Thematic Trend Report: Industry-Science Relations

Covering the period:
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European Trend Chart on Innovation

The European Trend Chart on Innovation

Innovation is a priority of all Member States and of the European Commission. Throughout Europe, hundreds of policy measures and support schemes aiming at innovation have been implemented or are under preparation. The diversity of these measures and schemes reflects the diversity of the framework conditions, cultural preferences and political priorities in the Member States. The 'First Action Plan for Innovation in Europe', launched by the European Commission in 1996, provided for the first time a common analytical and political framework for innovation policy in Europe.

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. Run by the 'Innovation' directorate of DG Enterprises, it pursues the collection, regular updating and analysis of information on innovation policies at national and Community level, with a focus on innovation finance; setting up and development of innovative businesses; the protection of intellectual property rights and the transfer of technology between research and industry.

The Trend Chart serves the 'open policy co-ordination approach' laid down by the Lisbon Council in March 2000. It supports policy makers and scheme managers in Europe with summarised information and statistics on innovation policies, performances and trends in the European Union. It is also a European forum for benchmarking and the exchange of 'good practices' in the area of innovation policy.

The 'Trend Chart' products

The Trend Chart on Innovation has been running since January 2000. It tracks innovation policy developments in all EU Member States, plus Bulgaria, Cyprus, Czech Republic, Estonia, Hungary, Latvia, Liechtenstein, Lithuania, Norway, Poland, Romania, Slovak Republic and Slovenia. The Trend Chart web site (www.cordis.lu/trendchart) will provide access to the following services and publications as they become available:

- a database of policy measures across Europe;
- a 'who is who?' of agencies and government departments involved in innovation;
- a series of country reports;
- a series of six-monthly trend reports;
- a number of benchmarking reports on specific themes;
- statistical reports such as the European Innovation Scoreboard;
- the six-monthly newsletters of the Trend Chart;
- the annual reports of the Trend Chart;
- and other publications.

The present report was prepared by Alasdair Reid of ADE S.A. (www.ade.be.) The information contained in this report has not been validated in detail by the Member States or by the European Commission.

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Executive Summary

- The report considers two specific action lines monitored by the Trend Chart, namely Mobility of students, research workers and teachers; and Intensified co-operation between research institutes, universities and companies (or industry science relations, ISR). In total, the report covers 258 measures in 27 countries (two countries reporting no measures). However, ten countries out of 27 account for close to 70% of all measures.
- The launching of new measures at national level under the scope of the two action lines has remained relatively constant compared to the previous reporting period (2001-2002). In the 12 months to September 2003, only three new mobility scheme measures were launched and fourteen in favour of ISR. Portugal has been most active with five new measures launched as part of a major push to increase commercialisation of research results.
- During the period July 2000 to September 2003, there has been no significant shift in priority given to mobility schemes (an average score for the 28 countries of 2.31) but there has been a decline in the priority given to intensified co-operation (from 3.43 to 3.17).
- However, for both types of measure, there is a diverging trend in priorities between the current EU Member States (EU15) and the eleven candidate countries (CC11). For mobility schemes, the priority has increased in the EU15 but steadily declined in the CC11, while the trend is the opposite for measures in favour of intensified co-operation.
- On average, the favoured mode of delivery is schemes that focus on the 'transfer and exploitation of results' (a mode adopted by 54% of all schemes), but mobility (27%) and networking (29%) initiatives are also important modes. A more in-depth analysis of modes of delivery could be usefully carried out in the future to confirm certain trends suggested by this broad analysis. For instance, there seems to be a trend towards supporting the creation of consortia based longer-term partnerships for ISR.
- SMEs are a target of almost 70% of all schemes with research institutes (63%) and universities (55%) also being important. Interestingly, the candidate countries place more importance, compared to the EU15, on young scientists and research institutes and a lower emphasis on SMEs as targets, which suggests a stronger 'science push' approach.

In terms of methodology issues relating to on-going monitoring of ISR policy, the conclusions remain very similar to the last reporting period and should be taken into account for the next phase of the Trend Chart (2004-2005):

- The analysis conducted here is largely based on 'number-counting' policy schemes. This is clearly sub-optimal and should be complemented by a more in-depth review, notably of trends in budgetary allocations for ISR schemes across countries. However, information on the financing of policy measures related to ISRs is insufficient for any robust conclusions to be drawn in this respect.
- Thematic trend analysis is made difficult by clearly diverging approaches to completing datasheets and country reports. Issues requiring attention include: reducing overlaps in definitions of action-lines and achieving a common understanding of what types of measures should be classified under the action line ISRs. At present, many schemes are relatively classic applied research schemes with only a small component being related to improving ISR. The quality of the datasheets and country reports for the candidate countries needs to be improved since many datasheets are summaries of laws or government decisions rather than concrete policy measures.

1. Introduction and policy context

The aim of this report is to present and analyse recent developments in the field of industry-science relations (ISRs), especially with a focus on recently adopted supporting measures and/or programmes aimed at strengthening such linkages. More specifically, two action lines of the Commission's 1996 Innovation Action Plan constitute the core of this report

- *I.2 Mobility of personnel*: this Action Line encompasses measures, actions and programmes aimed at encouraging and supporting the mobility of students, research workers and teachers from one country to another and from the research/education community to industry. The global objective is defined as encouraging transfer of technology and know-how.
- *III.4Intensified co-operation between research, universities and companies*: refers to different measures, actions and programmes which aim at promoting the dissemination of knowledge/research results from research institutions and universities to industry. This may include financing research collaboration projects between science and industry; legal and contractual arrangements for the exploitation of research results with industry; encouraging the creation of university spin-offs and the creation of support interfaces; training programmes for researchers in order to close the gap between research capacity and industry needs etc.

1.1 Policy issues and context

In Europe, a belief exists that there is a gap between high level and quality scientific performance and a lack of entrepreneurial capacities to transform research results into innovation, growth and jobs and this has been labelled the 'European paradox'[1]. One explanation for this weakness is the existence of barriers or the lack of incentives in national innovation systems which then lead to low levels of exchange between the research community and industry. Re-addressing this weakness and developing links between universities and industry can be achieved through both direct incentives (funding programmes for joint research activities, support for spin-offs, etc.) and by improving the so-called framework conditions (e.g. legislative framework and institutional settings, entrepreneurial cultures in academic and public research institutes, etc.).

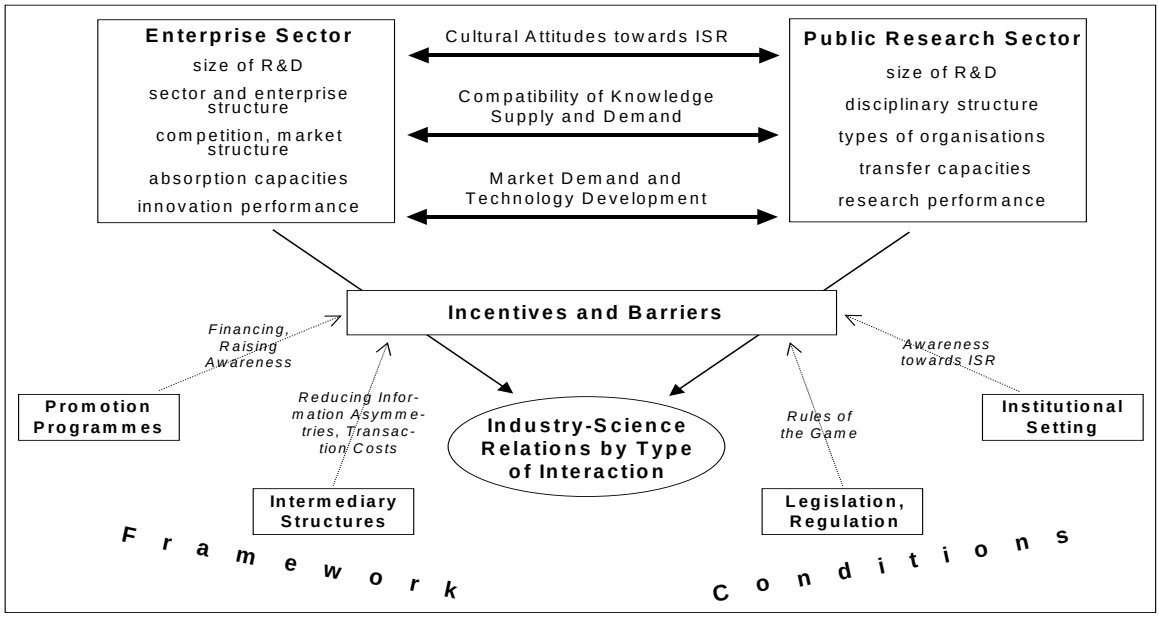
A 2001 report *Benchmarking Industry-Science Relations*[2] (commissioned by DG Enterprise, European Commission) and the Austrian Federal Ministry of Economy and Labour) provides a good review of issues in this field and complements on-going Trend Chart analysis on the same theme[3]. The diagram below summarises the conceptual framework used by the benchmarking report.

1 Although this conclusion has been challenged recently notably by Keith Pavitt who argued that this conclusion ignores the process of internationalisation of research. An alternative theory is that European research is not as strong as in the USA (especially in biotechnology and IT), that relatively less business R&D is performed in Europe because European firms are performing an increasing share of their R&D in the US, and that improved access to US research is one of the principal reasons for this. See Pubic Policies to support basic research. SPUR Electronic Working Papers Series. Paper n°53 (2000).

2 European Commission, Enterprise Directorate General and Austrian Federal Ministry for Economy and Labour. Joanneum Research Institute, Austria. (2001), Benchmarking Industry-Science Relations - The Role of Framework Conditions.

3 For instance the Trend Chart Policy Benchmarking Workshop on 'The changing role of public support to academic spin-offs'. February 2002.

Figure 1 : Conceptual Model for Analysing Industry-Science Relations



Source: Benchmarking Industry-Science Relations in Europe. The Role of Framework Conditions. (2001).

This model has the advantage of distinguishing between three groups of variables affecting ISR performance in a specific country. Firstly, the characteristics of the main actors (enterprises and the public/higher education research sector); secondly, framework conditions such as public promotion programmes, intermediary structures, legislation and regulations and institutional settings, and thirdly, performance indicators for ISR.

The Trend Chart monitoring, particularly the measure datasheets, essentially captures promotion programmes and intermediary structures; and where evidence is included from evaluations, etc. this allows some insight into evolving industry-science performance indicators. The Benchmarking report proposes a range of 'indicators for the performance of ISRs', reproduced in the table below. Most are too specific to be covered by the *European Innovation Scoreboard* although some are based on EU or OECD level data.

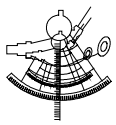


Table 2: Indicators of the Performance of ISR

Variable	*Indicator*	*Year*	*Source*
Contract and	R&D financing by industry for HEIs in % of HERD	1998*	OECD
Collaborative	R&D financing by industry for PSREs in % of GOVERD	1998*	OECD
Research	R&D financing by industry for HEIs/PSREs in % of BERD	1998*	OECD
	Significance of R&D consulting with firms by HEI researchers	mrya	nat. rep.
	Significance of R&D consulting with firms by PSRE researchers	mrya	nat. rep.
Co-operation in	Innovative manuf. enterprises co-operating with HEIs in %	1994-96	CIS2
Innovation	Innovative manuf. enterprises co-operating with PSREs in %	1994-96	CIS2
Projects	Innovative service enterprises co-operating with HEIs in %	1994-96	CIS2
	Innovative service enterprises co-operating with PSREs in %	1994-96	CIS2
Science as Infor-	HEIs used as inform. source by innov. manuf. enterpr. in %	1994-96	CIS2
mation Source	PSREs used as inform. source by inn. manuf. enterpr. in %	1994-96	CIS2
for Industrial	HEIs used as inform. source by innov. service enterpr. in %	1994-96	CIS2
Innovation	PSREs used as inform. source by inn. service enterpr. in %	1994-96	CIS2
Mobility of	Share of researchers in HEIs moving to industry p.a. in %	mrya	nat. rep.
Researchers	Share of researchers at PSREs moving to industry p.a. in %	mrya	nat. rep.
	Share of HE graduates at industry moving to HEIs/PSREs p.a. in %	mrya	nat. rep.
Training and	Income from vocational training in HEIs in % of R&D expenditures	mrya	nat. rep.
Education	Number of vocational training participants in HEIs per R&D employees in HEIs	mrya	nat. rep.
	Share of students carrying out practices at enterprises during their study (placements, master thesis, PhD programmes etc.) in %	mrya	nat. rep.
Patent Applications by	Patent Applications by HEIs (and individual HEI researchers) per 1,000 employees in NSEM in HEIs	mrya	nat. rep.
Public Science	Patent Applications by PSREs (and individual PSRE researchers) per 1,000 employees in NSEM at PSREs	mrya	nat. rep.
Royalty Incomes	Royalties in % of total R&D expenditures in HEIs	mrya	nat. rep.
by Public Science	Royalties in % of total R&D expenditures at PSREs	mrya	nat. rep.
Start-ups from	Number of technology-based start-ups in HEIs per 1,000 R&D personnel	mrya	nat. rep.
Public Science	Number of technology-based start-ups at PSREs per 1,000 R&D pers.	mrya	nat. rep.
Informal contacts,	significance of networks between industry and HEIs (exp. assessment)	mrya	nat. rep.
personal networks	significance of networks between industry and PSREs (exp. assessment)	mrya	nat. rep.

Source : Benchmarking Industry-Science Relations: the role of framework conditions (2001).

Data from the survey carried out for the *Global Competitiveness Report*[4] provides another source of information on the potential for the research base to co-operate with industry in terms of the quality and availability of scientific research institutions, services and scientists and engineers, as it included a specific question on university/industry research collaboration. The table below presents the results for five questions from the GCR survey. Trend Chart countries are split between candidate countries

4 The Global Competitiveness Report 2001-2002 (Porter M., Sach E., Cornelius P., McArthur J.W., Schwab K.)

(CC9, the GCR survey did not include Cyprus and Malta) and the EU Member States (EU14, Luxembourg was not included). Aside from the indicator on availability of scientists and engineers where the CC9 are equal to the EU14 (reflecting the relatively strong education systems of the central and eastern European countries), the candidate countries score significantly lower than the EU14.

Table 3 : Global Competitiveness Report: university/industry research collaboration

Indicator	Quality of Scientific Research Institutions	Availability of Scientists and Engineers	Local Availability of Specialized Research and Training Services	University/Industry Research Collaboration	Brain Drain
Description	Scientific research institutions in your country, such as university and government laboratories, are (1=non-existent, 7=the best in their fields)	Scientists and engineers in your country are (1=non-existent or rare, 7=widely available)	In your industry, specialized research and training services are (1=not available in the country, 7=available from world-class local institutions)	In its R&D activity, business collaboration with local universities is (1=minimal or non-existent, 7=intensive and ongoing)	Scientists and engineers in your country (1=normally leave to pursue opportunities elsewhere, 7=almost always remain in the country)
Bulgaria	4.0	5.3	3.9	2.8	2.5
Czech Republic	5.0	5.8	5.2	4.1	5.1
Estonia	5.2	5.5	4.9	4.1	4.4
Hungary	5.2	6.2	5.0	4.8	4.0
Latvia	4.3	4.6	4.5	3.7	3.3
Lithuania	4.7	5.7	4.5	3.3	3.3
Poland	4.5	5.3	5.0	3.8	3.9
Romania	3.2	6.5	3.4	1.6	3.3
Slovak Republic	4.4	6.4	5.0	4.6	3.4
Slovenia	4.8	5.2	4.3	3.8	4.2
Turkey	3.5	4.6	3.7	3.4	4.0
CC-11 mean	**4.4**	**5.6**	**4.5**	**3.6**	**3.8**
Austria	5.6	5.8	5.6	5.1	5.2
Belgium	5.8	4.9	5.2	5.4	5.4
Denmark	5.3	5.7	5.4	5.0	5.1
Finland	6.3	6.4	6.1	6.1	6.1
France	6.2	6.0	6.0	5.1	5.3
Germany	5.9	5.5	6.0	5.1	5.4
Greece	4.1	5.7	3.9	3.9	4.5
Ireland	5.6	5.8	5.1	5.1	4.6
Italy	4.6	5.4	4.9	4.2	4.1
Netherlands	6.2	5.6	5.6	5.2	5.5
Portugal	4.4	4.8	4.4	3.8	4.4
Spain	4.8	5.6	5.3	4.2	4.8
Sweden	6.0	6.0	5.7	5.7	4.8
United Kingdom	6.1	5.3	6.0	4.9	4.8
EU-14 mean	**5.5**	**5.6**	**5.4**	**4.9**	**5.0**
GCR Mean	4.6	5.1	4.5	3.9	4.0

Source: The Global Competitiveness Report 2001-2002 (Porter M., Sach E., Cornelius P., McArthur J.W., Schwab K.)

Amongst the current EU countries, Finland stands out from the survey as having an exceptionally good research base and high-level of research-industry collaboration. At the other end of the spectrum, Greece and Portugal score lowest on two indicators respectively, with Italy being most affected by a brain-drain. Amongst the candidate countries, the Czech Republic and Hungary appear best placed with Romania and Turkey offering the least potential for industry-science relations. A brain-drain seems to be a particular issue in Bulgaria.

Data from the *European Innovation Scoreboard 2002*, which highlights the low levels of business expenditure on R&D in the candidate countries, and survey evidence, such as the GCR, would suggest that on average the forthcoming accession of 10 new members states to the EU, is most likely to exacerbate the 'European paradox'. It may be possible for the candidate countries to benefit from the experience of some EU countries, such as the recent Estonian example of adopting the Competence Centre model for ISR developed in Austria and other EU countries. However, learning from good practice is a one thing but copying solutions to another country embedded in different cultural, social and economic contexts could bring negative effects, especially in the context of the still restructuring research systems of the CCs.

1.2 New measures 2002-2003

1.2.1 Mobility of students, research workers and teachers

Only one new measure with mobility of students, research workers and teachers as a primary objective has been launched during the 12-month period to September 2003. This continues the trend of giving a low priority to this type of scheme across the countries covered by the Trend Chart since, during 2001-2002, only two measures were launched which had mobility as their primary objective.

Table 4: List of new (*or modified*) measures in favour of mobility

Belgium	FIRST Elite International (BE 64)
Portugal	QUADROS Programme (PT 35), NITEC – Incentive System for Creating R&D Nuclei in the Company Sector (PT 36),
United Kingdom	*Knowledge Transfer Partnerships (formerly TCS and the Teaching Company Scheme) (UK 18), Higher Education Innovation Fund – HEIF (UK 38)*

In the Walloon region of Belgium, the FIRST family of measures in favour of industry-science mobility has been added to by the launch of *FIRST Elite international* (BE 64) in June 2003. The new scheme extends the existing formula of *FIRST Europe* (BE 39), which aims to attract skilled researchers to the region from other EU regions and to recruit researchers from third countries with which the Walloon Region has signed a co-operation agreement.

In Portugal, two important measures have been launched with a bearing on the mobility of technically skilled staff, although not chiefly addressing this issue. One is the *QUADROS Programme* (PT 35), which follows in the vein of previous JTI programme (*Young Technicians for Industry*) and is aimed at encouraging SMEs to recruit young technical staff in technological fields, as well as in economics and management (up to a maximum of 3 people per firm). A similar effect is aimed at through the *NITEC Programme* (PT 36), regarding the creation of R&D teams in companies, as well as enhancing their capabilities in the areas of designing and implementing projects for developing new products and/or processes and of assimilating external technologies and knowledge.

More specifically aimed at promoting mobility and industry-science co-operation are the so-called grants for in-company PhDs. The objective of this programme, which has still to be launched, is to foster the involvement by firms in post-graduate education, through the provision of grants for doctoral or master candidates to develop their research projects inside firms which are interested in the respective research topics.

Aside from the officially launched new measures, a cross-country analysis of the information available in the national trend chart reports suggests a number of emerging trends:

- ← In a number of EU Member States (and associated countries), there is an emphasis on measures to attract foreign knowledge workers to come or to return (nationals of EU Member States working in the US, etc.) to work in EU countries. Country reports highlighting such initiatives include the Austrian, Belgian (*First Elite International),* German, Danish and Norwegian reports
- ← In contrast, in the candidate countries, where measures have been taken, the objective is usually to retain skilled scientific and technical personnel in the country in order to stem a 'brain-drain' and this is notably the case in Bulgaria and Romania. However, it is apparent from an analysis of the information available on mobility schemes that the understanding of this concept is very weak across most of the candidate countries (mobility being discussed more in the context of reform of education systems or geographic spread of research facilities than in terms of promoting science-industry relations).

Boosting availability of R&D employees in Austria.

In Austria, there is a recognition that ongoing efforts to increase spending on R&D, with a view to meeting the Lisbon targets, will boost demand for skilled research employees as additional R&D funding needs additional researchers to carry out research and development work. The Council for Research and Technology Development stated in its *National Research and Innovation Plan* published in December 2002 that there is a shortfall of 500 researchers per year. The Plan called for concrete measures to close this gap including (i) increasing the percentage of doctoral students through attractive research positions, (ii) the reduction of the brain-drain through attractive research positions in Austria, (iii) invitations for foreign researchers to come to Austria, and (iv) retaining R&D oriented foreign graduates who have studied at Austrian universities.

Additionally, the Council for Research and Technology Development has allocated _7.27 million for a higher endowment of existing mobility grant schemes for Austrian researchers. Special emphasis is given to creating incentives for Austrian researchers abroad to return to Austria. In August 2003, an initiative called '*Austrian Brain Power*' was announced which will aim to motivate researchers who left Austria – mainly for the US and Canada – to return.

1.2.2 Intensified co-operation between research institutes, universities and companies

During the previous 2001-2002 reporting period, 14 new measures were identified in the field of intensified co-operation between research institutes, universities and companies. In the current period, a similar number of new measures have been launched with once again a single country accounting for a significant number of the new measures. In the 2001-2002 period, a veritable 'big-bang' reorganisation of research promotion programmes occurred in Austria (with the launching of seven new measures) while in the current period, five new programmes aimed, primarily or indirectly, at promoting ISR have been launched in Portugal.

Table 5 : List of new (*or modified*) measures in favour of ISR

Austria	GENAU (AT 59)
Belgium	Subsidy for a Technical Feasibility Study (BE 67)
Cyprus	Research for enterprises (CY 25), Sequence (CY 26)
Estonia	Competence Centres Programme (EE 22)
France	Innovation Plan (FR 53)
Lithuania	Programme on Innovations in Business (LT 16)
Portugal	IDEIA - Applied Research and Development in Companies (PT 33), NEST – New Technology Based Companies (PT 34), QUADROS Programme (PT 35), NITEC – Incentive System for Creating R&D Nuclei in the Company Sector (PT 36), DEMTEC – Incentive System for Undertaking Pilot Projects Concerning Technologically Innovative Products and Processes (PT 37)
Romania	Programme for development of technological and software parks (RO 19)
Spain	Financial support to the development of non profit Technology Transfer Offices (OTRIs) (ES 10), Initiative to recruit personnel for non profit Technology Transfer Offices (ES 40)

According to the Portuguese Country Report, improving ISR is 'a hot topic in the political discourse on innovation policy'. One of the headlines of the Presidential discourse during the 'Innovation Week' was the need to encourage co-operation between the University and Industry, to generate virtuous circles of technological development and create an upsurge in innovation. While the need to strengthen the links between science and industry is unanimously acknowledged, the translation of policy intentions and statements into reality is not easy, due to both behavioural and structural factors. The *University Teachers Career Statute* is undoubtedly a hindrance to a closer relationship – but it would be unwise to put all the blame on it.

Bridging the two worlds demands people capable of acting as 'translators' and who are at ease in either world or even in both at the same time. During the last year, several measures were taken in this regard (in addition to the NITEC and QUADROS programmes mentioned above):

- NEST – *New Technology Based Companies* (PT 34), providing support for the creation of new technology oriented companies, with an aim of profiting from the country's investment in the education of scientists and engineers;
- DEMTEC – *Incentive System for Undertaking Pilot Projects Concerning Technologically Innovative Products and Processes* (PT 37), which focuses on the industrial validation of knowledge relating to the application of new technologies as well as on the demonstration and diffusion of such applications;
- IDEIA – *Applied Research and Development in Companies* (PT 33).

IDEIA encompasses the old POCTI and POE programmes on *R&D activities by consortia* (PT 21) and *Mobilising Projects for Technological Development* (PT 23) and is one of the main thrusts of the Government in the area of innovation. IDEIA supports projects involving companies and S&T organisations, led by the former. Projects should have a maximum duration of three years, and their objectives should include the following: valorisation of the results of research by S&T organisations and the transfer of technologies to companies; the development and endogenisation of technologies concerning new products, processes or services; and the support and participation of Portuguese consortia in international projects on research and technological development. Projects may include two types of actions: (1) industrial research, focused on the development of new technologies and the mastering of new competencies, and (2) pre-competitive research through the development of prototypes and pilot projects with a view to the economic valorisation of research results. Incentives consist of a reimbursable grant, when support is below €100,000, and a combination of a non-reimbursable grant and a zero-interest loan, when the amount is higher. The maximum incentive should not exceed 75% of eligible expenditures for 'industrial research' projects and 50% for 'pre-competitive research'.

Generally speaking, the new schemes launched can be divided into three categories:

- *Funding for joint research-industry projects or long-term consortia*. Examples from this round include Research in Enterprise and Sequence programmes in Cyprus, the Competence Centres programme in Estonia and GEN-AU in Austria. During the previous reporting period, a number of new schemes of this type were also launched notably in Denmark and Greece both of which launched programmes in favour of innovation or R&D consortia (DK 17 and GR 55). Existing measures which continue to benefit from support include the Austrian K-Plus centres (AT 23), the Competence Centres in Sweden (SE 04), the Faraday Partnerships in the UK (UK 19), etc. all of which aim to create platforms where joint research projects between companies and universities at a pre-competitive stage are carried out. Finally, thematic programmes aimed at stimulating R&D co-operation in specific technology fields are widely used for instance in Austria, Belgium (Wallonia) and Finland.
- *Research-industry commercialisation centres aimed at providing a physical hub around which ISR can develop in specific sectors or technologies.* An example of such initiatives is described for the case of Belgium (Flanders) below. This type of initiative is also identifiable in countries such as the UK where support for University Innovation Centres under the HEIF initiative (*Higher Education Innovation Fund*, UK 38) continues in England and Wales while in Scotland three new Intermediary Technology Institutes have been launched in mid-2003.
- *Support for the creation or reinforcement of interface and technology transfer offices at universities or public research centres.* The current period has seen the reinforcement of existing university interface structures in Spain notably through funding for additional personnel. Reinforcement of interface structures was also the focus of a number of measures in the previous reporting period such as in Flanders (Belgium). In France, the SAIC (FR 51) measure provides for the creation of specialised commercialisation services linked to higher education institutes but with an independent legal identity giving them greater room for manoeuvre in developing activities towards enterprises. Fourteen experimental SAICs have been launched and the first lessons summarised in a series of guidelines published end 2002.

Research-industry initiatives in Belgium (Flanders)

A number of projects supported jointly by the Flemish Minister for Economy, Foreign Policy, Foreign Trade and Housing and the Flemish Minister for Finance and Budget, Innovation, the Media and Town and Country Planning aim at building bridges between economic and technological innovation.

The project *Flanders' DRIVE,* which was to establish a knowledge centre that supports the suppliers to the vehicle sector, started definitively at the end of 2001. It is developing on the basis for two individual, integrated initiatives: the establishment of the Flemish Engineering and Testing Centre (VETC), which provides the mathematical capability and material infrastructure for integrated designs, and the not-for-profit Flanders' DRIVE, which provides a support structure for research and the dissemination of knowledge.

The Flemish Institute of Logistics (VIL) is a response to the urgent need for professional support for the logistic sector in Flanders. The VIL is an umbrella platform that comprises the three most important parties: the companies in the Flemish logistics sector, the research centres, and the Government of Flanders. Its main task is to restructure and coordinate all aspects related to the logistics sector in Flanders in its attempt to achieve full Supply Chain Management and logistical excellence. It does this by gathering knowledge, innovation and the transfer of knowledge. Supporting the sector with the use of innovative methodologies and technologies is also an essential part of this task.

The processing of images from data received - for example, from satellites - is an increasingly important economic activity, with increasingly broad applications. The Flemish universities, as well as the Flemish Institute for Technological Research (VITO), have built up an important body of expertise in *télédétection* and an Incubation Centre for Geographical Information Processing has been set up with the aim of:

- ← Gathering together the available expertise and stimulating networking with all the parties involved in Flanders;
- ← Stimulating technology and product development in projects with research institutes, companies and government departments, and the commercialisation of the resulting innovative products and services;
- ← Supporting government departments with regard to the use of up-to-date geographical information for taking and implementing policy decisions.

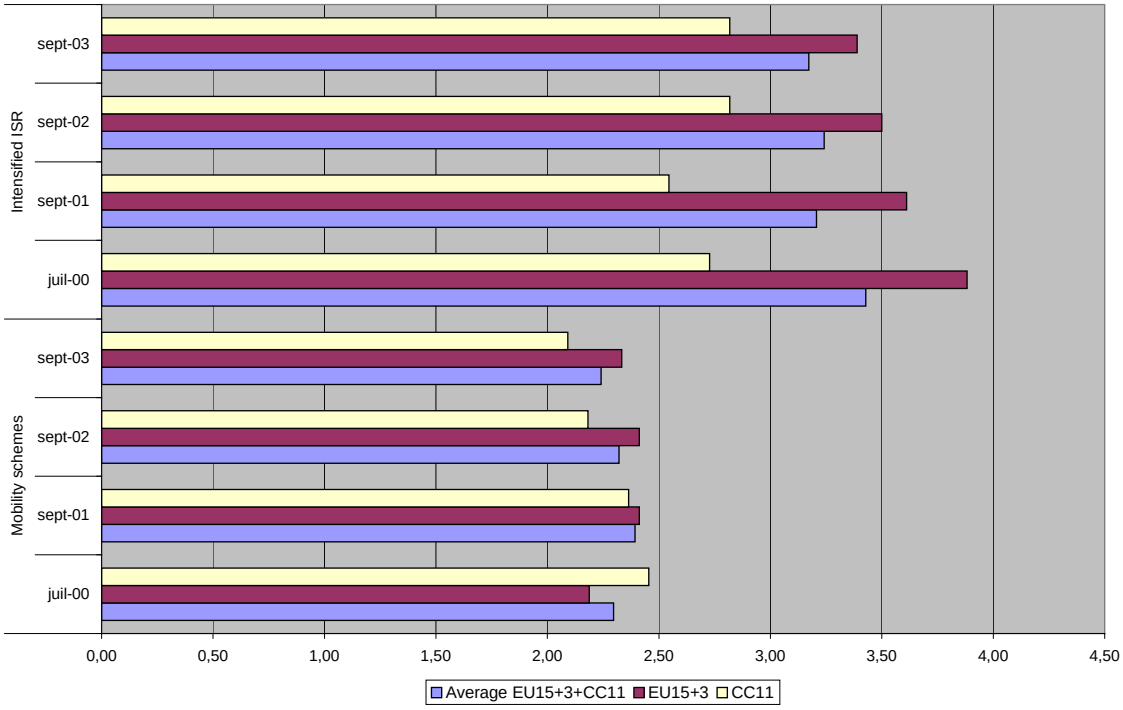
2. Policy trends

2.1 Trends in policy priorities

This section of the report updates the analysis presented in the previous Thematic Trend Report (September 2002). In general, as was noted above, there have been few significant changes in terms of new measures and this is also reflected in trends in policy priorities.

Figure 2 below is based on the latest policy data in the Trend Chart Country Reports (September 2003) and presents an overview of innovation priorities according to action-lines I.2 (mobility schemes) and III.4 (intensified industry-science relations). In general, it confirms that measures aimed at facilitating intensified co-operation between research organisations, universities and industry are given a higher priority than those for the promotion of mobility of researchers between science and industry.

Figure 2: Trends in policy priorities for mobility and ISR schemes – July 2000 to September 2003



Source: European Trend Chart Country Reports (September 2003)

The priority given to mobility schemes as a means of promoting stronger knowledge flows between science and industry has, over the four year period, fluctuated around an average 2.2 points (scored out of a maximum of 6), across the 29 countries reviewed (EU15, Norway, Israel, Iceland and the 11 candidate countries). However, this hides a diverging trend between the EU15 (plus three associated countries) and the CC11.

Table 6: Overview of innovation priorities – mobility schemes and ISR

	Mobility schemes							Co-operation research, universities and companies						
Country	juil-00	sept-01	sept-02	sept-03	July 00 to Sept-03 change	Sept 02 to Sept 03 change	Average July 00-Sept 03	juil-00	sept-01	sept-02	sept-03	July 00 to Sept-03 change	Sept 02 to Sept 03 change	Average July 00-Sept 03
Austria	2	3	2	2	0	0	2,3	4	4	3	3	-1	0	3,5
Belgium	2	3	3	2	0	-1	2,5	2	3	3	3	1	0	2,8
Denmark	3	4	4	4	1	0	3,8	6	5	6	6	0	0	5,8
Finland	2	2	2	2	0	0	2,0	4	4	4	3	-1	-1	3,8
France	4	4	3	4	0	1	3,8	4	4	4	4	0	0	4,0
Germany	2	2	2	2	0	0	2,0	4	4	4	3	-1	-1	3,8
Greece	2	2	3	2	0	-1	2,3	4	3	3	3	-1	0	3,3
Iceland		1	2	2	2	0	1,7		3	3	3	3	0	3,0
Ireland	1	2	2	1	0	-1	1,5	3	4	3	3	0	0	3,3
Israel				2	2	2	0,5	4	4	4	4	0	0	4,0
Italy	3	3	2	2	-1	0	2,5	3	3	3	3	0	0	3,0
Luxembourg	2	2	2	4	2	2	2,5	4	1	1	1	-3	0	1,8
Netherlands	1	1	1	1	0	0	1,0	5	5	5	5	0	0	5,0
Norway	1	1	2	2	1	0	1,5	2	1	2	2	0	0	1,8
Portugal	2	2	2	2	0	0	2,0	4	4	4	4	0	0	4,0
Spain	2	3	3	2	0	-1	2,5	5	5	3	3	-2	0	4,0
Sweden	3	3	3	3	0	0	3,0	4	4	4	4	0	0	4,0
United Kingdom	3	3	3	3	0	0	3,0	4	4	4	4	0	0	4,0
Bulgaria	2	2	2	3	1	1	2,3	2	2	2	2	0	0	2,0
Cyprus	2	2	3	3	1	0	2,5	3	2	3	4	1	1	3,0
Czech Republic	1	1	1	1	0	0	1,0	2	2	3	4	2	1	2,8
Estonia	1	2	2	2	1	0	1,8	2	4	4	4	2	0	3,5
Hungary	3	3	3	2	-1	-1	2,8	6	6	5	5	-1	0	5,5
Latvia	3	4	3	2	-1	-1	3,0	4	2	2	1	-3	-1	2,3
Lithuania	5	2	2	2	-3	0	2,8	3	3	3	3	0	0	3,0
Poland	1	1	1	1	0	0	1,0	1	1	2	2	1	0	1,5
Romania	5	5	4	4	-1	0	4,5	3	2	3	2	-1	-1	2,5
Slovak Republic	1	1	1	1	0	0	1,0	2	2	2	2	0	0	2,0
Slovenia	3	3	2	2	-1	0	2,5	2	2	2	2	0	0	2,0

Source: calculations of ADE on basis of Trend Chart Country Reports for the period September 2002 – August 2003

In the former group, the priority given to mobility schemes increased from 2.19 in July 2000 to 2.33 in September 2003. In the CC11, there has, on the contrary, been a steady decline from 2.45 in July 2000 to 2.36 in September 2001 to only 2.09 in September 2003. As can be seen from the detailed priority figures presented in table 6 above, the decline in the CC11 is due in part to a significant fall (minus 3 points) in priority given to mobility schemes in Lithuania. In the EU, the only significant change to priority given to mobility schemes is a two point rise over the last year in Luxembourg, reflecting the creation of a new national university and accompanying measures (see *Luxembourg Country Report* September 2003).

In terms of relative priorities amongst the countries surveyed, Denmark and France give the highest priority to mobility schemes within the group of EU15+3 with an average priority of 3.8 over the period July 2000 to September 2003 while Romania is a clear outlier amongst the CC11 with an average priority of 4.5. The Danish score appears to reflect a long-standing commitment to supporting mobility, notably through the *Industrial Research Scheme* (DK 5), which enables students to obtain their PhD through employment as researchers in private companies. The Romanian score reflects (i) significant policy concerns to counter a brain-drain and make skilled personnel available to private enterprises, and (ii) the significant funding allocated to the CORINT programme (RO 8) which is the only one of its kind in the candidate countries.

At the other end of the scale, the Netherlands gives the lowest priority (average of 1) to mobility schemes over the period 2000-2002 as do the Czech Republic, Poland and the Slovak Republic. Somewhat surprisingly, Ireland, which has pursued a policy of encouraging skilled human resources to return from abroad, also scores very low. In the case of the Netherlands, this low priority seems to be explained by a streamlining of measures which has resulted in the merging of the former 'knowledge carriers in SMEs' measure into Feasibility Studies measures. This decision mirrors recent changes in neighbouring Flanders with a similar result, namely the disappearance of a specific scheme for human mobility.

Turning to schemes in favour of intensified ISR, the average priority for the 29 countries reviewed has declined from 3.43 in July 2000 to 3.17 in September 2003. Once again there is a difference in trends between the EU15+3 and the CC11:

- ← In the EU15+3, the priority given to ISR schemes decreased from 3.88 in July 2000 to 3.39 in September 2003;
- ← In the CC11, the level of priority has fluctuated from 2.73 in July 2000 to 2.55 in September 2001 to finish higher at 2.82 in September 2003.

The overall decline in the EU15+3 group can be attributed to two significant national changes in priority, namely a three point drop in Luxembourg and a two point drop in Spain. Amongst the CC11, the most significant changes are a two point increase in Estonia and the Czech Republic and a three point drop in priority in Latvia.

In terms of relative priorities amongst the countries surveyed, Denmark once again gives the highest priority to ISR schemes within the group of EU15+3 with an average score of 5.8 over the period July 2000 to September 2002 while Hungary is a clear outlier amongst the CC11 with an identical average priority of 5.5. At the other end of the scale, Norway and Luxembourg give the lowest priority (average of 1.8) to ISR schemes over the period 2000-2003; and Poland stands out amongst the CC11 with a priority score of only 1.5. The Norwegian score is more difficult to understand since a number of new measures have been launched in the last couple of years in favour of stronger ISR.

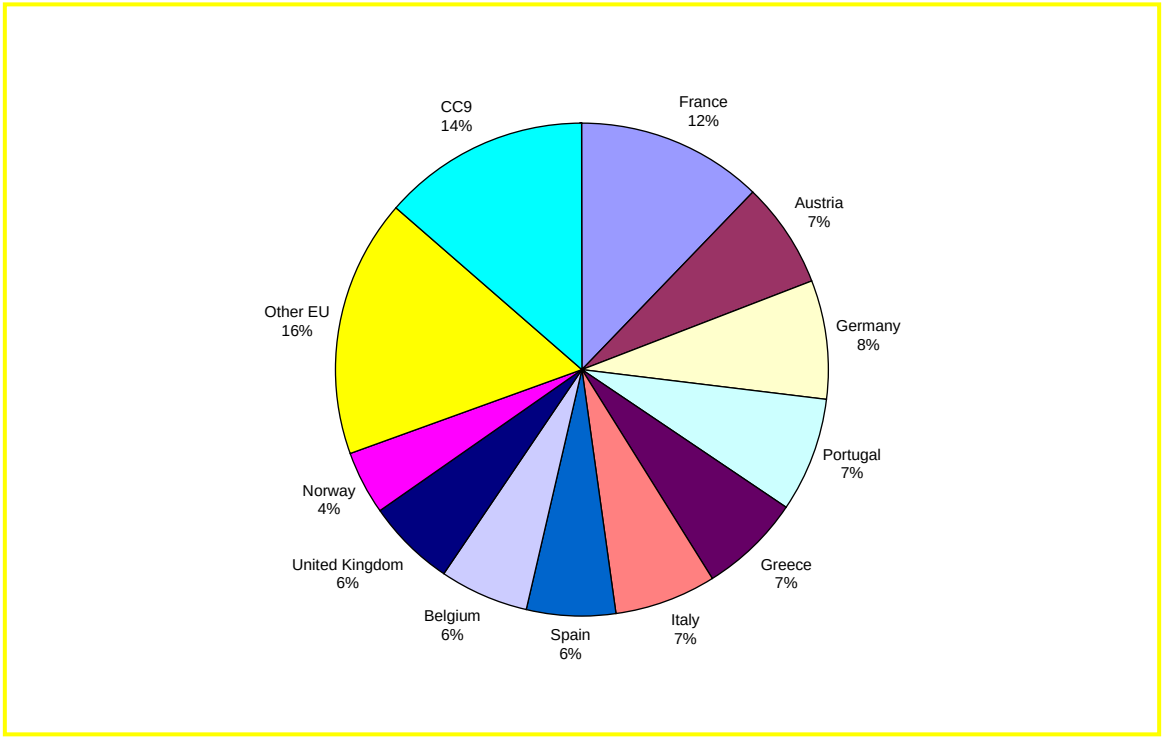
2.2 Modes and targets of current ISR measures

Annex 2 provides a list of all measures per country for both mobility and intensified co-operation schemes for which a Trend Chart measure datasheet exists. The table classifies the measures according to the mode of delivery (mobility of personnel, transfer and exploitation of results, information diffusion/promotion, demonstration projects and networks/clusters) and the targets (sectors/large firms, research institutes, SMEs, universities, young scientists, regions) of the measures.

The table in annex 2 covers 256 measures for 27 countries (two countries, Slovakia and Bulgaria, reporting no measures). As can be seen from figure 3 below, 10 countries out of 27 account for close to 70% of all measures. It is impossible to draw a firm conclusion about the importance of policy by counting schemes since this would require weighting of financial data, etc. in order to have a more precise perspective. However, in the absence of reliable and complete financial data in the database of Trend Chart measures, the analysis here is limited to 'number counting' which at least allows some idea of the relative 'sophistication' or variety of measures that are explored further through the analysis of modes and targets.

A first remark is that although there is some correspondence between size of economy, innovation system and number of measures (France and Germany amongst the countries with the largest number of measures), smaller countries are also present in this leading group (Austria, Belgium, Greece and Norway). Compared to the previous period Thematic Trend Report, Portugal has significantly increased the number of schemes targeting ISR with five new schemes launched and, as noted above, supporting more effective ISR is 'hot political topic'.

Figure 3 : distribution of measures by country

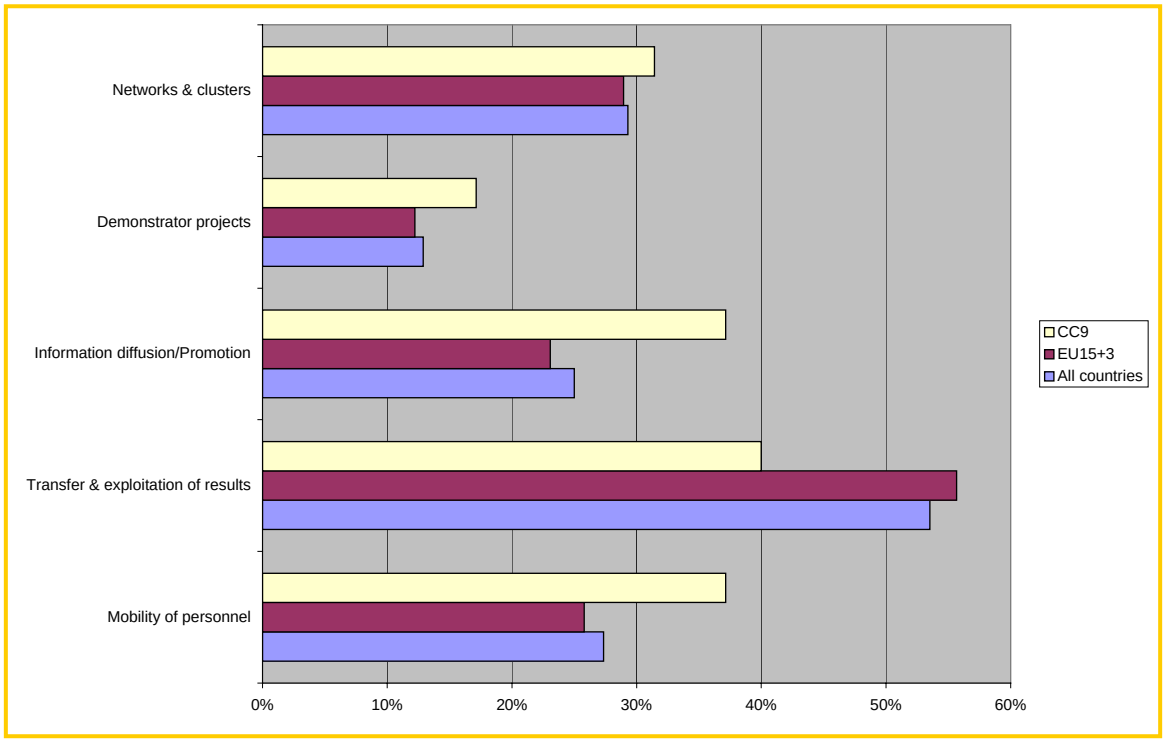


Source : Calculations on basis of Trend Chart database analysis of policy measures (see annex 2).

Looking now at the other smaller countries: In the case of Austria and Belgium, this seems to reflect the decentralised nature of innovation policy, while in Greece the importance of Structural Fund supported programmes during the 2000-2006 period may be an explanatory factor. The low number of measures from the nine candidate countries (only 35 measures or 13.7% of the total) may be a sign of their still under-developed range of policy measures in favour of industry-science relations. This conclusion has been confirmed by the recent studies carried out on behalf of DG Enterprise on innovation policy in the candidate countries[5].

On average across all 27 countries, the most favoured modes of delivery are measures focusing on the transfer and exploitation of results (54% of all measures), followed by those in favour of networks and clusters (29%) and then mobility of personnel (27%). There is some difference in the relative importance of modes of delivery between the more advanced economies (EU15 plus Iceland, Israel and Norway - EU15+3) and the nine candidate countries (CC9). In particular, the CC9 are, on average, much more likely to favour mobility schemes than the EU15+3 (37% of all measures compared to 26% in the EU15+3) but give less emphasis to promoting the transfer and exploitation of results (40% compared to 56%). Equally, more importance is given to information and diffusion of information on research results (37% compared to 23%). This seems broadly consistent with the current state of economic development and innovation policy in the candidate countries, where retaining skilled human resources (e.g. avoiding a brain-drain) and raising awareness amongst enterprises about the opportunities to exploit technology developments despite limited financial resources, etc. are currently higher priorities. Networks and clusters are almost equally important in both groups of countries.

Figure 4: Modes of delivery of measures in favour ofISRs



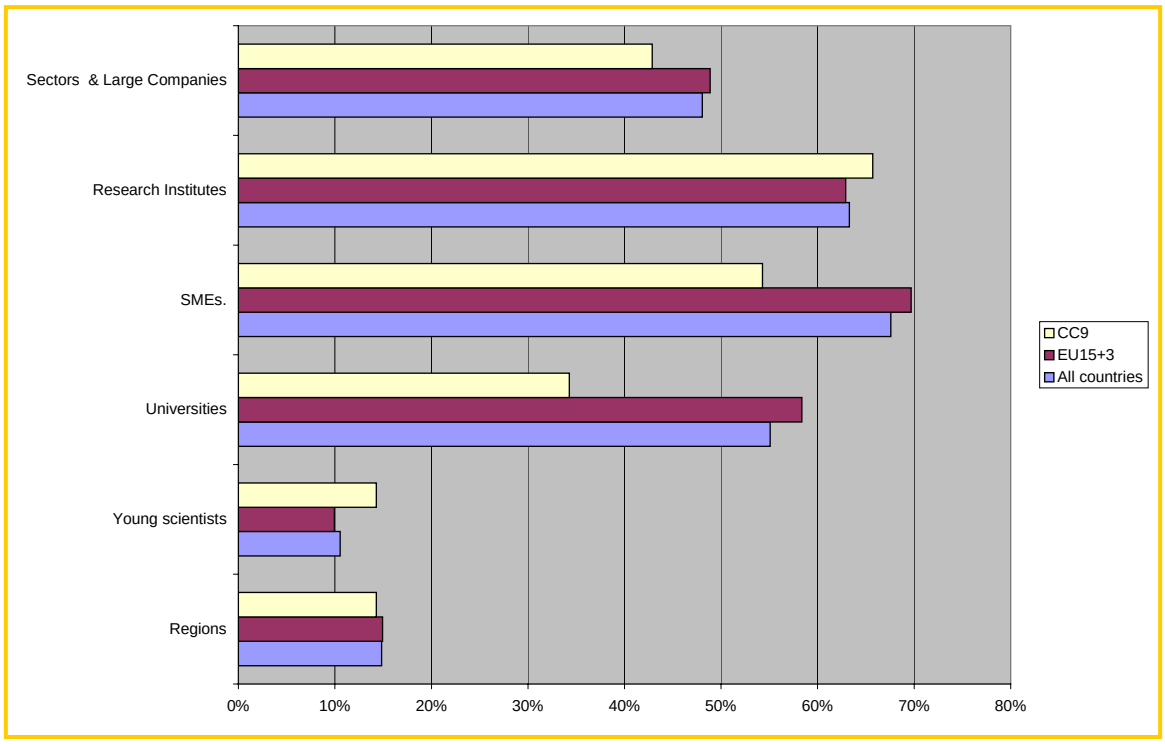
Source : Calculations on basis of Trend Chart database analysis of policy measures (see annex 2).

In terms of the targets for the measures identified, SMEs (68% of all measures), research institutes (63%) and universities (55%) are the most common. It is difficult to draw conclusions from this expect perhaps to note that smaller enterprises as opposed to universities or research institutes are the

5 http://www.cordis.lu/innovation-policy/studies/

leading targets, which is encouraging from the point of view of promoting greater absorption of research results and stimulating demand for R&D.

Figure 5: Targets of measures in favour of ISRs



Source : Calculations on basis of fTrend Chart database analysis of policy measures (see annex 2).

Finally, the CC9 place more importance on young scientists and research institutes suggesting perhaps a stronger 'science push' approach in the candidate countries compared to the average for all 27 countries.

3. Conclusions

The report has reviewed trends related to two specific means of promoting ISRs, namely:

- Mobility schemes encouraging 'knowledge transfer' though researchers, etc., and
- Various types of funding schemes or other initiatives aimed at stimulating more sustained co-operation between research institutes, universities and enterprises.

The report has updated the analysis presented in the previous Thematic Trend Report for the period 2001-2002. The previous report identified a number of key conclusions:

- Availability of skilled human resources is often cited as a major constraint for innovation in the enterprise sector, yet governments across the 28 countries monitored give a relatively low priority to this type of policy measure.
- In contrast, a range of direct funding schemes for companies, research organisations and intermediaries (interfaces,) exist to promote intensified ISR.
- The rate of introduction of new measures for both mobility and ISR schemes is relatively slow particularly since a single country accounts for a large number of the new measures.
- A significant 'policy sophistication' gap exists between the current EU15 Member States and the candidate countries (CC11).

The country level reports for the current period (September 2002 to August 2003) largely confirm these conclusions. The trends across the 29 countries have not significantly changed:

- The launching of new measures at national level falling under the scope of the two action lines has remained relatively constant compared to the previous reporting period (2001-2002). In the 12 months to September 2003, only three new mobility scheme measures have been launched and fourteen in favour of ISR. Portugal has been most active with five new measures launched as part of a major push to increase commercialisation of research results.
- During the period July 2000 to September 2003, there has been no significant shift in priority given to mobility schemes (an average score for the 28 countries of 2.31); while there has been a decline in the priority given to intensified co-operation (from 3.43 to 3.17).
- However, for both types of measure, there is a diverging trend in priorities between the current EU Member States (EU15) and the eleven candidate countries (CC11). For mobility schemes, the priority has increased in the EU15 but steadily declined in the CC11; while the trend is the opposite for measures in favour of intensified co-operation.
- On average, the favoured mode of delivery is schemes in favour of the 'transfer and exploitation of results' (a mode adopted by 54% of all schemes), but mobility (27%) and networking (29%) initiatives are also important. A more in-depth analysis of modes of delivery could be usefully carried out in the future to confirm certain trends suggested by this broad analysis. For instance, there seems to be a trend towards supporting the creation of consortia based longer-term partnerships for ISR.
- SMEs are a target of almost 70% of all schemes with research institutes (63%) and universities (55%) also being important. Interestingly, the candidate countries place more importance on young scientists and research institutes and a lower emphasis on SMEs as targets than do the EU15, which suggesting a stronger 'science push' approach.

Mobility schemes

The need to meet the Lisbon objectives in terms of R&D expenditure are clearly having a knock-on effect in terms of the realisation that the human resources available in science and engineering may prove to be a bottleneck in a number of countries. Two specific trends are visible:

- In a number of EU Member States (and associated countries), there is an emphasis on measures to attract foreign knowledge-workers to come or to return (nationals of EU Member States working in the US, etc.) to work in EU countries.

- In contrast, in the candidate countries, there is still less of an emphasis on mobility between science and industry and most effort goes to stemming a 'brain-drain' - this is notably the case in Bulgaria and Romania.

In next phase of the Trend Chart – broad issue of availability of scientific and engineering personnel and schemes to encourage mobility in the broadest sense (promoting S&E careers, attracting and retaining S&E in countries, mobility between science and industry) should be the subject of a thematic report and workshop.

Intensifying ISR

Most country reports underline that improving ISR is a major political priority, and policy development activity in this field remains relatively sustained. As noted above, there have been 14 new measures introduced, although five of these are attributable to Portugal alone. However, in most EU countries significant levels of funding remain allocated to existing programmes and in certain countries additional funding has been made available (e.g. the UK, Belgium, etc.).

Generally speaking, schemes can be divided into three categories:

- *Funding for joint research-industry projects or long-term consortia*: including classic R&D funding schemes where co-operation is often a selection criteria; targeted technology programmes (for a specific sector or technology); and research-industry consortia aiming to create platforms where pre-competitive work is carried out between companies and universities, and so on.
- *Research-industry commercialisation centres aimed at providing a physical hub around which ISR can develop in specific sectors or technologies (including through spin-offs).* Examples of such initiatives include a range of centres established in the Belgian regions, University Innovation Centres and Intermediary Technology Institutes in the UK, GTS institutes in Denmark and AplusB centres in Austria.
- *Support for the creation or reinforcement of interface and technology transfer offices at universities or public research centres.* The four-year period since 2000 has seen the reinforcement of existing university interface structures in most EU Member States as well as the launching of such measures in many candidate countries. New approaches are identifiable where the interface structure is not necessarily an internal unit of a higher education or research institute but rather a partnership or commercial vehicle for research commercialisation.

Annex 1: Extracts from September 2003 Country Report

EU Countries

Austria

Austria's EU membership opened the community programmes aimed at increasing mobility (i.e. LEONARDO, SOKRATES or TEMPUS) to Austrian students. Unlike these European programmes, *Impulse Projects* (AT 19), *FFF Young Researchers Programme* (AT 28) and the *Young Innovators Scheme* (AT 17) aim at initiating contact between students and industry. All three measures have a different target group: while the Impulse Projects promote Post-Docs, the FFF supports undergraduates at the university and the Young Innovators Scheme supports students at upper secondary schools.

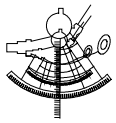
The mobility of university researchers was discussed in depth as part of the reforms, proposed by the Ministry for Education, Science and Culture, which are intended to change the terms of employment for university researchers. These reforms are to increase the mobility of university researchers between national and international institutions and between the commercial and academic sectors. These goals should be achieved by changing the contractual relationship for assistant professors: the latter will no longer be allowed to become civil servants as this would give them a status where the employment relationship cannot be terminated by the employer. This issue is much disputed and has led to strikes at some of the universities. Nevertheless, it was established through the implementation of the new law on the organisation of universities (UG 2002).

The ongoing efforts to increase spending on R&D will elevate demand for skilled research employees: additional R&D funding needs additional researchers to carry out research and development work. The Council for Research and Technology Development stated, in its *National Research and Innovation Plan* (December 2002), that, if Austria wants to increase the R&D quota in terms of gross domestic product (GDP) from 1.8% in 2000 to 2.5% of GDP in 2005, then there was a shortfall of 500 researchers per year. It asked for concrete measures to address this and the following were identified:

- Increasing the percentage of doctoral students through attractive research positions
- Recruiting graduates from Polytechnics (Fachhochschulen) for an additional R&D-qualification
- Expansion and strengthening of R&D at the Polytechnics
- Reduction of the brain-drain through attractive research positions in Austria
- Creation of attractive endowment professorships
- Invitations for foreign researchers to come to Austria
- Keeping R&D oriented foreign graduates who have studied at Austrian universities
- Creation of attractive conditions in terms of the law on aliens and the labour and pension laws for the integration of international R&D personnel and their families
- Joint technology and employment promotion programmes for the 'promotion package' of innovation and qualification projects

Additionally, the Council for Research and Technology Development has allocated 7.27 million for a higher endowment of existing mobility grant schemes for Austrian researchers. Special emphasis is also given to the creation of incentives for Austrian researchers abroad to return to Austria. In August 2003, an initiative called '*Austrian Brain Power*' was announced with the aim of motivating researchers who left Austria – mainly for the US and Canada – to return.

Intensified relations between research institutes, universities and industry are one of the main goals of the Austrian innovation policy. The most important programme in this field is the *k plus* programme (AT 23, AT 48) which aims at installing centres where joint research between companies and universities at a pre-competitive stage can be carried out. Two other projects with a similar objective are *k ind - k net* (AT 27) and *Tech Gate Vienna* (AT 24). The *Impulse Polytechnics - Industry Project* (AT 22) can also be added to programmes of this kind. Contacts between research and industry are



also promoted by the *Relay Projects Science-Industry* (AT 20), the *Impulse Projects* (AT 19), and the *FFF Young Researchers Programme* (AT 28).

In April 2002 the BMVIT launched and re-launched a number of programmes which focus on research institutions and enterprises:

1. FIT-IT (http://www.fit-it.at/) (AT 54) - Research programme for information technologies. This programme concentrates on high-quality research in the area of information and communication technologies. The programme will make available more that €10 million within a two-year time frame. FIT-IT continually searches for topics that are likely to be an important part of the future of IT.

As a first topic of FIT-IT, the programme concentrated on embedded systems research. Embedded systems are not only pervasive in everyday household appliances and electronic tools, they currently also mark an important and rapidly growing field of IT research. Scientists and engineers from Austrian universities and research institutes have in the past made significant contributions to the field of embedded systems. This strength in research is paralleled by a number of innovative Austrian companies that develop solutions for embedded systems, for example in the area of car-related secure real-time embedded systems.

The first round of project financing stimulated 27 project proposals of which 20 are research oriented. The value of these proposals amounts to more than €21 million while the requested funding is about €12 million and the allocated budget for projects funding is €3 million. Thus only 25% of the research proposals will receive financing. In the second round, 15 projects have been selected for funding to the value of €9 million.

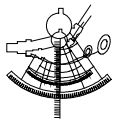
2. *ASAP - National Space Programme* (AT 55): This programme intends to fund development work which precedes and supports ESA and bilateral projects. Furthermore, it should help the integration of spin-offs in terrestrial applications. Currently €7.27 million has been allocated to this programme. The national space programme is complemented by the ARTIST programme (AT 57) which aims at establishing broad acceptance and use of satellite navigation systems and €2 million will be spent to achieve this objective.

3. *Sustainable Development* (http://www.nachhaltigwirtschaften.at/english/index.html) (AT 58): This programme came into being as a result of increasing pressures to reduce the consumption of energy for economic processes in general. Research activities - which receive financing of about €40 million - are grouped around 3 topics: Factory of the Future, House of the Future, Energy Systems of the Future.

4. *A3 – Austrian Advanced Automotive Technologies* (AT 51), ISB - *Innovative Rail Systems* (AT 52), *I2 - Intelligent Infrastructure* (AT 53) all focus on intelligent solutions for logistic problems.

The 'AplusB' (academia plus business) (AT 47) programme, which is managed by TIG, aims to bring about a sustainable increase in the number of innovative, technology-oriented spin-offs from the academic sector.
AplusB Centres assist in the preparation of spin-offs from universities, polytechnics and non-university research institutions by providing professional support for scientists in the difficult process of turning an idea into a viable business. This involves counselling and assistance during the actual start-up phase and establishing the idea of entrepreneurship more firmly in academic theory and practice. Close links between potential founders and their academic 'home base' ensure that the new companies can exploit the know-how developed in academic institutions.
So far, the following AplusB-Centres have been established:
- BUILD! Business Idea Lab and Development Kärnten (Carinthia)
- CAST Center for Academic Spin-offs Tyrol
- INiTS Universitäres Gründerservice Wien
- SPG - Science Park Graz (Styria)
- tech2b Oberösterreich (Upper Austria)

Additionally, the universities of Klagenfurt (Carinthia), Linz (Upper Austria) and the University of Economics and Business Administration in Vienna have built up institutes for entrepreneurship which focus on questions of innovative business ideas and administration.



To improve the links between the economy and science is one of the most important action lines for the Council for Research and Technology Development. The Council has allocated additional funding for competence centres (AT 23 and AT 27) and has highlighted its priorities for the education system.

Belgium

The mobility of innovation and research personnel between the research community and business is the prerogative of the regional governments in Belgium. Differing approaches can be identified between Flanders and Wallonia: the first has chosen to including mobility as an eligible activity within its funding measures targeted at innovation projects in SMEs; while the latter has developed a family of separate measures under the FIRST label.

Since February 2001, funds for research-industry mobility in Flanders fall under the broad KMO measures managed by IWT-Vlaanderen (KMO-Programma, or SME Programme) (see section 3.2). The Government of Flanders also makes funds available for the mobility of individuals (mobility grants). These cover the travelling expenses of Flemish researchers who go abroad for short periods for education or research. The accommodation expenses of foreign researchers in Flanders are also paid. The conditions are the same for every country and were determined by a decision of the Government of Flanders on 27 March 1991. The number of bursaries to be awarded varies from country to country. The credits amount to €0.53 million for science policy.

Since 1989, the regional administration in Wallonia has developed a number of mobility schemes under the FIRST label with each based on the same model but with slightly different objectives or eligibility criteria. The sub-schemes described below are currently operational.

The schemes are divided into two categories with the region providing funding in both cases for the salary (and related operating costs) of a young researcher for a period of two years.

The first category of schemes relates to projects that are submitted by and carried out within a research laboratory of a university or *haute école* (third level non-university institute or polytechnic) in partnership with an identified partner-enterprise which sponsors the project. The schemes falling under this category are:

- FIRST PhD (BE 38) and FIRST '*Hautes-Ecoles*' (BE 63) which fund a doctoral research project within a university (in the case of FIRST PhD) with the aim of creating the necessary knowledge for development of a product or process for the enterprise sponsoring the project. The aim of FIRST *Hautes-Ecoles* is similar but only research units of these types of institutions are eligible.
- FIRST Spin-off (BE 37) was launched with the objective of encouraging a university researcher to explore the possibility of creating a spin-off; and
- FIRST Europe (BE 39) with the objective to attract skilled researchers to the region from other EU regions. The projects must either involve a firm operating in the Objective 1 zone (the Hainaut Province) or under the Objective 3 (employment and training) programme covering the rest of the region.

A new scheme *FIRST Elite international* (BE 64) was launched in June 2003 extending the FIRST Europe scheme to the recruitment of researchers from third countries with which the Walloon Region has signed a co-operation agreement.

The second category of projects are those submitted by and carried out within a regional enterprise with the aim of enabling the firm to hire a young researcher to carry out a research project leading to the transfer of technology from a university or research institute. The schemes falling under this category are FIRST Enterprise (and FIRST Enterprise International) (BE 61).

Over the period 1999-2002, a total of 273 researchers have been funded under the FIRST family of schemes of which 83 were covered by FIRST Enterprise grants (in 2002, 17 grants amounting to a total subsidy of €1.4 million were awarded to firms under this scheme)[6]. A further seven grants in

6 Annual Report of the DGTRE 2002. See : http://mrw.wallonie.be/dgtre/

2002 were awarded under the FIRST Spin-off scheme (a total subsidy of €1.1 million) compared to 11 grants for €1.3 million in 2001.

The Government of Brussels-Capital Region has not created a specific measure in favour of research-industry mobility and only supports staff costs for R&D personnel in companies under the revised schemes which cover subsidies for industrial research (BE 6) and funding for pre-competitive development (BE 8).

The Federal Government also provides tax incentives for the hiring of additional technical and research staff (see section 2.6 below).

In addition to specific research programmes and the initiative in favour of spin-offs already discussed above, all Belgian authorities give a strong emphasis in their policy documents and measures to this priority.

In 2002, the Federal Government launched a new measure *Technological Attraction Poles* in 2002 (TAP) (BE 59). The measure complements existing programmes aimed at supporting and increasing the country's scientific potential in vital leading-edge domains. The new programme aims specifically at improving the relationship between research and development, and hence at increasing co-operation between universities and specialist sectoral centres. The TAP programme activities focus on the development and use of scientific and technical knowledge in order to devise methods, procedures and tools able to generate innovation in the industrial sector. The programme is open to university institutions, public scientific establishments and non profit-making research centres. The research proposals should be of a maximum duration of 3 years and a network needs to be constituted consisting of maximum five teams, which must include at least one university establishment and one *De Groote* or similar research centre. Networks may be financed up to a maximum of €250,000 per partner.

The main measures in the Brussels-Capital Region aimed at supporting greater interaction between Universities and enterprises. These are encapsulated in the 2002 Regional decree on encouraging scientific research and technological innovation and the funding of interface services in the two major universities (ULB and VUB) of the region. The new decree simply provides a legal basis for this funding which has existed for a number of years.

In Flanders, interface services of the universities (BE 18) have received financial support since 1998. Up to the 2001-2002 academic year, this support has been on the basis of recurrent ad hoc decisions. From 1 October 2002, the ad hoc support was replaced by the measure contained in the regulation approved by the Government of Flanders on 13 September 2002. The act aims at promoting co-operation between Flemish universities and companies, the economic valorisation of academic research and the creation of spin-offs. An annual amount of €1.3 million will be at the disposal of the universities for this purpose. A major change is that the funding period is now five years compared to the system in place since 1998, where the level of support for university interface services has been decided on an annual basis through ad hoc decisions. This created uncertainty in terms of financial planning and prevented the development of new services. With the approval of the act, the ad hoc decisions will be replaced by a structural measure from 1 October 2002 onwards[7]. The new act provides for sustainable support in order to allow planning and functioning over the long term. Another new aspect is that after five years a thorough evaluation will be conducted. IWT-Vlaanderen is responsible for monitoring the measure. This involves both the financial management, and the content of policy plans and reports.

In Wallonia, funding for University Interfaces (BE 47) has been provided since 1998 and all Walloon universities receive funding for the hiring of one (for small universities) or two (for large universities) supplementary personnel in university-industry interfaces. The funding is provided to cover the salary of experts within the interfaces who are in charge of fostering the valorisation of research results in industry. The mission of these additional experts is to help with the writing of business plans, as a follow-up to feasibility analysis of projects for the exploitation of research results. They have to

[7] The Flemish Science Policy Council (VRWB) issued an *Opinion (n°76 of 13 December 2001) concerns the support for interface activities at Flemish universities*. Overall, the VRWB agrees with the proposed reform of the Interfaces. Critical remarks mainly concern the insufficiency of the budget (€1.3 million for 2001-2002), the need to focus on the five-year plan and consequently the evaluation on a limited number of actions and clearly defined objectives, the advice to use a distribution key that is not too complex and to avoid development of services at the IWT-Vlaanderen that are overlapping with interface services.

establish contacts with potential industrial partners and with investors willing to finance these developments. They have also the mission to advise the university staff involved in research funded by the Walloon region of IPR issues.

Research-industry initiatives in Flanders

A number of projects supported jointly by the Flemish Minister for Economy, Foreign Policy, and E-Government and the Flemish Minister for Finance and Budget, Town and Country Planning, Sciences and Technological Innovation aim at building bridges between economic and technological innovation.

The project 'Flanders' DRIVE' which aims at establishing a knowledge centre that supports the suppliers to the vehicle sector started definitively at the end of 2001. It is developing on the basis of two individual, integrated initiatives: the establishment of the Flemish Engineering and Testing Centre (VETC), which provides the mathematical capacity and material infrastructure for integrated designs, and the non-for-profit Flanders' DRIVE, which provides a support structure for research and the dissemination of knowledge.

The Flemish Institute for Logistics (VIL) responds to the urgent need for professional support for the logistic sector in Flanders. The VIL is an umbrella platform that comprises the three most important parties: the companies in the Flemish logistics sector, the research centres, and the Government of Flanders. Its main task is to restructure and coordinate all the aspects related to the logistics sector in Flanders. It must support the logistics sector in Flanders in its attempt to achieve full Supply Chain Management and logistical excellence by gathering knowledge, innovation and the transfer of knowledge. Supporting the sector with the use of innovative methodologies and technologies is an essential part of this task.

The processing of images from data received, e.g. from satellites, is an increasingly important economic sector, with increasingly broad applications. The Flemish universities, as well as the Vito, have built up an important body of expertise with regard to *télédétection*. An Incubation Centre for Geographical Information Processing has been set up (IncGEO, the Incubatiepunt Geo-Informatie), with the aim of:

- Gathering together the available expertise and stimulating networking with all the parties involved in Flanders;
- Stimulating technology and product development in projects with research institutes, companies and government departments, and the commercialisation of the resulting innovative products and services;
- Stimulating and supporting government departments with regard to the use of up-to-date geographical information for taking and implementing policy decisions.

At the beginning of 2000, Agoria-Vlaanderen's sector 'Mechanics and mechatronics' carried out a study of its members' strategies. This revealed two priorities with regard to future development: co-operative ventures with greater added value, and the need for acquiring a greater knowledge of mechatronics. The Flemish mechanics and mechatronics sector is clearly behind other sectors and European regions. In 2001, a feasibility study for an engineering centre was carried out. The non-for-profit Flanders' Mechatronics was officially established in December 2001. Three other structures will be set up:

- the 'Mechatronics Engineering Centre CV', which gathers together measurement techniques and testing equipment for mechatronics companies and is funded by about ten companies;
- the 'Flanders Mechatronics Innovation Center', which serves as the platform for the establishment and maintenance of innovation networking between companies, including raising awareness of and the demonstration of innovative mechatronics technology, as part of the not-for-profit Flanders' Mechatronics;
- the 'Flanders' Mechatronics Technology Center, FMTC', which carries out long-term research on the three priority subjects as a separate not-for-profit company.

The initiative was launched by the companies themselves, without a government subsidy, during the period 2000-2002. They are now applying for a substantial contribution for the continued development. A project proposal is being evaluated by the IWT-Flanders. Subsequently the Government of Flanders will take a definitive decision on the basis of a concrete proposal.

Finally, it should also be noted that the new management agreement with the Flemish public television and radio (VRT) determines that the VRT will play a leading role in the field of the new media services, both with investments in new media products, and by providing a technologically up-to-date, high quality media platform in Flanders.

Denmark

One of the measures from the Trend Chart can be put under this sub-theme, namely the Industrial Research-scheme (DK 5).

No new specific measures have been introduced under this heading in the period under review.

In 2002 a common Internet portal for foreign knowledge-workers was established, covering all relevant parts of the public sector (http://www.workindenmark.dk/). Here both foreign knowledge-workers seeking employment in Denmark and Danish companies and research institutions wishing to hire foreign knowledge-workers will be able to find information on matters such as taxation, industrial relations, children's programmes and school programmes and other important topics in connection with employment in Denmark.

A further aim is to identify and remove administrative barriers in order to attract and retain foreign knowledge-workers.

The intention of the Industrial Research Scheme (DK 5) is to permit students to obtain their PhD-degree through employment as researchers in private companies.

The Danish Research Training Council has recently invited applications for subsidies for three-year internationalisation grants stating from January 2004. The programme is aimed at promoting the internationalisation of Danish research environments. The objective is to achieve this by not only sending people abroad but also attracting PhD students attached to the Danish research schools.

No new measures have been introduced in this field during the period of this report.

In the Finance Act for 2003, resources have been appropriated for so-called *innovation Consortia* (DK 17), which aim at intensifying co-operation between public and private research and to strengthen applied research. Each Consortium constitutes a binding co-operation between research institutions, companies and a technological service. The companies finance 50% of the total budget, and the public co-financing covers the expenses to the research institutions. DKK 101 million (approximately €13 million) has been allocated for the years 2003-2005. The new Council for Technology and Innovation is responsible for the allocation after hearings in the Research Councils.

The Innovation Consortia scheme replaces the Centre Contract scheme (DK 7).

Four other Trend Chart measures have their main focus here. These are *the Centre Contract Scheme* (DK 7), the *Approved Technological Service Institutes* (DK 8), the *Innovation Post-Doc Scheme* (DK 11), and *Regional Growth Centres* (DK 13).

GTS institutes (DK 8) develop technological competencies, transmitting these to Danish trade and business. The public certification enables the institutions to apply for so-called basic funds as co-funding for parts of their activities. The Council for Technology and Innovation directs the funding through a set of three-year contracts. The funding has totalled between DKK 250 and 300 million (€35 million to €40 million) in recent years.

The research programme *Innovation Post Doc* (DK 11) is focused on younger researchers within all research areas and it facilitates co-operation between public research institutions and private companies. The resource is a so-called post-doc scholarship given to researchers having a maximum seniority of five years in research or a PhD degree. It is a prerequisite that a formalised co-operation with one or more companies should be established, but the researcher may be employed at a university, a hospital or a public research institution.

The purpose of the *Regional Growth Centres* scheme (DK 13) is to build on existing regional strengths, and to promote co-operation between companies and knowledge institutions within technology, market development and organisation.

The intention is to develop centres that build on regionally based technologies or competencies having commercial potential. Companies, vocational educational institutions and technological service

institutions can then combine forces in these centres to carry through concrete development projects. The centres will make facilities and manpower available to local trades and industries and also provide a framework for developing educational competencies. The centres will be co-financed by the state, regional authorities/institutions and local businesses. It has a long time horizon, and will be evaluated for possible adjustments in 2003. Six centres were established in 2001, and 11 in 2002 (none has been established in 2003). The budget for 2001-2003 (inclusive) is DKK 80 million (about €11 million).

The scheme will contribute to the establishment of long-term co-operative relationships between the parties, and to an increased sharing of knowledge among them.

From an organisational point of view a 'Regional growth centre' will be established as a consortium, comprising at least one educational institution and one technological service institution (typically one of the relevant GTS institutes). Other members would be local authorities, companies, and private consultancies. The consortium would also set up a secretariat with its own name and logo, etc.

Finland

Even though the mobility of personnel is considered to be one of the most important mechanisms of knowledge transfer, mobility between the universities and the business sector has been more modest than expected. Thus, in its 1996 review, the Science and Technology Policy Council recommended the promotion of expert mobility and the intensification of its monitoring (Science and Technology Policy Council of Finland 1996).

According to a recent survey on the significance of measures aimed at increasing human resource mobility between industry and science, the most significant factors have been long-term relations between companies and universities in graduate mobility, co-operation in graduate education between universities and industry (e.g. joint supervision of doctoral and master's theses), and coordinating structures for considering the requirements of industry within university education programmes. Additionally, many doctoral and master's theses have been funded by the industry sector in Finland.

It has been recognised that mobility of research staff between the public and private sectors is relatively minor. There are structural barriers which do not encourage career moves in either direction, for example disparity in earnings. There are also factors that discourage researchers from creating new start-ups. In addition to financial risks, the founder may lose his/her professional reputation should the business fail.

Overall though, the mobility of highly educated personnel increased during the 1990s. In 1998, nearly one in four highly educated employees changed job (compared to 17 per cent in 1992). The mobility of educated research personnel was slightly higher, being clearly highest in the ICT sector. (Statistics Finland 2001).

Close co-operation between companies, research organisations and universities is considered a specific strength of the Finnish system of innovation. The single most important ongoing activity in this field has been *Tekes'* technology programmes (FI 12). In 2002, about 45 large national technology programmes were under way. Participating in them were some 2,200 companies and 790 research institutes. Approximately 52 per cent of the financing for company projects and 58 per cent of the financing for public sector research projects was channelled through technology programmes, totalling € 204 million.

Tekes' technology programmes are used to promote practical co-operation and encourage networking between companies and research institutes, while also strengthening technology transfer and supporting international expansion. The technology programmes are demand-oriented in the sense that they have been planned with the needs of companies in mind, and have been implemented in collaboration with companies. The planning takes place in workgroups and seminars involving firms, universities and research organisations, and the explicit aim of the programmes is to promote collaboration between these parties. Each programme has a steering group, a co-ordinator and a representative from *Tekes*. The technology universities and the Technical Research Centre of Finland (VTT) have led most of the programmes. Their duration ranges from three to five years (average 4.5 years) and their average budget is approximately € 33 million. *Tekes* usually finances about half of the

costs. The technology programmes have also functioned as a good framework for international R&D co-operation, for example, within the EU's framework programmes.

The achievement of programme objectives and the success of projects are systematically evaluated both during their implementation and after their completion. Interim evaluations help in steering the programmes more effectively and in achieving better results. They help in evaluating the profitability of the programmes and support the overall strategic development of programme activities and the activities of *Tekes* in general.

The main benefits of the technology programmes lie in the close co-operation established between research institutes and industry, the widespread involvement of small and medium-sized companies, and the high level of international co-operation. The technology programmes have been criticised for being too technology-oriented and too fragmented, and not allowing room for unconventional approaches (Tuomaala et al. 2001).

The cluster programmes (FI 8) are also an example of major public support for collaboration. They aim to support R&D that strengthens industrial clusters by promoting co-operation in certain fields of industry, or around certain themes.

In addition, there are various initiatives and schemes that concern the establishment of framework conditions conducive to innovation at the regional level, most notably *the Centre of Expertise Programme* (FI 5). Part of the R&D funds channelled through the TE centres, for example, finance co-operative R&D projects. The EU's Structural Funds - in particular the objective 2 RTDI funds and measures - also play an important role since they are typically integrated into regional projects of domestic origin.

France

Although there are no new measures related to this action line during this period, the earlier measures introduced by the Government and related to this subject are still in use (FR 3, FR 6, FR 7, FR 14, FR 31). Besides, the Ministry of Research continues to simplify the access to these measures at regional level. In most of the regions, these measures are part of the multi-annual contract between the regions and the state (CPER).

Besides these measures, the *Innovation Law* allows, encourages and favours the creation of innovative enterprises by all research actors[8]. Some of the requirements for co-operation with enterprises for research personnel are as follows:

- The enterprise should valorise the research results
- The researcher should keep in touch with the public service
- The researcher should join the enterprise as a partner or as the director
- A contract must be concluded

The researcher needs to ask for a written authorisation, before the registration of the enterprise is done. This authorisation is given for two years, renewable twice. It is interesting to note that the authorisation cannot be rejected, except for exceptional cases and for reasons related to the respect of moral and material interests of the public service.

Once the authorisation is given there are several possibilities offered to the researcher:

- The researcher is on secondment: the salary is paid by the enterprise
- The researcher is a delegate: the salary is paid by the original organisation
- The researcher is a delegate for a research valorisation organisation (if the enterprise is not created)

At the end of the six-year period the researcher can continue to work for the company, in which case he needs to cease all his activities for the organisation of origin, or he can go back to his organisation

[8] Innovation Research University Enterprise, New Possibilities for the research personnel co-operation with enterprises. Practical Guide. Ministry of National Education, Research and Technology.

of origin. It is important to note that at any time during this six years the researcher can change his status within the company or end his link with the company and go back to his original organisation.

Although only one possibility for this type of mobility was here analysed, there are other ways of research and enterprise co-operation that proceed along the same lines:

- The researcher leaves for a company already created
- The researcher can carryout a consulting activity in a company
- The researcher can hold to up to 15% of the capital of an enterprise
- The researcher can be on the supervisory board of a public limited company

Co-operation between research institutes, universities and companies is one of the main priorities of the French Government. All of the measures explaining the importance given by the Government to the subject have been studied before: *RRITs* (FR 17), the *CNRTs* (FR 29), the incubator structures (FR 12), the seed-capital funds (FR 13) and the project of *Technological Platforms.*

Another important issue is the development of SAIC (FR 51**-***Services d'activités industrielles et commerciales* – Industry and trade activity services). The 1999 Law provided the option for a university or a higher education institute to create SAICs in order to structure and manage all their activities in the valorisation of research. All the industrial and trade activities of HEI can be managed by SAIC with the exception of training activities. The three first decrees concerning SAICs organisation were published in 2002. A fourth one, concerning the human resources recruited outside the permanent HEI staff statute, will be published soon.

SAICs have their service status in the place where they operate. They are in charge of managing all the industrial and commercial activities that are not ensured by the company or a grouping. Their role can be divided into different categories:

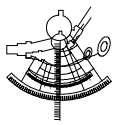
1. The activities for which an enterprise requests the services of a university: negotiation and management of test, research, analysis, consulting, contracts and so on.
2. The valorisation of research activities: patents, licences, IPRs, etc.
3. Activities where specific tools should be at the disposal of a researcher wishing to create an enterprise or launching a commercial or industrial activity.
4. The general management of the university's commercial activities, with the exception of life-long learning.

SAICs have a budget and accountancy system separate from the operational organnisation. In turn, the organisation can hire personnel to assist the of functioning the SAIC. The objective of these experimental establishments is to define the necessary legal, organisational, financial and accountancy conditions for the SAICs in a public scientific, cultural and professional organisation. In 2002, 14 experimental SAICs were put into place in volunteer organisations. The capitalisation of the experience gained became concrete with the development of the *Guide for the setting up of a SAIC*. And finally, a seminar was held in Rennes in December 2002 to evaluate the results of the experiment. It allowed for the comparison of experiences, problems and the solutions to be undertaken.

In 1999, the Ministry of Research created the Technological Research Teams (ERT). These teams are made up of recognised researchers that, together with industrialists, work towards the solution of long-term technological problems. In order to be recognised as an ERT, it should be involved in research of quality and count on the financial and/or human support of its economic partners. A total of 56 ERTs have been recognised: 11 in 1999, 12 in 2000, 19 in 2001 and 14 in 2002.

At the European level, France plays an important role in the Eureka programme. During the last Ministerial Eureka conference, France was placed first with the initiation of 25 projects for a total of €80 million. French public financing was also important:

- The ANVAR assists 25 projects for a total of €12 million
- The Ministry of Research has provided €2 million for five projects



- The MINEFI has financed projects for a total of €5.2 million

A new measure, *Better valorisation of research by enterprises*, launched by the innovation plan will indirectly encourage co-operation between research universities and companies. As mentioned before, this measure has the objective of improving the valorisation of both research and project research investments. There are three possible ways of valorisation one of them being the partnership contract between public and private research to transform an idea or a product in the market.

Germany

Personnel mobility is one of the most important sources of technology transfer and technological co-operation between firms and public research institutions. In addition, the international exchange of students is gaining importance in a globalised economy. However, recent studies complain that German universities are unattractive to foreign students due to an internationally incompatible system of courses, bureaucratic burdens for foreign students, and a low number of courses taught in English.

Moreover, both within political parties and public institutions, openness as regards international mobility is not always highly developed. In December 2002, the Federal Constitutional Court rejected a new Federal law that intended, among others, to ease mobility of qualified people.

Many innovation policy programmes address issues of human resource mobility, especially with respect to knowledge and technology transfer between industry and science. The international mobility of students and researchers in science is supported by special measures offered by the BMBF, such as exchange programmes and. internationally oriented study courses. The *Investment Programme for the Future*, launched in 2001, provides €87 million for mobility programmes for students, graduates, and top-level scientists.

The recently established 'junior professorships' are expected to contribute to increased mobility in the academic sector (see DE 59, 2.4). The professorships have been introduced to offer an internationally compatible way for academic qualification at German HEIs after finishing a doctoral study and before receiving a full professorship. Junior professorships are designed for young scientists with a PhD and offer a three-year period for research and teaching at a HEI that may be extended by another three years following a positive evaluation. By this measure, the average age of entering a professorship at German HEIs should decrease. The BMBF gives financial support to HEIs to establish such professorships to the tune of €180 million.

In order to tackle the shortage of highly skilled workers, especially those with ICT skills, an Emergency Programme was announced by the Federal Government in September 2000 (DE 45). The programme aims to facilitate access to IT jobs in Germany for top-level IT specialists from abroad. In a first step, up to 20,000 IT specialists may take up jobs in Germany. At the same time, companies are urged to increase their own investment in education and vocational training. Furthermore, the supply of computer science studies at universities is being increased. As a consequence of the current economic recession, demand for IT workers decreased considerably in 2002. At the end of January 2003, the number of issued working permits for IT specialists was 13,566. Foreign IT specialists who have been dismissed due to the current recession are now forced to return to their home countries. Nevertheless, the programme was extended in July 2003 until the end of 2004 in order to compensate for the lack of the new immigration law that had been rejected by the Federal Constitutional Court in December 2002.

In addition, there are government programmes that support the exchange of research personnel between industry and public research institutions, e.g. ProInno (DE 28, see 3.2). In this programme, support for transnational R&D co-operation will receive a higher rate of subsidy from 2004 onwards. For Eastern German SMEs, there is a special action line within the R&D grants programme for SMEs in Eastern Germany (DE 19, see 3.2). Almost all *Länder* run separate exchange and mobility programmes designed to stimulate researcher mobility. Some programmes are called 'Innovation Assistant', providing financial support for SMEs that employ graduates in the course of innovation projects. A further measure in this context is the reform of higher education institutions (DE 59, see 2.4) that aim, amongst other objectives, to increase the attractiveness for researchers from the

company side to move back to universities. Mobility of students, researchers and teachers is partially addressed by the following measures, which are discussed in some detail in the sub-sections given in parentheses: DE 03 (1.1), DE 21 (3.3), DE 23 (3.3), DE 44 (1.1), DE 64 (3.3) DE 74 (3.3).

Strengthening knowledge and technology transfer between industry and science is one of the major goals of the Federal Government's innovation policy. In April 2001, a new action programme, *Knowledge Creates Markets,* was presented jointly by the BMBF and the BMWA. Within the action programme, several new measures have been announced and were implemented in the past two years. They attempt, together with a number of existing schemes, to strengthen the links between industry and science and to smooth the exchange of new technologies and competencies in innovation activities. The most recent developments are a programme to improve the commercialisation of research findings at HEIs and PSREs, the so-called 'commercialisation offensive' (DE 72), and the implementation of the recommendations out of a system evaluation of co-operative research promotion by the BMWA, covering the schemes ProInno (DE 28), InnoNet (DE 26), IGF (DE 17) and R&D Grants for SMEs in Eastern Germany (DE 19) (see 3.2 for a short characterisation of the planned changes in DE 26, DE 17 and DE 19).

The following programmes focus on intensifying co-operation between public research and the enterprise sector:

- The InnoNet (DE 26) programme aims to improve co-operation between SMEs and research establishments and to initiate a comprehensive way of collaborating. Collaborative projects are required to involve at least four SMEs and two public research institutions. InnoNet covers pre-competition R&D projects, while financial support is provided for the research institutions involved in the network only. The programme ProInno (DE 28) also provides funding for collaborative R&D projects among SMEs and public research organisations, including the temporary transfer of R&D personnel (see 3.2). About 50 % of all projects funded under ProInno concern collaborations between SMEs and public research organisations.

- Direct research grants within thematic programmes (DE 67 to DE 71) are normally provided for research consortia that consist of both companies and public research institutions. About 35% of all R&D grants to firms are provided for co-operative research that involves public research organisations. This share has been rapidly increasing in recent years. In the case of *Lead Projects* (DE 25) in particular, this type of research is compulsory. Out of co-operation in publicly supported projects, many long-lasting relationships occur. In order to support such relationships, sector-specific networks of competence are fostered (see DE 36). In certain fields of technology, such as biotechnology, special sub-programmes directly address the issue of technology transfer (see BioRegio/BioProfile – DE 23).

- The Universities of Applied Sciences (*Fachhochschulen*) are an important source of knowledge to SMEs. Strengthening the support for the research base of this university segment, which is quite small compared to that of ordinary universities, is therefore essential for fostering innovation in SMEs (see DE 42). Moreover, the BMBF, having increased the inclusion of *Fachhochschulen* in the project grants, is also supporting the addition of extra research personnel in the *Fachhochschulen*.

Increasing interaction between industry and science is also among the main goals of institutional reform at PSREs (DE 58) and HEIs (DE 59), including activities within the HEI special programme (DE 03). Special measures concern the promotion of start-up activities (EXIST-programme, DE 21) and the commercialisation of research results by using IPRs (DE 72). Furthermore, almost every HEI and PSRE in Germany runs its own technology transfer office, some on a centralised basis and others on a more decentralised basis. The financing is provided from institutional funds and (in some cases) out of the income of commercialisation activities (see Schmoch *et al*. 2000 for an overview). The Federal Government also offers support for the establishment of new professorships on entrepreneurship at HEIs (DE 60) as well as the strengthening of study courses on start-ups and the management of new enterprises within university curricula. Both activities should serve as another element in improving framework conditions for interaction with companies.

Finally, co-operation between industry and science is part of several other R&D promotion programmes, such as the IGF programme (DE 17) and *the Grants for R&D in SMEs in Eastern Germany* programme (DE 19). Moreover, cluster programmes are also addressing the issue of co-

operation in research. InnoRegio (DE 16) and *Innovative Regional Growth Poles* (DE 57), for example, exclusively fund regional networks that consist of industry and academia, and most projects that receive funding under these programmes are co-operative research projects. Also the programme NEMO (DE 75) is intended to strengthen networks of SMEs and public research organisations.

Greece

Mobility is relatively low in Greece but there are schemes that aim at improving it. Mobility was, in the past, supported through the YPER [GR 11] programme, by European programmes and by the university placement programmes. Overall the number of schemes and budgets indicates that compared to other countries it remains a lower priority in the Greek agenda. The YPER targets are now taken over by PENED [GR 41]. Mobility between industry and academia is assured directly by a student placement programme [GR 38] but also indirectly through the networking activities such as R&T consortia [GR 55]. Greece, which is a country known for a large scientific diaspora, also promotes cross-border mobility. A less successful scheme of the past was replaced by the ENTER Programme in 2001 [GR 44] which is operational. International mobility is supported through bilateral agreements.

Greece has a limited culture of research organisations and industry. The last decade is marked by an effort to create such a culture, initially with smaller less ambitious programmes and then through the EKVAN [GR 16], which was the basis for the new *Research and Technological Development Consortia in Sectors of National Priority* [GR 55]. A new call for the support Liaison Offices [GR 10] implemented in 2003 may further strengthen this co-operation, and so will AKMON [GR 43], supporting technological services from academic laboratories. Past calls on excellence in the GSRT supervised research centres and institutes [GR 49] and PENED [GR 41] launched by the GSRT in the framework of the Operational Programme ''Competitiveness'' also aimed *inter alia* at reinforcing co-operation between research, universities and companies.

Ireland

The shortage of research graduates available to Ireland's scientific community has been a concern for Forfás and the Expert Group on Future Skills Needs. The latter carried out a study which has revealed that the supply of research graduates leaving the Irish third-level education system is insufficient to meet the needs of the Irish research system. The Expert Group has highlighted the urgent need to attract foreign research graduates and post-doctoral researchers to Ireland.

The Expert Group commissioned a study to examine strategies and mechanisms that have been put in place by best practice and competitor countries by national governments, science and technology organisations and third-level institutions to attract foreign researchers.

The study compared strategies and mechanisms developed in five benchmark-countries to attract foreign research graduates and post-doctoral researchers. The five benchmark-countries were the following:

- two countries that are the top global competitors in the attraction of internationally mobile researchers: the UK and the US, and

- three 'competitor' countries in Europe that have similar small research systems with modest international reputations: Finland, Denmark and the Netherlands.

The report made a number of recommendations to attract foreign researchers to Ireland:

1. Build up centres of excellence.

2. Improve international networks and visibility of Irish universities.

3. Improve the status and remuneration of research graduates and post-doctorates.

4. Make the move to Ireland as smooth as possible.

A recent study by the Irish Council for Science, Technology and Innovation (see Section 6 below) found that post-graduate stipends and salaries in Ireland were competitive with those offered by research institutions in competitor countries such as the United Kingdom.

Two initiatives recently introduced by the cross-border trade and business development body, InterTradeIreland, target students/colleges and companies across the whole of Ireland. These are:

1. FUSION (IE 29) - previously termed the 'All Island Knowledge Transfer Initiative' (replaces IE 11 on an all-island basis)

This initiative brings together three partners:

- Company — an SME with a technology-based development need.
- Knowledge Centre — a third-level institute such as a college, university or technology centre.
- Knowledge Carrier—a degree or diploma holder out of college/university within the last five years.

Each participating company has a specific technology-based development need and is subsequently matched with a knowledge centre with specialist expertise in that field. A graduate is then employed by the company for up to 18 months to work specifically on meeting the specified development need. During this period, the graduate has full back-up support from and access to the knowledge centre. In essence, the graduate acts as a conduit or knowledge carrier facilitating the transfer of knowledge from the college to the company. A dynamic tri-partite arrangement is formed between the company, college and graduate focusing solely on meeting the high-spec technological development need.

This project will involve 40 companies, 40 colleges and 40 graduates. The 40 companies will be 'recruited' onto the initiative on a rolling basis over a period lasting four to six months.

A panel of 300 graduates has been set up. These graduates will be presented with employment opportunities to start on a rolling basis in line with the recruitment of companies.

2. FOCUS (IE 30) - previously termed the 'Cross-Border Trade Programme' (replaces IE 12 on an all-island basis)

This initiative targets SMEs that want to develop new business opportunities on the opposite side of the border. For each participating company, a graduate is employed for a 12-month period to work specifically on identifying real market opportunities and delivering actual sales on a cross-border basis. During that period, the graduate receives full back-up support from an experienced sales-and-marketing consultant coupled with a series of intensive tailored training sessions. The consultant also works with the company in overseeing the complete process. This project will involve 20 companies and 20 graduates.

Enterprise Ireland, the State development agency for the indigenous enterprise sector, operates a number of researcher mobility schemes including the Post-Doctoral Fellowship which supports high quality post-doctoral fellows to conduct research in Ireland and the International Collaboration scheme which assists Irish researchers to establish new research collaborations with high quality research groups internationally.

There are a number of initiatives that seek to development co-operation between the third level sector and companies. An example of such an initiative is the *Innovation Partnership* scheme operated by Enterprise Ireland, the national agency responsible for the development of indigenous enterprises in the manufacturing and internationally traded services sectors. The purpose of the Innovation Partnership scheme (formerly known as the Applied Research Grants Scheme for Universities and the Institutes of Technology) is to support the undertaking of collaborative applied research with direct

industrial and commercial application, between industry and third level colleges. The Innovation Partnership scheme is open to academic staff of third level colleges in collaboration with an Irish-based company, including commercial state bodies or a consortium of both. Successful project proposals must demonstrate a clear benefit to the participating company(s), for whom the college carries out the R&D. Enterprise Ireland co-funds the college research costs, providing grants from 35% up to 75% of its total eligible costs, subject to a maximum contribution of €190,000.

Other relevant Enterprise Ireland initiatives which support co-operation between the third level sector and enterprise include:

- *Research Innovation Fund:* This Scheme provides support to researchers in the third level sector to bring projects to the stage of 'working prototype' or 'proof of principle'. The scheme essentially supports research ideas with commercial potential that arise from researchers within the Third Level academic community.

- *Regional Business Incubation Space:* This Programme strengthens the regional innovation infrastructure by facilitating the provision of incubation and commercial R&D space for the development and establishment of high potential businesses, with particular emphasis on the role of the Institutes of Technology.

- *Third Level Incubation Centres*: This Programme aims to expand the base of high-tech companies operating on college campuses by providing funds to assist third level colleges to develop and expand incubation space facilities.

New funding from Science Foundation Ireland (SFI), which is responsible for funding Ireland's technology foresight initiative, has also impacted on the development of co-operation between the third level sector and industry. SFI's Centres for Science, Technology and Engineering (CSET) scheme is designed to foster collaboration between academic and industrial researchers on research programmes in biotechnology and ICT.

Expertise Ireland (www.expertiseireland.com) is a web-based information portal that has been developed to collect information on all researchers in the Republic of Ireland and Northern Ireland. Currently only six universities are providing information to this database, but there have been agreements with the other universities, Institutes of Technology and some other research institutions. Visitors to the web site can use the search facility to find relevant expertise within the participating education institutions. The Expertise Ireland web site has been developed by InterTradeIreland and the Conference of Heads of Irish Universities (CHIU).

Italy

The implementation of this objective started with Law no 196, (24 June 1997) and Law no 449/97. It is now regulated by the D.L. 297/1999, which represents an important 'innovation' in this field. D.L. 297/1999 covers all MIUR interventions concerning the coordination, promotion and implementation of measures aimed at sustaining research and innovation in industry by mean of a unique fund which absorbs all the previous ones. (IT 11, IT 36) (MURST Decree 8 August 2000, Official Journal n.14 18 January 2001).

Luxembourg

Until 2003 the absence of complete university masters degree courses in Luxembourg had put students in the position of having to continue their studies abroad. ('forced' mobility)

Research grants from the Ministry of Culture, Higher Education and Research allow students and companies to be put in touch with each other and the scientific interests and research work of the former to be directed towards the technology needs of the latter. These grants are awarded to Luxembourg or foreign scientists or technicians for a maximum period of three years to enable them to complete their doctoral (or post-doctoral work) or to collaborate in an R&D project. Research can be carried out at a university or a research centre abroad, in a PRC in Luxembourg or in a company based in Luxembourg (LU 7).

So far the promotion of student transfer to companies, within the framework of the Leonardo da Vinci community programme for student mobility, has given rise to a certain amount of interest within Luxembourg companies.

September 2002- August 2003

As previously stated, the new University of Luxembourg (LU 14) will place an emphasis on the mobility of students (an obligatory period of study abroad is foreseen), teachers and researchers.

The very foundations of this co-operation were laid with the law of 1987 on research in the public sector and technology transfer to private companies, however, it took shape though the PRC co-operative projects with private companies. It is expected that the approach of poles of technological competence will help to strengthen links between PRCs and companies.

The law of 9 March 1987 on R&D lays down conditions for the setting up of public research centres within public organisations or public higher and university education centres. PRCs are responsible for undertaking research as well as technological development and transfer activities aimed at promoting scientific progress or technological innovation. Their aim is also to promote, both on a national and on an international level, the transfer of technologies and scientific and technical co-operation between Luxembourg or foreign PRCs and companies. They can undertake R&D and technology transfer activities in fields covered by higher education in Luxembourg. At present, there are three PRCs: PRC Gabriel Lippmann, PRC Henri Tudor and PRC Health.

The PRC Gabriel Lippmann was created by the law of 31 July 1987 and its activities are aimed at strengthening the country's economic tissue by creating new technological expertise within the Gabriel Lippmann Public Research Centre and transferring this know-how to companies. It is qualified to operate in the following fields: Material analysis, environmental technology and biotechnology, information technology, economic and social aspects of today's world.

The PRC Henri Tudor was also created by the law of 31 July 1987 and seeks primarily to promote technological innovation in the private and public sectors. To this end, it offers a wide range of services and activities, including R&D projects, technology transfer, technological assistance and advice, training and high-level skills.

It is divided into service groups, resource groups and laboratories:

- Activity poles: information and communication technology; industrial technology; environmental technology.
- Service groups: SITEC - continuing education centre; Data communication services in co-operation with Restena; Technology Watch Centre, which includes the library jointly shared with IST.
- Resource groups: Technological Resource Centre for manufacturing industry; Technological Resource Centre for the Disabled and Elderly; Technological Resource Centre for Health; Multimedia Resource Centre; Building Information Technology Resource Centre.
- Laboratories: Production System Automation; Biomedical and Image Processing; Software Engineering; Applied Micro-Electronics; Multimedia Engineering.

The PRC Health was created by the law of 18 April 1988. It is responsible for undertaking and co-ordinating research, development and technological transfer activities aimed at promoting, both on a national and on an international level, scientific progress and technological innovation in fields relating to the various departments of the National Health Laboratory and the CHL. It is also responsible for development, research and technological transfer in all fields of medical science, including the promotion of public health, treatments, prevention of human diseases, virology, immunology and cancer research. This has allowed the promotion of an effective and essential collaboration with research organisations in the private and public sectors as well as on a national and international level.

Within the context of their attributions in matters of technology transfer, the PRC also organise specialist training courses, and create tools for information, sensitisation and documentation in the matters in which they specialise.

September 2002- August 2003

No specific change

Netherlands

The priority assigned to this sub-area was relatively low. As part of the streamlining of the technology policy instruments in the Netherlands in May 2001, the KIM (Knowledge Carriers in SMEs, NL 6) was merged with the Feasibility Studies MKB (NL 12, see under 3.5). The firm-oriented knowledge transfer facility, *Knowledge Transfer Entrepreneurs SMEs* (NL 35) still contains elements of mobility. The measure seeks to support innovation projects in SMEs through the (temporary) employment of high-skilled workers.

No new initiatives have been taken in the period under review in this report. The priority given to this area remained largely the same in the period under review. It is however expected that this area will become a major area in the near future as it appears that the lack of researchers and teachers is also related with a lack of mobility. One issue that the government announced to be addressed in the coming period are the huge bottlenecks in recruiting research workers from abroad and especially from outside the EU.

Since the early 1980s the collaboration between research, universities and companies has remained an important item on the policy agenda. Several instruments were developed accordingly, especially by EZ:

- The Leading Technological Institutes (see NL 19)
- R&D subsidy schemes which promote collaboration, such as BTS (NL 1), SMO (NL 14), EET (NL 13), IOP (NL 18) and Technological Co-operation (NL 37)

Besides instruments that encourage co-operation directly, there are a number of initiatives that induce research institutes and universities to direct research efforts more toward the needs of business. One important instrument is the Innovation-oriented Research Programme, IOP (see NL 18). The IOP instrument is an umbrella-scheme of subsidies to universities and non-profit research institutes for research programmes in pre-determined technological areas that meet the long-term needs of business. Second, as described above semi-public organisations such as TNO, the GTIs and DLO need to acquire a major share of their funding through external contracts. Moreover, funding of TNO by EZ is contingent upon co-financing by firms. The second initiative in this respect is the Technology Foundation STW (NL 31). EZ and the Research Council NWO jointly contribute to the Technology Foundation STW. The aim of the contribution is to promote high-quality technical-scientific research projects and its application by business in particular. Finally, the projects that are funded in the context of ICES/KIS (NL 29) also involve private-public co-operation. As indicated in section 3.1 above €805 million was committed to a third investment impulse into the knowledge infrastructure (ICES/KIS-3) in March 2002.

The priority given to this area remained largely the same in the period under review. Nevertheless the approach to this subject has become more systematically embedded in the overall policy approach. The Government Agreement announced that efforts should be targeted to a number of strategic areas such as IT and biotechnology. The IBO exercise has prompted a streamlining of instruments, leading to a reduction of the number of instruments as well as a more systematic categorisation into types of measures. We can now distinguish between:

- Basic/strategic research conducted in organisations such as TNO, the Large Technological Institutes, the Technological Top Institutes (NL 19)
- Instruments with a long-term programmatic character with multi-annual research plans
- Instruments supporting collaborative RTD projects (often with specific tasks and limited in time)
- Large scale integrated activities and programmes such as a package of measures on the topic of genomics, using several existing instruments to focus on one strategic technology area
- A fiscal instrument (WBSO (NL 5) to support R&D efforts in individual firms

Portugal

The need to promote people mobility and to improve the linkages between University and the Industry has been addressed by several Operational Programmes, namely the Operational Programme Education, the Operational Programme Employment, Training and Social Development, POE (now PRIME), POSI and POCTI. In 2001 a new regulation on the integration of doctors and masters in companies and technology centres was published (PT 22) under POCTI, with an aim to improve companies' in-house capabilities. The mobility issue was also included in PROINOV through the action line 'Enhancing education and training'.

In the period under review, two important measures were launched with a bearing on technically skilled staff mobility, although not chiefly addressed to this issue. One is the *QUADROS Programme* (PT 35), which follows the line of the old programme on 'Jovens Técnicas para a Indústria – JTI' (Young technicians for Industry). It is aimed at encouraging companies, mainly SMEs, to recruit young technical staff in technological fields, as well as in economics and management, up to a maximum of 3 people per firm. The programme supports the employment of people holding a doctoral, master, licenciatura or bachelors' degree, thus contributing to the mobility of people from University to industry. A similar effect may be reached through the NITEC programme (PT 36), regarding the creation of R&D teams in companies. It is, however, to be seen how these programmes will be articulated, as well as how they will relate to POCTI programme on the integration of doctors and masters in companies and technology centres (PT 22).

More specifically aimed at promoting mobility and University-Industry co-operation are the so-called grants for in-company doctorates. The objective of this programme, which has still to be launched, is to foster the involvement of firms in post-graduate education through the provision of grants for doctoral or master candidates to develop their research projects inside firms which are interested in the respective research topics.

This is a hot topic in the political discourse on innovation policy. As it was mentioned in previous reports, the Operational Programmes for 2000-2006 – namely POE, POCTI and POSI – include several actions aimed at promoting the co-operation between the University and Industry. The main measures in this regard have been R&D activities by consortia (PT 21) and the *Mobilising Projects for Technological Development* (PT 23). Both are now included in the context of IDEIA (PT 33) – the main programme for addressing University-Industry co-operation.

One of the headlines of the Presidential discourse during the 'Innovation Week' was the need to encourage the co-operation between University and the Industry, to generate virtuous circles of technological development and an upsurge in innovation. This is also one of the main objectives of COTEC. This association is expected to act upon the demand side in order to contribute towards an easier relationship between these two worlds. Similarly, the about-to-be published *Action Plan on Innovation* is expected to address this issue.

While the need to strengthen the links between science and industry is unanimously acknowledged, the translation of policy intentions and statements into reality is not easy, due to both behavioural and structural factors. The University Teachers Career Statute is undoubtedly a hindrance to a closer relationship – but it would be unwise to put all the blame on it. Bridging the two worlds demands people capable of acting as 'translators' and who are at ease in either world or even in both at the same time.

During the last year, several measures were taken in this regard:

- NEST – *New Technology Based Companies* (PT 34), providing support for the creation of new technology oriented companies with the aim of profiting from the country's investment in the education of scientists and engineers.
- NITEC – *Incentive System for Creating R&D Nuclei in the Company Sector* (PT 36), which aims to create in-house R&D competencies in firms, as well as to enhance their capabilities in the areas of designing and implementing projects for developing new products and/or processes and of assimilating external technologies and knowledge.
- DEMTEC – *Incentive System for Undertaking Pilot Projects Concerning Technologically Innovative Products and Processes* (PT 37), which focuses on the industrial validation of

knowledge relating to the application of new technologies as well as on the demonstration and diffusion of such applications.

- The launch of the Programme for Supporting and Encouraging the Participation of Portuguese organisations in the VI Framework Programme (PT 38), which is aimed at helping in the process of identifying partners and preparing applications to the Framework Programme. Designed by UMIC, this Programme includes three instruments; a web page, a consultants roster and a financing line through POSI and POCTI.
- Although indirectly, the QUADROS programme (PT 35) may also contribute to create bridges between Universities and SMEs, and
- IDEIA – *Applied Research and Development in Companies* (PT 33).

IDEIA is a new programme, which encompasses the old POCTI and POE programmes on R&D activities by consortia (PT 21) and Mobilising Projects for Technological Development (PT 23), respectively. It is one of the main thrusts of the Government in the area of innovation, and deserves a closer presentation. It supports projects involving companies and S&T organisations, led by the former. Projects should have a maximum duration of three years, and their objectives must include the following: valorisation of the results of research by S&T organisations and the transfer of technologies to companies; the development and endogenisation of technologies concerning new products, processes or services; and the support and participation of Portuguese consortia in international projects on research and technological development. Projects may include two types of action: (1) 'industrial research', focused on the development of new technologies and the mastering of new competencies, and (2) 'pre-competitive research' through the development of prototypes and pilot projects with a view to the economic valorisation of research results. Incentives will consist in a reimbursable grant when support is below €100,000, and a combination of a non-reimbursable grant and a zero-interest loan, when the amount of incentive is higher. The maximum incentive rate should not exceed 75% of eligible expenditures for 'industrial research' projects and 50% for 'pre-competitive research'.

Available information indicated that up to the end of February 2003, 93 projects were submitted to IDE of which 85 have been evaluated, but only 30 approved. In the second call of IDEIA (30 June 2003), 53 applications were received[9].

Spain

The importance of Human Capital on Research has been one of the main strategic objectives of the Government in this period (since the implementation of the *IV National Plan for Scientific Research, Technological Development and Innovation 2000-2003*). The Ministry of Science and Technology (MCYT) has demonstrated its commitment to improve labour and mobility conditions of researchers and RTD personnel, with the general aim of favouring the transfer of knowledge and increasing the number of RTD personnel. Thus, through the IV National RTD Plan some new measures have been launched, and those traditional schemes have been improved.

Accompanying the Ministry's goal, we can mention the *New Law of Universities,* which gives particular attention to human resources and foresees the creation of new university RTD professional profiles. The new Law encourages:

→ mobility of researchers;

→ engagement of professors to carry out mainly research activities;

→ hiring technicians to support research in university departments;

→ establishment of mixed centres among universities, public and private research centres and firms;

→ start-up of new technology-based firms from university research activities.

Regarding traditional schemes under the IV National RTD Plan, some mobility fellowships have been launched: *Mobility Grants for Professors and Doctoral Students* and *Grants for Researchers and*

[9] *Jornal de Negócios*, August 6, 2003

University Professors to make residential visits in Spain and abroad. Used as a RTD political instrument for a long time, this grant system has experienced a significant updating since 2001, for instance, the increased amounts of grants and endowments.

On the other hand, the MCYT has introduced some modifications favouring the flexibility and mobility of researchers working in Public Research Organisations attached to the MCYT. These modifications, approved in the framework of the Law of Fiscal, Administrative and Social Measures, allow the mobility of researcher among the different public research organisations as well as their mobility to enterprises, having their original labour post assured for four years. In the same direction, an amendment to the Science Law allow public research organisations to operate in a more flexible way, permitting greater co-operation fields and modalities between them and companies.

As relevant new measures we can mention two key programmes: the *Ramón y Cajal Programme* (ES 25) and the *Torres Quevedo Programme* (ES 30).

The *Ramón y Cajal Programme* (ES 25), launched in 2001, is aimed at the permanent insertion of researchers in the Spanish Research System. This programme is the response to the research community's claims of a lack of job opportunities in the national public research system. The programme co-finances the cost of researchers' contracts in a Public Research Institution (RTO and Universities) during a period of five years. It is practically a reform of a previous measure based on a three-year return-grant system for Spanish researchers who had developed their RTD training out of Spain. This new measure extends the coverage of contracts (up to five years) and reinforces the commitment between research institutions and researchers.

This programme has published three calls for proposals, one in each year of its duration (2001-2003). In its two first calls, the programme has approved the co-financing of 1,215 contracts. The third call, published in February 2003, offers the co-financing for another 700 new contracts, with a budget of €32 million for 2003.

The MCYT will provide the 80% of the contract cost for its whole duration (5 years), and the centres will finance the rest. Some novelties of this third call can be mentioned: the updating of the annual gross salary (up to €39,589 plus an additional grant of €6,000 in the first year to initiate the research activity in the new centre); the smoothing of the call management and accelerating procedures; the electronic submission; the improvement of the payment process.

The *Ramón y Cajal* programme finishes in December 2003, but the MCYT intends to renew the programme and include it in the new National RTD Plan 2004-2007, which is currently being developed.

On the other hand, we have the *Torres Quevedo Programme* (ES 30), aimed at the insertion of doctorates in firms. This programme is the re-formulation of the former IDE Action (ES 2), running from 1997 to 2001, with the main objective of promoting innovation in firms through the placement of doctoral degree holders. The programme's main goal is to transfer research results from R&D and innovation centres to enterprises through the mobility of doctorates and skilled personnel. In the two first calls a total of 263 contracts have been financed: 60% for doctorates and 40 for technologists, who will carry out research and technological development activities in firms and technology centres in the next three years.

The strengthening of the Science-Technology-Enterprise system and the interactions between research providers and companies is one of the most notable targets of the Spanish innovation policy. The IV NP designed and launched mechanisms to reinforce co-operation and reduce obstacles to the formation of alliances and co-operation networks and the next V NP framework also envisages this action.

It is worth mentioning an indirect instrument to foster co-operation between research centres, universities and firms, that supports the interface units (Technology Transfer Offices, OTRI`s) allocated in public research institutions or non-profit research bodies (ES 10). Recently this instrument has been updated and reinforced with another initiative that seeks to recruit trained professionals in innovation management and technology marketing (ES 40). The VNP intends to reinforce the role of these units, which form part of the S-T-E system. They channel firms' technological demands to the public system and facilitate technology knowledge transfer between the agents of the S-T-E system.

The new initiative (ES 40), which helps to recruit innovation managers in public technology transfer offices, tries to gives new capabilities and opportunities to R&D groups and speed the communication and exploitation of R&D results.

PETRI Programme (ES 7) that stimulates technology and knowledge transfer from universities and public research bodies to enterprises is continuously running.

PROFIT programme (ES 17) is devoted to increasing technological innovation performance within firms has launched a new call for proposal every year from 1999. In this programme, although it is not a co-operative mechanism, different modalities of participation, which facilitate co-operation among public research bodies and enterprises, is envisaged.

The CDTI (Centre for Industrial Technological Development), an agency of the Ministry of Science and Technology, has managed the PIIC scheme since 200. This supports concerted industrial research projects (ES 24). PIIC aims to finance pre-competitive research initiatives, with high technical risk and non-immediately-marketable results. Projects must be presented by industrial companies and developed in collaboration with Universities, Research Centres and/or Technology Centres.

The other new measure with some implications in fostering co-operation between science and companies was launched at the end of 2000 to promote Scientific and Technological Parks (ES 23), mainly aimed at helping promote entities inside Universities or Publics Research Institutions to design scientific and technological co-operative spaces. This mechanism has been updated continuously since 2001.

Sweden

In the Government Research Bill 1996-1997, the need for increased measures for supporting young researchers and their mobility within Sweden and internationally was stressed. In the most recent Research Bill, the need for increased mobility between universities, university colleges and other parts of the labour market has been stressed again, and the Government has pointed to the need for investigations into possible ways to achieve this. As part of the interest in increasing mobility, new graduate research schools have been created over the past few years (SE 7). The large research foundations like MISTRA, (Swedish Foundation for Strategic Environmental Research) and KKS (Swedish Foundation of Strategic Research) have all founded new graduate schools. These graduate schools have been set up in close co-operation with industry. The more recent research Bill also announced that budget allocations for research and postgraduate education would be increased by €150 million during the period 2000-2003. This implies an increase of approximately 2% per annum. Slightly more than 50% of this increase is destined for direct funding in the higher education sector, including €25 million for the funding of 16 new graduate schools. Even though the primary objective is not to promote mobility but to increase the number of researchers within areas of strategic importance to Swedish industry and to stimulate increased co-operation between higher education institutions and companies, one definitely expected effect is an increase in mobility.

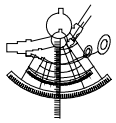
Since a very large share of Swedish public RTD resources has historically been allocated to the higher education sector, there has always been a discussion on how society could profit from the RTD work carried out by universities and university colleges. This debate escalated at the beginning of the 1990s, and in 1996 the principle was codified in the Higher Education Act through the amendment that states:

> 'The Higher Education Institutions shall also [besides providing education and performing research] co-operate with the surrounding society and inform about their activities.'

This so-called 'third mission' has brought with it an increase in the activities aimed at connecting universities/university colleges and foremost industry. The range of activities has expanded so much that voices are being raised for greater coordination and transparency of the system. Many critics also point to the fact that co-operation tends to be treated in separate organisations, while the legislator had intended to establish greater integration of the co-operation task and the two traditional tasks of education and research. In 1998, the debate was revived as the parliamentary committee on research[10] in the next decade proposed the reformulation of the amendment from 1996 as follows:

> 'The higher education institutions shall participate in taking charge of IPRs stemming from any research result and in enabling research results to come to practical use.'

[10] Official Government Committee, Forskningspolitik (Research policy), SOU 1998:128



This proposal was wildly criticised in many of the answers in the referral procedure, since it was viewed as codifying an interpretation of the co-operation with society as a one-way communication phenomenon instead of the dialogue touched upon in the 1996 formulation.

Public initiatives in the field include the building of Competence Centres (SE 4), which are joint ventures between universities, industrial firms and research institutes. This measure was introduced in 1995, with a planned life span of five to ten years and with the following aim:

> 'To achieve a stronger industrial impact and enhanced concentration of resources by creating multidisciplinary academic research environments in which industrial companies participate actively and persistently in order to derive long-term benefits.'

The centres are up to 40% funded by VINNOVA and the rest split between the other two partners, university and industry. Over the period March 1995-July 1996, 28 NUTEK competence centres at eight universities were approved after negotiations and then started their activities (SE 4).

Active Industrial Collaboration, AIS, (SE 11) is a project launched in 1998, and was considerably scaled-up in 2000. It is today run by VINNOVA. It is the further development and widening of a more focussed programme – VAMP – that concerns the utilisation of materials in the products of the engineering industry. The four focus areas of AIS are IT, life sciences, manufacturing and processing and sustainable development. The vision for AIS is to contribute to RTD-related networking projects - between small and big companies, universities, and research institutes - that can be a basis for long-term relationships, built on confidence, that can be utilised by all parties for strengthening and maintaining industrial competitiveness.

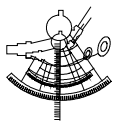
Enterprises and research organisations from both sides of Öresund work together in an R&D-project, Öresundskontrakt (SE 25). The intention is that the collaboration between expertise and R&D-resources should strengthen the industrial competitiveness of the region. The bridge between Malmö and Copenhagen generated governmental activities to identify obstacles and problems for mobility and integration in the Öresund region. In 1999 it was proposed that a connected knowledge system should be strengthened in which enterprises, research institutes and universities operating in the region may all participate in a project. Currently, six projects are running and new knowledge is being developed and applied in these projects, primarily for the participating enterprises. However, participating research organisations are supposed to transfer the knowledge to other enterprises.

United Kingdom

Unlike several other EU Member States, the UK has no overall legal or regulatory framework that acts as a barrier to the general mobility of researchers between the public and privates sectors. Rather, policy attention is focused on the stimulation and development of linkages between these sectors, especially between the science base and industry, generally through collaborative projects. Thus most of the relevant schemes aimed at the promotion of mobility are reported under Section 3.4. Examples of such mobility schemes that have operated for some time now include TCS – now relabelled as *Knowledge Transfer Partnerships*[11] (UK 18), CASE (UK 58) and elements of the consolidated HEIF (UK 38). Others include the *Faraday Partnerships* (UK 19), and LINK (UK 55).

This area continues to represent a major objective of the Government's innovation policy. A large number of schemes already exist to support the transfer of research results from the science base into new competitive products, processes and services. Examples of ongoing initiatives having an specific impact in this area include: the Fund for commercialisation of research in PSREs (UK 52), the Higher Education Innovation Fund – HEIF (UK 38), the Business Fellows Scheme (UK 51), Faraday Partnerships (UK 19), LINK (UK 55), CASE UK 58), the University Challenge Fund (UK 11) - now part of HEIF, the Science Research Investment Fund (UK 39) and the Regional Innovation Funds (UK 44). Also relevant are the Knowledge Transfer Partnerships (formerly TCS) (UK 18), which act to lower the commercial and technological risks of investment in R&D and innovation, particularly for SMEs. It is expected that the outcomes of the DTI/HM Treasury Innovation Review and Lambert Review (see Sections 0.2 and 0.3) will influence the structure and number of schemes under this Action Line and

[11] See: http://www.ktponline.org.uk



that some rationalisation will occur, together with the establishment of additional complementary activities.

Under the broad umbrella of the HEIF (UK 38), 89 universities have been supported in a range of activities such as the employment of specialist staff, establishing business incubators, improving the IP infrastructure and providing enterprise training for staff. Five University Innovation Centres (UICs) have also been established, with total funding to date of £30 million (€44 million), and more are planned. UICs are intended to be sector-focused, top-class, long-term research partnerships between major business interests and the university sector, and to be at 'the heart of cluster development and support for new start-ups and businesses that are growing in business incubators'. The new centres are to be funded from a range of funds including the HEIF (UK 38) and loans from the European Investment Bank (the EIB is also considering a new £100 million (€160 million) loan facility for investment in universities). In addition, New Technology Institutes are also being set up (2 in each English region). These are based on partnerships between universities, colleges and local business and provide specialist ICT and other high tech learning programmes, working closely with local companies to ensure they have the know-how to apply advanced technology practices. Treasury funding of £25 million (€40 million) has been provided over two years for their support. It is intended that, at the regional level, networking arrangements will be established between them and the University Innovation Centres.

The DTI has progressed with funding of a new set of collaborations, worth around £10 million (€16 million), between university and industry within its established LINK programme. This tranche of funding saw a slight shift in the focus of LINK, towards an emphasis on 'basic technologies that can be commercially exploited' through technology transfer in areas of superconductivity, photonics, nanotechnology, data storage, and several power-saving technology areas. Networking activities encouraging university-academic links also receive a new funding boost of around £500,000 (€800,000) within LINK over the next three years. These include electronic discussion forum use, seminars, conferences, and other workshops. Overall, LINK currently receives around £43 million (over €62 million) of business support. Some 75 new collaborative projects are planned for 2003-04.

In September 2002, the DTI announced that with the creation of a further six Faraday Partnerships, it had achieved the target of 24 pledged in the 2000 Science and Technology White Paper. The latest partnerships are supported with about £7 million (€10 million) from the DTI and £6 million (€8.7 million) from other sponsors, including other Government departments and the devolved administrations.

Following on from last year's announcement by the Ministry of Defence (MoD) for the creation of a new range of Defence Technology Centres (DTCs), three have now been set up in the areas of Data and Information Fusion, Human Factors Integration and Electromagnetic Remote Sensing. DTCs focus on specific research areas and will attempt to work in collaboration with academia. DTCs involve consortia (including academics and public sector organisations) and the MoD will part fund the work carried within them. MoD funding amounts to about £5 million (€7.2 million) per year and is available from between 3-6 years.

Associated and candidate countries

Cyprus

As mentioned above, the PENEK programme (CY 20) supports mobility through its action 'Mobility', which supports the employment of a new scientist, who holds a doctoral title, in a Cypriot enterprise with the aim of carrying out specialised research.

Also, mobility is supported through the programme 'Bilateral Collaborations', and its action 'Cyprus - Greece' (deadline: 10 October 2003), which is the follow-up of (CY 21) measure titled ''Common Programme for Scientific and Technological Co-operation of Cyprus and Greece 2000-2002''.

The connection of Cyprus with the *European Research and Academic Network QUANTUM/QMED*, the COST Programme for research co-operation in Europe, as well as the *EUREKA* programme promotes researchers' mobility. Within the framework of IAESTE (International Association for Exchange of Students for Technical Experience) Cyprus secures industrial placements abroad for a number of *Higher Technical Institute* students during the summer vacations. The *Socrates* programme

promotes exchanges of students and staff at the tertiary level. The *Youth for Europe* programme aims at bringing together young people from different countries. 'Leonardo da Vinci' supports transnational mobility projects for people in vocational training, especially young people and for those responsible for training. The full participation of Cyprus in the EU framework programmes for the Research, Technological Development and Demonstration, from 1999 promotes also researchers mobility.

The programme "Students in Research - MERA" awards to high school students an educational travel grant to a research centre in Greece, while the winning students in the research competition for undergraduate students - PRO-FIT - are participating to the *London International Youth Science Forum* (LIYSF). The LIYSF constitutes a programme of mobility, education and training of students worldwide concerning scientific and research issues.

As mentioned above, the creation of the new *Centre for Technology Research and Development* for carrying out applied research and development in specific high-tech fields, which is in the process of being created as a result of collaboration between the *Ministry of Commerce, Industry and Tourism* and the *University of Cyprus,* is expected to further promote the co-operation between research institutes, universities and companies.

The fourth call of the ''Annual Programme of Financing of Research Projects'' as well as the 2001 PENEK Programme established the participation of the Final User, so they guarantee higher exploitation of the results and allow the participation of many more companies in the process (CY 3 and CY 20). The ''Common Programme for Scientific and Technological Co-operation of Cyprus and Greece 2000-2002'' of the RPF and the GSRT also gave incentives for the participation of companies able to exploit the research results (CY 21).

The new programmes 'Research for Enterprises', Actions: 'Development of New Products and Processes', 'New Applications of Information Technology and Telecommunications in Products Production and Processes Improvement', 'New Applications of Information Technology and Telecommunications in the Services Sectors' (CY 25) and Follow Up, Actions: ' RPF Projects' and 'General Projects ' (CY 26) are strongly intensifying the co-operation between research, universities and companies.

Iceland

No new specific measures have been introduced under this heading within the period under review. However a re-examination of Icelandic research and innovation policy has revealed measures not yet included in the Trend Chart. Under this heading there are three such measures, namely IS 7, IS 9 and IS 14.

The mission of the Fisheries Technology Forum (IS 7) is to encourage co-operation between fisheries and industry in order to reinforce the development of equipment that increases the production values of fisheries. The Forum focuses on development of equipment in the entire value chain from catching and processing to marketing. The Forum provides professional and financial support. The annual budget is ISK 11 million (€140,000).

The 'Out of Drawers' programme (IS 9) is a co-operative project between the Research Liaison Office of University of Iceland and the New Business Venture Fund. The main objective of the project is to encourage personnel from higher education and public research institutions to bring forward their R&D results for further exploitation by industry. The project has been in operation since 1998.

The Health Technology Forum (IS 14) was established in 2001 as an initiative of Rannis. The objective of the Forum is to encourage firms, institutions and individuals to increase domestic and foreign co-operation for development and marketing in the field of health technology. Besides Rannis Ministry of Health and Social Security, Federation of Icelandic Industries, the New Business Venture Fund, the Icelandic Society for Biomedical Engineering and Ministry of Industry and Commerce are all involved in the project. The Forum evaluates and finances projects. The annual budget is ISK 38 million (€475,000).

Israel

MAGNETON (little MAGNET) is a sub program of MAGNET (IL 5), is a program promoting 'Generic Pre-Competitive Technologies and R&D'. While activity in MAGNET is organised through consortia of several industrial companies and academic units, in MAGNETON a one-to-one connection is sufficient. The direct objective is to facilitate co-operation between research institutes, universities and companies.

In 2002 a new programme NOFAR made its first step within the framework of MAGNET. Its objective is promoting initial applied research in life sciences by industry and the academy. The program is designed to support applied academic research in biotechnology in order to promote the transfer of the technology to Industry. Grants are up to 90% of the approved expenses. No royalty payments.

Liechtenstein

No information

Norway

There are at the moment no new measures targeting the mobility of students, research workers or teachers. One reason for this may be that policy makers are uncertain whether there is a need for new measures in this field. Some statistics indicate a rather high mobility rate for people with a high formal education.

The major problem is not to move researchers from the universities and colleges into society, but to keep them in the institutions. This is why the Government has announced that it will implement new measures in order to secure the recruitment of new permanent scientists in the public research institutions.

In order to ensure a sufficient number of new doctorate candidates, the Government aims at establishing 1600 new doctorate positions within 2007.

The public user-oriented R&D programmes are to strengthen the collaboration between firms and universities, colleges and R&D institutes (NO 2). The NT-programme (NO 3) is to develop network between companies and knowledge institutions, and so is FORNY (NO 11), TEFT (NO 12), and MOBI (NO 30), including ARENA (NO 32).

There are several so-called Professor II positions at the universities, part time positions for – among others – people from industry.

In 2002, the Research Council of Norway appointed a new Commission with members from universities, research institutes, industry and the public sector. The commission, called KomInn ('Come In'), was to assess possibilities for increased mobility of researchers from other countries to Norway. It made two surveys of factors encouraging foreign researchers to apply for research positions in Norway.

Their report, *Forskermobilitet i Norge* (Researcher Mobility in Norway), was presented in May 2003.[12] These are the main recommendations:

- The Research Council should establish a mobility centre, part of the European Network of Mobility Centres.
- The Research Council should establish a post.doc programme for promising foreign researchers.
- The Research Council should increase funding for the recruitment of foreign researchers as short term guest lecturers or guest researchers at Norwegian institutions.

[12] The Commission was led by Arld Kjerschow, a Norwegian version can be found at http://www.forskningsradet.no/omnfr/strategi/hva_gjor_vi/internasjonalisering/Kominn.pdf

- Research organisations and companies should develop and implement strategies for internationalisation.
- The law for foreign residents should include special regulations that automatically grant residence for foreign researchers and research recruits, and their families, if they have been offered a position or a scholarship in Norway. This should also apply to researchers from outside the EU/EEA-area.
- The Government should establish a time-limited tax exemption for foreign researchers establishing themselves in Norway, at least comparable to the ones found in Denmark and Sweden.

The Bernt Commission

On April 19 2002 the new Government presented to parliament a proposal regarding changes in the law of intellectual property rights.[13]

The proposal was based on the Bernt Commission's green paper on commercialisation of results from university and college research (published in March 2001[14]). Professor Jan Fridthjof Bernt of the University of Bergen led the commission.

The commission felt that commercialisation should be considered an integrated part of the institutions' duty to disseminate knowledge.

The majority of the commission believed that the researcher ought to retain the full property rights of an invention (as it is the case today). These members argued that this is necessary in order to defend the freedom of scientific research. A minority would like to transfer this right to the institution. They argued that the institution needs these rights in order to promote commercialisation in an efficient way.

The whole commission held that the income following from such commercialisation should be split between the researcher, the institution and the research units. Commercialisation can be strengthened by the use of various incentives, practical organisational changes and information on the importance of such activities. The commission argued that the institutions should develop relevant strategies and establish 'innovation centres' with professional advisers, internally or externally.

A summary of the report can be found in the Norwegian Trend Chart Report for June 2001.[15]

In its proposal to Parliament the new Government argued that universities and colleges should be more involved in the commercialisation of R&D results, especially in the form of patents, so that society gets more out of its investments. The law is to be changed so that universities and colleges may claim the right to exploit inventions made by teachers and researchers commercially.

To secure the researchers' right to diffuse their knowledge, teachers and scientific personnel employed by these institutions will have the right to publish their findings, even if this may stop the institution from commercialising the invention.

The researchers must inform the institution if they believe they have made an invention that can be patented. In order to stop the institution from taking over the intellectual property right, the researcher must make use of his or her right to publish the results within one year after the institution was informed.

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[13] *Ot.prp. nr. 67 (2001-2002) Om lov om endringer i lov av 17. april 1970 nr 21 om retten til oppfinnelser gjort av arbeidstakere.* See http://odin.dep.no/ufd/norsk/aktuelt/pressem/045071-070029/index-dok000-b-n-a.html and http://odin.dep.no/ufd/norsk/publ/otprp/045001-050003/index-dok000-b-n-a.html

[14] NOU 2001:11 *Fra innsikt til industri* – 'From insight to industry', http://odin.dep.no/odin/norsk/index-b-n-a.html – in Norwegian.

[15] Koch, Per M. *Monitoring, updating and disseminating developments in innovation and technology diffusion in the Member States - The TREND CHART: Norway*, *Covering period: November 2000 – April 2001*, May 2001.

Incomes from the commercialisation of inventions are to be divided between the institution and the researcher. The law does not say anything about percentages or on how the institution is to spend its part of the income.

When the research project is to be financed by external sources, there must be set up a contract between the financiers, the institution and the researcher regarding the intellectual property rights before the research project starts.

Annex 2 – Analysis of modes of delivery and targets for ISR measures of Trend Chart

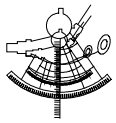
			Modes						Targets					
Country	Instruments	Date	Mobility of personnel	Transfer & exploitation of results	Information diffusion/Promotion	Demonstrator projects	Networks & clusters		Regions/Public authorities	Young scientists	Universities	SMEs.	Research Institutes	Sectors & Large Companies
Austria	AT 8 1) ERP Technology Programme2) ERP SME-Technology Programme3) ERP Special Programme on Growth and Technology	1962												1
Austria	AT 16 Technologiemarketing Austria (TecMa)			1						1	1		1	
Austria	AT 17 Young innovators scheme	1989			1	1								
Austria	AT 18 BIT (Büro für Internationale Forschungs- und Technologiekooperation)	1993			1		1				1	1	1	
Austria	AT 19 FWF Impulse Projects (1997-2000)	1997	1							1		1		
Austria	AT 20 Relay Projects Science-Industry (1995-2000)	1995		1							1		1	
Austria	AT 22 Impuls Polytechnics-Industry (1997-2003)	1997		1							1			
Austria	AT 23 Kplus programme	1997		1							1	1	1	
Austria	AT 24 TechGate Vienna	1999		1								1	1	
Austria	AT 27 Kind/K net	1999		1			1							

			Modes						Targets					
Country	Instruments	Date	Mobility of personnel	Transfer & exploitation of results	Information diffusion/Promotion	Demonstrator projects	Networks & clusters		Regions/Public authorities	Young scientists	Universities	SMEs.	Research Institutes	Sectors & Large Companies
Austria	AT 39 Technologies for a Sustainable Development	1999		1					1		1	1	1	1
Austria	AT 47 A plus B	2000		1								1		
Austria	AT 50 Protec 2002+	2002		1		1						1	1	
Austria	AT 51 Advanced Automotive Technology A3	2002			1	1	1				1	1	1	1
Austria	AT 52 Innovative Systems Bahn ISB	2002				1	1				1	1	1	1
Austria	AT 53 Intelligent Infrastructure I2	2002												
Austria	AT 54 Forschung, Innovation, Technologie: Informationstechnologie - FIT-IT	2002			1						1	1	1	1
Austria	AT 55 Austrian Space Application Programme - ASAP	2002			1		1				1	1	1	1
Austria	AT 56 TAKE OFF - The Austrian Aeronautics Programme	2002	1	1							1	1	1	1
Austria	AT 57 ARTIST	2002												
Austria	AT 58 Sustainable Development	2002												
Austria	AT 59 GEN-AU	2003												
Austria	18		2	10	5	4	5		1	2	11	12	12	7
Belgium	BE 1 Collective research centres	1948	1	1	1							1		1
Belgium	BE 12 HOBU-Fonds ('Non-university Higher Education Fund')	1997		1	1							1	1	1
Belgium	BE 18 (Vl) University Interfaces (1998-2001)	1998		1							1			
Belgium	BE 27 (Vl) Incubators & Innovation Centres	1997		1								1	1	
Belgium	BE 38 FIRST doctorate enterprise	1999	1								1		1	
Belgium	BE 42 Mobilising programmes	1991	1	1							1	1	1	1
Belgium	BE 43 (Wa) Technological guidance (1995-)	1995		1								1		
Belgium	BE 44 Horizon Europe	1991	1				1				1	1	1	
Belgium	BE 47 (Wa) University Interfaces (1999-2002)	1999		1								1		
Belgium	BE 56 Vlaamse Innovatiesamenwerkingsverbanden (VIS)	2001			1							1		1
Belgium	BE 57 Generic Basic Research at Universities	2000-2001		1			1				1		1	
Belgium	BE 58 Programme for the stimulation of innovation in SMEs	2001		1								1		
Belgium	BE 59 Technological attraction poles (TAP)	2002				1			1		1		1	
Belgium	BE 67 Subsidy for a technical feasibility study	2002		1		1						1		
Belgium	15		4	10	3	2	2		1	0	6	10	7	4

			Modes						Targets					
Country	Instruments	Date	Mobility of personnel	Transfer & exploitation of results	Information diffusion/Promotion	Demonstrator projects	Networks & clusters		Regions/Public authorities	Young scientists	Universities	SMEs.	Research Institutes	Sectors & Large Companies
Cyprus	CY 20 Programme for the Support of Young Researchers in Cyprus	2000			1		1			1			1	
Cyprus	CY 21 Common Programme for Scientific and Technological Cooperation of Cyprus and Greece (2000-02)	2000	1	1								1		1
Cyprus	CY 25 Research for Enterprises	2003		1		1			1			1	1	1
Cyprus	CY 26 Follow-up actions	2003		1		1			1			1	1	1
Cyprus	4		1	3	1	2	1		2	1	0	3	3	3
Germany	DE 3 HSP III - Special Programme for Higher Education Institutions	1996	1	1	1						1		1	
Germany	DE 16 InnoRegio (1999-2005)	1999			1	1	1				1	1	1	
Germany	DE 17 Promotion of Joint Industrial Research Associations (1952-)	1952	1	1			1				1	1	1	1
Germany	DE 21 EXIST – start-ups from colleges and universities (1998-2001)	1998	1	1			1		1	1			1	1
Germany	DE 23 Biotechnology Initiatives	1997	1	1	1						1	1	1	1
Germany	DE_25 Lead Projects (1997-2003)	1997		1							1	1	1	
Germany	DE 26 InnoNet (1999-2003)	1999	1	1	1		1				1	1	1	
Germany	DE 28 ProInno	1999	1		1						1	1	1	
Germany	DE 36 Networks of Competence (1999-2002)	1999					1			1				
Germany	DE 42 Applied Research at Polytechnic Colleges (1992-)	1992		1	1						1			
Germany	DE 48 INSTI - IPR at Higher Education (AKPat, InWert)	1996			1						1	1		1
Germany	DE 57 Innovative Regional Growth Poles	2001	1	1		1	1		1		1	1	1	1
Germany	DE 58 Institutional Reform at Public Sector Research establishments	1997											1	
Germany	DE 67 Direct Research Promotion - Natural Sciences, Climate, Environment, Energy	1957			1		1				1	1	1	1
Germany	DE 68 Direct Research Promotion - New Technologies	1969			1		1				1	1	1	1
Germany	DE 69 Direct Research Promotion - Information and Communication Technology	1967			1		1				1	1	1	1
Germany	DE 70 Direct Research Promotion - Biotechnology, Health, Design of Working Conditons	1970			1		1				1	1	1	1
Germany	DE 71 Direct Research Promotion - Transportation, Astronautics, Construction	1962			1		1				1	1	1	1

			Modes						Targets					
Country	Instruments	Date	Mobility of personnel	Transfer & exploitation of results	Information diffusion/Promotion	Demonstrator projects	Networks & clusters		Regions/Public authorities	Young scientists	Universities	SMEs.	Research Institutes	Sectors & Large Companies
Germany	DE 72 Commercialisation of Intellectual Property at Public Science	2001		1			1		1		1		1	
Germany	DE 75 NEMO - Management of Innovation Networks for East German SMEs	2002		1			1					1	1	
Germany	20		7	10	12	2	13		3	2	16	14	17	10
Denmark	DK 5 Industrial Researcher-scheme	1970	1										1	
Denmark	DK 6 Icebreaker projects	1998	1							1		1		
Denmark	DK 07 Centercontracts	1995		1			1				1	1	1	1
Denmark	DK 08 GTS-institutes	1996		1			1				1	1	1	1
Denmark	DK 11 Innovation Post-Doc Scheme	2000	1							1	1	1	1	
Denmark	DK 13 Regional growth centres	2001							1			1	1	
Denmark	DK 15 Industrial Innovator Scheme	2001	1								1	1	1	
Denmark	DK 16 150 per cent tax deduction on certain research expenditures	2002											1	1
Denmark	DK 17 Innovation Consortiums	2003				1					1	1	1	1
Denmark	9		4	2	0	1	2		1	2	5	7	8	4
Spain	ES_01 CDTI Financial support	1978		1								1		1
Spain	ES 2 IDE Action to support the placement of doctorates in enterprises	1997	1		1							1		1
Spain	ES 06 ATYCA Initiative (1997-1999)	1997		1					1		1	1	1	1
Spain	ES 07 PETRI Programme (1995-)	1995		1								1		
Spain	ES 08 Concerted and cooperative industrial R&D projects (1994)	1994		1		1					1	1		1
Spain	ES 09 FEDER - Fostering R&D and Innovation in Objective 1 and 2 Regions (1997-1999)	1997		1							1	1		
Spain	ES 10 Financial support of non-profit Technology Transfer Offices (1996-)	1996		1							1		1	
Spain	ES 12 Cooperation projects – P4 Modality (2000-2003)	2000		1		1					1	1	1	
Spain	ES 13 R&D projects National Programmes (2000-2003)	2000		1								1		1
Spain	ES 14 National Food Programme (2000-2003)	2000		1		1					1	1	1	1
Spain	ES 15 National Programme of AgroFood Resources and Technologies (2000-2003)	2000		1		1							1	1
Spain	ES 17 PROFIT: Programme to encourage technological research (2000-2003)	2000	1	1	1							1	1	1
Spain	ES 20 Special Actions of National Programmes (2000-2003)	2000		1	1						1		1	1

			Modes						Targets					
Country	Instruments	Date	Mobility of personnel	Transfer & exploitation of results	Information diffusion/Promotion	Demonstrator projects	Networks & clusters		Regions/Public authorities	Young scientists	Universities	SMEs.	Research Institutes	Sectors & Large Companies
Spain	ES 25 'Ramón y Cajal' Programme (RyC)	2001	1								1		1	
Spain	ES 30 Torres Quevedo Programme	2001	1									1		1
Spain	ES 40 Initiative to recruit personnel for non profit Technology Transfer Offices (not filled in)													
Spain	15		4	12	3	4	0		1	0	8	11	8	10
Finland	FI 5 Centre of expertise programme (1994-2006)	1994		1		1			1		1	1		1
Finland	FI 6 TULI-programme	1993		1							1		1	
Finland	FI 7 Programme for increases in government research funding	1997							1		1		1	
Finland	FI 8 Cluster programmes	1997					1		1		1	1	1	1
Finland	FI 9 Improving the use of research results at universities	1999		1	1						1			
Finland	FI 10 Technology transfer from universities and research organisations (1999-2001)	1999		1	1				1		1			
Finland	FI 12 Tekes Technology programmes	1984		1	1						1	1	1	1
Finland	7		0	5	3	1	1		4	0	7	3	4	3
France	FR 2 Support for technology transfers	1967		1							1	1	1	1
France	FR 3 Support for the recruitment of researchers and R&D engineers	1988	1									1		
France	FR 4 Technology diffusion procedure (ATOUT)	1984		1								1		
France	FR 6 Support for the recruitment of technicians on innovative projects	1988	1									1		
France	FR 7 CIFRE convention	1981	1									1	1	
France	FR 8 Call for projects on key technologies	1996			1						1	1	1	1
France	FR 12 Creation of Incubator structures (1999-)	1999		1			1					1	1	
France	FR 14 Support for the recruitment of post-doctorate in SMEs	1998								1		1		
France	FR 17 Technological Research and Innovation Networks (1998-)	1998		1			1						1	
France	FR 29 National Centres for Technological Research (2000-)	2000		1								1	1	1
France	FR 30 Technological Research Diploma (DRT)	1997	1									1	1	
France	FR 31 Youth and Innovation	1996									1			
France	FR 33 Technology Platforms (PFT)	2000	1		1		1			1	1	1		
France	FR 34 RIAM (Research and Innovation for Audiovisual and Multimedia)	2001			1		1					1	1	1



			Modes						Targets					
Country	Instruments	Date	Mobility of personnel	Transfer & exploitation of results	Information diffusion/Promotion	Demonstrator projects	Networks & clusters		Regions/Public authorities	Young scientists	Universities	SMEs.	Research Institutes	Sectors & Large Companies
France	FR 36 RNRT (Research and Telecommunications National Network)	1998											1	
France	FR 37 RMNT (French Research Network in Micro and Nano Technologies)	1999		1			1						1	1
France	FR 38 RNTL (National Network of Research and Software Innovation Technologies)	2000		1			1				1	1	1	1
France	FR 39 RNMP (National Network for Materials and Process)	2000		1			1							
France	FR 40 RITEAU (Research Innovation Technology Network Water and Environment Technologies)	2000		1			1				1	1	1	1
France	FR 41 PACO (New Energies and Fuel Cells)	1999		1			1				1	1	1	1
France	FR 42 GenHomme (Human Genetics and medical Innovation Network)	2000		1			1				1	1	1	1
France	FR 43 RNTS (National Network for Health Technologies)	2000		1			1				1	1	1	1
France	FR 44 PREDIT	2002		1			1				1	1	1	1
France	FR 45 RITMER	2001		1			1				1	1	1	1
France	FR 46 RGC&U (Civil and Urban Engineering Network)	1998		1			1				1	1	1	1
France	FR 47 Supersonique	2000		1			1				1	1	1	1
France	FR 48 Genoplante	1999		1			1				1	1	1	1
France	FR 49 Terre et Espace	2000		1			1				1	1	1	1
France	FR 50 RARE	1997		1			1				1	1	1	1
France	FR 51 SAIC	2002		1							1		1	
France	FR 53 Innovation Plan	2004			1	1	1					1	1	
France	31		5	20	4	1	19		0	2	17	25	24	17
Greece	GR 10 Liaison Offices	1995	1	1							1		1	
Greece	GR 11 Targeted Research Scholarship Programme - YPER	1994	1	1							1		1	
Greece	GR 12 Co-financing Programme - SYN	1992	1						1		1		1	
Greece	GR 16 EKVAN (1997-2000)	1997	1									1	1	1
Greece	GR 17 Development of microelectronics technology and micromechanics (1998-)	1998	1											1
Greece	GR 18 Special Programme for Research and Innovation in the Transport Sector	1998			1		1				1		1	
Greece	GR 19 Research and innovation in Agricultural Biotechnology (1998-)	1998	1											1
Greece	GR 25 Open Gates	1994			1					1			1	

			Modes						Targets					
Country	Instruments	Date	Mobility of personnel	Transfer & exploitation of results	Information diffusion/Promotion	Demonstrator projects	Networks & clusters		Regions/Public authorities	Young scientists	Universities	SMEs.	Research Institutes	Sectors & Large Companies
Greece	GR 26 AXIA – Exploitation of successful projects of STRIDE and EPET 1 (?-?)	1994	1											
Greece	GR 28 Technology Transfer Offices for Technology Parks	1995		1										
Greece	GR 32 Bilateral Co-operations for Research and Technology	1964	1				1				1		1	1
Greece	GR 41 Programme for the Reinforcement of Research Manpower	1989								1	1		1	
Greece	GR 44 Programme for the Placement of Researchers from Abroad to the Greek R&T System - ENTER	2001	1				1				1		1	
Greece	GR 49 Excellence in the GSRT Supervised Research Centres and Institutes	2001											1	
Greece	GR 51 International Co-operation in Industrial Research and Development Activities in the Pre-competitive Stage	2002	1			1	1				1	1	1	
Greece	GR 53 Supporting entrepreneurial ideas through tertiary education structures	2002			1					1	1			
Greece	GR 55 Research and Technological Development Consortia	2002		1		1	1				1	1	1	1
Greece	17		10	4	3	2	5		1	3	10	3	12	5
Iceland	IS 5 Information and Environment Research Programme - The U+U Programme	1999							1	1	1	1	1	
Iceland	IS 9 Out of the drawers	1998		1	1		1				1		1	
Iceland	IS 14 Health Technology Forum	2000												
Iceland	2		0	1	1	0	1		1	1	2	1	2	0
Ireland	IE 22 Technology Centres (1989-)	1989		1	1						1			
Ireland	IE 23 Graduate Enterprise Programme (1995-)	1995	1						1	1	1			
Ireland	IE 24 Campus Companies Programme (1996-)	1996		1							1	1		
Ireland	IE 28 Business Incubation Centre programme	1996				1						1	1	
Ireland	4		1	2	1	1	0		1	1	3	2	1	0
Israel	IL 05 MAGNET	1992		1							1	1	1	1
Israel	1		0	1	0	0	0		0	0	1	1	1	1
Italy	IT 01 Special applied research fund (1997-)	1997		1		1						1	1	1
Italy	IT 02 Employment in the field of research (1997-)	1997	1	1								1		1
Italy	IT 03 Support for the promotion of scientific culture (1997-)	1997		1	1								1	

			Modes						Targets					
Country	Instruments	Date	Mobility of personnel	Transfer & exploitation of results	Information diffusion/Promotion	Demonstrator projects	Networks & clusters		Regions/Public authorities	Young scientists	Universities	SMEs.	Research Institutes	Sectors & Large Companies
Italy	IT 04 Autonomous research projects in the regions lagging behind (1995-)	1995		1		1						1		1
Italy	IT 05 Research centres in the regions lagging behind (1995-)	1995		1								1		1
Italy	IT 07 Measures aimed at sustaining innovation (1997-)	1997		1								1		1
Italy	IT 08 Research assignments to public research laboratories and SMEs (1998-)	1998	1									1		
Italy	IT 11 Reorganisation of Fund for Research Support (1999-)	1999	1									1	1	1
Italy	IT 15 Reorganisation and establishment of public research centres (1999)	1999	1						1					
Italy	IT 18 Large research projects (1988-)	1998				1			1		1		1	1
Italy	IT 23 Reordering of promotion bodies and establishment of Sviluppo Itlalia (1999)	1999		1										
Italy	IT 25 CSF Objective 1 2000-2006/PIA (2000-2006)	2000		1								1		1
Italy	IT 26 Agreement Sviluppo Italia – MURST (2000 -)	2000		1						1	1		1	
Italy	IT 32 MURST Directive 1310 (1999-)	1999		1								1		
Italy	IT 33 MURST Directive 760 (1999-)	1999		1					1		1	1		1
Italy	IT 36 Decree for the implementation of the Fund for Research Support	2001										12	1	1
Italy	IT 37 Decree for the implementation of the Fund for Technological	2001									1	1	1	1
Italy	17		4	11	1	3	0		3	1	4	23	7	11
Luxembourg	LU 7 Research training grants (Bourse Formation-Recherche)	1987	1										1	
Luxembourg	1		1	0	0	0	0		0	0	0	0	1	0
Netherlands	NL 01 Business-oriented Technological Cooperation Projects (1997-)	1997		1								1	1	1
Netherlands	NL 06 Knowledge Carriers in SMEs	1994	1									1		
Netherlands	NL 07 BIT Industry oriented International Technology Cooperation (1997-)	1997		1		1								1
Netherlands	NL 13 EET (Economy, Ecology and Technology) programme (1997-)	1997		1										1
Netherlands	NL 14 SMO Subsidies Maritime Research (1997-)	1997		1										1

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Netherlands	NL 16 Industry facility	1993			1							1		1
Netherlands	NL 19 Technological Top Institutes (1998-2006)	1998		1							1	1	1	1
Netherlands	NL 29 ICES/KIS (1998-)	1998		1					1			1	1	1
Netherlands	NL 31 Technology Foundation STW (1981-)	1981		1							1		1	1
Netherlands	NL 37 Technological Co-operation	2001	1			1					1			
Netherlands	10		2	7	1	2	0		1	0	3	5	4	8
Norway	NO 10 BRIDGE Programme	???		1			1					1		
Norway	NO 11 FORNY II – research based innovation & establishment (1999-2004)	1994		1						1	1		1	
Norway	NO 12 TEFT – tech. transfer from technological research institutes to SMEs (1994-2003)	1999		1								1	1	
Norway	NO 14 SME Competence (1994-2003)	1997	1	1						1	1	1		
Norway	NO 22 Regional Development SME State-colleges - RUSH	1995		1								1		
Norway	NO 23 SME Colleges (1994-2003)	1999		1										
Norway	NO 28 Value creation 2010	2001	1				1				1	1	1	
Norway	NO 30 MOBI	2002	1		1				1		1	1	1	
Norway	NO 31 Centres of Excellence	2001			1						1	1	1	1
Norway	NO 32 Regional Innovation Pilots	2001			1		1		1		1	1	1	1
Norway	NO 42 Start Norge	2002	1							1				
Norway	11		4	6	3	0	3		2	3	6	8	6	2
Portugal	PT 01 Programme on R&D activities by consortia, PRAXIS XXI	1994							1			1	1	1
Portugal	PT 02 Regulation on the recruitment of doctorates and masters	1996	1									1		1
Portugal	PT 07 Development of Technological Capabilities at enterprise level (1997-2001)	1997		1								1		
Portugal	PT 09 Financial incentives to R&D industrial projects (1994-1999)	1994		1							1	1	1	1
Portugal	PT 10 Innovation and Technological Transfer measure (1994-1999)	1995		1		1					1	1		1
Portugal	PT 16 SIME (2000-2006)	2000		1							1	1	1	1
Portugal	PT 18 Industrial Property Use Incentive System (SIUPI)	2000			1								1	1
Portugal	PT 20 Measure for Supporting the Dynamisation of Technology, Training and Quality Systems (MTTQS)	2001		1	1				1		1			

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Portugal	PT 21 R&D Activities by Consortia (POCTI/POSI)	2001									1	1	1	1
Portugal	PT 22 Integration of Doctors and Masters in Companies and Technology Centres	2001	1											1
Portugal	PT 23 Mobilising Projects for Technological Development (POE)	2001									1	1	1	1
Portugal	PT 26 Industrial Property Support Offices (GAPI)	2001			1				1		1	1	1	1
Portugal	PT 28 LISACTION	2002			1				1		1	1	1	1
Portugal	PT 29 INOVAlgarve	2002			1				1		1	1	1	1
Portugal	PT 33 IDEIA Applied R&D in Companies	2003		1			1				1	1	1	1
Portugal	PT 34 NEST	2003		1			1			1	1		1	
Portugal	PT 35 QUADROS	2003	1									1		
Portugal	PT 36 NITEC	2003	1	1								1		1
Portugal	PT 37 DEMTEC	2003		1		1					1	1	1	1
Portugal	19		4	9	5	2	2		5	1	12	15	12	15
Sweden	SE 04 Competence Centre Programme (1995-2006)	1995		1							1			1
Sweden	SE 06 The regional technology program 'SME consortia'	1995			1		1					1		
Sweden	SE 07 New Graduate Schools (1996-)	1993		1					1	1	1			
Sweden	SE 09 New liaison functions (1997-2002)	1997		1			1					1		
Sweden	SE 11 Active Industrial Cooperation (?-?)	1998	1	1			1				1	1	1	
Sweden	SE 19 VINNVAXT Regional growth through dynamic innovation systems	2002			1		1		1		1	1		1
Sweden	SE 25 Öresundkontrakt		1	1							1	1	1	1
Sweden	SE 27 VINST - Researchers in collaboration with smaller high-tech companies	2001		1								1		
Sweden	9		2	6	2	0	4		2	1	5	6	2	3
UK	UK 01 Foresight Programme (1993-2001)	1993		1	1		1					1	1	1
UK	UK 18 Teaching Company Scheme (1987-) (funding doubled in 2000)	1987							1	1	1	1	1	1
UK	UK 19 Faraday Partnerships (1999-)	1999				1					1	1	1	
UK	UK 20 Foresight LINK (1995-)	1995		1		1			1		1		1	
UK	UK 29 Joint Research Equipment Initiative (1996-)	1996									1			
UK	UK 37 Biotechnology Exploitation Platform Challenge (1999-)	1999		1			1				1		1	1
UK	UK 38 Higher Education Innovation Fund	2001		1							1			

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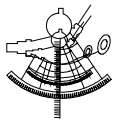
UK	UK 39 Science Research Investment Fund	2001		1			1				1			
UK	UK 44 Regional Innovation Funds	2000					1		1		1	1	1	1
UK	UK 48 Database of Technology Offers	2001			1				1	1	1	1	1	1
UK	UK 51 Business Fellowship scheme	2001		1	1		1							
UK	UK 52 Fund for commercialisation of IP in PSREs	2001							1		1		1	
UK	UK 55 New Foresight LINK Awards	1995	1	1			1				1	1	1	1
UK	UK 57 Manufacturing Molecules Initiative (MMI)	2001	1		1		1				1	1	1	1
UK	UK 58 CASE - Cooperative Awards in Science and Engineering	1980	1						1	1	1	1	1	1
United Kingdom	15		3	7	4	2	7		6	3	13	8	11	8
Slovenia	SL 4 Research Group Program financing scheme	2000											1	
Slovenia	SL 5 Subsidies for fostering of R&D units in enterprises	2000	1									1	1	1
Slovenia	SL 7 Subsidies for fostering linkage of companies.	2000		1								1	1	1
Slovenia	3		1	1	0	0	0		0	0	0	2	3	2
Hungary	HU 1 Tender for Applied Research and Development	2000		1										1
Hungary	HU 4 EUREKA	1992	1		1		1					1		1
Hungary	HU 8 Information and Communication Technologies and Applications (IKTA-2000)	1997			1	1						1	1	1
Hungary	HU 10 IKTA-NI (High-Speed Internet Programme)				1							1	1	1
Hungary	HU 11 Call for proposals to support the establishment of Co-operative Research Centres	2000		1							1			1
Hungary	HU 13 Call for proposals to support the social facilities of R&D	1991	1							1			1	
Hungary	HU 19 COST	1991	1									1	1	1
Hungary	HU 23 Application for establishing innovative enterprises	2001			1		1							
Hungary	HU 43 OTKA-Application of conference organising	2000	1							1	1		1	
Hungary	9		4	2	4	1	2		0	2	2	4	5	6
Czech Rep	CZ 6 Park Programme	1995					1			1			1	
Czech Rep	1		0	0	0	0	1		0	1	0	0	1	0



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Estonia	EE 3 Estonian Genome Project (EGP)	2001			1				1		1		1	
Estonia	EE 4 IT College	2000		1	1				1		1	1	1	1
Estonia	EE 15 CARIN /ES_22 Tartu RIS	2001			1		1		1		1	1	1	1
Estonia	EE 17 SPINNO	2001		1		1					1		1	
Estonia	EE 20 Competence Centres	2003		1		1	1				1	1	1	1
Estonia	5		0	3	3	2	2		3	0	5	3	5	3
Latvia	LV 6 The Latvian Technology Park at Riga Technical University	1996		1	1		1			1		1	1	
Latvia	LV 8 Electronic Industry Business Innovation Centre of Latvia	1997			1		1					1		
Latvia	LV 14 Latvian Academy Of Sciences (LZA) Web-site				1						1		1	
Latvia	LV 15 Innovation Relay Centre - Latvia	2000					1					1		
Latvia	4		4	1	3	0	3		0	1	1	3	2	0
Lithuania	LT 7 Governmental decree 'On participation of Republic of Lithuania in EU training and education programmes 'Leonardo da Vinci II' and 'Socrates II''.	2000	1								1		1	
Lithunia	LT 8 Programme on innovations in business	2000										1		1
Lithunia	LT 12 Governmental decree 'On participation of Republic of Lithuania in EU training and education programmes 'Leonardo da Vinci II' and 'Socrates II' (change of LT_7)	2000	1								1			
Lithunia	3		2	0	0	0	0		0	0	2	1	1	1
Poland	PL 9 Bank of Technologies and Designs	1999		1							1		1	
Poland	1		0	1	0	0	0		0	0	1	0	1	0
Romania	RO 1 RELANSIN Program	1999		1	1		1					1		
Romania	RO 3 PHARE Partnership Program	1999			1								1	
Romania	RO 5 Technology Transfer, Stimulation and Dissemination of Innovation 1998 – 2010 (TTSDI'98)	1998		1								1		
Romania	RO 8 Programul 'Cooperare si parteneriat international' - CORINT	2001	1				1					1		
Romania	RO 13 INVENT Program – Stimulation of invention application	2001		1		1					1		1	
Romania	5		1	3	2	1	2		0	0	1	3	2	0
TOTAL	**256**		**70**	**137**	**64**	**33**	**75**		**38**	**27**	**141**	**173**	**162**	**123**