a subordinated loan under 'de minimis' conditions with a subsidy equivalent of max €100.000 on top of an actual subsidy. The aim of the VINNOF-fund is to close the financing gap of up to €1 million being faced bythat

innovative start-ups ~~are facing~~. Given t~~T~~he amount of money involved in the different routes and their sequencing, it is possible~~these routes allows~~, in principle, to accommodate an SBIR equivalent.

In 2005, t~~T~~he Flemish Government ~~has in 2005~~ revised the loan and equity guarantee measures provided through the Flemish Guarantee Fund: the equity guarantee measures were suspended due to lack of interest from the venture capital side, while the loan guarantee mechanism was simplified. The Flemish Guarantee Fund ~~now~~ has now provided ~~for~~ a 75% guarantee at individual loan level for a total portfolio of €200 million of loans.

The detailed measures taken in Flanders by IWT and belonging to the category of holistic embedding of innovation ~~can be found~~are described elsewhere in this report.

~~Finally~~ Lastly, as an innovation-stimulating agency, IWT ~~perceives~~ sees two needs which~~that~~ the Flemish innovation policy for the private sector ~~needs to~~must ~~respond~~address ~~to~~:

- A need for coaching of start-up~~ing~~ innovative SMEs
- A need to broaden technology innovation, in line with the new Oslo Manual, to:
  - n~~N~~ew types of innovation: marketing and organisational innovation
  - i~~I~~nnovation activities and capabilities related to knowledge development

With the new initiatives implemented or underway, there is ~~an~~ increased access to money for innovative SMEs in the Flemish region. This money is ~~in search~~looking for attractive innovation projects. Traditionally, innovation projects are B2B or B2C. With a purchasing power of about 16% of GDP, each government can ~~as well~~also supply innovation projects with the aim ~~to solve~~of solving socio-economic problems. To this end Public Technology Procurement can provide the necessary tool to ~~additionally~~ further stimulate innovation in the private sector, and more specifically in SMEs.

4.2.2 Actions: first steps towards a public procurement policy

Public Technology Procurement[67, 68, 69] is defined as the purchase of a product or service that does not exist at the time of procurement, but that could probably be developed within a reasonable period of time.

As a consequence Public Technology Procurement ~~is~~ should preferably not be:

- Innovative procurement based on new procurement methods or processes (e.g. Public Private Partnerships, PPP or Third-party financing)
- Procurement of existing 'off-the-shelf' high-tech or 'green' products.
- Procurement of R&D by the Government

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67 Public technology procurement and innovation theory: ISE (Innovation Systems and European Integration) report, Sub-project 3.2.2: Public technology procurement as an innovation policy instrument, Edquist, C. and Hommen L., 1998.

68 Public Technology Procurement as a Demand-side Innovation Policy Instrument- an Overview of Recent Literature and Events, Max Rolfstam (Division of Innovation, Department of Design Sciences, Lund Institute of Technology, Lund university, Sweden), January 5th 2005: http://www.druid.dk/ocs/viewpaper.php?id=329&print=1&cf=2.

69 Public Technology Procurement and Innovation, C. Edquist, L. Hommen, L. Tsipouri, Kluwer Academic Publishers, 2000.

Besides the regulatory dimension, i.e. the creation of rules to make tendering procedures more transparent, respect for the principle of equal treatment and, increased competition with the final goal of achieving public sector savings, Public Technology Procurement creates additionally creates a strategic dimension in public procurement, i.e. the use of public technology procurement as an instrument to stimulate innovation.

The point of departure in PTP is a perceived socio-economic problem or need that is not solved. Major public areas of socio-economic needs are:

- Construction and infrastructure
- Security
- Improved public services
- Environment and energy
- Health-care
- Transport and mobility
- Education

PTP responds to the need to 'reduce the risk perceived by (producer) firms that demand will fail to materialise' as expressed by Porter in 1990. Assurances of future demand are required in order to encourage a sufficient investment in R&D, and production. PTP is a form of economic arrangement that has the 'potential to smooth peaks in the perception of risk, essentially by shifting some part of the risks from seller to buyer'[70].

From the literature and from our own experience so far, we can identify perceive two basic success factors for Public Technology Procurement:

- Political commitment of at the highest political level is essential to drive public technology procurement.
- Procurement legislation should not contain any barriers to the implementation of PTP.

The following are considered as key features of PTP[71, 72]:

- Socio-economic needs are translated into performance or functional output-based criteria.
- There is a shift from price to "MEAT" (Most Economically Advantageous Tender) as the purchase decision criterion.

[70] Technology procurement as a special form of buyer-seller interaction in industrial markets: CIM report no. 84:06, O. Grandstrand, Göteborg: Chalmers University of Technology, Department of Industrial Management, 1984.

[71] Issue papers: EU Expert Group on measures and actions to assist in the development of procurement practices favourable to private investment in R&D and innovation, version 1.4, 17 February 2005.

[72] Public Procurement for Research and Innovation: Expert Group Report, Developing procurement practices favourable to R&D and innovation, European Commission, September 2005.

- Early communication to the market of (long-term) governmental needs is preferred. This allows the ~~use of~~ time factor to be used as a risk~~-~~controlling strategic parameter.
- The availability of a technology assessment capacity ~~at~~ on the buyer's side is essential.
- ~~A m~~Market survey and market ~~evolution~~ trends should be conducted using foresight techniques~~ should be carried out~~.
- Technical dialogue between suppliers and the contracting government should be organised in technology platforms, as ~~is done~~happens with ~~in~~ the defence Smart Procurement programme in the UK.
- As a basic IPR-concept, the supplier is assigned full ownership of IPR while the contracting government has ~~use~~ rights of use. This should be reflected in the price of the service or product.
- Risks and rewards should be shared between the supplier and the government in order to create a win-win situation.
- It is recommended to secure or encourage a continuous innovation effort from the side of the supplier using value engineering techniques.

Public Technology Procurement projects can be positioned in a matrix along two axes: one axis that characterizes the type of technology procurement and a second axis that characterizes the stage of the project on the innovation cycle. There are three types of public technology procurement:

- Direct procurement, that is based on needs intrinsic to the procuring organisation (e.g. e-government services).
- Cooperative procurement, that is based on shared needs, congeneric to multiple users (e.g. energy efficient lighting or buildings).
- Catalytic procurement that is based on needs extrinsic to the procuring organisation, i.e. of other users (e.g. new sustainable technologies).

The stage on the innovation cycle can be characterized by the gap ~~that exists~~ between the requested output performance and the output performance available with existing products/services.
The bigger the gap, the greater the preference for ~~more~~ smaller~~-~~scale exploratory procurement ~~is preferred~~ by means of~~through~~ feasibility studies, concept development, prototypes, pilots, etc. The smaller the gap, the more scope there is for full-scale projects with back-up from existing solutions: innovation in such a case consists in system integration, developing some new building blocks or increasing the functionality or reliability of existing systems.
All categories in the PTP-matrix can accommodate SMEs.

Managing risk is of critical importance in PTP. Risk can be controlled or mitigated in the following way:

- Install a technology/market assessment capacity that interacts with the supplier side in a technology platform.
- Define the state-of-the art of technology/innovation and define the gap between the requested performance and the available performance in the market.

- Use time as a risk mitigating parameter: time allows ~~for~~ information gathering, concept development, feasibility studies, prototype building, learning, testing and ~~finally~~ ultimately full-scale implementation.
- Use of existing ~~classical~~ conventional solutions as back-up.
- Allow different technological trajectories in parallel for high-risk projects in early stages of development.

A central decision-making criterion in the IWT-subsidy programme is the potential for generating additional economic added value ~~generation~~ in Flanders through exploitation of the project results by the beneficiary, contributing to ~~the~~ overall Flemish GDP. In the Flemish subsidy policy, a GDP contribution of between 10 - 25 times the value of the subsidy over the life-cycle of commercialisation of the project results is requiredested, ~~irrespective of~~ whether the submitting party is a domestic or foreign owned subsidiary firm. To be of strategic interest to Flanders, PTP as an innovation-stimulating instrument should likewise contribute to the Flemish GDP. As a consequence there is a potential conflict between the MEAT concept in PTP and GDP contribution, ~~through~~ due to the fact that MEAT does not ~~exclude~~ rule out direct cross-border procurement that does not lead to GDP contribution of the procuring region/country. Analysis of the bidding behaviour~~2~~ shows that more than 50% of all firms are domestic firms, bidding exclusively for contracts in their home country. Bidding abroad through subsidiaries is clearly a dominant strategy, while direct cross-border bidding is of minor importance. This bidding behaviour indicates that ~~the~~ fears ~~for~~ of direct cross-border bidding in PTP without contributing~~on~~ to~~t~~ GDP ~~could~~ may well be unfounded.

In ~~With the exception of the USA and the UK, where policies are explicit and actively pursued, in~~ Belgium, ~~as in~~as in most countries (except for the USA and the UK, where policies are explicit and actively pursued), innovation~~ve~~ procurement occurs more as a result of good ad hoc policies in selected cases[73], driven by political commitment. Specific cases in Belgium are the e-ID and e-Health card, e-government (e.g. new web-based personal income tax declaration) and low-emission public bus transport.

The e-ID project ~~started~~ launched in 2001 was driven by a policy~~political~~ commitment. The tendering process was started as an open procedure. However, no single party ~~succeeded to~~managed to comply under this ~~procedure~~ procedure, so~~after which~~ it was switched ~~in~~to a negotiated procedure. The value of the project was estimated at about 100 MEUR and was finally assigned to a system integrator. Under ~~high~~ intense time pressure, the card was introduced on 31 March 2003~~/03/03~~. The actual production volume is about 40.000 cards per month. The technology risk can be ~~considered~~ regarded as ~~being~~ moderate: the ~~innovation~~ innovation mainly took ~~mainly~~ place at system integration level rather than at component level. The technology assessment capacity was present ~~at~~ in FEDICT, the federal government ICT agency. IPR for tailor-made software belongs to the government since ~~the government~~it paid ~~for~~ the full development cost. In the mean-time, further development of the e-ID card into a smart card with additional functionalities has started. The purpose of the smart card ~~hai~~s to facilitate the interaction between the

[73] Procurement and Innovation, Synthesis from country reports, Conference on Public Procurement stimulating Research & Innovation, L. Tsipouri, 14 December 2005, Brussels.

citizen and the government at federal/regional and local level based on a back-office connected government using open source. Throughout the further development process, FEDICT runs short-term proof-of-concept projects following a restricted procedure without publication. A second-generation e-ID/smart card is due to be introduced in 2009 - 2010. This allows time to be used as a strategic parameter. In the preparations for the second-generation card no explicit foresight is in place. However, FEDICT has entered into cooperation with universities, Research Institutes (IBBT) and Cooperative Innovation Networks like L-SEC to explore future trends, and sets up Requests for Information to consult and inform the markets and shorten calls for proposals, as well as consultation with branch organizations. FEDICT has also expressed an interest in the incorporation of value engineering into the innovation process.

The following points relating to the supply side should be mentioned. For the e-card business, FEDICT preferred to work with a single contact point: the system integrator. FEDICT acknowledges that the selection criteria in the procurement process were not SME-friendly in terms of securities, financial criteria (turnover) and terms of payment. SMEs, however, have access to the e-card optimization process through proof of concept projects, show their capabilities, building trust and finally giving them access to delivery via the system integrator. The winner of the tender (Zetes), also won an UN ID-contract (value of 40 MUSD) to facilitate identification in the election process in the Republic of Congo. On 22/11/05 Zetes successfully completed an IPO. The introduction of the Belgian e-ID card had a positive effect on the e-card market. As a result of the successful e-card introduction, smart-card competence centres of MNEs are moving to Belgium, attracted by the availability of a suitable test environment.

We also analysed road building as a second case considered by IWT as a candidate for public technology procurement. In road building there are clear signs of shift towards performance specifications and whole life costs. In the particular case of road building in Flanders there is a perceived commitment for innovation on the part of the responsible minister and the procurement agency. There is a strong need for risk management: pilot projects are standard practice in road building. There is also a need for recycling of materials: used road materials like asphalt and other waste, such as rubber. The Belgian and Flemish agencies responsible for road construction can rely on the Belgian Road Research Centre that has a research, testing and assessment capacity. The above characteristics make road building a suitable candidate for public technology procurement, especially since environmental aspects are involved.

Without stating it explicitly, the Belgian federal government has implicitly chosen e-related topics as candidates for public technology procurement in order to improve security and public services. The Flemish regional government, on the other hand, has explicitly chosen to pursue environmental and energy related topics for public technology procurement. This was consolidated by the foundation of the Environmental Innovation Platform (MIP) in 2005.

MIP is based on ~~the~~ cooperation between the ~~3~~ three governmental areas of responsibility~~:~~ - innovation, environment and energy~~,~~ - involving all relevant innovation actors from industry, Research Institutes and governmental administrations. One of the strategic actions of MIP consists ~~of~~ in stimulating the demand side by public technology procurement with the use of innovative procurement methods such as third party financing or public-private partnerships (PPP). At the same time, MIP will also try to remove barriers ~~for~~ to innovation (over-regulation) and instead introduce innovation-stimulating regulations responding to environmental needs. MIP will also have a pole of excellence providing the necessary assessment capacity generally accepted in the context of PTP.

The environmental industry in Flanders can be summarized as follows[74]:

- The expenditure (public and private) amounts to~~t~~ 1.,3% of GDP of which 70% ($ 2 billion) in Flanders.
- Engineering and service-oriented.
- Environmental problems to be solved: ozone levels, climate change, over-fertilization, and water and soil pollution.
- Fragmented sector with many small players and foreign MNEs and a few big governmental agencies (OVAM, Aquafin, VMM).

This is somewhat comparable with the environmental industry in the UK ~~that~~ which is summarized as follows[75]:

- £25 billion annual turnover (GDP (2004): £1.164 billion)
- 400.000 people employed in UK
- 17.000 companies
- On a par with aerospace and defence

4.2.3 Conclusions: promising results for PTP

De facto, Belgium ~~at the federal level~~ has introduced public technology procurement at the federal level and ~~this primarily~~ in an area which lends itself to such a process, namely ~~domain that by its very nature is inviting to do so, i.e. the purchase of ICT~~ ICT procurement, to improve public services. Flanders has started the MIP pilot project ~~that~~ which, in addition to~~on top of~~ the regulatory dimension, primarily explores the strategic dimension of PTP, i.e. stimulation of innovation by PTP. The more PTP cuts across different governmental departments, the more political commitment is essential for the success of PTP.

Technological failure cannot be tolerated in ~~big~~ large-scale public procurement. At first ~~glance~~ sight this ~~is in~~ conflicts with the definition of PTP ~~that refers to PTP~~ as the purchase of a product that does not exist ~~yet~~ at the time of purchase. This conflict can be resolved by introducing time as a risk-mitigating parameter: time allows a big PTP project to start as a small exploratory project in which different technological solutions can be explored in parallel. Gradually, technological uncertainty disappears and gives way to large-scale innovation that allows ~~solution of~~ socio-economic

[74] Stat-USA Market research reports: Environmental Technologies Market Profile for Belgium, August 11, 2002.

[75] Sustainable Procurement: the national perspective, Barbara Morton, DTI-Defra Environmental Industries Unit & University of Manchester, Thursday 10 March 2005.

problems to be solved, giving value for money and, if properly designed, ~~contributes~~ contributing to the GDP of the purchasing country. Early start-up of a PTP project also ~~facilitates also the degree of~~helps the level of participation of SMEs. Besides time, the provision of a technology assessment capacity ~~at~~ on the buyer's side can also help ~~to~~ in the management of technological risk.
Each technology procurement project can be positioned in a matrix that has ~~2~~ two axes: a project type axis and an axis that positions the project on its innovation cycle. This matrix will also help to build a balanced technology procurement portfolio and assist ~~to~~ in developing an innovation strategy based on PTP.

~~Based~~ On the basis of~~on~~ its grant policy experience, IWT is confident that a transparent and open public technology procurement approach will stimulate innovation and contribute to GDP in the region. Moreover, PTP can ~~can potentially better than grants do,~~ respond - potentially better than grants do - to the need to reduce the risk perceived by innovative firms ~~that~~ of demand ~~would~~ failing to materialise.

The a~~A~~bove can be summarised by the saying: "T~~t~~hink big, start small!"

4.3 Response by the Netherlands: SBIR[76]

The Innovation system of the Netherlands has been described in detail in ~~within the framework of~~ Case I, and will therefore not be addressed ~~within the framework~~in ~~of~~ this Case IV.

4.3.1 Actions: a new PTP programme to address SMEs

As described in Case I, innovation in the Netherlands is lagging behind. SMEs are an important economic factor and have a high level of knowledge. However, ~~the~~ financing remains a problem. There are s~~S~~everal programmes ~~i~~exist ~~i~~n the Netherlands~~,~~ which address the various stages of financing. In addition to these, technology procurement can be a useful tool for the (very) early stage financing of innovative SMEs.

Recently, several initiatives have been set up in the Netherlands ~~concerning~~ relating to public procurement in general. These initiatives aim to centralise the organisation and knowledge of public procurement. ~~Besides that~~In addition, an action plan for the government as launching customer will be presented in May.

However, innovative SMEs or technology procurement as such are not addressed within these initiatives. Therefore, the Netherlands ~~are~~ is in the process of implementing the Small Business Innovation Research (SBIR) programme.

4.3.1.1 The SBIR programme in general

SBIR is a programme that has been running successfully in the US since the early ~~eighties~~1980s. It concerns the development by SMEs of innovations on socially relevant themes (e.g. safety, health, sustainability). SBIR is based on the following key elements:

- Only SMEs can apply
- An SBIR project consists of three phases:
  - Feasibility
  - Research and Development
  - Commercialisation (development into product or service)
- The government has a specific question. Via a public procedure, the government asks SMEs to submit proposals addressing this specific question.
- There is competition. The government awards a contract for phase 1 and, where applicable, for phase 2 (during a second round) to more than one SME.
- Phases 1 and 2 are fully funded by the contracting authority. The government does not fund phase 3, unless the government itself buys the end product of phase 3.
- The intellectual property (IP) remains with the company.

In this way, the government contracts the SME for research and development on a socially relevant theme. This is a "win-win" situation. On the one hand, SMEs are helped to perform research. Commercialisation is more likely to succeed, as there is an actual market for the end-result. On the other hand, the government gets innovative

[76] Response presented by the Dutch experts, and Nelleke Corbett, Ministry of Economic Affairs

solutions on a social theme. This is a good way of investing public money; the investment in R&D directly contributes to solving public concerns. In the US, departments and agencies are obliged by law to use 2,~~,~~5 % of their R&D budget for SBIR.

4.3.1.2 Legislative framework for SBIR: subsidy or contract?

A contract ~~through~~ via procurement has several advantages over the traditional subsidy. With a contract it is possible to fully fund the necessary R&D, regardless of the phase of the project (fundamental, industrial or pre-competitive), while a subsidy is always bound to a maximum percentage ~~due~~ owing to the state aid rules. A contract is a two-~~-~~way obligation. Subsidisation involves fewer obligations and therefore provides less certainty that the result will indeed be achieved. For these reasons, the Netherlands ~~have~~ has opted for contracts by means of procurement for SBIR.

As a consequence, SBIR contracts must comply with the P~~p~~rocurement D~~d~~irective 2004/18/EC~~G~~. Normally, this would not allow ~~for~~ a specific group (like SMEs) to be selected. An R&D contract, however, may fall under the R&D exception~~al~~ rule (A~~a~~rticle 16(f)~~ sub f~~[77]), which allows of~~ing~~ a less strict interpretation. However, the selection procedure must still be transparent, objective and non-discriminatory. Therefore, SMEs from other countries should also be able to compete and phase 2 must fall within the definition of R&D. Naturally, the results may not accrue exclusively to the contracting authority, and realistic arrangements must be made ~~about~~ concerning price and contract.

4.3.1.3 The Dutch SBIR project

In 2004, a pilot project was started on the topic of power technology. This topic was chosen for several reasons. First of all, the potential of this technology for energy conservation fits in with the energy policy of the M~~m~~inistry of Economic Affairs. A lot of studies and research have been done, but there are not many existing products. Furthermore, the sector is well known and there are many SMEs, so the pilot could be set up very quickly.

The call for proposals for phase 1 was worded as follows: ‘Research is needed to apply the principles of power technology to the areas of energy conservation and sustainability’. It was published widely through press releases, internet etc. Only SMEs that fall under the EC definition ~~could~~ were allowed to apply. The proposals were judged on innovativeness, sustainability and economical potential. Within three weeks, we received 17 proposals of which 4 were awarded a contract of €50.000 for a feasibility study. Six months later after completing phase 1, all four participants applied for phase 2, the R&D phase. The same three criteria were used, but more importance was ~~put~~ placed on~~in the~~ economical potential. A business plan was required and bonus points were awarded if there was external interest for financing of phase 3. In December 2005, two companies were awarded a contract for €450.000 to develop a working prototype in two years.

[77] 2004/18~~/EG~~/EC, A~~a~~rt 16(~~ sub~~ f): “This Directive shall not apply to public service contracts for: research and development services other than those where the benefits accrue exclusively to the contracting authority for its use in the conduct of its own affairs, on condition that the service provided is wholly remunerated by the contracting authority.”

4.3.1.4 Funding

SBIR in the Netherlands is not a new programme with a separate budget, but a concept, a tool that can be used within existing programmes. There is no separate funding; ~~eventually~~ where necessary, the money must be ~~a~~ set aside from the total governmental R&D budget. In the US, departments and agencies are obliged by law to use 2~~,~~.5% of their R&D budget for SBIR. The UK has recently changed ~~their~~ its similar SBRI programme from voluntary to obligatory. ~~For~~ To a large ~~part~~extent, the R&D budget in the Netherlands belongs to ~~other~~ organizations other than the Ministry of Economic Affairs. Therefore, in the following period, ~~the~~ attention is focused on gaining support for SBIR within other departments and governmental agencies. TNO (Netherlands Organization for Applied Scientific Research) has already started a SBIR pilot and ~~hopefully~~ it is hoped that additional departments and agencies will follow. If all goes well, we hope to introduce the SBIR concept in the Netherlands at the end of 2006.

4.3.2 Conclusions: too early to assess SBIR

As SBIR is still in the pilot phase, it is too early to ~~make~~ draw any conclusions ~~on~~about ~~the~~ its effectiveness in the Netherlands. However, it has been running successfully for over 20 years in the US. Even so, there are some interesting results ~~of~~ from the Dutch project. In general, there is wide support for the concept. Stakeholders involved, varying from SMEs and their sector-organisations to parliament and other departments, are enthusiastic. The SMEs involved in the pilot were positive about the procedure. The administrative burden was less than with regular subsidies. Even though the time frame for ~~the~~ reply~~Response~~ was limited, ~~the demands for the~~ tender applications were found to be acceptable. As a direct result of phase 1, one of the participants has received several orders for its product. A company participating in phase 2 expects to be hiring new employees, also as a direct result of the award.

Bottlenecks are found to be not so much the technology, the ideas or getting SMEs involved, but ~~the~~ European legislation. The main problem is~~Mainly~~ the uncertainty surrounding~~around~~ the public procurement directive: what is the status of contracts falling under the R&D exception and what are the possibilities for innovative SMEs? A recent interpretative communication of the C~~c~~ommission on contracts which are not covered or only partially covered by the D~~d~~irective (CC/2005/11) suggests a strict interpretation. This would make it impossible to specifically select SMEs, thereby undermining the whole purpose of using the SBIR tool.

In conclusion, SBIR is an instrument that is quick and easy ~~tool~~to use, and which can contribute to increasing innovation in SMEs. The concept has proved~~n~~ its worth in the US and the parties involved are very positive. It can be easily implemented in existing programmes. No additional funding is needed, as it is a set-aside of existing budgets. This requires support from departments and agencies with R&D budgets. Good intentions ~~might~~ may not be sufficient; in that case, some form of obligation to set aside a budget for SBIR might be necessary.

On the other hand, for SBIR to be useful in the ~~objective~~ aim of supporting innovative SMEs, it is necessary to be able to target it ~~on~~ at these innovative SMEs. It is not clear ~~if~~ whether this ~~r~~is still~~emains~~ possible under the current European procurement ~~legislation~~ legislation, as the status of exceptions is uncertain. Therefore, we

recommend that the legislation ~~is~~ be clarified on this point and, if necessary, special provisions ~~are~~ be ~~made~~ introduced for innovative SMEs. Such a policy would be in line with the objectives of the European Community and the Lisbon strategy. The argument in favour of~~ation for~~ preferential treatment of SMEs under the Community Framework for state aid for research and development can similarly be applied ~~in relation~~ to the procurement regime.

4.4 Public Procurement: conclusions and recommendation

This paragraph defines conclusions and recommendations concerning Public Technology Procurement, based on the input of Sweden, the Netherlands and Flanders. However, t~~T~~he recommendations in this paragraph ~~however~~ are generic, and could be applied in different innovation systems.

Figures indicate that the bigger players on the market ~~perform~~ account for the largest share of R&D carried out by Industry. An important barrier for SMEs wanting to perform R&D is the lack of resources to cover the risks of a research-oriented innovation process. The outcome of such a process is difficult to manage and highly uncertain, resulting in a possible lack of resources.
Within the scope of this Case, Public Technology Procurement has been discussed as an important instrument to increase efforts in R&D by SMEs by addressing the perceived risks involved.

Technology procurement can be used in many ways. It can address a need on the part of the procuring organisation itself, other users or both. In all cases, however, the point of departure of technology procurement is an underlying socio-economic problem or need that is not yet solved. In this way, technology procurement ~~gives~~ provides the possibility of developing and demonstrating new technological solutions that are not available yet.
An EU expert-group has identified Public Technology Procurement as the most powerful weapon in the armoury of policy instruments to achieve the Barcelona 3% target for R&D as a proportion of GDP by 2010.

By means of PTP, a government will cover the SME's costs for R&D ~~by the SME~~ performed within the framework of the procurement. Besides grants and loans, public technology procurement can be a powerful instrument to stimulate innovation. Technology procurement is important for all innovative companies, but especially for ~~the research intensive~~research-intensive SMEs. It allows ~~for~~ procuring organisations to ~~perform~~ act as 'launching customers' by demonstrating new solutions in real conditions and thus favour the entry of new markets. For ~~research intensive~~research-intensive SMEs it can therefore offer a more attractive financial opportunity than a ~~classical~~ conventional subsidy scheme. Widespread structural commitment is required at the highest policy level. Using technology procurement means ~~shifting~~ moving away from old and comfortable habits to a new method. Without this backup, it is difficult to ~~get~~ achieve the desired change in attitude.

A contract through procurement has several advantages over the traditional subsidy. With a contract it is possible to fully fund the necessary R&D, regardless of the phase of the project (fundamental, industrial or pre-competitive), while a subsidy is always bound to a maximum percentage due to the state aid rules.
A contract is a two-way obligation. Subsidisation involves fewer obligations and therefore provides less certainty that the result will indeed be achieved.
But as a consequence, procurement contracts must comply with the procurement D~~d~~irective 2004/18/EC~~G~~ and this restricts the ~~possibilities~~scope for ~~for~~ using PTP as an instrument for stimulating innovation.

4.4.1 Conclusions

So far, only the UK and US (for over 20 years) have an explicit policy on using technology procurement as a tool to stimulate innovation. However, many EU Member States have some experience with technology procurement and several Member States are actively developing schemes for technology procurement;, one is even in the pilot phase.

Based on the experience from the countries participating in the Case, and also based on literature, the following key -features can be identified for PTP schemes:

- Socio-economic needs are translated into performance or functional output-based criteria.
- As It is a basic IPR-concept that the supplier is assigned full ownership of IPR while the contracting government has use-rights.
- Offers obtained within the framework of a PTP are not only be selected on the basis ofbased on their price;, but issues such aslike stimulating research and innovation within SMEs are also considered.
- PTP allows for the parallel development of different solutions addressing the identified needs at the same time. Early communication to the market of (long-term) governmental needs is preferred in that case. This allowsenables the use of time to be used as a risk controlling strategic parameter.
- A market survey and market evolution using foresight techniques should be carried out, for instance by means of a feasibility study.

The current practice of PTP indicates that the problems -/- bottlenecks hindering the successful implementation of such a scheme are not so much the technology, the ideas or getting SMEs involved, but the European legislation. This is mMainly related to the uncertainty surroundingaround the public procurement directive: what is the status of contracts falling under the R&D exception and what are the possibilities for innovative SMEs?.
The Ccurrent European procurement legislation is unclear on this point, and might require special provisions for research intensiveresearch-intensive / innovative SMEs. Such a policy would than be in line with the objectives of the European Community and the Lisbon strategy. The argumentation for preferential treatment of SMEs under the Community Framework for state aid for research and development can similarly be applied in relation to the procurement regime.

4.4.2 Recommendations on national policy level

Based on the information provided within the frameworkin the context of this Case, the following two basic recommendations for technology procurement can be made both at the national level:

- Widespread structural commitment is required at the highest policy level. Using technology procurement means a shift awaying from old and comfortable habits to a more risk-taking approach. Without this backup, it is difficult to get the desired change in attitude.
- Legislative barriers thrown up by national procurement regulations should be taken awaydismantled. A very restrictive national procurement policy limits the possibilities of technology procurement and can lead to unnecessary administrative burdens.

4.4.3 Recommendations on European level

Two recommendations can be identified as a first step towards an integrated approach ~~for~~ to technology procurement in Europe:

- The European Commission should clarify and, if necessary, improve the real opportunities for technology procurement in relation to its general procurement ~~regulations~~ rules concerning research, innovation and SMEs.
- The Member States and the EC have done a lot of analysis on technology procurement. Networking and mutual learning ~~is~~ are therefore ~~more than~~highly recommendable. The Member States would like to continue their efforts, for example by means of a dedicated OMC-Net on this topic.

5 Conditions supporting high -growth of SMEs

Within ~~the framework of~~ the OMC-SMEs expert-group on SMEs, the ~~also~~ conditions supporting the high- growth of SMEs have also been discussed, as a logical next step in the development of ~~research intensive~~research-intensive SMEs and high-tech start-ups. However, due to limited resources (time), this issue has ~~been~~ merely ~~introduced~~ been touched on ~~to~~ in the expert-group, as an introduction to further discussion, possibly within the framework of other expert-groups.

For this discussion the expert-group relied on the results of the HiGroSME-project[78], a Specific Support Action (SSA) supported under the 6th Framework Programme of the European Commission. This project ~~is~~ has been running since 2005, and seeks to explore new ways of supporting innovative European SMEs with high growth potential. The project involves ~~8~~ eight national technology and innovation programme agencies. Main topics of its work programme are: the creation of a European support network to promote the technological and business development and the internationalisation of high-growth-potential SMEs (HiGro's) in Europe, the optimisation of existing national and European support programmes for HiGro's and the preparation of a new European support programme and structure for HiGro's to close critical gaps in existing programmes.

The weakness of economic growth in Europe suggests there is a need to look~~ing~~ for new ways of ~~reinforced~~ strengthening support, especially for SMEs with high growth and innovation potential. This problem demands new concepts of SME support. Limited resources raise the need for ~~an~~ effective and efficient use of public support instruments. ~~Under~~ From this perspective, the group of high growth- potential SMEs (HiGroSMEs) should be the main target group for new innovation-related support instruments in Europe. Unfolding the full potential of HiGroSMEs in Europe could be the appropriate answer to the lack of growth and innovation in the European common market. ~~Such a~~A targeted 'pick-the-winner' approach of this type also promises a better return-on-investment for public funding in the field of R&D -policy.

5.1 Definition and Identification of HiGroSMEs

Discussions about HiGroSMEs or the so-called 'Gazelles' (D. Birch) often display a lack ~~a~~ of clear understanding about what constitutes a HiGro and what kind of companies should be targeted by HiGro-Support schemes. An ~~frequently posed~~ opinion frequently voiced (especially ~~expressed~~ by venture capitalists) is that high growth is exclusively related to research-intensive SMEs in high-tech-industries. Past e~~E~~conomic research ~~in the past~~ has shown clearly~~,~~ that this assumption is not valid. HiGroSMEs could be found in any industry sector of an economy, in the manufacturing and trading area as well as in the (low-tech) service industry (OECD 2002). HiGroSMEs in most cases are not hi-tech companies, but innovative and technology-enabled companies. ~~By~~ Through~~an~~ innovative use of technology or a new innovative service, these companies are able to offer unique products, outperform their competitors (in terms of price or quality) or invent a whole new niche market that has not existed before. Looking only at Hi-Tech-HiGro would be a much too

[78] http://www.higrosme.org.

narrow view; wes and one should be ready to find these companies in industry segments where they we would not expect them.

Since HiGros could be found in different areas, in different positions in the value chain, the question arises: W what have do these companies have in common? HiGroSMEs present themselvescome in different shapes, sizes and ages and can derive their existence source from many different streams sources e.g., technology-based start-ups, campus companies, spin-outs, high potential start-ups, high potential growth companies, mergers and kick-starts (companies in decline, but whicho are regenerated on to new growth and profit curves).

To get a better understanding of the attributes of HiGroSMEs, researchers in the field of innovation have developed criteria based on sets of quantitative and qualitative criteriacharacteristics, that HiGroSMEs are expected to showdisplay. Quantitative characteristics of HiGroSMEs are mostly related to company growth. Although nNecessaryeded for a company to be called a HiGro, minimum growth rates (in terms of turnover, profits, employment and productivity) do vary. David Birch regards a 20% annual growth rate per year (over a period of 5 years) as sufficient for a HiGro; researchers from the Center for European Economic Research in Mannheim are in favour of an annual rate of 35 - 50% per year rate. Prof. David Storey (Warwick Business School) prefers a growth rate of 36% per year. This is based on the assumption, that the upper top 10% of fastest growing companies could be labelled as HiGros. For the UK, the average growth rate of this group of 10% fastest growing companies is 36%. To cover a wide range of different HiGros, a prospected prospective growth rate from between 20 — and 50 % per year (3-year period) could be a pragmatic assumption.

Related to qualitative criteria for HiGros, it has to be stressesstressed, that HiGroSMEs (and their managers or founders) in most cases combine a strong entrepreneurial vision (which also inspires and motivates also the employees) with a realistic business plan. They should operate under an experienced and creative entrepreneurial team. They are expected to have a strong customer and international orientation and are able to manage continuous R&D-and/or innovation-activities (management of change). Their products (or services) offer a clear technological/competitive superiority. They are characterised by a progressive approach in to human resources management and they are able to build networks across the value/knowledge chain in a short time. Although not all HiGroSMEs could might be able to fullfillmeet all of these criteriaa, a HiGro –, according to innovation researchers –, should at least show most of these qualityative attributes.

5.2 Targeting the right groups

Under the heading of policy aspects, there is also the question of the right target group (and time) of support measures for HiGroSMEs. Picking the right target groups with the right instrument at the right time is crucial, when taking into account the effective and efficient use of limited resources.

Two major target groups can be defined: Actual HiGros with a solid track record of growth in the past 3 to 5 years (ex-post-measurement) and high-growth potential companies (e.g. start-ups) that have no track record, but show most of the qualitative attributes of a HiGro and therefore big high potential to become one.

An initial ~~first~~ policy approach will address every kind of actual or potential HiGroSME as a target for support. In this approach, potential HiGroSMEs (without a real growth track-record like start-ups) are a target based on ~~the~~ qualitative criteria and assumptions about the prospective growth of the company (e.g. on the biography of the managers and founders). ~~Also a~~Actual HiGros (with a track record of growth in the last 3 - 5 years) are also targeted (based on quantitative and qualitative criteria). Therefore, quantitative and qualitative criteria are equally important for defining and selecting HiGroSMEs.

By contrast, t~~T~~he second approach ~~in contrast~~ focuses exclusively on actual HiGroSMEs and is based primarily on empirical, ex-post-data of the company's development. Only HiGros with substantial growth in the past (no start-ups) are relevant in this case~~;~~, qualitative aspects are of second priority.

The first approach clearly has the advantage~~,~~ that in the case of start-ups, early intervention is possible in order to support the growth of a chosen company. Also in this approach~~,~~ the 'whole potential of HiGro potentials' in an economy is exploited. On the other hand, the approach is heavily based ~~strongly~~ on qualitative data and assumptions about a company's future (or the ability of the managers/founders) and to some extent leaves ~~partly~~ quantitative data aside. This could mean ~~more~~ greater risk in selecting companies and could also lead to a heterogeneous group of companies and a~~n~~n~~m~~ imprecise set of support instruments that lack clear focus.

The second approach has a higher reliability of identification based on facts, not expectations. The focus on quantitative criteria also has the advantage of intra-national comparability of target groups and criteria, which could also lead to a much clearer focus on a specific target group and set of support instruments. ~~A~~One~~s a~~ disadvantage is that this approach only addresses a particular subset of potential HiGroSMEs ~~is addressed by this approach~~.

5.3 Factors for company growth

David Storey, in his empirical study on fast growing companies in the UK from 1996 to 2002, gives an insight into the different factors for growth and failure in a company's development. His analysis of the fastest growing companies in the set of companies examined ~~set~~ shows~~,~~ that ~~the size of the~~ company size has no influence on its growth, which also confirms ~~the so-called~~what is known as "Gibrat's law". It demonstrates also that growth is discontinuous: Companies growing fast in an initial ~~first~~ period decline in a second period, and factors of growth ~~in one phase~~ differ from one phase to an~~the~~ other. Growth ~~also~~ in most cases is also more knowledge- or innovation-~~-~~based than R&D-~~-~~based. ~~And, not to forget:~~Also, it should not be forgotten that a ~~A~~ company's growth is normally not random, but dependent~~ing~~ on relevant circumstances of the market environment and the management strategies chosen by the companies. ~~To get~~For a better understanding of these growth factors, Storey also tried to link basic management strategies (as described in business literature) to the growth and development of the companies in the past. It is demonstrated that there is a relation between management functions - human resource management (Huselid, 1995), innovation and technology (Itami and Numagami, 1992), administration and governance (Daily et. al, 2002), marketing and sales

(Matsuno et al, 2002) and the actual growth in sales of a company. Financing and funding problems of HiGroSMEs were not in the scope of Storey's study.

The relevance of the various management strategies ~~for~~ to the company's growth differs ~~a lot~~widely. The data showed that, for human resources management, ~~that~~ ownership share in the workforce slows growth, but availability of HR is crucial for a company's success. ~~No advantage can be stated for~~ Ttechnology-based companies enjoy no clear advantage compared to others. Also, the constant development of new products slow~~ed~~ growth substantially. Firms that share ownership with either new directors or external institutions also have ~~also~~ slower growth. Marketing and sales strategies, on the other hand, had a clear effect on growth: Use of customer surveys was associated with growth, and companies with a marketing department were more likely to become 'big survivors', not ~~only~~ just 'survivors' or 'low-flyers'.

Seeking an overall explanation for growth, Prof. Storey came to these conclusions: C~~c~~ompanies that adopt more appropriate strategies in a given environmental context perform better. Rules-of-thumb in one period may not work in a second period due to a changed context; those companies that apply dynamic management strategies as described above perform better.

5.4 European perspectives on growth of research-intensive SMEs[79]

Statistics on the share of business R&D performed by SMEs across Member States[80] provide an uneven picture. On the one hand, SMEs have high levels of participation in business R&D in the majority of the new Member States, Italy and Spain and in smaller European economies like Denmark, Greece and Ireland (between 91.7% in Malta and 49.6% in Greece). On the other hand, only about one-fifth (or even less) of total business R&D is performed by SMEs in Sweden and Austria as well as in large EU economies like the UK, France and Germany. A potential explanation ~~to~~ for the large differences could be the lack of a minimum scale to host large R&D-intensive companies.

SMEs receive more than 75% of the total government-financed business R&D in Ireland, and between 30% and 50% in Hungary, Finland and Portugal. In the remaining EU countries, large companies are the main recipients of government-financed business R&D[81].

Global trends show significant changes in the R&D investment~~s~~ strategies of firms. In comparison with previous decades, in the 1990s~~,~~ large companies both within and outside ~~of~~ Europe were downsizing their corporate R&D labs, putting more resources ~~on~~ into a ~~fewer~~ smaller number of core areas and placing more emphasis on development of new business models, as well as reducing investment in basic research. First of all, SMEs and to some extent university labs are the beneficiaries of this trend that are rapidly increasing the share of their R&D expenditures or incomes

[79] The overview is based on literature review and should not be seen as a comprehensive synthesis.

[80] Key Figures 2005. Towards a European Research Area, Science, technology and Innovation. DG RTD, Brussels.

[81] Key Figures 2005. Towards a European Research Area, Science, technology and Innovation. DG RTD, Brussels.

originating from industry collaboration. ~~Based on~~According to US data[82], SMEs with 50-99 employees were able to double (116%) their R&D expenditures between 1997 and 2001; R&D efforts in other SME size classes also grew between 37% and 96% in the same period ~~of time~~.

This ~~outsourcing~~ process of outsourcing R&D has affected economic sectors differently[83]. While companies in the energy sector almost completely outsourced their R&D, large pharmaceuticals companies outsourced up to 50% of their R&D efforts to small biotechnology and pharmaceutical knowledge suppliers, universities and research institutes in search ~~for~~ of radically new solutions. IT and electronics companies also outsourced ~~significantly~~ their R&D activities significantly and they kept the focus mainly on incremental innovation, the improvement of existing technical tools and expanding functionality. It seems, however, that in medium and low R&D-~~-~~intensive sectors (e.g. machinery and automotive) in-house R&D ~~is~~ still dominat~~es~~ing.

The 2005 EU Industrial R&D Scoreboard[84] reports that the very top EU companies (~~having~~ with their headquarters in Europe) have a world-~~-~~leading position in R&D investment, but ~~the~~ EU companies have a weaker presence in R&D-~~-~~intensive sectors, where there are very few companies carrying out most of the R&D. The l~~L~~argest R&D ~~-~~investors have similar R&D intensity all over the world, but the main issue is that the EU lacks ~~of~~ medium-sized, highly R&D-intensive companies. The 2005 Scoreboard also points out that the world's fastest growth in R&D investment is in service sectors (including software and computer services, health, media and entertainment, leisure and hotels) and in ~~pharmaceutical~~ pharmaceuticals and biotechnology.

Deloitte Touche Tohmatsu observed the following key trends in Europe in its 2005 ranking of the top 500 fastest-growing technology companies, ~~that is~~ based on five-year average percentage revenue growth in the US, Europe, the Middle East and Africa by covering both public and private companies[85]:

- Software firms ~~have~~ increased their dominance of the ranking, making up 47% of all listed firms.
- Communications and networking firms ~~-~~ with 16% of all listed firms ~~-~~ are generally better represented than last year~~, at 16% of all listed firms~~.
- Northern Europe and Eastern Europe ~~have~~ increased their share by ranked firms in 2005 from a very low level, with 25% (up 8%) and 7% (up 3%), respectively.

The main issue is that the fast growing companies are rather small and they achieve ~~a~~ rapid growth from a very low revenue level. These companies are also often blocked by a 'glass ceiling', preventing them from ~~n to~~ operating on international markets and ~~to~~ from becoming global players. ~~This type of c~~Companies of this type are bigger in the US~~;~~, they have more employees and are often managed by experienced manager(s). In Europe, the main objective for such enterprises is very often to

82 NSF (2003-5), Research and development in Industry, 2001.
83 Between invention and innovation, NIST, 2002.
84 http://eu-iriscoreboard.jrc.es/index.htm.
85 2005 Deloitte Technology Fast 500 EMEA Winners. http://www.deloitte.com/dtt/article/0,1015,sid%253D1012%2526cid%253D67797,00.html.

consolidate the business, to stabilise employment and income. Another ~~perceived~~ particular feature observed~~ity~~ is that the R&D efforts of European firms in this segment remain highly dependent on public funding.

Policy should take into account that research-based and high-tech SMEs tend to concentrate in a few geographical locations where R&D inputs are high. This is a global phenomenon and EUROSTAT data clearly show~~s~~ that R&D expenditures are highly concentrated in leading technology regions, as the top 10 in 2001 accounted for 30% of the EU's total (i.e., Braunschweig [DE], Vastsverige [SE], Stuttgart [DE], Oberbayern [DE], Pohjois-Suomi [FIN], Stockholm [SE], Tübingen [DE], Uusimaa [FIN], Berlin [DE] and Eastern [UK].

The proximity of universities and a favourable regional environment may be important ~~at~~ in the early stages. But after that, heavy dependence on public funding and regional support may become counter-productive. Apart from financing research and innovation, a pool and supply of mobile knowledge workers (i.e. talents) is essential. Another crucial factor for success is the innovator-investor proximity and diversity of networks and institutions supporting commercialisation of new technologies.

As conditions for success are manifold, an integrated policy approach is required. Such public interventions are most promising if they complement rather than act as a substitute for private funds. Effective policies may involve the following~~s~~:

- Establishment of local and regional environments that help bridge the gap between invention and innovation
- Facilitating university-industry partnerships through mobility schemes
- Leveraginge academic research funds by providing both general and targeted grants
- Building a technologically educated workforce

5.5 ~~High growth f~~Framework conditions for high growth: conclusions and an outlook on policy recommendations

Current research indicates that fast growth is not only an issue for young companies including start-ups (baby gazelles), but also for middle market companies (gazelles). P~~p~~olicies should address both target groups and take into account the specific and often different nature of problems affecting both types of companies. Concerning the first group, existing instruments should be improved in order to focus on those companies with a real growth potential. For the second group, for which actual problems related to growth can be clearly ~~stated~~identified, specific new support measures have to be designed. Supporting R&D will ~~remain~~ continue to be a central policy subject, even if not all types of (potential) growth companies are always affected or at~~and in~~ the same time ~~affected~~. However, consolidating the R&D basis of companies is crucial for future product developments. R&D activities are to be considered as strategic investments and should therefore be ~~be a subject of~~ supported. As in many cases, the primary obstacles ~~of~~ to growth - and caused by growth ~~—~~ are only partly to do with~~ially consist of~~ technological problems~~;~~, policies should also include ~~also~~ management issues. As innovation and the growth of companies are to a large extent determined by 'broader' conditions within and outside the company, ~~it~~ an

~~should be~~ assessment should be made to determine ~~ed whether~~ whether, in addition ~~further~~ to project funding, ~~–~~ indirect support instruments - including fiscal incentives - should be applied.

On the other hand, the problems and support needs of HiGroSMEs seem to arise in different areas (or basic business functions) and at different stages in the company life cycle. Therefore, it must be evaluated ~~if~~ whether the typical support programme design (targeting a defined problem at a defined ~~time~~ point in the company's development) is suitable for fast growing companies.

Discussions in the OMC-SMEs expert-group indicated that the problemss ~~concerning~~ of conditions that are conducive to high ~~-~~growth ~~framework conditions~~ are apparent throughout Europe, and seem to be generic. However, the expert-group ~~has not been~~was un~~a~~able to identify recommendations to further strengthen the position of HiGroSMEs, and therefore suggests additional analysis and research on the specific nature of the support needed by this ~~specific~~ particular group of SMEs.