ANEXO

Innovation policy in Europe 2001

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Introduction

Innovation is a priority of all Member States and of the European Commission. Throughout Europe, hundreds of policy measures and schemes aimed at supporting innovation have been implemented or are being prepared. The diversity of these reflects the diversity of the framework conditions, cultural preferences and political priorities across the Member States. The 'First Action Plan for Innovation in Europe'[1], launched by the European Commission in 1996, provided, for the first time, a common analytical and political framework by which to assess innovation policy in Europe. It adopted a systemic view of innovation (i.e. innovation is a complex process dependent on many factors including the regulatory, educational, competitive, research and innovation support environments) which is now widely accepted. Building upon the Action Plan, the 'Trend Chart on Innovation in Europe' is a practical tool for innovation policy-makers and scheme managers in Europe. It collects, regularly updates and analyses information on innovation policies at national and Community level. Particular focus areas include innovation finance, the setting up and development of innovative businesses, the protection of intellectual property rights, and the transfer of technology and knowledge between research and industry. The most recent strategic goal for European innovation policy was set out at the Lisbon Summit of the European Council in March 2000, and the broad policy approaches are contained in the Communication «Innovation in a knowledge-driven economy», adopted by the Commission on 20 September 2000. The Trend Chart supports the 'open policy co-ordination approach' advocated by the Lisbon Summit, by providing policy-makers and scheme managers in Europe with timely and accurate summary information and statistics on innovation policies, performances and trends in the European Union. It features the Innovation Scoreboard[2] —with a set of 17 comparative

[1] *First Action Plan for Innovation in Europe, COM (96) 589 final*

[2] *) 2001 Innovation Scoreboard, Commission Staff Working Paper, SEC(2001) 1414, 14.09.2001*

statistical innovation indicators which are updated regularly— and provides a European forum for benchmarking and the exchange of good practices in the area of innovation policy. *Innovation policy in Europe 2001* is the Trend Chart's annual report, reviewing current innovation policies and policy trends in the EuropeanUnion. It also presents each Member State's 'innovation profile' as derived from the 2001 edition of the European Innovation Scoreboard.

Trend Chart family of products

1.The interface between science and industry

Successful innovation depends upon the generation of new ideas and knowledge. These rely on the existence of a strong and diversified science base, supported by a modern research infrastructure which, in turn, is often dependent on government support. However, it is also widely accepted that the simplistic view of 'upstream' innovation linking the primary producers of knowledge and technology to the 'downstream' users who then transform this knowledge into innovative products, processes and services, is outdated. Rather, knowledge creation, transmission and absorption is changing from a perceived linear process to a morecircular, iterative one, known as a 'systemic' approach, where knowledge transfer is constant and two-way. In this scenario the private sector is increasingly playing a dual role of technology user and 'translator' of market needs into research problems; and traditional barriers betweenpublic and private sector research are starting to erode.

Direct and indirect schemes

There are a number of ways in which policymakers may influence the uptake of research results by industry. Some are indirect —for example, the modification of framework conditions. This includes adapting legislation so that greater interaction is permitted between public sector research institutes and businesses, or simplifying regulations for intellectualproperty rights (IPR) handling. Direct easures encourage collaboration between higher education institutes, public research organisations and companies, either by promoting the take up of research outputs or by encouraging students, research workers, engineers or scientists to work together or to move between organisations, sectors and countries.

Direct measures

Several countries have prioritised policy measures concerning the transfer and valorisation of research results between the public and private sectors. There are more knowledge and technologies transfers directly from public institutions to the private sector, rather than the other way around. In countries such as Belgium, France, Germany, the Netherlands, Sweden and the UK, which have a concentration of high-quality research capacities, innovation schemes aim at increasing the number and effectiveness of the paths by which research knowledge may be utilised in the innovation process.

In Germany, efforts are focused on increasing the speed and efficiency of existing knowledge transfer pathways and mechanisms, while in Finland, the emphasis is on close co-operation between companies, research organisations and universities. In other countries, it is recognised that both the

basic research infrastructure requires strengthening and that interactions between research providers and industry need improving. Examples include Ireland, Spain, Greece and Portugal, whilst the removal of institutional or legislative obstacles to the diffusion of research results is prevalent in Italy and France.

Benchmarking

Many Member States have entered a period of consolidation with regard to policies geared towards the promotion of both industry-science links and the mobility of researchers. However, this also involves a certain amount of reflection and stocktaking. For example, the Innovation and Enterprise Scoreboards, and the benchmarking exercises of the EU (including the project 'Benchmarking Industry-Science Relations') and the OECD, have attracted attentionamong the Member States. Certain countries (such as Germany and the UK) have embarked on their own analyses of the status of industryscience links within the broader framework in which the process of industry science co-operation takes place. In Germany, for example, the Federal Ministry of Education and Research commissioned a study on the state of industry-science links, which was presented in October 2000[3]. This study served as a base for an action programme called 'Knowledge Creates Markets', presented by the German Federal Government in March 2001. This comprises 26 actions under one conceptual umbrella andfocuses on four action lines: the commercialisation of research results; promoting start-ups by scientists in the field of new technologies; setting incentives and favourable framework conditions for transfer activities and establishing partnerships between industry and science; and supporting enterprises in building up and strengthening their innovation competence. In other countries (e.g. Belgium) institutiona evaluations include an examination of industry-science aspects.

Indirect and complementary measures

Leading from the benchmarking framework studies mentioned above, there appears to be a move towards measures which have an indirect effect on the intensification of industry-academic co-operation. In some cases, these are in addition to direct policies. In Germany, for example, attempts at institutional reform at higher education institutions are being strengthened Changes include the introduction of a junior professorship, and more flexibility in the salary system and in the transfer between public and industrial research. Finally, there are indications tha policy is shifting generally from schemes which fund university industry collaboration, usually via a single mechanism (usually applied nationally and within fairly rigid constraints), to those which provide funding for the promotion of a more flexible range of collaborative mechanisms at the local level. This is in keeping with the increasing regional and competitive orientation of innovation policies noted over the duration of the Trend Chart.

[3] Schmoch, U., Licht, G. and Reinhard, M. (eds.) Wissens- und Technologietransfer in Deutschland (Knowledge and Technology Transfer in Germany), September 2000 (Fraunhofer IRB-Verlag: Stuttgart

Intensified co-operation between research, universities and companies

This action line within the Innovation Action Plan includes activities which aim to promote the dissemination of knowledge between research institutions, universities and companies. Again, these include both direct and indirect measures. The former concern the development of closer links between research and training (anticipating the needs of the productive sector); facilitating university company start-ups; cofinancing schemes and awards for academic/industrial research cooperation; stimulation of dialogue between the producers and users of technology (such as sectoral and intersectoral forums, technology clubs, etc.). Indirect measures include the creation and growth of science and technology parks, etc.

Raising awareness and deepening links

There are a number of mechanisms which relate to the general improvement of the interface between science and industry. In Germany, there are a large number of promotion programmes aiming at increasing research co-operation between enterprises and the public science side. Some of the most important are EXIST (start-ups from colleges and universities), INNoNet (facilitates cooperative R&D projects amongst at least six research organisations and firms), and ProInno Networks of Competence (aimed at non R&D performers). In Spain, technology transfer offices have long been in existence to promote links between universities and public research establishments and their wider environments. In 2001, a new call under the PROFIT programme was launched to intensify co-operation between firms and universities or research and technological organisations. The Danish Centre contract scheme aims to intensify cooperation between universities, private companies and technological service institutions. It is a prerequisite that the knowledge gained in one project is 'reusable' in institutions' co-operation with other companies. A networking approach is also used in France, where there a number of long standing measures, including theTechnological Research and Innovation Networks which are public/private thematic networks, the National Centres for Technological Research (which bring together public research laboratories and large private research facilities), incubator structures, a seed-capital fund and a Technological Platforms project.

Several countries have taken this a stage further, building specific joint research centres. For example, in Austria, the k plus initiative sets up collaborative research establishments between companies and universities to carry out long term pre-competitive research. Projects must last seven years. Each centre should consist of at least five enterprises and one higher education institution (HEI) —this multi-enterprise approach is a major feature. In the Netherlands, where strengthening HEI and industrial cooperation is key, as it complements the strong Dutch focus on cluster policy, there are the Technological Top Institutes (centres of excellence conducting long industry-led strategic and fundamental research), as well as the Technology Foundation STW (which funds and stimulates research and promotes the application of the results). A slightly different approach is adopted in Greece. Here, a new measure 'Research Centres Development and Ser-

vices Providing Projects with the User Participation —AKMON' was launched in 2001 to improve the research infrastructure and support the expansion of research activities, or the establishment of newones. The emphasis is on building medium-term and long-term cooperation ith users of their research results, who also have to contribute to the laboratory infrastructure and the project activities.

Regional approaches

In Austria, the new (2001) REG-Plus scheme is financing Technology and Innovation Centres (known as Impulse Centres), encouraging them to improve their capacity, capabilities, services and competences, which are used by regional enterprises. In Belgium, funding has been provided by the regions for 'technological attachés' in the collective research centres (essentially sectoral research and technology organisations, providing precompetitive R&D accessible to entire sectors, with training, testing and technology transfer services). This is a type of 'manufacturing extension service' with the aim of providing proactive advice and of establishing co-operation between the centres and their industrial clients. In Sweden, the measure 'New Liaison Functions' fits very well with the ambition to increase interaction between the universities and industry and to give the new universities an important role in regional development. The Active Industrial Collaboration (AIS) project is more targeted, involving one or two research institutes, one or two university or university college research departments, and six to 15 companies. These actors are meant to collaborate actively during a threeyear period, with knowledge or technology transfer as a key aim. Focus areas are IT, life sciences, manufacturing and processing, and sustainable development. The programme was expandedconsiderably during 2000.

Funding joint research

In Finland, close co-operation between companies, research organisations and universities is often considered a special strength of the national system of innovation. The most important ongoing activities are the national technology programmes of the National Technology Agency (TEKES). These are demand-driven and firm-oriented, they have been planned with the needs of the companies as the point of departure, and are implemented collaboratively. The objective is to gain new technology expertise and product development options in the important business areas of the future.

The new (2001) Spanish Projects for Industrial and Concerted Research (PIIC) scheme aims to finance precompetitive research initiatives with high technical risk and nonimmediately- marketable results. Projects must be presented by industrial companies and developed in collaboration with universities, research centres and/or technology centres. The UK government has recently introduced (or strengthened) a number of mechanisms to promote industry-academic collaboration. The Regional Innovation Funds, along with a number of initiatives under the new Higher Education Innovation Fund, together with the new Science Research Investment Fund, all encourage universities to collaborate with local industry.

In the Netherlands, R&D subsidy schemes are also used to promote collaboration, including the new technological co-

operation instrument. Italy has a variation on this, as Law 449/97 (art.5) allows firms to use fiscal incentives to pay for R&D projects carried out on their behalf by public research laboratories. Similarly, the Portuguese Tax Incentives Legislation also allows enterprises to use fiscal incentives to pay for R&D projects carried out on their behalf by public research They should help the creation of an efficient interface between public research and the business world. In Ireland, advice and general business planning support is provided through the Campus Company Programme which assists academics to spin-off into new businesses. The Business Incubation Centre programme is aimed at expanding the base of hightech companies operating on the campuses of the 11 institutes of technology by providing funds to develop and expand incubation spacefacilities. These are for use by researchers to develop their own businesses as well as helping firms in the region that are collaborating with the college or institute. In Greece, a scheme being launched in 2001 will finance the development of new hightech enterprises exploiting research results. Such enterprises can be established by research centres, HEIs and other research bodies, or by the researchers who have produced commercially exploitable new services or products. Entitled 'Development of Spin offs - Support of Young Researchers and Scientists', the measure is expected to support 200 plans for the setting up of newenterprises, and it is estimated that 50 new enterprises and 500 new jobs will be created. institutions. Furthermore, the Agência de Inovação has launched a new R&D support programme on collaborative R&D projects in consortia between enterprises and research institutions. This programme, which introduced a echanism of reimbursable financing,prioritises product innovation and internationalisation of R&D projects through its evaluation criteria.

Supporting spin-offs

A growing number of Member States are seeking to expand and support university-based high-technology spin-outs. A specific mechanism for this policy action concerns the creation of support infrastructure in the form of incubation units. In Flanders, Belgium, such incubators are developed in partnership with universities and the major public research centres (VIB, IMEC, etc.), whilst in Wallonia and Brussels, they take the form of the Business Innovation Centre model with a less explicit link to the research base. In France, the 'Incubator structures' scheme is seen as a way of bridging the acknowledged gap between the production of knowledge and its diffusion or exploitation. There are now 31 such schemes, mostly partnerships between HEI, public authorities and capital investors.

Mobility of students, research workers and teachers

Mobility schemes, which aim at the transfer of knowledge through the movement of personnel, and through recruitment and secondment, enable host or recruiting organisations to benefit from the expertise of qualified, and in some cases, experienced, researchers. These are in evidence across a number of Member States, with the principal emphasis on the mobility of university-based researchers, mainly postgraduates, towards industry. Although generally speaking, Member States accord this type of

activity a lower priority than that of intensifying co-operation between researchers and firms, and policy activity remains stable, there are some policy changes. For example, in Portugal, Ireland, the Netherlands and Sweden several new schemes are in place to increase the number of researchers. Although thisis not directly related to mobility, there is a correlation between the two, with the former likely to lead to the latter. In Portugal, with the financial support of the Operational Programme, Science, Technology and Innovation (POCTI), a new programme was launched to stimulate the employment of Masters and PhDs in companies in the moulds and dies industry.

Following the success of this pilot exercise, POCTI foresees extending the support of Masters Programmes to other industry sectors. In Ireland, a number of new graduate placements have been proposed arising from a study on the development of an all-island approach to the optimum utilisation of research and other skills. In the Netherlands, the upcoming acute problem of losing one- third of researchers through retirement over the next ten years has led to initiatives to improve the attractiveness of a career in science —especially to enhance the position of young researchers and for the promotion of women in science. Kickstart funding in 2000/01 will enable 40 new positions to be created, levelling off at 20 new positions per annum for the next eight years.

In Sweden, the 2000 Research Bill has once again highlighted the need for increased mobility between universities and university colleges and other parts of the labour market. As a partial solution, 16 additional graduate research schools are foreseen, which will be set up in close cooperation with industry. Their main goal is to increase the number of PhD graduates with an industry-related and/or trans-disciplinary and/or international angle.In both Germany and the UK, in orderto satisfy the short-term personnel needs in the IT sector, regulatory changes have been made concerning the provision of work permits to overseas researchers and employees. In Germany, in July 2000, the socalled 'Green Card' scheme was implemented to allow a first wave of 20 000 IT specialists to take up employment. In France, the priority is to simplify access to a wide range of measures at the regional level.

Strengthening the absorption capacity of SMEs

Strengthening the ability of companies, particularly SMEs, to absorb technologies and know-how is another relevant area in terms of research collaboration, although this is not necessarily dependent on strong industrial/academic relationships being in place. For example, the Austrian programme Techno- Kontakte, encourages the adaptation and exploitation of technological know-how by arranging knowledge or technology transfer meetings between technologically advanced firms and less experienced companies. The Belgian Innovation Technology Manager (RIT) programme finances a preliminary needs analysis, and subsequently the salary and training costs of a new employee to support R&D —either as a researcher, or as a project manager, IPR specialist, etc.

However, the employee does not need to come from a research institute or HEI. There have been recent proposals to expand this to e-commerce and new information

and communication technologies applications in SMEs. A slightly different approach is being adopted in the UK. Starting in 2001, 20 business fellows will be supported, with more to follow. They will spend around 20% of their time advising businesses (particularly SMEs) about technical and research problems, and the rest on academic projects (which are curiosity based) and leading their HEI colleagues in working with business.

In Sweden, the TUFF measure encourages the trade in technological services between public R&D technology providers and SMEs. A key feature, however, is how it encourages SMEs to co-operate in order to become stronger customers of qualified technology services. It stimulates SME demand through support for feasibility studies, creation of groups or networks of firms, and co-operative projects. A technology network broker acts as a single entry point to the expertise offered by the whole network.

The aim is for 15 000 SMEs to establish relations with the public R&D sector within ten years. A more classic knowledge transfer model has long been used in France where the Support for Technology Transfers scheme is one of the main regional measures to support innovative projects in SMEs. It acts as a process consultant for innovative projects —either for a technologybased start-up, a newly created firm or a company willing to develop an innovative project. It also supports technology transfer from public or private laboratories to industry and, in particular, SMEs. A different type of regional approach is used in Ireland, where technology transfer schemes typically involve the sourcing of technologies on a global basis and their diffusion through a regional structure across the country. A number of new initiatives are under consideration, particularly on a northsouth/ allisland of Ireland basis. In Finland, technology clinics are used to promote the adaptation of specified technologies for problem solving to SMEs, to introduce new technological possibilities and to raise their awareness of external R&D resources. The clinics have undertaken 250 assignments, each of which involves four different actors — TEKES, the SME, the clinic co-ordinator and the technological service provider. There are at least ix generic clinics, including specific technologies, IPR protection and management issues. Other approaches, such as the use of intermediaries and demonstration projects are equally important, as are measures to help SMEs identify their own knowledge and technology requirements. An example of the latter is the Technology Strategy Consulting Service in Finland, which concentrates on creating and stimulating technology management and strategy within SMEs. It uses tools such as Managing the Integration of New Technology (MINT —which originally started under the European Commission's Sprint programme)— and Innovation Management Techniques (IMT). Austria also uses the MINT scheme, as well as a variation called FINT (promotion of innovation and technology applications), and the Austro-Bunt scheme (Business Development Using New Technologies). As well as directly assisting SMEs, these initiatives provide advanced training courses for counsellors, multipliers andentrepreneurs, thus fulfilling an important dual function —the creation of a cadre of informed intermediaries and advisors, as

well as building stronger companies. The German ProInno measure specifically addresses SMEs that do not have innovation networks and/or do not participate in R&D activities, but which would benefit from doing so.

This layer of companies accounts for a sizeable proportion of all firms, but is often ill-addressed by existing programmes. Measures such as science parks, technology valleys, technopoles or similar initiatives are also relevant, but can move beyond the boundaries of close academic/industrial linkages. Some Member States, such as Spain and Greece, are still creating this sort of infrastructure.

Innovation policy frameworks

Promotion of co-operation for innovation

Innovation policy is a 'horizontal' activity, cutting across many, more traditional policy-making fields including research, education, industry and enterprise. Many Member States are increasing their efforts to treat innovation policy holistically, by bringing together disparate ministries and functions, creating new single 'umbrella' organisations where necessary. For example, in Austria, the recently created Council for Research and Technology Development replaces several other institutions. Its eight members are selected by the Ministry of Transport, Infrastructure and Technology and by the Ministry for Science, Education and Culture.

They represent HEIs and enterprises, and include one international representative (from Ireland). The Council will advise the government, develop long-term RTD strategies, produce guidelines for priority research areas and make recommendations concerning international aspects, encourage collaboration between academc and applied industrial research and monitor research institutions. Recommendations will be made public, and an annual report will be published.

In Spain, a whole new ministry has been created —the Ministry of Science and Technology (MCYT) was set up in 2000. This single governmental department now has integrated responsibility for research & development & innovation policy. This integration of the initiatives from different ministerial departments, rather than simply co-ordinating them, is an important change in Spanish policy formulation. The UK has adopted a slightly different approach to the co-ordination of interdepartmental strategic decision-making. Each government department published a 'Science and Innovation Strategy' in spring 2001.

These cover arrangements for improving connections with relevant science & technology-related activities and bodies overseas, as well as arrangements for the commercial exploitation of research. The strategies also explain how departments are encouraging innovation, through regulation, procurement, and the services offered. Sweden has experienced a recent major reorganisation of its innovation institutions and the support structure for the public funding of R&D, and support to business and regional development, with 15 organisations being reduced to six in January 2001. The key development is the creation of the Swedish Agency for Innovation Systems (VINNOVA), which can be seen as an expression of a move towards a single national innovation policy.

New advisory bodies

In Belgium, each of the three regional governments and the federal government have established a science policy council with a consultative role in reviewing legislation and policy implementation; the council in the Brussels region began operation in 2001. In France, at the end of 2000, the Minister of Research created the Technology Academy (Academie des Technologies), which is an offshoot of the Science Academy. Its objectives are to provide the government, alongside other main actors, with technological expertise and Foresight knowledge.

A Council for Innovation has recently been created in Denmark to support the Minister for Trade & Industry, especially on issues relating to SMEs and innovation. In Ireland, there are several advisory bodies, including the new (January 2001) Irish Council for Science, Engineering and Technology.This comprises representatives from the science research community in third-level colleges, research institutions and industry together with international experts. In the Netherlands, in 2001, the Ministry for Economic Affairs (EZ) split into four directorates-general, including one for innovation which will deal with knowledge and technology, employment and innovative entrepreneurship.

Strategic vision of research and development

The publication of Green and White Papers is always key in the framing of national innovation policy, while the advent of the new Structural Funds programming period has also heralded a number of new national planning documents.

In Italy, the National Research Plan, approved in 2000, deals with strategic choices, financing options, opportunities for the public scientific system, opportunities for enterprises, and expected impacts.

In Spain, the integration of research, development and innovation under the new national plan has led to the setting up of two areas of strategic activity—scientific-technological areas (knowledge-based) and sectoral areas (industrially focused). A yearly evaluation and revision of priorities employs external advisers and technological observatories, as well as the conclusions from specially commissioned studies related to the science, technology and enterprise (S-T-E) system. One of the most favoured ways of obtaining a strategic vision of the future for innovation is by undertaking Foresight exercises.

These 'forward looks' enable policymakers to create scenarios for future technological and scientific developments, and to begin to plan and impleent the necessary policies to achieve the desired outcomes. In several countries, 'new rounds' of Foresight activity have recently been implemented. As a follow-up to the 1996-98 Foresight exercise in Germany, the FUTUR initiative was started during spring 2000. It is a communication activity, concentrating on the needs of people in society, and important areas for future industrial competitiveness, sustainable growth, and technological interdisciplinarity. The results of the Swedish Foresight exercise have heavily influenced debate on future priorites concerning investments in higher education and research, as evidenced by its impact on the priorities presented in the recent government research bill[4]. In the UK, following the publication of

[4] *Government Bill 2000/2001:3 (Research and Renewal).*

13 Foresight reports at the end of 2000, the Foresight panels and task forces have been asked to remain in place until at least 2002 to take forward their recommendations in a more detailed manner with other actors and stakeholders. This was supported bythe launch of a new Foresight Fund in February 2001, initially worth up to _25 million. In Finland, and assessment report on Finnish Foresight activities completed in February 2001 suggests that a clear institutional framework in the form of a Foresight secretariat is needed to promote and support Foresight exercises, and to better co-ordinate the diverse activities.

Other countries have recently undertaken their first Foresight activity. In Ireland, the new Science Foundation Ireland was created in autumn 2000 for the management, allocation, disbursement and evaluation of expenditure of the Technology Foresight Fund. This large fund (_711 million) was created as a result of Ireland's first Foresight exercise (1999), which recommended prioritising Ireland's research efforts into ICT and biotechnology. The money will fund strategic, large, world-class research projects chosen by international peer review. In Portugal, the 'Engineering and Technology 2000' Foresight exercise has indicated the need for stimulating technological education and training, promoting R&D programmes involving universities, companies and the public administration, and for encouraging company networking and partnerships. In Spain, the *First Report on Industrial Technological Foresight: The technological future towards 2015,* from the Industrial and Technological Foresight Observatory (OPTI), is intended to help policymakers to establish strategic action lines and to decide financial priorities for the development of new technologies, as well as raising awareness of the importance of achieving a strategic vision of innovation and technology at the company level.

A tool which is often used as part of the Foresight process is the Delphi Survey. In Austria, the latest ITFprogrammes 'MOVE' (improving innovative activities in the transport sector) and 'Technologies for a Sustainable Development' can be regarded as outcomes of a Delphi survey.

Raising the awareness of the larger public

Award schemes are often used to raise awareness of innovation. Examples include the Austrian State Award, and the Young Researchers Scheme in Austria, as well as the Innosuomi initiative in Finland which awards an annual prize recognising exceptional innovativeness and entrepreneurship. Here, the prize is given by the president, thereby guaranteeing high levels of prestige and interest. In France, the National Innovation Contest is seen as very important. It doubled its budget in 2000 to _30 million, when almost 300 projects were selected. The same rate of funding is being used in 2001. Involving the media is another way of raising awareness across large groups.

In Germany, 2001 is the 'Year of the Life Sciences', whilst in the UK, September 2001-02 has been designated 'Science Year'. The intention is to raise the profile of science & technology in schools, with both teachers and parents. As part ofthis, a Science Ambassadors' programme has been launched in which top science students will form links with their old school or college, inform pupils about their own experiences, and

provide coaching and mentoring. Raising awareness amongst students and young people is also important in Portugal, Greece and Germany. Within the German INSTI-network, two projects in particular are aimed at raising the awareness of pupils and students as regards innovation. The INSTI Inventors' Clubs offer a platform for the exchange of experience and advice between inventors and young creative individuals. They are organised by high schools, private associations and technicalcolleges amongst others. The INSTI-School Action 'Tour d'Innovation' offers 50 secondary schools the opportunity to participate in an innovation education programme. Greece also has a measure o raise awareness in secondary schools —the Technomathia Programme.

In Portugal, the 'Live Science' initiative of the National Agency for Scientific and Technology Culture aims to stimulate young people to follow a career in science. Raising awareness amongst the general public is also important. In Portugal, the Science and Technology Observatory published the results of the second survey on the scientific culture of the Portuguese population during Autumn 2000. This suggested a gap between the perception of the relevance and the interest shown about scientific culture on the one hand and, on the other, the mastering of scientific concepts. However, initiatives are being taken to address this issue, as demonstrated by the "Live Science" (Ciência Viva) Programme, launched in 1996. This seeks to promote science through education, involves a support programme for the promotion of experimental teaching of science and the renewal of technological education in elementary and secondary schools. It also includes a network of Ciência Viva Centres, designed as interactive spaces for scientific diffusion. Four centres are already part of this network, and projects for the creation of six new centres have been launched. Established all over the country, they aim to operate as regional scientific and economic platforms, taking advantage of the most active participants in these regions.

In Spain, a new measure (March 2001) regarding raising awareness amongst the general public was launched called Grants for Diffusion Activities related to the Ministry of Science and Technology Policy and Competencies. The objective of this scheme is to bring scientific policy information closer to the general public. This will be achieved through promotion of dissemination activities about the competencies and political goals of the Ministry of Science and Technology. In its strategy paper 'Austria 2,5%+', the newly established Austrian Council for Research and Technology Development underlines that one of the priority tasks for Austrian research, technology and innovation policy has to be to raise awareness amongst the public of the positive impacts of research, technology and innovation on economic, social and cultural development. A wide-ranging promotional campaign will be launched by the national government, the regional governments and other actors including the social partners.

In Belgium, there is a novel way of raising general interest in science and technology – in the Walloon region there is a Science Adventure Park (PASS), and in the Flemish region, Technopolis, a 'science docentre' for young people.

Regional policy

Approaches to regional aspects of innovation policy vary across Member States, according to the political, social, economic and historical frameworks in which regional government operates. Some countries (Austria, Germany, Belgium) are of a federal nature. Others have historically pursued a more centralised approach (such as France and Portugal), whilst countries such as the UK are undergoing change with the emergence of a new layer of regional administration. However, even this broad classification of governmental models does not imply consistency across that group. For example, the key players in Austrian technology and innovation policy are federal institutions, whereas in Belgium, the federal government has very few powers in the field of innovation.

In Germany, there is a complex division of responsibility between the federal government and the 16 Länder for the financing of education, R&D and innovation policy programmes, and launching innovation policy initiatives.

Regional approaches to the delivery of innovation policy are increasing. New schemes have been announced in several countries including Austria, the UK, Denmark, Finland and Germany.

In Finland, the Centre of Expertise Programme supports regional specialisation and co-operation between different centres. It aims to enhance regional competitiveness by strengthening innovation, renewing the production structure and creating new jobs within the expertise areas selected. There are 14 regional centres of expertise and two nationwide networks carrying out the Centre of Expertise Programme for 1999-2006.

In Austria, the REG plus programme is funding (via competitive tender) the activities of nine regional 'Impulse Centres' to support regional innovation, designed to stimulate the activities of the centres themselves, well as entrepreneurship in the Austrian provinces.

In the Netherlands, there are longestablished Regional Development Companies (ROMs). Their role and remit has been changed recently, with central funding becoming more dependent on goal attainment ability. In parallel, the ROMS are being given more flexibility to assume a role in the development of business parks (there is a shortage of these), and are being encouraged to co-operate more closely with Syntens whose mission is to strengthen the innovative capacity of SMEs through the active provision of information and advice. This cooperation is particularly effective in terms of supporting start-ups, as ROMs and Syntens collaborate to offer integrated packages of support, i.e. both financial support (from various funds) and management advice, at the regional level.

In Sweden, the first regional growth agreements (RGAs) were launched in March 2000. These are geared towards supporting the specific industrial specialisations in each region, including innovation measures. They focus to a substantial degree on R&D activities, technology diffusion institutions and venture capital markets. In February 2001, an evaluation of the first agreements was published —this will become an annual evaluation process. It found that RGAs have increased awareness the importance of the regional and local economic environment to the competitiveness of enterprises. Networks and clusters have gained much

attention and cluster policies are increasingly taking shape at the regional level.

In France, both national and regional agencies provide support measures for SMEs; and it is acknowledged that better co-ordination of programmes would help improve the visibility of innovation measures amongst SMEs. Over the past few years, some new national measures have required cooperation between regional actors. For example, to be selected for the financing of incubator structures within universities, regional actors have to propose specific co-operation between universities, other public research structures, local and regional authorities and advisory bodies. The implementation of the National Technological Research Centres (CNRT), which started in 2000, must include the main public and private regional R&D actors in a particular field. By activating regional support agencies as well, regional actors, strategies and priorities can all be supported.

In Germany, the Federal Government has launched numerous measures with a regional orientation. Each of the 16 Länder also offers a set of innovation policy actions whose scope is restricted territorially to acertain federal state. There are over 130 innovation promotion programmes at this level alone.

In Portugal, innovation policy has traditionally been created centrally, but there are allowances in the new operating programmes for 'nonconcentrated funds which can be used for the development of regionally-based projects with a 'structuring' content. Similarly, in Spain, one of the aims of the new national plan is to create explicit regional interaction mechanisms, both in the determination of priorities and during the carrying out of the activities. In Italy, following the 1999 Bassanini Decrees and their recommendations for decentralisation, Emilia Romagna was the first region to create its own plan for development (including innovation measures); other regions are now following suit.

In the UK, the Regional Development Agencies (RDAs) came into existence in April 1999. They are now a key conduit through which innovation policy is delivered, with access to various funding sources, including a new Regional Innovation Fund worth _86 million in 2001/02. Each RDA has produced a regional strategy which includes innovation measures, and most are now in the initial stages of implementing these. In Greece, a regional focus on innovation policy is also relatively recent as, for the firsttime, all 13 regions foresee some expenditure for innovation in the 2000-06 operational programming period. In addition, the national government is promoting the creation of new research centres in peripheral regions, having previously earmarked research grants for the least favoured regions. In Ireland, both main development agencies are set to 'regionalise' before the end of 2001.

Clusters

One of the most prevalent expressions of regional policy, and one of the most popular mechanisms for encouraging co-operation 'on the ground' between firms, or between firms and academic institutions, as well as between policy-makers, is by clustering. This is independent of the regional government model used.

Cluster policy is very important in the Netherlands. The most recent programme

offering direct support is Technological Co-operation, launched in May 2001 with a budget of _68 million. It merges three 'old' measures so that support becomes more transparent and accessible. The new scheme consists of a generic part (all technological areas) and a specific part – international co-operation in Europe,USA, Japan or Singapore; co-operation with partners in emerging markets (China, Indonesia, South Africa or India); collaboration within the maritime sector; and in the area of ICT breakthrough projects.

In Austria, clustering is seen as a way of stimulating an economy dominated by SMEs. One of the most successful clusters is in the automotive sector (with 100 members). At the federal level the cluster approach is led by the 'k plus' programme for enterprises, universities and research institutions wanting to engage in long-term pre-competitive research collaborations, and the 'A plus B' scheme which brings together regional partners (universities, research centres, regional support agencies, firms, qualification agencies, etc.) to compete for national support. The 'k ind' and 'k net' programmes are also important – both aim to create research co-operation between universities and industry based on existing regional strengths, and to promote the diffusion of cluster-based knowledge.

In Germany, there is explicit recognition of clustering in regional support programmes and various BMBF-supported programmes address these issues. They include InnoRegio (promoting collaboration in the New Länder), EXIST (five regional innovation networks), Learning Regions (regional education networks) and the new Innovative Regional Growth Poles (regionally and thematically focused innovation initiatives in the New Länder). These programmes are based on emerging regional clusters and strengthening their development. The success of one of them, BioRegio, which was created to develop a specific biotechnological profile in selected regions —delivered by regional consortia— and to support the commercialisation of the acquired knowledge, has prompted a new competition: BioProfile. This focuses especially on regional competence in specific fields of application in biotechnology, and is therefore more suited to smaller regions than the previous competition.

Common to all these approaches is the integration of the regional dimension. This means including regional competencies in the knowledge-generating process (i.e. existing public and private R&D facilities), as well as supportive public administrations, institutions for financing innovation (e.g. venture capital funds) and lead customers (e.g. chemical industry, in the case of biotechnology).

In Belgium, the importance of support for clustering is growing, although specific budget lines of public funding for such initiatives have remained modest with support coming through existing schemes.

In Flanders, 11 clusters have been developed and supported since 1995. These are defined as networks of companies co-operating with one another and/or co-operating with research institutes or universities in one or several domains such as research, product development, education, etc. However, the cluster policy will be phased out in 2002 when a new policy initiative for co-operative networks will start within the legal framework of the Flemish Innovation

decree of 1999. In Wallonia, a series of 'grappes technologiques' (technology clusters) have been launched with the support of the Regional Innovation Strategies[5] 'Prométhée' project.

In Finland, cluster programmes aim to support R&D which strengthens industrial clusters. They are funded from the programme for additional R&D funding. In a recent assessment of this programme, the evaluation group found that the cluster programmes have already initiated some productive co-operation. Thereport also points out that development needs for theprogrammes seem evident: more focus should be given to the objectives, coordination between financiersshould be improved, and the reportingrequirements are too complex. In conclusion, the evaluation group recommends that clusters should beextended to new areas and that the existing clusters need to be more focused. In the present research policydebate in Sweden, support for existing research clusters is considered to be extremely important. Most regionalgrowth agreements include explicit cluster development ambitions, although the approaches vary considerably.

[5] *Regional Innovation Strategies were launched in a number of Member States during the period 1998-2000. They were co-funded by the European Commission's Regional Policy DG.*