



Cohesion policy funding for innovation and the knowledge economy

IQ-Net Thematic Paper 15(2)

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***Improving the Quality of
Structural Fund Programming through
Exchange of Experience***

***IQ-Net Phase III Conference
Tuscany, 8-10 November 2004***

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November 2004

Preface

The research for this paper was undertaken in preparation for the third meeting of Phase III of the Structural Fund exchange of experience network IQ-Net, which took place in Toscana, Italy in November 2004.

The paper is the product of desk research and fieldwork visits among national and regional authorities in Member States (notably among Partners in the IQ-Net Consortium) during Summer 2004. The field research team comprised:

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Many thanks to all those who participated in the research. EPRC also gratefully acknowledges the financial support provided by participating regions, which is co-financed by technical assistance from the European Regional Development Fund.

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EXECUTIVE SUMMARY

Support for R&D and technological innovation has come to play a more important role in Cohesion policy and in Member States' regional policies in recent years. In February 2004, the Third Cohesion Report included the proposal that 'innovation and the knowledge economy' be a significant focus in Structural Funds programmes after 2006. This is seen to be in line with the broader proposal that Cohesion policy be more strongly integrated with core EU policies, notably those reflected in the Lisbon and Göteborg agendas.

The EU as a whole lags behind the US on key indicators relating to productivity, R&D and innovation, although individual Member States – notably Finland and Sweden – outperform the US on certain indicators. Studies from a number of different theoretical viewpoints agree that investment in R&D and innovation can contribute to productivity gains and real (as opposed to nominal) GDP growth. There is, however, some disagreement over the appropriate role that can and should be played by public authorities in supporting R&D.

It is also not to over-emphasise the role of R&D and innovation in fuelling economic growth and to adapt policies to the domestic situation. Other aspects of the economic and institutional context may be more important, for example the degree of trade openness, stability-oriented macroeconomic policies, the availability of factors of production including human and physical capital, and the quality of the overall regulatory context for business.

Most Member States and many regional authorities have developed explicit strategies or policies in support of R&D and innovation. Structural Funds programmes and domestic regional policies are, to varying degrees, integrated into these strategies. EU support for regional innovation strategies has played an important role in enhancing the strategic focus in some regions.

The importance of R&D and innovation in the IQ-Net partner programmes varies greatly, from over 50 percent, to less than two percent. Most programmes provide some kind of support for R&D and/or innovation in enterprises, either via State aids or loans, or via different kinds of technology transfer and technology-oriented services. Some programmes also finance public R&D (sometimes only if projects include business involvement), and the construction of science parks and innovation centres.

There is also great variety in terms of progress on financial absorption for R&D/innovation Measures, relative to the programmes as a whole. Financial absorption has been affected by different factors, including administrative uncertainty, narrow eligible areas, the need for planning certain types of interventions, and the weakness of the overall business climate in some Member States.

Programmes also take different approaches to the development and application of project selection criteria, monitoring indicators and systems, and evaluation in the field of R&D and innovation. Some of the issues identified in the mid term evaluations of RTDI interventions include the need:

- to focus on project generation and business take-up;
- to ensure the involvement of universities and research centres;
- to concentrate funding on a critical mass of projects;

- to address the possibility that Structural Funds programmes may enhance risk aversion among policy-makers;
- to coordinate Structural Funds programmes with the domestic policy context; and
- to ensure a sufficient focus on building an innovation culture.

Although most programme administrators in the IQ-Net network took a positive view of the Commission's proposals to prioritise spending on RTDI after 2006, some questions were raised. While some argued that the proposals needed further clarification, others noted the ongoing importance of other types of intervention – particularly investment in physical infrastructure and human capital – in Structural Funds strategies. Further questions relate to whether it is appropriate to finance RTDI support in all Member States and regions, and whether different types of RTDI support are needed in different kinds of locations.

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1. INTRODUCTION

This paper examines roles of Cohesion policy in financing support for research and development (R&D) and technological innovation. It starts by looking at the broad policy context, relating particularly to the Lisbon and Göteborg agendas, and the Commission's proposal that 'innovation and the knowledge economy' be a significant focus in Structural Funds programmes after 2006. It then considers various rationales for government support for R&D and innovation, before looking at the various ways in which Member States and regional authorities in the EU are developing strategies in support of innovation.

The following sections look at the roles of innovation support in the IQ-Net partner programmes, and on issues relating to financial absorption, monitoring and evaluation in this domain. The paper then examines the possible roles of innovation support in future Structural Funds programmes, and identifies a series of issues for discussion.

1.1 Setting the context: the Lisbon agenda

Research, Technological Development and Innovation (RTDI) has become a key focus of policy-makers at the levels of the EU, Member States and regional authorities. This is partly due to the consensus that RTDI is one of the key drivers of productivity gains, along with investment in human and physical capital, and improvements in the allocation of resources due, for example, to trade openness and to regulatory frameworks that are conducive to enterprise. RTDI is thus seen as an area where public investment may potentially be able to contribute to more rapid economic growth in the EU as a whole, including an acceleration of the catching up of the EU's lagging Member States and regions.

The policy goal of stimulating RTDI appears to have risen in importance since the EU's Lisbon Council in March 2000, when the Member States agreed the common goal of becoming "the most competitive and dynamic knowledge-based economy in the world capable of sustainable economic growth with more and better jobs and greater social cohesion". The Council identified three key policy areas, namely:

- preparing the transition to a knowledge-based economy and society;
- modernising the European social model; and
- ensuring an appropriate macro-economic policy mix.

Policy-makers point to the gap between the USA and the EU in terms of gross value added per worker (labour productivity) and gross domestic product per capita, which appears to have grown since the 1990s, with the USA enjoying stronger productivity growth than the EU as a whole. The European Council has agreed a set of Structural Indicators to be used for monitoring progress towards the Lisbon goal, and these include a number of indicators relating to RTDI, including the level of R&D expenditure as a percentage of national GDP.¹

The Council has also agreed a target, to be attained by all Member States, of raising the level of R&D expenditure to three percent of GDP by 2010, with a significant share of this increase to be accounted for by the private sector. In 2003, the EU's aggregate investment in R&D was two percent of GDP, compared to 2.7 percent in

¹ European Commission (2004) Structural indicators: Update of the statistical annex (annex 1) to the 2004 Report from the Commission to the Spring European Council. Brussels. <http://europa.eu.int/comm/eurostat/structuralindicators>

the USA and 3.1 percent in Japan. There is, however, considerable variation in R&D expenditure across Member States, with the highest levels in Sweden (4.3 percent of GDP) and Finland (3.4 percent), and the lowest in Cyprus (0.3 percent of GDP) and Latvia (0.4 percent) (See annex 1). More detailed monitoring of innovation indicators is undertaken in the context of the Trend Chart on Innovation in Europe, incorporating the EU's Innovation Scoreboard (See annex 2).

There are also widespread differences between regions within individual Member States and within the EU as a whole, as R&D activities tend to be concentrated in the main agglomerations where the major enterprises and public R&D centres are located. This may be explained by the cumulative role of knowledge spillovers in driving technological development, which seem to be facilitated by spatial proximity. Policy-makers may therefore face a trade-off between concentrating R&D expenditure in order to maximise aggregate outcomes, and dispersing expenditure across regions with the aim of enhancing geographical equity.

1.2 RTDI investment and Cohesion policy

It is in this context that the Commission has published the Third Cohesion Report² and proposed that in future Cohesion policy be integrated more closely into broader EU strategies, notably the Lisbon and Göteborg agendas, as well as the Broad Economic Policy Guidelines and the European Employment Strategy. In particular, it has put forward the proposal that after 2006, particularly outside those Member States and regions covered by the Convergence objective, funding should be focused on the following themes:

- innovation and the knowledge economy (ERDF);
- the environment and risk prevention (ERDF);
- accessibility and services of general economic interest (ERDF);
- education, employment and social support systems (ESF);
- human capital and labour supply (ESF); and
- adaptation of the public administration to change through administrative and capacity building (ESF).

Cohesion policy has allocated some funding to RTDI at least since its reform in 1989. Initially, funding tended to be focused on subsidising R&D projects in the public or private sector, as well as on constructing public R&D centres and science parks. In the 1994-99 period, a wider range of activities was funded, particularly in the Objective 2 areas, including small-scale aid or loans for SMEs; funding for SME networks, sometimes in cooperation with R&D centres, universities or other institutions; and finance for the provision of technology-oriented services to SMEs. Via the Innovative Actions programme, Cohesion policy has also funded the development of bottom-up regional innovation strategies, via the Regional Technology Plans and Regional Innovation Strategies (with similar initiatives funded under the Framework Funds' Regional Innovation and Technology Transfer Strategies).

1.3 Potential difficulties with RTDI policy

Although there seems to be consensus among policy-makers at different levels over the importance of encouraging R&D and innovation with the aim of enhancing real economic growth, there are disagreements over the appropriate policy recommendations. For example, some argue that business R&D and innovation can best be stimulated by reducing protectionism and barriers to competition, thus

² European Commission (2004) A new partnership for cohesion: Convergence, competitiveness, cooperation. Third report on economic and social cohesion. Brussels. http://europa.eu.int/comm/regional_policy/sources/docoffic/official/reports/cohesion3/cohesion3_en.htm

implying the need to reduce State aid and other forms of preferential treatment.³ Others, however, contend that market failures mean that the public sector should intervene to enhance incentives for innovation; in particular, the private rate of return is likely to be lower than the aggregate rate of return, because of the positive spillover effects from one enterprise's investment in R&D onto other enterprises in the form of improved products or processes, or new knowledge that can be used in other ways.

There is also a risk that the role of R&D and innovation in fuelling economic growth may be exaggerated, or that RTDI policies are equally appropriate to all Member States and regions. Other types of policies may be more important for the overall context for economic growth, not least appropriate macroeconomic policies, as well as policies oriented towards trade openness, and the quality of the overall regulatory context for business. In the context of public investment strategies, there is a need to take account of the current and potential comparative advantage of a Member State when deciding on whether to focus funding on R&D/innovation or, for example, on human and physical capital. Different types of R&D/innovation interventions may also be appropriate in different locations. Lagging regions may benefit more from effective technology transfer and diffusion strategies rather than investment in public R&D institutes or projects.

A further difficulty with this policy field is the terminology, which is rather complex and not always used in a consistent way. Although there is a generally-accepted distinction between basic and applied R&D, the term "innovation" is used in a variety of ways, sometimes to refer only to products and processes that are 'new to the world' and commercialised by enterprises, but sometimes to include any new technical or management process used by an enterprise, or to any product improvement, even if it is only 'new to the enterprise' and thus perhaps best regarded instead as 'diffusion' or 'imitation'. "Innovation" is also sometimes used to refer to broader processes of change, whether in policy organisations or in society as a whole, for example in terms of a "culture" or "climate" of innovation. The term "knowledge based economy and society" is also difficult to define, but generally implies broader processes of change than those simply related to RTDI, namely the diffusion and use of new information and communication technologies, as well as the higher levels of skills required by all workers and citizens in using such technologies.

³ European Commission (2004) The report on the implementation of the 2003-2005 Broad Economic Policy Guidelines. Luxembourg: Office for Official Publications of the EC.

2. THE RATIONALES FOR REGIONAL INNOVATION POLICY

Analysts from a number of different disciplines and viewpoints emphasise the role of technological innovation in economic development. This section provides a brief overview of theoretical and empirical studies in economics, as well as in the field of regional geography.

2.1 Economic growth theories

While a number of early political economists recognised the role of technological change in driving capitalist development, contemporary economic analyses of the role of technology in the economy usually take the work of Robert Solow as a starting point. Solow⁴ developed a model which disaggregated growth in output into the following components: increases in the number of workers, increases in the amount of physical capital and a residual, which he argued could be understood as qualitative improvements in the efficiency with which labour and capital inputs were used (or total factor productivity), whether due to technological progress or other factors, such as organisational improvements. Because increases in capital per worker are subject to diminishing marginal returns (i.e. the benefits from adding to the amount of capital per worker are finite), this model implies that long run economic growth is ultimately driven by population growth and by total factor productivity. However, Solow's model does not explain the reasons for either of these factors, and thus ultimately does not explain the sources of economic growth.

Although numerous studies had analysed the reasons for differences in countries' growth performance, it was not until the 1980s that economists succeeded in providing formal theoretical models of the contribution of human and knowledge capital to economic growth, where technical change is seen as the result of the decisions of profit-seeking agents.⁵ A variety of models were developed, all of which rely on the possibility that aggregate returns to certain types of capital (notably human and knowledge capital) may not diminish over time due to positive spillover effects from the investment of one firm or worker on the productivity of other firms and workers. This implies that there may be market failures; for example, as firms cannot appropriate the full benefits of their investments in knowledge capital, they may invest at a lower level than would be optimal from an aggregate viewpoint, so that policymakers may be able to increase efficiency by enhancing incentives to businesses to invest in R&D.

These models all aimed to explain the roots of economic growth in order to explore economic differences between countries. They assume, for example, that spillovers will diminish over distance and international borders, so that investment in knowledge and human capital may reinforce virtuous cycles of development, potentially leading to widening income differences between countries. This view is supported by the 'new economic geography' which emphasises that once the forces of agglomeration (including technological spillover effects) take root, they tend to become self-reinforcing, leading to widening geographical disparities.⁶ Other models, however, have shown that this is not inevitable, however, as openness to international trade and investment in education and training are seen to enhance the flow of ideas and

⁴ Solow, R.M. (1956) A contribution to the theory of economic growth. *Quarterly Journal of Economics*, Vol.70:pp.65-94.

⁵ Lucas, R.E. (1988) On the mechanics of economic development. *Journal of Monetary Economics*, Vol.22:pp3-42. Romer, P.M. (1986) Increasing returns and long-run growth. *Journal of Political Economy*, Vol.94:pp.1002-1037. Romer, P.M. (1990) Endogenous technological change. *Journal of Political Economy*, Vol.98:pp.S70-S102.

⁶ Fujita, M., P. Krugman and A.J. Venables (1999) *The Spatial Economy: Cities, Regions, and International Trade*. Cambridge, MA: MIT Press.

new technologies across borders, allowing lagging countries to imitate and thus catch up with more advanced locations.⁷

2.2 Evolutionary and institutional economics

Some economists take a different approach to the analysis of technological development. They emphasise that technological change is conditioned by uncertainty and tends to follow trajectories that may lead to non-optimal outcomes which nevertheless are not easily reversed and yet condition future possibilities for development.⁸ They argue that technological change depends on the routines that determine the firm's capacities for decision-making and acting, as well as on the external institutional context, not only in terms of formal regulatory frameworks, but sometimes also in terms of shared belief- and value-systems).

One influential example of this approach focuses on 'systems of innovation',⁹ which are seen to include all those institutions that influence technological development. Studies typically aim to identify all relevant actors, not only enterprises, but also banks, policy agencies, universities, socio-economic partners and so on, and to map their activities and interactions. While early studies focused at a national level, others have taken a regional or a sectoral approach.

2.3 Regional geography

A number of different concepts have been put forward since the 1980s in support of the view that technological innovation is driven by factors at a regional level, including 'innovative milieu',¹⁰ 'learning regions',¹¹ and 'industrial districts'.¹² These regional factors are sometimes seen in terms of cultural commonalities or repeated face-to-face interactions between businesses and other actors, leading to trust-based relations. At other times, they are argued to be based on enhanced access to formal and informal sources of knowledge from organisations located nearby, or on particular policy institutions and programmes undertaken by regional authorities.

One interesting feature of these studies is that, like recent models in mainstream economics, they derive their ideas from Alfred Marshall's¹³ analysis of agglomerations. Marshall argued that firms choose to locate close to one another because this reduces the costs of market transactions; promotes access to skilled labour; and facilitates the exchange of technological and other information. However, economists draw the conclusion that an increased emphasis on R&D and technological innovation tends to lead to a widening of geographical disparities, as the advantage of leading locations is further reinforced, while the diffusion and imitation of existing technologies tend to reduce inequalities. By contrast, geographers argue that the experience of the most dynamic agglomerations can be replicated in lagging regions, and perceive innovation policies as solutions to the economic development of all regions. In part, this divergence is due to the tendency for geographers to use a very broad definition of innovation that includes not only 'the commercialisation of new products and processes', but also any form of technological

⁷ Grossman, G. and E. Helpman (1991) *Innovation and Growth in the Global Economy*. Cambridge, MA: MIT Press.

⁸ David, P.A. (1985) *Clio and the economics of QWERTY*. *American Economic Review*, Vol.75(2):pp.332-337.

⁹ Lundvall, B.-Å. (Ed.) (1992) *National Systems of Innovation: Towards a Theory of Innovation and Interactive Learning*. London: Pinter. Nelson, R.R.(Ed.) (1993) *National Systems of Innovation: A Comparative Study*. Oxford: Oxford University Press.

¹⁰ Aydalot, P. and D. Keeble (Eds) (1988) *High Technology Industry and Innovative Environments*. London: Routledge.

¹¹ Morgan, K. (1997) *The learning region: Institutions, innovation and regional renewal*. *Regional Studies*, Vol.31:pp491-503.

¹² Becattini, G. (1979) *Dal settore industriale al distretto industriale: Alcune considerazioni sull'unità di indagine in economia industriale*. *Rivista di Economia e Politica Industriale*, Vol.1:pp.7-22.

¹³ Marshall, A.M. (1890) *Principles of Economics*. London: MacMillan.

or organisational improvement within an enterprise, as well as broader processes of socio-institutional or policy change.

2.4 Empirical studies

A number of studies have drawn on econometric models to assess empirically the impact of public subsidies and incentives on business R&D expenditure. A macroeconomic approach that takes account of economy-wide interactions can provide information on social – rather than simply private - returns. For example, a recent panel data analysis of nine OECD countries in 1979-97 finds a positive and significant correlation between R&D tax credits and rises in business R&D expenditure, controlling for country-specific fixed effects and world macroeconomic shocks.¹⁴ It calculates an impact elasticity of around -0.1 in the short run, rising to around unity in the long run. This indicates that a ten percent reduction in the cost of R&D would lead to a one percent increase in the amount of R&D in the short run, and a ten percent increase in the long run. Another study of 17 OECD countries in 1981-96 shows similar results, but also finds that direct subsidies may be more effective than fiscal incentives in the long run, and that the two instruments tend to substitute for one another.¹⁵ They also find that stable policy regimes have stronger results, and that the returns to R&D subsidies follow an inverted U-shape, increasing up to an aid rate of around 15 percent, and decreasing thereafter.

Some studies also note, however, the need to take account of other factors when deciding whether the benefits of increased public spending on R&D would outweigh the costs, such as the administrative burden; the difficulties in designing efficient aid systems; the risk that increased subsidies may simply lead to a relocation of R&D rather than an aggregate increase in R&D output; and the possibility that increased R&D spending is translated into salary increases for R&D staff, rather than increased output.¹⁶ There may also be other means of enhancing the efficiency of business R&D expenditure (and thus incentives for firms to invest), notably steps to enhance market integration and patent protection.

¹⁴ Bloom, N., R, Griffith and J. Van Reenen (2000) Do R&D tax credits work? Evidence from an international panel of countries 1979-1984. London: Institute for Fiscal Studies Working Paper.

¹⁵ Guellec, D. and B. van Pottelsberghe de la Potterie (1997) *Does government support stimulate private R&D?* OECD Economic Studies Vol.29:pp.95-122.

¹⁶ Bloom et al, 2000. Op.Cit.

3. BUILDING INNOVATION STRATEGIES

3.1 National innovation strategies and regional development policies

All Member States have explicit national strategies and/or policies aimed at enhancing R&D and innovation. In some States, there are explicit links between these national strategies and regional development policy, either because the national RTDI strategy is implemented at a regional level and is perceived to contribute to regional development, or because regional policy is seen as a component of the national RTDI strategy. In other Member States (e.g. Denmark), however, national innovation policy does not have an explicit regional dimension, nor is there any specific connection between the national policy and Structural Funds programmes.

There are strong linkages between the two policy areas in Austria, where it is sometimes difficult to distinguish between national RTDI policy and regional policy. Indeed regional policy is often perceived as a component of RTDI policy, with key interventions, such as the national ERP-Fund, focusing regional policy programmes on technology-oriented enterprises. The federal government provides funding for a number of technology-oriented programmes, some of which aim specifically to stimulate bottom-up development via technological innovation projects, notably via the central State's *REGplus* and *RIF2000* programmes.

In Sweden, the national strategy for innovation, *Innovativa Sverige*, identifies regional development policy as one of the policy fields that contribute to developing a climate for innovation. Moreover, *Innovativa Sverige* is financed and implemented in the framework of Sweden's Regional Growth Programmes, which draw *inter alia* on finance from Structural Funds programmes. Similarly, RTDI is seen as an important component of domestic regional policy. A parliamentary report on the future of regional policy in September 2000 noted the importance of inter-firm co-operation, entrepreneurship and new technology for regional economic development, with universities and colleges seen to play particularly important roles.

In Finland, the Science and Technology Policy Council's 2002 review "Knowledge, Innovation and Internationalisation", which set the core of the national strategy, notes the need for regions to enhance their factors for development, not least by drawing on higher education institutions and research institutes, which are seen as a means of building international linkages. The National Technology Agency (Tekes) coordinates sectoral technology programmes, which are delivered through 14 regional Employment and Economic Development Centres. Although funding under these programmes is allocated on the basis of national selection criteria, the award rate may be raised by an additional ten percentage points for lagging regions. The national strategy for innovation is taken into account in the Structural Funds programmes, first via the involvement of the relevant Ministries and Tekes in the regional groups that developed the programmes, and secondly via sub-regional strategies, which both reflect and influence national goals, including those relating to innovation policy. Domestic regional policy also has an innovation component, in the form of the Centres of Expertise programme, which aims to encourage cooperation between research providers and users in different sectors. There are now 22 Centres of Expertise which were selected in response to competitive tenders and are managed by the regional authorities.

In the UK, national science and innovation policy is mainly oriented towards the goal of enhancing national productivity, and core public and private R&D expenditure is unevenly distributed, with particularly high concentrations in the East and South East regions, as well as in the military and health sectors. However, there is also a regional dimension to the national strategy, particularly in relation to the goal of promoting enterprise, innovation and increased productivity – as opposed to funding

for scientific R&D. National policies influence both domestic regional policy and the UK's Structural Funds programmes, with the national White Paper on Competitiveness of 1998, which emphasises enterprise, innovation and clusters, being seen as a key influence on the context in which the 2000-2006 programmes were formulated. A key component of UK domestic regional policy relates to the goal of enhancing productivity in all regions, by stimulating innovation, skills, investment, enterprise and competition, with the Regional Development Agencies seen to play a key role in developing strategies and channelling funding.

In Spain, the strategic framework for RTDI policy is provided by the National Plan for Research, Development and Innovation, which was approved in November 2003. It commits the central government to raising annual expenditure on RTDI by ten percent, and to take steps to enhance incentives for private sector participation in RTDI, not only via direct aid and tax credits, but also by improving the conditions for public-private partnerships (such as technology centres and parks), and by strengthening intellectual property rights. Due to the distribution of responsibilities between levels of government in Spain, the administration of RTDI policies is divided between the central State and regional authorities, with the central State administering the larger share of funding. The National Plan for RDI sets the framework for a significant proportion of funding for Structural Funds co-financed projects in the Basque country, as in other Spanish regions.

In some Member States, RTDI policy is mainly focused at a national level, with regional policy – which may include some RTDI component – primarily focused on those regions which lag behind most severely. In Italy, there is a National Research Plan and a National Research Programme, as well as public funding for industrial and basic research.¹⁷ In terms of regional policy, the national government provides State aid for business R&D projects (under law '488/92 Research') in designated domestic regional aid areas.

3.2 Regional strategies for innovation

Member States and regional authorities also take different approaches to regional strategies. In some cases, the Structural Funds programme itself is perceived as a regional strategy for innovation (Lombardia, North Jutland, Sachsen-Anhalt). Elsewhere, the national economic policy framework requires all regions to develop a regional economic development strategy, which includes a strong emphasis on innovation (Finland, Sweden). In other cases, individual regional authorities have developed their own innovation strategies or policies (Austria; Flanders, Nordrhein-Westfalen, País Vasco, Wales), sometimes drawing on EU funding for building regional innovation strategies.

In Sweden, the national government instructed each county authority in 2002 to develop Regional Growth Programmes for 2004-2007, focusing on the issues of labour supply, entrepreneurship, businesses, business climate, innovation systems, and clusters. A similar approach is taken in Finland, where, under the Regional Development Act of 2002, Regional Councils must develop four-year regional strategies which are consistent with national targets. These strategies aim to integrate the regional implementation of national special programmes and Structural Funds programmes, whilst also taking account of longer-term regional plans.

Some individual regional authorities have developed their own innovation strategies or policies (Austria; Flanders, Nordrhein-Westfalen, País Vasco, Wales). In some regions, the construction of a new policy field of "innovation support" – separate from traditional policies for R&D or business - has allowed regional authorities to develop certain spheres of activity as their own (País Vasco, Wales). In Steiermark, the *Land* has set out a policy framework on technological innovation which focuses on seven

¹⁷ FAR or *Fondo per le Agevolazioni alla Ricerca*, D. Lgs. 297/1999 artt.1-12, and FIT or *Fondo per l'Innovazione Tecnologica*, law 46/1982

thematic clusters, each of which has its own strategy. In Nordrhein-Westfalen, the *Land's* economic development strategy has focused on technological innovation since the 1970s, but has shifted over time. In the 1970s, it funded large R&D programmes in traditional coal, steel and related sectors. From the early 1980s, it moved towards a more 'bottom up' strategy, aimed at setting up technology transfer agencies in universities, and establishing new R&D institutes, science parks and innovation centres throughout the Land. From the mid 1990s, the focus moved towards building networks of firms, R&D centres and other actors, not least via the thematic *Land* Initiatives. Since the turn of the century, this approach has been complemented by a focus on cluster-building and cluster-support.

The Italian Objective 1 Community Support Framework (CSF) states that each regional authority shall develop a regional innovation strategy (RIS), setting out the criteria and orientations for RTDI interventions. The State Ministry for Education, University and Research recommended that the RIS should be based on:

- An analysis of regional demand for innovation-related services;
- A description of the regional supply of innovation;
- An assessment of past experiences in RTDI policy, in order to identify interventions that have not worked and should be discontinued;
- An identification of objectives that are coherent with the goals of the CSF's two national Operational Programmes relating to Research, and to Local Economic Development, as well as with the National Research Strategy.

However, the experience of drafting the regional strategies is considered to have been unsuccessful because the regional authorities have not undertaken these different analytical steps or developed adequate strategies.

BASQUE NETWORK OF SCIENCE, TECHNOLOGY AND INNOVATION (SARETEK)

The 'Basque Technology Network' was formed in 1997 upon the initiative of the Basque regional government. A government Decree 96/1997 defined the characteristics and functions of the 'Technology Research Entities' composing the network and set out the mechanisms for collaboration and coordination between them. The name SARETEK was given to the group incorporating the various members of the network, which took the legal form of a non-profit making association. On the 26th December 2000 a new decree modified the legal framework incorporating a larger array of actors and including the word 'science' in the name of the network. The latest regulatory change in October 2002 has further widened the classification of entities and renamed the network the 'Basque Science, Technology and Innovation Network'.

The network incorporates over 60 key actors involved in science and technology activities, classified as follows: Universities (4); Sectoral Research Centres (4); Basic and Excellence Research Centres (2); R&D business units (17); Research Centres (14); Health R&D unit (1); Technology Centres (9) Certification Institutions and Testing Laboratories (4); Cooperative Research Centres (4) Intermediary Innovation Institutions (15); International Development and Technology Transfer Centre (1) Technology Parks (4) Public Research Institutions (2) Business Innovation Centres (3)

The following 'Scientific-Technological Areas' are covered by the network: Biotechnology and Biomedicine; Knowledge Management; Business Management; Computing and Communications; Materials and Processes; Metallurgy and Calibration; Chemical Products and Processes; Production and Automation; Recycling, Natural and Agri-food Resources; Socio-economy; Information Society; Information Communication Technologies.

The mission of SARETEK is to: represent all the technology agents based in the Basque Country; encourage the development and strengthening of relationships between its members; facilitate dialogue between its members and those responsible for Technology Policy in the Basque Government; and, to promote the integration of the Science-Technology-Business-Society System in the Basque Country.

The País Vasco government's overall economic development strategy, the Interinstitutional Economic Promotion Plan 2000-03, focuses on three areas of intervention, namely innovation, internationalisation, and investment and employment. Around one third of the plan's €900 million budget is allocated to innovation, with interventions focused on enhancing incentives for businesses to engage in RTDI, as well as on improving the provision of technology supply and diffusion. Since 1990, the Basque government has also developed plans on the theme of RTDI, and the plans for 1997-2000 and 2001-2004 have drawn on funding from EU RIS and RIS+ programmes. Preparations for the 2001-2004 Plan for Science, Technology and Innovation included a series of studies on areas such as: technology needs, the supply of technology-oriented services to business, and science / technology forecasting. There was also widespread consultation with businesses, technology-oriented organisations, both via a web-based forum and via technical committees and the Basque Council for Science and Technology.

It is not only in the País Vasco that EU funding has facilitated regional strategy-building, notably via the Regional Technology Plans (RTP) and Regional Innovation Strategies (RIS) which were funded by the Structural Funds' Innovative Actions programme, and via the Regional Innovation and Technology Transfer Strategy (RITTS) which was funded by the EU's Framework programmes for R&D . These initiatives aimed to stimulate a bottom-up approach to the development of a regional innovation strategy, that would be based on an analysis of regional weaknesses and identify areas where action could be taken. These strategies often aimed not only at specific RTDI interventions, but also at stimulating broader cultural changes towards 'innovativeness' (Niederösterreich, País Vasco, Toscana, Wales, Western Scotland).

A general criticism of this approach is that funding is only provided for strategy building and not for implementing the strategy's interventions, so that its direct effects are limited. Moreover, if each region develops its own strategy, this can lead to fragmentation and inefficient aggregate outcomes. However, it is perceived to have been highly beneficial in a number of partner programmes (UK; Niederösterreich, País Vasco, Toscana) and has also been pursued in other areas, often at a sub-regional level (Germany; Steiermark). In the UK, the EU co-financed innovation strategies are seen to have provided the basis for more inclusive and focused debate about RTDI; to have contributed to consensus-building; and to have raised the political profile of RTDI.

4. THE ROLE OF INNOVATION SUPPORT IN THE IQ-NET PARTNER PROGRAMMES

4.1 The evolution of innovation support since 1989

Some qualitative changes can be identified in the approach to innovation support in the programmes over time, although it is not possible to demonstrate a clear quantitative trend, for example towards increased funding for RTDI. One reason for this is that there tended to be a stronger focus on financing high-cost projects in earlier programmes, such as R&D infrastructure, science parks or similar infrastructure, whereas many programmes have now moved into financing other types of projects that individually are less costly. This does not necessarily mean that the emphasis on RTDI has necessarily been reduced. Indeed, in a number of programmes, the focus on RTDI has been strengthened and mainstreamed so that many different Measures are seen to contribute to the goal of enhancing the innovative capacities.

A number of programmes emphasise the need to build regional strategies, as well as broader mechanisms for enhancing policy co-ordination and cooperation between different actors. This is seen to be of particular importance because various different organisations are now involved in providing innovation support, with universities and colleges often encouraged to provide services to businesses and to develop collaborative projects with individual enterprises or groups of enterprises, notably SMEs.

Almost all partner programmes financed some type of R&D infrastructure in the form of R&D centres, science parks or incubators in the early 1990s, although in many programmes, this is no longer a major emphasis. Consecutive Structural Funds programmes in Limburg, for example, have seen a rise in the importance of applied business-oriented research, relative to investment in basic R&D projects and R&D infrastructure. The aim has been to improve the usefulness of R&D centres for businesses located in Limburg. A different trend is seen in Sachsen-Anhalt, where funding for RTDI infrastructure has increased in the 2000-2006 programme, compared to the previous programming period.

Most of the programmes adopt a broad definition of innovation, which is seen not to be limited to R&D nor even always to new technologies. It is argued that there is a need to build wide-ranging, bottom-up innovation strategies that involve various organisations at regional and local levels (Niederösterreich, País Vasco, Wales). The focus on bottom-up strategy building can also be seen in Finland, where in the previous period EU funding for innovation tended to be allocated in line with national priorities. The regions now have their own strategies under which they try to invest in long-term "strategic" targets and in improving competitiveness. However, the Finnish regions must still take national goals and priorities into account.

Many programmes also emphasise the need to encourage cooperation in project implementation. A good example of this is in Sweden where there is an emphasis on partnership between the private sector and academic institutions. In Norra Norrland, the business sector has increased its involvement in R&D projects whilst in Norra, academic institutions are now more involved than before and RTDI projects have become more firm oriented. This is also the case for the País Vasco where policy-makers encourage cooperation between academic institutions and the private sector. In Denmark, there is a strong emphasis on helping enterprises to develop knowledge in cooperation with universities and consultants.

A further theme that can be identified in the 2000-2006 programmes is the stronger orientation towards business needs, rather than simply building infrastructure or funding R&D projects in the public sector. This business-oriented approach can be

seen in the País Vasco, where there is a clearer emphasis on addressing firms' needs and in involving different organisations in 2000-2006. In Nordrhein-Westfalen, the percentage of the programme allocated to innovation support has risen in 2000-2006 with a greater focus on support for start ups, the development and use of Information and Communication Technologies, and a concentration on clusters and sectoral priorities. Both the Toscana and the Lombardia programmes, RTDI interventions are mainly concentrated on the development and strengthening of SMEs. Such interventions had already, however, been funded in the two Objective 2 programmes implemented in 1994-99, particularly in Toscana, where funding was allocated to the promotion of networks and cooperation between private and public actors. Similarly, in the UK, RTDI Measures have long been oriented towards the needs of businesses, and there is a strong emphasis on demonstrating that there are market failures that public intervention can address. The 2000-2006 programmes in the UK often use clusters as a frame for business-oriented activities in relation to RTDI, in particular as a means of targeting interventions more clearly.

4.2 The strategic role of innovation support in the programmes

Innovation support has a central position in many but not all programmes' development strategies. A number of programmes emphasise the importance of RTDI, notably Finland, Sweden, Germany, Austria, and the País Vasco, but others, such as Kempen in Flanders, Lombardia, East Wales and the Western Scotland, put less emphasis on RTDI in their strategies. RTDI support plays a significant role in the partner programmes for a number of reasons:

1. It is often argued that regional economic development depends on mobilising and developing bottom-up resources and capacities.
2. The increasing internationalisation of goods and services markets is seen to imply that countries should now take into account economic conditions in other countries, for example relative costs, and re-orient the basis of their comparative advantage towards more highly skilled sectors.
3. Europe spends a lower percentage of its GDP on R&D investment than the USA. Since the 2000 – 2006 programmes were adopted, the Göteborg and Lisbon agendas have reinforced the policy focus on innovation and R&D.
4. National policy goals emphasise growth and this approach is translated into the Structural Funds programmes.

Innovation and technology support are central to the País Vasco's SPD strategy, not least because the regional economy is characterised by a low level of investment in R&D due to the dominance of traditional sectors. Support for innovation is concentrated heavily in Priority 3 "The Knowledge-Based Society", and 36 percent of total EU funding is allocated to this priority, which is the largest in the programme.

Innovation and technology support are central to the Finnish programme's overall development strategy. It is recognised that Finland cannot compete with lower-cost countries in conventional industrial sectors and policy-makers therefore aim to develop the region's comparative advantage by building up strengths in R&D and new technologies. The RTDI financial allocation is 25-30 percent of overall programme spending.

Support for technology and innovation plays a strong role in both programmes in Germany, with both programming documents underlining the importance of upgrading technological resources and enhancing the use and creation of technologies as a means of stimulating structural change, long-run economic growth and employment creation. In Nordrhein-Westfalen, the total financial allocation for RTDI measures is 37.3 percent of total public funds. In Sachsen-Anhalt 14.3 percent of the programme funds are allocated to RTDI related measures.

In Sweden innovation and R&D have taken central stage in recent political rhetoric and are endorsed as the key instruments to long run (sustainable) economic growth. RTDI thus play an important role in the programmes. In Norra Norrland, there are two RTDI related measures and they account for 19.0 percent of the total EU programme budget. Norra has also two RTDI measures and financial allocations account for 40.7 percent of the total EU programme budget.

In Niederösterreich around 30 percent of ERDF funding is allocated to innovation. The *Land* has drawn on the EU's initiative for Regional Innovation Strategies as a means of developing *Land*-wide strategies, encouraging the introduction of more technology-oriented approaches, and developing new forms of intervention. In Steiermark, data on ex ante financial allocations show that 59.7 percent of EU funds were allocated to RTDI related measures. Steiermark's SPD has the overall goal of improving the regional innovation system's performance and raising the intensity of innovation in business.

The Objective 2 programme in Denmark sees innovation as a core goal of the strategy, so that a considerable amount of funds are spent on innovation support. Innovation is seen as a precondition for regional development and thus the success of the programme.

In terms of the prominence of RTDI interventions in the various UK programmes, as well as in terms of the budget dedicated to this theme, the least weight is given to RTDI in the Western Scotland and East Wales. There is a stronger focus on RTDI in the West Wales and the Valleys programme, and also in the North East of England programme.

In Flanders, the Kempen programme's main focus is on developing new business sites and infrastructure, and promoting tourism, and only around 9.5 percent of the programme is allocated to RTDI. This is because innovation support is not a major policy priority for the area; instead, the main need identified in the ex ante evaluation was to build new business parks. In Limburg, on the other hand, the Measure on 'Technology and Innovation' represents over 21 percent of the programme's total funding and is the second largest measure in the programme. Policy-makers in Limburg perceive the provision of innovation support as a means of attracting and maintain businesses in the area.

The Italian programmes show some variation in their approach to RTDI. In Lombardia, relatively little funding is allocated to innovation or R&D due to the weakness of other key endowments, notably infrastructure. Funding for RTDI in Lombardia is mainly focused on business-oriented projects, particularly the diffusion of existing technologies because most of the businesses in the eligible areas are in traditional sectors and make limited use of technologies. The Toscana programme also focuses mainly on business support for RTDI, due to the importance of SMEs in traditional sectors within the regional production structure. The programme states that the promotion of RTDI is one of the pillars of the SPD strategy but only 7.4 percent of the total SPD allocation is allocated to innovation support. Italy's OP LED programme, that has traditionally provided standard State aid to firms, allocated around 15 percent of funding to aid for innovation projects for the 2000-2006 programme, and raised this proportion to around 23 percent of funding in the context of the Mid Term Review.

There is also considerable variation in the importance of RTDI support in the Objective 1 and 2 programmes in France. The French authority, DATAR, has analysed the percentage of projects in different categories. This programme where the innovation support is highest – in terms of the number of projects funded – is Nord-Pas-de-Calais (16 percent), followed by Poitou-Charentes (nine percent) and Aquitaine (seven percent). In 19 programmes, between one and five percent of the number of projects are in the field of innovation support, while in four programmes (Midi-Pyrénées, Martinique, Corse, Auvergne) less than one percent of the number of

projects relate to innovation. It is important to note that these data refer to the number of projects, rather than to the level of financial allocations, and therefore only provide a partial picture of the importance of RTDI in the French programmes.

4.3 Different types of innovation support

4.3.1 Funding for public sector R&D

The main reasons for this type of innovation support are market failure, as well as the high risk associated with R&D. It is argued that the business sector may under-invest in R&D projects from the point of view of society as a whole. This is because the private gains from investment in R&D are lower than the total social gains, due to the spillover benefits from one business's investment onto the productivity or efficiency of other businesses. It is also argued that public support for R&D can mean that projects can be undertaken that would be too risky or costly from a business perspective, or where benefits are uncertain.

The partner programmes finance different forms of funding for public sector R&D: R&D infrastructure, R&D projects, and R&D staff. Relatively few of the programmes fund capital expenditure in public R&D centres or universities, although such projects are financed in Sachsen-Anhalt. Some funding is also provided in Nordrhein-Westfalen, although the SPD focuses only on modernising existing infrastructure and exceptional projects linked to strengthening regional clusters, and even then, infrastructure is seen to include innovation centres and training centres, as well as R&D centres. Higher education institutes and public R&D centres in NRW may also receive funding for RTDI projects but the lead partner in such projects must always be a business. In the País Vasco, Measure 3.5 provides support for consolidating the science and technology infrastructure incorporating both the public and private sector. It supports the creation or extension of University centres, public research centres and private not-for-profit technology centres. The Limburg programme also provides capital investment to expand research facilities.

Various programmes provide funding for R&D projects. In Niederösterreich, Measures 2.3 and 2.4 provide support for applied R&D in enterprises, often in cooperation with public or quasi-public R&D centres or higher education institutes. In Steiermark, Measure 2.2 provides funding for pre-competitive R&D in higher education institutes and R&D centres and also finances R&D infrastructure and projects. In Norra Norrland, Measure 1.3 "Research and Development", there is a strong emphasis on encouraging co-operation and networking between the business sector and R&D centres. The promotion of increased R&D, improved accessibility to R&D results, new forms for knowledge transfer, and new forms for social infrastructure are some initiatives mentioned in the Norra Norrland SPD.

Programmes also finance training for R&D staff. The País Vasco programme supports training and researcher mobility in public research centres, including PhD scholarships in public research centres; support for recruiting/contracting post-doctoral staff in research centres; provision of PhD scholarships in businesses or technology centres within the priority areas of the national plan for Science, Technology and Innovation; and support for technology centres or businesses to recruit highly qualified staff. Another example is in the Wales programme which finances customised training, staff exchange, graduate retention, initiatives to accelerate the exploitation of R&D, and stimulating awareness of innovation. The Finnish programme aims to strengthen connections between educational institutions, teachers and the workplace. It aims to increase levels of expertise, create links to information networks, promote cooperation amongst specialists and secure a well-trained workforce for businesses. Finally in North East England, interventions include work placements, training subsidies, retraining to adapt to innovation, high level training to address specific innovation and technology skills shortages, training for Centres of Excellence staff collaborating with SMEs, and graduate retention.

4.3.2 *Science parks, innovation centres and incubators*

The main rationale for these types of intervention is to facilitate co-operation between the private sector, academic institutions, and policy-makers. These are not a major focus of funding in the programmes, partly because many already funded these types of interventions in the early to mid 1990s (UK, Austria; Nordrhein-Westfalen, Limburg, País Vasco).

CRYSTAL VALLEY IN OBJECTIVE 2 NORRA

The Objective 2 programme in Norra has contributed to funding the infrastructure and capital equipment within a broader initiative aimed at supporting the growth of a cluster in Liquid Crystal Display (LCD) technologies. It has financed the creation of an LCD Centre AB in area that has come to be called "Crystal Valley", located in Borlänge.

The aim of this initiative is to provide a favourable context for the development of Liquid Crystal Display technologies. It is a good example of the so-called "Triple Helix model" that is common in the Nordic countries, where actors from the business sector, the policy sector, and academic institutions all work together in a specific project.

LCD is an important high-tech growth area which already employs many people in Crystal Valley, whether in businesses or university and industrial research institutes. There are few other such centres of LCD expertise outside Asia. The LCD Centre provides advanced further education/training programs and conducts applied research and development into new technologies and production methods that can then be transferred to industry. The LCD Centre also promotes the area, with the aim of attracting new companies and activities. For more information, please visit: <http://www.lcdcenter.com>

Both programmes in Austria allocate a degree of funding for such projects, although finance is generally focuses on developing existing innovation centres. The Sachsen-Anhalt programme also finances such interventions and project applicants can apply for funding under a number of different sub-Measures, namely sub-Measure 1.21.5 (Aid for innovation and start up centres), Measure 2.1.1 and Measure 2.2.1 (R&D infrastructure).

In Kempen, the programme manager has ring-fenced a significant amount of funds for a new business incubator for firms specialising in environmental science, but the final decision has not yet been taken due to difficulties relating to spatial planning permits.

4.3.3 *Funding for enterprises*

The reasons for funding this type of project are very much the same as those put forward in favour of funding public R&D. In addition to the market failure argument, however, it is also argued that businesses find it difficult to obtain private sector funding, especially from banks, due to the high levels of risk associated with R&D projects. These difficulties are argued to be particularly severe in the case of SMEs, which in recent years have come to be seen as increasingly important in the modern economy.

There are different types of RTDI-oriented aid for businesses. Perhaps the most common one is aid for business R&D. Such interventions are funded in both Swedish programmes, often with the aim of drawing on existing R&D expertise and exploiting it economically, as well as facilitating R&D cooperation projects between businesses, as well as with other actors, including universities. Both Austrian programmes provide funding for industrial research and pre-competitive development, with finance targeted on individual firms, as well as on cooperation projects with R&D institutes.

The País Vasco programme finances support for RTDI projects in the private and public sector. It co-funds an aid scheme, called INTEK, which finances technological innovation projects in businesses. Eligible activities include industrial research (creating new or improvement of existing products, processes or services) and

technology development (including activities associated with applied research). Priority is given to cooperative projects including more than one business. In Sachsen-Anhalt, aid is provided to enterprises to undertake a variety of RTDI projects, including in cooperation with HEIs/R&D institutes, or with other enterprises.

Italy's OP LED programme has traditionally co-financed large-scale aid to enterprises, but in the 2000-2006 has started to focus a proportion of the funds on activities such as innovation, via an instrument called "PIA Innovation" (Integrated Assistance Package – *Pacchetto Integrato di Agevolazione*). Its main objective is to support pre-competitive research programmes and the commercial application of research outcomes. The PIA Innovation aims to enhance firms' capacities to innovate, which Italian policymakers see as crucial to their ability to compete in international markets.

The Toscana programme also provides aid for pre-competitive research to SMEs in various sectors, as well as for applied research in manufacturing firms of all sizes. The measure is administered by the regional Business Innovation Centre, BIC Toscana. For pre-competitive research projects in SMEs, the gross grant equivalent is 35 percent of total eligible expenses, which may be raised by ten percentage points if the project involves cooperation between firms and public research institutions, and a further five percentage points if projects are located in Article 87(3)(c) areas in the context of EU regional aid guidelines. For industrial research projects, the gross grant equivalent is 50 percent of total eligible expenses if the project is undertaken in an Objective 2 area, and 40 percent in phasing out areas.

A second type of business aid takes the form of support for business start-ups and SME development, whether traditional grants or different types of seed and venture capital. Such interventions are funded, for example in Finland, Steiermark, Wales and Norra. The Toscana programme is in the process of setting up a fund that will provide both seed financing and start-up financing to support the creation and development of firms operating in the technologies with high growth potential. The seed financing will support the exploitation of the results of R&D research, as well as product and process development, and will fund all activities that are normally excluded from public funding, such as prototyping, testing, market analyses, business plans. The start-up financing will support business projects that are born from R&D activities, funding the development of products from the prototyping to the commercialisation.

Third, some business aid is allocated in the context of cluster-projects. In Finland, a variety of types of funding is allocated to support so-called "clusters of expertise", not least in order to strengthen cooperation between research and training units, development organisations and business. Support is directed towards technology transfer, links to information networks, the use of new energy and environmental technology, and R&D. In Nordrhein-Westfalen one Measure finances the transfer and application of existing environmentally friendly technologies in SMEs, while other Measures provide aid in the context of cluster-building activities, for example in the media and communications sectors, and in alternative energies.

Finally, in France, some Objective 2 programmes provide aid for relatively soft types of activities. In both Lorraine and Rhône-Alpes, the programmes finance the recruitment of skilled staff for innovation projects in businesses. The Rhône-Alpes programme also finances aid to businesses for activities such as acquiring innovation project management skills; designing innovation strategies; supporting cooperation projects between firms and R&D centres; and financing the design and manufacturing of new products and processes.

4.3.4 *Technology-oriented services for enterprises*

The main rationale for these types of intervention is that SMEs often do not have sufficient access to technology and the appropriate skills. It is sometimes argued that technology-oriented services for enterprises are often more effective than business grants in the traditional sense. There are three main types of interventions within this

group, namely services provided by R&D centres, inter-firm co-operation, and start-up services.

The first type of intervention can be seen in the Toscana programme, which aims to connect enterprises with the providers of research, such as universities, research centres, and other centres providing technical services to firms. The programme has funded "*Tecnotessile*", which is a centre that provides services to businesses, and undertakes research into textile-oriented technologies and processes. The direct provision of services to businesses, notably SMEs, in Toscana is seen as particularly important because the regional economy is largely made up of small businesses, often in traditional sectors such as textiles, that have limited skills and access to technologies, yet face severe international competition.

Both Austrian programmes provide support for the provision of technology oriented services to businesses. In Niederösterreich, funding is provided to R&D centres and technology transfer agencies to set up and improve technology transfer activities in terms of equipment, staffing, consultancy, network running costs etc. In Steiermark, finance is provided for soft interventions that support the allocation of aid for R&D projects, not least in the field of network building.

TECHNOLOGY-ORIENTED SERVICES TO SMES IN TOSCANA

A key component of the Toscana programme (Sub-measure 1.7.2) aims to promote innovation by connecting enterprises with universities, research centres, and centres providing technology-oriented services to businesses, for example in the field of rapid prototyping. This approach was born out of the results of EU co-financed projects on building regional innovation strategies - RITTS Toscana, RIS+ Toscana and the Regional Innovation Network.

Eligible types of expenditure include: staff costs related to network development; equipment used by the network; consultancy or advisory services; project-design and feasibility studies; the cost of immaterial goods, such as the purchase of the results of research activities, licenses, patents etc.; and general expenses to a maximum of 15 percent of the total project cost.

One of the projects funded is *Tecnotessile* which will be visited during the study tour. *Tecnotessile* is a centre which provides innovation-oriented services to firms, including advice on textile technologies; design of mechanical devices; machinery development and process automation; applied research projects and technological transfer; training for technicians and researchers; experimental testing of textile machines and processes; computer technology integration and development, CAD applications, machinery and process control; laboratory tests; and the development of quality systems according to the ISO 9000, ISO 14000 and EMAS Standards.

Tecnotessile also undertakes R&D into new techniques in the textile sector e.g. recycling waste water in the production process; developing innovative fabrics (e.g. fabrics that are anti-bacterial, or that screen ultraviolet rays and electromagnetic waves); and experimenting with production processes to reduce environmental impact. For more information, see <http://www.tecnotex.it/online/>

A second project has involved the development of a software package for the Empoli textile cluster. The software allows the various stages of the production process to be tracked, across the various firms that belong to the cluster. Each firm has access to the software via a password and, through the barcode attributed to each specific item, can see where the product is and its stage of completion. The project was jointly coordinated by the local chamber of commerce, the local *Confindustria* (business association) and IBM. A similar project has been implemented in Prato in the wood production cluster.

Some of the French programmes finance the provision of innovation-oriented services. The Lorraine programme (Sub-measure 1.5.2), for example, funds projects which aim to enhance services for SMEs in terms of innovation and technology. A

separate Measure (Measure 1.6) aims to enhance the innovation-related human resources of businesses, for example by improving the skills levels of staff in technology transfer centres, and developing training packages for businesses in the fields of 'innovation management' and 'technology transfer'.

Support for inter-firm cooperation projects in RTDI is provided in Niederösterreich. The Sachsen-Anhalt programme provides support for inter firm cooperation, advisory services for start ups, and advisory services for technology transfer. The Limburg programme funds inter-firm cooperation projects in the field innovation, including an innovation forum for companies and other organisations, as well as specific projects involving cooperation between companies and other organisations in the field of product development.

The Western Scotland programme also finances technological diffusion, including support to address gaps in facilities that aim to facilitate the transfer of knowledge and the development of innovation where this clearly benefits SMEs in the region and where there is clear evidence of market failure. The Nordrhein-Westfalen programme also finances advisory or technology-oriented services to businesses, not least in the context of the cluster-oriented strategies.

4.3.5 *Other types of interventions*

It is not always easy to separate RTDI interventions from other components of individual programmes, particularly in areas such as the Information Society, and professional or vocational training. A number of the programmes finance interventions in relation to either one or both of these themes.

Most programmes have an Information Society component, with the Tuscan and Austrian programmes, for example, funding telecommunications infrastructure, including links to broadband networks. Some of the best practice in this field is seen in the far-northern areas of Sweden and Finland, where public services are sometimes limited due to the region's large area and low population density. In Norra Norrland, funding is provided for information technology infrastructure projects, which also include the development of the skills needed to exploit this infrastructure in the education system, business sector, health sector and public services.

In the other Swedish programme, in Norra, the University of Gävle has received funding to set up a "Learning Centre", which aims to stimulate and develop initiatives to increase co-operation between the business sector and academic institutions, partly in the field of R&D but also in relation to academic distance education. It has developed "Blackboard", which is a web-based system that provides on-line access to courses at the university, including course material, handing in assignments, and creating web exams.

5. FINANCIAL MANAGEMENT AND ABSORPTION

In some programmes, it is relatively easy to identify the progress of interventions focuses specifically on RTDI, as opposed to other types of interventions. This is particularly the case of programmes which clearly demarcate innovation related activities. This may mean that all funding for RTDI is allocated under one specific Priority (e.g. the País Vasco and West Wales and the Valleys), or under a number of different Measures in different Priorities (e.g. Finland, Flanders, Nordrhein-Westfalen, Sachsen-Anhalt).

Measuring progress is more complicated, however, where innovation support is provided as part of a Measure (e.g. Toscana, East Wales), and where information is not provided separately for such interventions. It is also difficult where policy-makers have attempted to mainstream innovation (e.g. Western Scotland) throughout the programme.

This section endeavours to provide an overview of financial implementation of RTDI related interventions within the partner programmes, drawing on quantitative data on commitments and expenditure, as well as interview evidence. It reveals a wide range of variation both between the programmes and across Measures within individual programmes.

5.1 A diverse picture across programmes and Measures

In Austria, financial progress in innovation support has been good across both programmes. Performance has, however, varied across Measures, partly for administrative reasons, but also due to the poor economic climate which has led to generally weak take-up of aid and other types of business support. For example, in Steiermark financial absorption has been high under Measure 1.3 (modernisation of enterprises), and Measure 2.2 (support for pre-competitive R&D in universities and R&D centres). On the other hand, implementation has been slower under Measure 1.2 ('support for innovative start-ups') and Measure 2.3 ('Research, development and innovation in enterprises'), partly related to the weak economic climate.

In País Vasco, the RTDI related priority has absorbed the lowest level of funds relative to the rest of the programme, although progress is still considered to be strong, with expenditure levels (as of December 2003) at half of the Priority's entire allocation. Moreover, no difficulties are expected in spending the available funds for the remainder of the programming period, reflecting the high level of overall financial implementation in the Basque programme. Again, progress varies across the Measures, with RTDI projects and infrastructures (the core of innovation support within the programme) performing particularly strongly and technology transfer and diffusion less so due to administrative reasons.

In Finland, financial progress has been strong under the Measures which provide support for public sector R&D centres (including higher education institutes) and the provision of technology oriented services to businesses, which show above-average expenditure levels (as at 31st March 2004). On the other hand, progress in relation to support for science parks, innovation centres and incubators under Measure 1.2 ('Improving the operating conditions of businesses') has been much slower than average. Nevertheless, as in the Basque case, there are few difficulties in terms of absorption within the Western Finland Objective 2 programme and there have been no n+2 problems.

In Sweden progress has been positive across both programmes. In the Norra Norrland Objective 1 programme practically all the funds for IT infrastructure and R&D have been committed and roughly half of the funds spent (as at December 2003). In the Objective 2 Norra programme, progress is also positive although varied across

the two main innovation related Measures (as at March 2004). The IT infrastructure Measure has committed over 90% of funds, although expenditure is around a fifth of programmed allocation over the programming period. On the other hand, the financial implementation of 'knowledge development projects' is progressing more rapidly with over half of the allocation spent and additional funds allocated to the Measure. Finally, in North Jutland, progress is also positive across the two innovation related Priorities.

THE DIGITAL TECHNIUM IN WEST WALES AND THE VALLEYS

The Welsh Assembly's economic development strategy includes a strong emphasis on technological innovation. Some of the most high-profile projects are the so-called "Techniums" – which are thematic or sectoral centres, usually located on university campuses, which provide incubator units for technology-oriented businesses, as well as R&D and advanced technological services to enterprises.

Objective 1 funding has been used to finance the "Digital Technium" in the University of Wales Swansea, Wales's second city. It has co-financed the construction and equipping of the centre, which provides:

- Incubator units for new high-tech companies working in multimedia systems, optical and wireless communications, voice recognition, computer graphics, e-learning and virtual reality;
- Access to specialist research expertise and facilities via the University's Civil & Computational Engineering Centre and the Centre for Communications and Software Technologies – both of which have re-located to the Technium;
- Development laboratories including a state-of-the-art virtual reality facility which enables researchers to test a design or product in 3D. This means that products – ranging from new cars to heart valves - can be built and tested in a fraction of the time that would be needed for a conventional prototype.

The aim is encourage the exploitation of expertise from both industry and academia; to encourage and support young companies and spin-out enterprises; to increase investment in R&D; and to ensure that companies based in Wales have support to use and exploit new and existing technologies.

The Digital Technium has been developed by the University of Wales Swansea and the Welsh Development Agency, with the support of the Welsh Assembly Government, local government partners and the private sector (including Sony, IBM UK Ltd, and Agilent Technologies).

In the East Wales (Objective 2) programme, support for innovation is subsumed within Measure 1.1 ('support for enterprise, innovation and SME development). Financial absorption for these interventions has been positive, with the second highest commitment rate in the whole programme. In the West Wales and the Valleys (Objective 1), support for RTDI is largely focussed on Priority 2 ('developing innovation and the knowledge based economy'). Progress in 'support for the development of innovation and R&D' (Measure 2.3) has been high, resulting from the success of the *Digital Technium* concept (please see Box) and support for opto-electronics cluster development. Reported progress under Measure 2.4 (Skills for Innovation and Technology) is also strong. On the other hand, progress in IT infrastructure projects (Measure 2.1) has been delayed, largely due to the lack of development of a clear strategy for broadband infrastructure.

In Sachsen-Anhalt, innovation related activities are concentrated in Priorities 1 and 2, which support business competitiveness and infrastructure respectively. Commitments and expenditure levels for all the innovation related Measures within the two Priorities are below the programme average, although no problems are expected in absorbing the available funds over the remaining period. In terms of

Priority 1 ('support for business competitiveness'), expenditure is greatest under the Measures for 'Innovation support, product and process development; Information Communication Technologies; and new financial instruments for business support. Financial progress is slower under the measures for 'environmental technologies' and 'initiatives for SMEs', which, in any case, account for only a relatively small share of innovation support. Progress under the infrastructure support Measures within Priority 2 is slower in terms of expenditure, but higher in relation to commitments. Expenditure is greatest under R&D infrastructure, which is the innovation related Measure with the greatest financial weight within the programme, followed by ICT infrastructure and business oriented infrastructure for the industrial sector.

In Nordrhein-Westfalen, absorption is generally positive. Progress has been high in the core innovation related Measure 2.1 (Technology and Innovation). This is despite delays in obtaining European Commission approval for the legal framework of a key project, namely a competition for cooperation projects between SMEs and R&D centres or universities (Future Competition or *Zukunftswettbewerb*), that was implemented via a call-for-tender process. The second most significant innovation related Measure in terms of financial resources ('development of medium sized enterprises') is also progressing smoothly. Other Measures with a positive performance include support for alternative energy projects (Measure 2.8) and 'indirect support for start-ups' (Measure 2.2). On the other hand, progress has been less positive under a number of other Measures, although not necessarily presenting difficulties over the remainder of the period. Absorption has been relatively slow under Measure 2.4, which aims to finance the implementation of existing environmentally friendly technologies in SMEs, due in part to low take-up by businesses because of the relatively low award rates. The implementation of a new Measure for supporting university start-ups has also been slow due to administrative delays. Finally, financial implementation under the Measure (2.5), which supports projects in media and communications, has been relatively slow, possibly because there has already been support for this sector for some time.

In the programme for Toscana, overall progress in the innovation-related measures is reported to be slow. Expenditure levels are less than 10 percent of the programme total under Measure 1.7 ('innovation transfer to SMEs') and Measure 1.8 ('Aids for industrial and pre-competitive research') which have experienced significant delays as a result of management turnover and administrative difficulties. In addition, the 'early stage fund' within Measure 1.3 ('financial engineering') has yet to be launched. Financial absorption has been highest in the 'Information Society' Measure (M2.8) which supports broadband and technology application projects with commitments of 41 percent and expenditure at 28 percent of the programme allocation.

In the Western Scotland, the programme has been slow to commit funds in relation to innovation. The mid term evaluation argues that the programme's approach of mainstreaming the promotion of innovation has proven to be problematic. More specifically, the mid term evaluation noted that Measure 1.2 (Enhancing services for SMEs) was unlikely to commit its full financial allocation, whilst Measure 1.1 (Enhance access to finance for SMEs) and Measure 1.3 (Developing a competitive workforce) were on course to meet their targets, although the commitment levels of the latter Measure were not as high as they should be.

5.2 Reasons for performance variation

Some of the problems facing programme administrators may be particularly acute in the case of RTDI interventions. For example, complex administrative and management structures can cause problems for all types of projects, but may be particularly problematic in the case of RTDI projects where higher risk levels require an added degree of flexibility for effective project management and implementation. Some programme managers see the N+2 rule as placing excessive demands on innovation related activities because the focus on financial absorption may be at the

expense of project quality. Similarly, softer form of support for cooperation between public and/or private actors are often a key component of RTDI interventions, and these generally involve a higher degree of uncertainty and may be more difficult to implement than, for example, simple State aid schemes or physical infrastructure.

A number of key factors can explain the reasons for performance variation across the programmes:

5.2.1 *Administrative uncertainty*

Administrative reasons such as changes in staffing and in core responsibility for a Measure have presented difficulties in a number of programmes. In Niederösterreich, financial absorption under Measure 1.5 saw a slow start for administrative reasons, although this has now improved. In Steiermark, staffing changes in the regional development agency led to initial delays in information society interventions under Measure 2.5. In Spain, the creation of a new national Ministry for Science and Technology in 2000 has led to delays in the implementation of technology transfer interventions in the Basque Country, as in the other Spanish regions. In Denmark, the imminent introduction of a new venture capital fund is considered to be partly responsible for the relatively lower amount of project applications under innovation-oriented Measures. It is expected, however, that the fund will facilitate absorption because there is strong interest from programme partners in this approach. In Toscana, difficulties relating to the finalisation of project selection procedures and staff turnover have caused delays in the implementation of innovation related Measures. In Nordrhein-Westfalen, there have been delays for those Measures which were new and for which the legal and organisational bases were not in place at the start of the SF programme (e.g. support for HEI start-ups under Measure 1.3 and the so-called 'Future Competition'). This was also the case in the País Vasco, where delays in the regional government's interventions under Measure 3.2 were due to the late approval of the ETORTEK programme (which supports 'basic targeted research' by the agents of the 'Basque Science and Technology Network' - SARTEK), in 2003.

5.2.2 *Narrow eligible areas*

Absorption is often more difficult where eligible areas are small and fragmented, particularly because this reduces the potential pool of businesses that can apply for funding, and creates difficulties in finding project partners (Flanders, Niederösterreich, Lombardia and NRW). The financial absorption of innovation support in Finland, for example for science parks and technology centres, is likely to be more rapid if the main regional town or city is within the eligible area because this means that there are more likely to be technology-oriented companies within the area.

5.2.3 *Planning and strategy building*

Some interventions require preparatory work and involve long run in phases. In Steiermark, the implementation of actions relating to setting up/extending innovation centres took some time to begin because there was a need to undertake feasibility studies. In Spain, the implementation of central government technology transfer and diffusion actions for all Objective 2 regions was delayed in part due to the need to evaluate and analyse prior actions in this field. In the Italian OP LED, the creation of a new instrument, namely the Integrated Assistance Package, or PIA, meant that there was a need to develop new implementation procedures. This has led to delays, so that only one of the new components of the PIA, that focused on technological innovation projects, had been launched by the end of 2003. The other forms of the PIA – focusing on aid for networking and for training – are still in preparatory phases. Financial absorption may also depend on the existence of broader domestic strategies. For example, in the West Wales and the Valleys programme, IT infrastructure projects have been delayed by the lack of a clear strategy for broadband infrastructure.

5.2.4 *Weak business climate*

The economic climate in a number of Member States has been weak in recent years, which is reflected in generally low levels of business investment and activity. This has contributed to the low level of take up for some innovation-oriented measures, as for other types of business support (Steiermark, Sachsen-Anhalt, Finland, Flanders). These problems may be particularly severe when aid rates are relatively low. In NRW one reason for the rather slow financial implementation of Measure 2.4 (Support for environmental protection in businesses) is the relatively low aid rate. This in turn is due to the fact that the Measure focuses on diffusing existing technologies rather than R&D or product/process innovation.

5.2.5 *Project size and type*

Financial absorption may also be affected by the size or type of projects. In Niederösterreich, absorption under one of the main innovation related Measures ('Research, development and innovation in enterprises') – which is co-financed through federal government instruments – has been facilitated by the focus on large projects. A separate Measure – which is co-financed through *Land* instruments – focuses instead on smaller projects in the fields of networking, advice and knowledge transfer. This implies that the second type of Measure involves more work for programme administrators, and that it is necessary to process far more projects in order to achieve the same levels of financial absorption. Despite this, the smaller and softer interventions are generally seen to be very useful and well worth funding. Similarly, in Steiermark absorption under the Measure for 'modernisation in enterprises' is high, partly because it provides support for larger firms as well as SME, whilst progress under support for innovative start-ups is more gradual.

5.3 **Corrective Measures**

A number of programmes have used the mid term review to reallocate funding towards better performing Measures. In Nordrhein-Westfalen, additional funding has been allocated to Measure 2.8, which finances projects in alternative energies, for example in the fields of technological development, demonstration projects, diffusion projects, energy/heat linking, and other heating projects. Not only is the Measure absorbing funds, but the quality of project applications is seen to be high. The double focus on technological innovation and environmental protection also fits well with the programme's horizontal priorities. In Western Finland, slow progress under Measure 1.2 ('Improving the operating conditions of businesses') has led to the removal of €900,000 within the Objective 2 areas (a 1.4 percent reduction) and €637,000 in the phase-out areas (a 10.7 percent reduction). In the País Vasco, a low level of financial implementation for the ESF funded human resource development Measure led to a reallocation of funds during 2003 to stronger performing Measures, such as RTDI projects.

6. PROGRAMME QUALITY: PROJECT SELECTION, MONITORING, AND EVALUATION

Structural Funds programmes involve a number of procedures that are supposed to raise the quality of projects. These include project selection criteria; systems for monitoring outputs, results and impacts; and the evaluation of programme strategies and implementation. This section draws on information from interviews, programming documents and the mid term evaluations for 2000-2006.

6.1 Project selection criteria

'Innovation' is one of the criteria used within the project selection process in some programmes. In Sachsen-Anhalt, "potential for innovation" is a project selection criterion which is applied to all projects, along with other criteria such as "potential for employment creation". Similarly, the Western Scotland programme aims to mainstream innovation via the project selection process, which incorporates a technical assessment checklist for each of the horizontal themes. The appraisal of innovation includes *inter alia* the degree to which the applicant provides information on how creative thinking and the generation of new ideas have informed the design and planned delivery of the project.

In Denmark, policy-makers noted the need for project selection criteria to take account of different definitions of innovation, which might be seen to characterise different types of locations and different types of enterprises. They argued that existing criteria focused on R&D-oriented larger enterprises and that these criteria discriminated against SMEs, particularly in rural peripheral areas, where innovation mainly takes the form of low level product development. There may therefore be a need to adjust selection criteria to take account of different types of innovativeness.

In Italy, the OP LED mid term evaluation identified weaknesses in the selection criteria and methods used for the PIA Innovation scheme, which allocates State aid for innovation projects. The evaluation argued that the indicator on the innovative character of the projects was too mechanical and unable to assess the real innovative potential of project applications. It also privileged, in practice, firms operating in the service sector to the detriment of production companies. Some modifications are currently being introduced to the selection procedures of the PIA innovation and are being applied to the second call for projects.

SELECTION CRITERIA FOR INNOVATION PROJECTS IN ITALY'S OPERATIONAL PROGRAMME FOR LOCAL ECONOMIC DEVELOPMENT

The creation of a new instrument for innovation-oriented State aid in **Italy's OP LED** has led to interesting experiences with project selection criteria. Funding is allocated via a competitive tendering system. Project applications are ranked on the basis of a scoring system, which was initially based on the following three indicators:

- 1 *Level of innovation*: The ratio of the eligible costs involving pre-competitive R&D, relative to the eligible costs involving the commercialisation of R&D results;
- 2 *Quality of the new jobs created*: The ratio of new skilled staff relative to total project cost;
- 3 *Environmental problems*: One additional point is given to those firms that join environmental management systems (such as EMAS or UNI EN ISO 14001).

The total points for each indicator is raised by:

- five percent if the firm cooperated with a university / public research centre; and
- ten percent if the pre-competitive R&D project also included product innovation.

The mid term evaluation suggested changes to these selection criteria and methods. For example, the “Level of innovation” indicator was argued to give too much weight to pre-competitive research and was seen to favour service firms rather than manufacturers. The evaluators suggested introducing separate ranking lists for manufacturing and service sector companies; amending the ‘Level of innovation’ criterion; and appointing scientific experts to appraise proposals. A number of changes are now being introduced to the selection procedures and are being applied in the second round of bidding (deadline 30.07.2004):

The ‘Level of innovation’ indicator is now calculated as the sum of two ratios:

- (i) the ratio of eligible costs for pre-competitive R&D relative to the sum of eligible costs for pre-competitive R&D plus eligible costs for commercialisation;
- (ii) the ratio of eligible costs for the innovative component of eligible expenditure for commercialisation, relative to the sum of eligible costs for pre-competitive R&D plus eligible costs for commercialisation.

Now, the total points for each indicator can be raised by:

- either 15 percent if the project involves a product innovation that provides solutions to environmental problems;
- or 10 percent if the project involves a process innovation that reduces the use of raw materials, energy or water, and reduces waste water and gas emissions.

6.2 Monitoring outputs, results and impacts

Structural Funds monitoring procedures focus on three types of indicators: outputs (e.g. the number of the types of RTDI activities), results (e.g. the direct and immediate effects of RTDI activities on the beneficiaries) and impacts (e.g. the consequences of the RTDI activities beyond the immediate effects). Although it is not always simple to differentiate between these categories in practice, it is a regulatory requirement that these indicators and associated quantified targets be provided in the programme complements.

6.2.1 Programme-level indicators

Some programmes also include innovation support as horizontal theme or overarching goal of the economic development strategy. This means that specific targets may be set at the level of the programme as a whole, for example in relation to the total number of projects funded or businesses assisted. In Sachsen-Anhalt, the following goals have been agreed: to finance 2,500 RTDI projects; to provide 8,500-10,000 start-ups with advisory services focused on RTDI or the Information Society, with the goal of raising business competitiveness.

Other programmes set out goals in the programming documents that, however, have a broader focus. In the País Vasco, one of the programme’s global targets is to reach a level R&D expenditure as a proportion of GDP of 2% by the end of the programming period.

The Nordrhein-Westfalen programme draws on both approaches, and sets innovation support is one of the programme’s horizontal goals. It identifies the following quantitative targets:

- to increase the percentage of R&D staff from 7.2 to 9.0 per 1000 employees;
- to increase the number of start ups in high tech sectors from 1.75 to 2.0 per 10,000 people in work;
- to develop and use innovative solutions or methods in at least 30% of projects; and
- to develop and use new ICT in at least 30% of projects.

6.2.2 *Measure-level indicators*

A review of IQ-Net programme complements reveals a range of indicators used for monitoring the progress of Measures in the field of RTDI. These reflect differences in the foci of the programme, as well as differences in methodological complexity.

Many of the indicators used for innovation aim to count the number of activities and projects of different kinds, such as the number of RTD projects, the number of ICT projects or the number of risk capital projects for high-tech start-ups. Technology infrastructure support measures generally relate to the 'number of research/technology centres constructed or extended' (Austria, País Vasco). In the case of technology transfer support, common indicators include the 'number of technology transfers to the private sector' (Nordrhein-Westfalen, East Wales) or even the number of 'international technology transfers' where cross border activities are funded (País Vasco). Obviously, the types of indicators used vary according to the aims of the innovation related Measures.

Some programmes seek to measure the level of 'private sector investment induced in support of projects', or private sector leverage. The advantage of this indicator is that it helps to measure the degree to which the interventions reflect business needs and demands. A more qualitative indicator used to capture beneficiary satisfaction is the 'number of surveyed SMEs satisfied with services provided (e.g. East Wales).

Other common types of indicators aim to monitor the number of participants involved, both directly and indirectly. Such indicators may include the 'number of SMEs assisted implementing process improvements' or the 'number of researchers receiving training'. In addition, some programmes focus attention on the collaborative effort of the interventions with the inclusion of indicators on the 'number of firms participating in networks' (Steiermark), the 'number of collaborative projects (or links) between research institutes and businesses' (País Vasco, Western Scotland, Wales, Toscana). One problem with these indicators is that it is difficult to assess whether they are meaningful e.g. what is the appropriate cost-output ratio for different types of interventions.

The main impact indicators relate to the 'numbers of jobs created or maintained in the firm'. There are a number of weaknesses with this type of indicator. Firstly, the reliability of the data may be questionable as programme managers often have to rely on information provided by beneficiaries or project holders, who may overestimate such impacts. The second key problem is that RTDI impacts may take a long time to materialise, so that it may be difficult to design impact indicators that can be easily measured, particularly in the short term. A third problem is of a methodological nature and relates to the calculation of the net effects of such indicators, requiring the subtraction of the jobs created or maintained that would have occurred in the absence of the interventions. Notwithstanding the well-known difficulties in constructing counterfactual scenarios, most of the programmes reviewed do not provide indicators for 'net' job creation (the UK is a notable exception). Finally, the impacts of RTDI interventions are not always directly related to job creation. Indeed, the primary objective of many RTDI interventions is to improve productivity and may be associated with a reduction in employment in the short-run if capital replaces labour – although in the longer run, productivity gains should favour overall employment creation.

6.2.3 *The mid term evaluations' comments on monitoring indicators*

A number of the mid term evaluations raise issues in relation to monitoring indicators in relation to the RTDI interventions. They focus in particular on the process of setting quantitative targets *ex ante*, that may not prove appropriate as the programme proceeds. Problems were noted by evaluators in Austria, Nordrhein-Westfalen and Wales. In País Vasco the evaluators noted that, as in other Spanish Objective 2 and

Objective 1 programmes, targets were not set for the mid-term but for the whole programming period, so that it was difficult for the evaluators to assess progress.

In Austria, the evaluations noted that R&D-projects are generally larger than had been anticipated *ex ante*. As a consequence, the number of projects that can be supported with the available funds is smaller than originally planned.

In Wales, problems have been experienced with the indicators relating to the creation and safeguarding of jobs under Priority 2, Measure 3 (Support for the Development of Innovation and R&D). Performance on the 'jobs created' indicator is weaker than expected. As nearly 60% of funds have already been committed under this Measure, it is unlikely that the employment targets will be met. Similar problems have been met in relation to the number of gross new high technology companies created, and the increase in turnover of supported companies. Further problems are seen under Wales's Priority 2, Measure 4 (Skills for Innovation and Technology) which focuses on training for managers in innovation. Although 43.5 percent of funds have been committed, only nine percent of the output target has been achieved.

6.3 Evaluation

This section examines some of the issues raised in the mid term evaluations that are relevant for RTDI interventions. There is considerable variation in the extent to which the evaluations of the partner programmes addressed specific questions in the field of RTDI. Some of the mid term evaluations of partner programmes looked primarily at issues relating to financial absorption (e.g. País Vasco, Toscana, Flanders, France). Others gave an overview of the progress of each Measure in terms of financial absorption, output/result/impact indicators, and management aspects (Austria, Finland, UK, Sachsen-Anhalt). A small number of evaluations explicitly focused on strategic and implementation issues relating innovation support (Nordrhein-Westfalen).

Information on appropriate approaches to be used for evaluating RTDI policies are provided on the European Commission's new MEANS website, at:

<http://www.evaled.info/>

6.3.1 *Project generation and business take-up*

A number of evaluations examined issues that related to the take-up of innovation funding by businesses, as well as more general issues concerning project generation (Germany, Western Scotland and Lombardia).

Some noted difficulties with business take-up. In Lombardia, for example, no project applications were received in response to the call for tender for business investment in organisational innovation and for work safety (Measure 1.2.A). The overall weak business climate, together with the narrow definition of eligible areas, are seen to have contribute to relatively poor take-up of some business-oriented innovation support in Austria.

Programme managers in Nordrhein-Westfalen have taken steps over time to improve the business-orientation of innovation support. However, the evaluators argued that further steps were still needed in order to ensure that this approach is maintained and enhanced. This may be partly because the legal framework for some types of innovation support is focused mainly on pre-competitive research. It was also noted that there was not enough emphasis on the innovation problems of SMEs, particularly on those businesses that are less innovative. The evaluators found that "Future competition" call for tender for technology projects has stimulated new cooperation projects between businesses and universities. They argue, however, that there may be a need for further effort to support project generation under this initiative in future.

6.3.2 Involving universities and research centres

Many programmes aim to enhance opportunities for businesses to cooperate with researchers in universities and other institutes of higher and further education – and perceive these organisations as key sources of new ideas and technologies for their regions.

In Western Scotland, the evaluators note that involvement of further and higher education institutions has been relatively limited, and that it would be desirable to involve them more strongly in the programme's strategy. They also find the relatively limited number of projects that involve the higher education sector in activities relating to innovation and the commercialisation of technology. They argue that stronger involvement by universities and other institutions is needed if the programme is to deliver on its primary objective of increasing innovation and business competitiveness. In the País Vasco, evaluations of the regional government's previous innovation strategy noted that universities now participate more actively in innovation-oriented activities within the region, but argue that there is a need to develop this participation further.

Some concerns were voiced by administrators in France over the research and technology transfer roles of universities. First, the large number of universities in France means that research expertise tends to be scattered and that there is lack of critical mass in specific areas of R&D expertise. Second, it is argued that universities undervalue technology transfer activities, and that they need to devote additional resources to these activities.

THE AUSTRIAN APPROACH TO EVALUATING RTDI POLICY

The Austrian Spatial Planning Conference (*Österreichische Raumordnungskonferenz* or ÖROK) coordinates the evaluation of all Structural Funds programmes in Austria. Mechanisms were set up to ensure communication between the nine teams of evaluators and the nine *Land* programme managers in the context of the mid term evaluation (see the Update paper for the IQ-Net conference in Oulu).

ÖROK also commissioned researchers to undertake a meta-evaluation of the *Land*-level reports, in order to draw out general themes of relevance, not least in the context of ongoing debates on the future of Structural Funds programmes. Their report¹⁸ provides an analysis of the main strategic and implementation results of the mid term evaluations. Many of the themes raised in the report relate to RTDI Measures, due to the importance of such interventions in the Austria programmes. Among the issues raised are the following:

- (i) Project quality is higher when RTDI funding is not directed towards particular themes, because a thematic approach limits the number of potential applicants.
- (ii) Narrow eligible areas hinder effective cluster-oriented strategies because the main towns and universities are often excluded, as are potential partners from other regions and Member States.
- (iii) Innovation centres and incubators need to be integrated into long-term strategies and their effects are seen mainly in the longer term.
- (iv) Structural Funds procedures, including the n+2 rule, encourage administrators to be risk-averse because of the penalties if errors are made. An effective RTDI strategy would aim to promote a less risk-averse approach among policy-makers.
- (v) Capacity to absorb RTDI funding is relatively limited in Austria because the economic structure is based on small enterprises, and many areas lack the critical mass of enterprises and population needed to induce a real innovation dynamic.

¹⁸ Hesina et al. (2004) Op.Cit.

6.3.3 Concentrating funding on a critical mass of projects

A number of evaluators noted some difficulties due to the dispersion of funds across many small interventions or projects. In Sachsen-Anhalt, for example, the evaluators found that too many relatively small types of interventions were funded under innovation support, and they recommended concentrating the programme's funds on a smaller number of interventions. Evaluators in Austria noted the high cost of administration relative to the average size of co-financed projects, arguing that low support intensity would tend to limit significant effects. They argued that a more effective innovation support strategy would be to support fewer projects but to raise the award rate and level of funding per project.

A recent overview of the results of the mid term evaluations in Austria¹⁹ also argues that R&D measures are less effective if there are thematic priorities because this limits the number of firms submitting proposals of a sufficiently high quality. It emphasises that problems were often caused by the narrow definition of eligible areas to exclude the main towns and universities, particularly as RTDI networks typically involve partners from a range of regions and Member States.

It should be noted, however, that it is not always possible or desirable for programme managers to take all these recommendations into account. For example, in Member States where Structural Funds programmes are subsumed into domestic funding programmes, such as Austria and Germany, may channel EU co-financing through a wide range of different domestic instruments. Similarly, programme managers often see softer types of intervention as effective despite the relatively higher administrative costs compared to traditional State aid measures (Niederösterreich).

However, the views of the evaluators, as summarised above, were supported by some programme managers. For example, some argued that project quality was enhanced if funding was focused on a coherent set of fewer but larger projects (North East England). Others noted that project quality tended to be reduced if eligible areas or measures were defined very narrowly or strictly, as this reduced the number of project proposals and potential project partners (Austria, UK, Nordrhein-Westfalen).

6.3.4 Risk aversion and innovation support

Some evaluators argued that Structural Funds procedures tended to limit the willingness of programme managers to finance projects perceived as riskier – including, by definition, those projects that focused on new technologies and R&D. In some places, Structural Funds programmes are used to co-finance simpler instruments, such as direct aid to enterprises, while more complex instruments – notably risk capital, or tax credits – are funded and implemented via domestic policies (Austria; País Vasco).

In the Western Scotland programme, the mid term evaluation found that the eligibility rules and selection criteria tended to mean that programme managers and project applicants alike focused on less risky, straightforward and low quality projects. In Austria, the overview of the mid term evaluation results also argued that the Structural Funds approach (such as the n+2 rule) tends to promote a risk-averse attitude among policy-makers, thus limiting the contribution of these programmes to innovation and enterprise.²⁰

This view is supported by some programme managers. Some argue that difficulties in supporting RTDI projects in Structural Funds programmes is due in part to the heavier administrative burden that characterises Structural Funds programmes (Finland; Nordrhein-Westfalen), and in part to the emphasis in project selection criteria and

¹⁹ Hesina, W., A. Kaufmann and P. Wagner (2004) Ziel-1 und Ziel-2 Halbzeitbewertungen in Österreich. Überblick über die Ergebnisse der Ziel-1 und Ziel-2-Halbzeitbewertungen in Österreich 2000-2006: Erfahrungen und Ausblick. Wien: ÖROK.

²⁰ Hesina et al. (2004) Op.Cit.

monitoring systems on demonstrating short-term quantifiable outcomes, results and impacts, as these are not always evident in RTDI projects (UK). Similarly, the overall emphasis on defining funding mechanisms and eligibility criteria may mean that programmes do not remain open to new ideas or to directions that are unanticipated during programme planning (North East England).

6.3.5 Coordinating programmes with the domestic policy context

A key issue raised by the mid term evaluation of Italy's OP LED is the lack of strategic coordination between the various Objective 1 programmes that finance innovation support – namely the national OP LED, the national OP for Research, and the individual regional Operational Programmes. Although extensive efforts had already been undertaken to improve coordination, one of the main priorities of the mid-term review of the Objective 1 Community Support Framework was to improve coordination, including between interventions focused on Research and Innovation (Priority III of the CSF) and those focused on business support (Priority IV).

Further coordination problems in Italy have been raised by the recent constitutional reforms. Research policy is now a joint competence (*competenza concorrente*) of the national and regional levels. Under recent Constitutional legislation, joint competence decisions should take the form of bilateral agreements between the relevant regional and national administrations. However, the Objective 1 CSF was drawn up before the constitutional reform, when industrial research was defined as a national competence. The CSF therefore allocated responsibility for technology transfer and pre-competitive development to the regions, but gave the task of supporting research centres, training/education for excellence and industrial research the national Ministry for Innovation, Universities and Research. The constitutional reform therefore implies the need for the regions and the national Ministry to renegotiate the allocation of tasks within the CSF.

THE EUROPEAN COMMISSION'S OVERVIEW OF THE MID TERM EVALUATIONS' RESULTS ON RTDI, 2000-2006

The Commission has undertaken an overview of the findings of the mid term evaluations for 2000-2006, which includes some considerations on the theme of R&D / innovation. It finds that those RTDI interventions that focused on businesses were often negatively affected by the cyclical downturn in a number of Member States in recent years. It also notes that, while the performance of RTDI support was generally good in the Objective 2 areas, there was a more varied picture for Objective 1. Some Member States (Greece, France, Ireland and Italy) were slow to get RTDI interventions started in Objective 1 regions, although performance was stronger in Germany, Austria, Finland and Sweden. The picture for the Objective 1 regions in Spain and the UK is more varied. This diverse situation may relate to the existing strengths – in businesses and in the policy sphere - of some Member States in the field of R&D and innovation.

The main issues raised for future RTDI policies include:

- (i) The desirability of moving towards more business-led interventions, and away from narrow support for public R&D.
- (ii) The potential for high deadweight i.e. businesses and other agents may have invested anyway, even without Structural Funds support.
- (iii) The difficulties of implementing cross-cutting themes in a meaningful way.

The Commission also notes the need for more focused, in-depth evaluation of RTDI in the future, as well as some of the challenges involved, for example in defining innovation, in selecting appropriate indicators and targets, and in measuring deadweight.

Source: Presentation by Veronica Gaffey of DG REGIO at the IQ-Net meeting in Toscana, 8-10 November 2004.

Some administrators also note the importance of issues relating to policy coordination and continuity (UK; Niederösterreich), as well as the role played by key organisations in actively taking forward and building support for new ideas (UK). While some argue in favour of reducing the number of actors involved in innovation support, due to the multiplication of organisations in this field (UK), others emphasise the need for mechanisms that facilitate cooperation and consensus-building, due to the large number of public, private and quasi-public actors with different rationales and ways of working (Finland).

6.3.6 *Publicity and innovation culture*

Some evaluations focus on issues that relate to the argument that one aim of innovation policy should be to raise a general awareness of the need to act in innovative ways, and to develop a 'culture' or 'climate' of innovation. This approach has, for example, been fundamental to the EU co-financed RIS and RITTS initiatives.

In Western Scotland, the mid term evaluation noted that there was a low level of awareness of the innovation theme among programme partners. In two out of three general workshops held with programme partners, participants could not name innovation as the programme's third horizontal theme, even though they recognised the importance of innovation for business competitiveness. The evaluators recommended that programme managers should give greater attention to mainstreaming innovation activities.

The evaluators in Nordrhein-Westfalen argued that one benefit of the call for tender approach that was used in the context of the 'Future Competition' (*Zukunftswettbewerb*) was that it generated publicity for innovation-oriented activities, and contributed to the development of a culture of innovation.

7. HOW COULD REGIONAL INNOVATION POLICIES BE IMPROVED IN FUTURE?

7.1 The role of Cohesion policy in funding innovation support

Most of the programme administrators took a positive view of the COM proposals that funding for "innovation and the knowledge economy" be prioritised after 2006 (Germany, Finland, Austria, Sweden, France). This is partly because this theme is perceived by many partners as one of the remaining opportunities to gain Structural Funds receipts, and partly because this approach is consistent with the existing strategies of many Member States and regional authorities (Finland, Sweden; Toscana, Nordrhein-Westfalen). Some partners emphasise, for example, the need for Member States to shift their comparative advantage towards human capital rather than natural resources or low labour costs, and noted the importance of productivity gains in facilitating the funding of social welfare programmes (Denmark, Sweden).

Some argued, however, that Cohesion policy should not be too narrowly focused on RTDI and that there was a need to allow flexibility to Member States and regional authorities to choose to focus also on other types of interventions, including physical infrastructure, environmental renewal and business support (Finland's national authorities, UK; Sachsen-Anhalt). The French authorities, for example argued that there was a need to clarify the exact content of the "innovation and the knowledge economy" theme, and to ensure consistency with EU and national priorities.

It was also noted that various different kinds of innovation support are needed (Finland; Niederösterreich), including innovation centres / science parks and different types of funding for enterprises (e.g. grants, loans and venture capital). Some emphasised the need to base the design of policy on consensus-based strategies; to tailor interventions to meet the needs of enterprises; and to ensure that Structural Funds programmes are complemented by other domestic policies, such as tax credits, spending on education, and improvements to the regulatory context for business.

The current role of Structural Funds receipts in financing RTDI interventions varies greatly. In some cases, the Structural Funds are a major source of funding for RTDI policy (Toscana, Sachsen-Anhalt), but in other cases, national or regional innovation policy is largely financed from domestic sources and implemented separately from the Structural Funds programmes (Flanders). In the País Vasco, there is a strong and long-standing emphasis on the regional government's own policies on technology and innovation, so that the Structural Funds programme represents only a small amount of total regional funding for RTDI, and its role has primarily been to support existing regional strategies, rather than to drive a new policy approach.

In Germany, the role of the Structural Funds in financing regional policy expenditure has increased in recent years, due to the ongoing fiscal constraints facing public authorities. In some places (Denmark, Finland, Austria, Nordrhein-Westfalen, Wales), the Structural Funds programmes are the main sources of funding for innovation support within the eligible areas, but domestic funding is used to finance similar interventions in other areas. Clearly, these differences are at least in part due to the overall role of the Structural Funds programmes relative to total public expenditure in different Member States and regions.

In some Member States and regions, it is anticipated that RTDI policy will continue to be a priority after 2006, regardless of the extent of funding received from EU sources, due to the commitment of national or regional political authorities (Germany, Finland, Austria, Flanders, País Vasco, Wales). In others, there was disagreement over the likely extent of future funding for innovation (Denmark), while many felt a strong uncertainty over the future form of regional policy (Austria, UK; Nordrhein-Westfalen).

Some argued that the degree of future funding for innovation would depend at least in part on the level of EU funding (Toscana). In one programme, while it was felt likely that funding for RTDI would continue after 2006, it was noted that the level of finance would probably not increase significantly due to the relatively slow absorption of funds, particularly for business R&D, compared to interventions in other components of the programme (Sachsen-Anhalt).

7.2 Is RTDI policy appropriate in all regions?

R&D and innovation activities tend to agglomerate in particular locations, possibly due to knowledge spillovers, so that the geographical distribution of these activities is uneven. In a number of programmes, policy-makers are engaging with the tensions between the two goals of raising R&D excellence and reducing geographical inequalities. In others, policy-makers are endeavouring to develop forms of RTDI policy that are appropriate for locations without a strong concentration of R&D-oriented enterprises and organisations.

If RTDI activities agglomerate, it is likely that the take-up of public funding for RTDI will be strongest in those locations with the main R&D-oriented businesses and organisations, unless programmes are limited to certain locations (Sweden, Nordrhein-Westfalen). In a number of programmes, RTDI expenditure is concentrated in cities and urban areas, as this is where the technical universities and technology parks are located (País Vasco, Western Scotland). However, some programme managers emphasised that innovation policy was also needed in other, more rural areas, where enterprises were seen to need local access to information sources, assistance in identifying problems and solutions, and support for low level product development (Denmark, Niederösterreich).

Some noted that, where eligible areas are defined too narrowly, the quality or quantity of RTDI projects can be negatively affected (Nordrhein-Westfalen, Wales). It also entails a risk of fragmentation and an inward-looking approach, and this is unlikely to foster innovation, which instead depends on building interconnections with sources of excellence, whatever their location (UK; Nordrhein-Westfalen). However, it is not always clear at which level geographical concentration is needed. In North East England, for example, half of the Objective 2 programme's RTDI resources have been allocated to five thematic Centres of Excellence in universities, with the aim of ensuring critical mass and visibility, rather than dispersing funds across many small projects. However, these centres may overlap with similar initiatives in other parts of the UK, so that, unless efforts are focused on ensuring cooperation, there is a risk that this could increase fragmentation from a UK perspective,

In a number of Member States, regional innovation policy is seen to be related to 'cluster' policy, although 'clusters' are defined in a variety of ways, depending on specific national and regional contexts (Germany, Italy, Austria, Sweden, UK). In the UK (particularly England), cluster policy is implemented by the regional development agencies, drawing on relatively small amounts of funding, and mainly takes the form of mapping studies, as well as identifying and building regional linkages between businesses and other actors. Policy aims to address coordination failures and to create the conditions that encourage the formation and growth of clusters, but not to artificially create clusters. In other Member States, larger scale funding, including State aid to individual enterprises, is available. In Austria and Germany, for example, cluster policy may involve identifying which sectors or types of enterprises or projects are eligible for funding, as policy-makers may restrict aid allocations to those projects that fit within the identified clusters. In the País Vasco, cluster policy has been employed since the early 1990s, and this approach has been used not least as a means of targeting public support on new emerging sectors, notably via the recent Biobask 2010' strategy for the biotechnology sector, which has led to the creation of two 'Cooperative Research Centres' (involving participation from the universities, technology centres, and private sector). One key issue raised in both Germany and

the UK is the need to ensure that clusters are outward-looking and are based on genuine excellence. There is a risk that a proliferation of regionally defined initiatives leads to overlaps and a neglect of extra-regional opportunities, so that aggregate development outcomes are suboptimal.

INNOVATION SUPPORT AND CLUSTER BUILDING IN NORDRHEIN-WESTFALEN

NRW's RTDI policy aims to concentrate funding on a limited number of themes in order to maximise the economic impact of public investment, and to bring the best firms and the R&D centres in NRW into international networks. This implies a narrow definition of innovation, based on R&D excellence, and a focusing of funding on a smaller number of larger projects. It also implies that projects are sometimes turned down because they are on a theme that does not fit into the Land's priorities.

This approach has been adopted in part due to the fiscal constraints facing the Land and hence the need to concentrate funds more effectively, yet it also draws on previous experiences of RTDI policy. From the mid 1980s, the Land focused on encouraging innovation in all sub-regions – an approach which is now criticised due to the lack of business involvement in the sub-regional networks, and because it led to multiple overlapping and fragmented strategies, that focused on 'the best in the sub-region', rather than on R&D excellence in an international context.

However, there may be tension between the goal of concentrating funding on R&D excellence and encouraging technological development in weaker regions. The narrow definition of eligible areas in NRW in 2000-2006 has caused problems because some of the best proposals for RTDI projects have been submitted by enterprises located outside the eligible areas, and public finance constraints have meant a limit on domestic funding for these projects. It is not surprising that the eligible areas – which by definition are structurally weaker - have fewer innovative enterprises but these difficulties do raise the question of whether the focusing of RTDI expenditure on structurally weak areas is likely to yield positive results, either in terms of overall R&D excellence or interregional disparities.

This 'cluster' approach is the subject of some debate in Germany, with Sachsen-Anhalt's Finance Minister, for example, questioning the capacity of policy-makers to select those themes and sectors that are more likely to contribute to economic growth. He argues that funding programmes should be open to all potential projects, and that funding should be allocated to the best ones, rather than to those that fit within particular policy priorities. However, Nordrhein-Westfalen *Land* states that its aim is not to create clusters but rather to identify existing concentrations of excellence in R&D and business, and to focus public funding on these.

In a number of programmes, administrators argued that, instead of focusing all types of RTDI expenditure on certain locations, there was a need to engage in different types of RTDI support in different locations, depending on their socio-economic characteristics. For example, in Finland, Tekes focuses its policies for the creation and commercialisation of radically new technologies on larger towns, including not only Helsinki but also other regional centres. In other areas, particularly those with structural economic weaknesses, the focus is instead on technology transfer.

8. KEY ISSUES FOR THE FUTURE

This report raises a number of issues over the current approach to funding RTDI support within the Structural Funds programmes, as well as in relation to the Commission's proposals to focus funding more strongly on this theme after 2006. Some of the main questions that could inform future discussion are set out in this section.

8.1 The strategic focus of Cohesion policy after 2006

1. Is funding for R&D and innovation a more appropriate instrument in some Member States and regions than in others?

- In what situations would it be preferable to focus instead on human capital and core infrastructure?
- Are some types of instruments more effective in certain types of locations? For example, are R&D interventions more suited to main agglomerations, and technology transfer and diffusion more appropriate in lagging or rural areas?

2. Should the Structural Funds regulations or associated guidelines for the next programming period provide an indication of the expected role of R&D / innovation in Member State and regional strategies? How should the role and importance of such interventions differ between the Convergence objective and the Competitiveness objective?

3. How can Structural Funds support for R&D/innovation take better account of the domestic policy context?

8.2 Involving businesses and other key agents

4. What policies and approaches are needed to address different types of businesses?

- Firms focused on applied R&D and product development e.g. high-skill small firms such as university spin-outs;
- Firms which undertake R&D but also other activities;
- Firms that need to upgrade their existing technologies (e.g. that may do process or organisational innovation, but are unlikely to do extensive product innovation).

5. How can interventions be designed in order to ensure the involvement of different partners? To what extent does this depend on the domestic policy context (e.g. the incentives facing academics to interact with businesses)?

- Universities, colleges and R&D centres
- Chambers, business associations and trade unions
- Policy-makers at national, regional and local levels

8.3 The implementation of RTDI interventions

6. Do some aspects of Structural Funds programming lead policy-makers to be risk averse, and act as disincentives for R&D and innovation support? E.g.

- The emphasis on financial absorption, including the n+2 rule;
- The focus on monitoring quantified short-run outputs

What could be done to reduce these disincentives, without undermining appropriate administrative procedures?

7. What actions could be taken to facilitate financial absorption for RTDI interventions in Structural Funds programmes? E.g.

- Increasing the scale (reducing the fragmentation) of eligible areas, without undermining the need for geographical concentration;
- Building in sufficient time for planning softer interventions;
- Allowing for more flexible spending profiles over time, in order to allow for changes in demand from businesses related to the economic cycle;
- Endeavouring to reduce the administrative burden associated with different types of interventions?

8.4 Enhancing the quality of interventions

8. How could project selection processes and criteria for RTDI be improved?

- What are the advantages and disadvantages of mechanical versus discretionary approaches?
- Should selection criteria be adapted to take account of different types of innovativeness, locations and enterprises?

9. How could RTDI monitoring procedures and indicators be improved?

- What steps could be taken to improve the selection of appropriate indicators?
- How can more meaningful targets be set for different indicators?

10. How could the evaluation of RTDI interventions be improved?

- What types of methods should or can be used to assess RTDI interventions?
- What constitutes best practice in RTDI evaluation?
- How can lessons be drawn from evaluations? E.g. via meta evaluations at Member State or EU levels?

ANNEX I: STRUCTURAL INDICATORS ON R&D

In response to the request of the European Council, the European Commission has developed a set of so-called “Structural Indicators” that are designed to allow the EU institutions and Member States to monitor progress towards the goals of the Lisbon/Göteborg strategy. The Commission annually provides a report to the Council, with the latest data available on the indicators. The most recent report²¹ is available on the Commission’s website at:

http://europa.eu.int/comm/lisbon_strategy/index_en.html

Full information on the indicators is available at:

<http://europa.eu.int/comm/eurostat/structuralindicators>

The latest report, of March 2004, provides data on all Member States and also, where possible, on the US, Japan, the (then) Accession Countries and the Candidate Countries. The report includes data on the following indicators:

GENERAL ECONOMIC BACKGROUND

1. GDP per capita in PPS
2. Labour productivity per person employed

EMPLOYMENT

- 2.1. Employment and productivity development in the EU
- 3.1. Total employment rate
- 3.2. Employment rate – females
- 3.3. Employment rate – males
- 4.1. Total employment rate of older workers
- 4.2. Employment rate of older workers – females
- 4.3. Employment rate of older workers – males

INNOVATION AND RESEARCH

5. GERD (Gross domestic expenditure on R&D)
- 5.1. Evolution of R&D spending
- 6.1. Youth educational attainment level - total
- 6.2. Youth educational attainment level - females
- 6.3. Youth educational attainment level – males
- 6.4. Evolution of youth educational attainment level

ECONOMIC REFORM

7. Comparative price levels
8. Business investment
- 8.1. Evolution of business investment

SOCIAL COHESION

- 9.1. At-risk-of-poverty rate after social transfers – total
- 9.2. At-risk-of-poverty rate after social transfers – females
- 9.3. At-risk-of-poverty rate after social transfers – males
- 9.4. Evolution of the at risk of poverty rate
- 10.1. Dispersion of regional employment rates – total
- 10.2. Dispersion of regional employment rates – females
- 10.3. Dispersion of regional employment rates – males
- 11.1. Total long-term unemployment rate

²¹ European Commission (2004) Structural Indicators: Update of the Statistical Annex (annex 1) to the 2004 Report from the Commission to the Spring European Council
Brussels, 16 March 2004

11.2. Long-term unemployment rate – females

11.3. Long-term unemployment rate – males

ENVIRONMENT

12. Total greenhouse gas emissions

13. Energy intensity of the economy

14. Transport – Volume of freight transport relative to GDP

15. Relative performance of the 15 Member States according to the Structural Indicators on the shortlist

16. Relative improvement of the performance of the 15 Member States according to the Structural Indicators on the shortlist

ANNEX II: INNOVATION SCOREBOARD

The increased policy focus on RTDI and, particularly, the focus on the use and diffusion of new technologies, has led to efforts to construct new indicators, as well as to gather and process new data. In particular, policy-makers have aimed to go beyond the more traditional indicators of (business) R&D expenditure relative to GDP, and the number of patents relative to GDP which have been criticised for not reflecting either R&D outputs or the range of activities involved in technological innovation. Within the EU, the Lisbon Council gave new impetus to this work, via its request to the Commission to develop an open method of coordination for benchmarking national RTDI policies, which had led to the creation of the EU's Innovation Scoreboard and related technical papers .

Full information on the EU's Innovation Scoreboard can be found at:

<http://trendchart.cordis.lu/Reports/index.cfm?fuseaction=ReportInnovationHome>

The most recent version of the Scoreboard was published in November 2003, drawing on data from the Labour Force Survey and the Community Innovation Survey, as well as on R&D expenditure and patent applications. The Scoreboard provides national data for the EU-25 (plus six other European countries, the US and Japan) on nineteen indicators, in the following categories: human resources; knowledge creation; the transmission and diffusion of knowledge; and innovation finance, output and markets. It also provides data on thirteen of these indicators at NUTS II level, and on nine indicators at a sectoral level.

The EU15 as a whole lags behind the Japan on all ten indicators for which data are available, and on all but one of the twelve indicators for which data are available for the US – the exception being “science and engineering graduates as a percentage of the population aged 20-29 years” . The performance of Finland and Sweden is strong, with each out-performing the US on six of the ten indicators for which US data are available. A number of other Member States also out-perform the US on one or more indicators (DK, DE, FR, IE, NL, UK).

There is a need for caution as regards data quality and consistency between Member States. For example, the Scoreboard draws on data for different years in different Member States, leading to possible distortions, particularly for data on business activity. Similarly, regional data for Belgium and the UK are not comparable with those for other Member States because they are provided at NUTS 1, rather than NUTS 2 level; regional data generally show stronger dispersion at more disaggregated geographical levels. Finally, some indicators may be open to different interpretations between Member States, for example, “the percentage of business turnover that is accounted for by the sales of products which are ‘new to the firm but not new to the market’”.

There are also questions over the reliability of data at a regional level, as the disaggregation of data to a regional level may be rather artificial. For example, business R&D expenditure may be reported as taking place in the location of the national headquarters – which is often the capital city region – even though it is actually spent in production plants located elsewhere.

More fundamentally, a great deal depends on how the data are interpreted, given the large number of indicators showing disparate performance across regions, which run the risk, either of confusion, or of overly simplistic policy conclusions. For example, the observation of a positive correlation between levels of GDP per capita and levels of R&D spending relative to GDP is sometimes interpreted to imply that an increase in R&D spending in lagging regions would lead to a direct increase in income per capita in these regions. However, given the apparent role of knowledge spillovers in RTDI activities, it is not necessarily the case that simply increasing public spending will raise RTDI outputs in lagging regions, nor translate directly either into reduced regional disparities in income per capita or into increased aggregate welfare.

The European Innovation Scoreboard 2003 includes information on the following indicators:

HUMAN RESOURCES

- 1.1 S&E graduates (% of 20 - 29 years age class) / EUROSTAT: Education statistics
- 1.2 Population with tertiary education (% of 25 - 64 years age class) / EUROSTAT (LFS)
- 1.3 Participation in life-long learning (% of 25 - 64 years age class) / EUROSTAT (LFS)
- 1.4 Employment in medium-high and high-tech manufacturing (% of total workforce) / EUROSTAT (LFS)
- 1.5 Employment in high-tech services (% of total workforce) / EUROSTAT (LFS)

KNOWLEDGE CREATION

- 2.1 Public R&D expenditures (GERD - BERD) (% of GDP) / EUROSTAT: R&D statistics; OECD
- 2.2 Business expenditures on R&D (BERD) (% of GDP) / EUROSTAT: R&D statistics; OECD
- 2.3.1 EPO high-tech patent applications (per million population) / EUROSTAT
- 2.3.2 USPTO high-tech patent applications (per million population) / USPTO
- 2.4.1 EPO patent applications (per million population) / EUROSTAT
- 2.4.2 USPTO patents granted (per million population) / EUROSTAT

TRANSMISSION AND APPLICATION OF KNOWLEDGE

- 3.1 SMEs innovating in-house (% of manufacturing SMEs and % of services SMEs) / EUROSTAT: CIS
- 3.2 SMEs involved in innovation co-operation (% of manuf. SMEs and % of services SMEs) / EUROSTAT: CIS
- 3.3 Innovation expenditures (% of all turnover in manufacturing and % of all turnover in services) / EUROSTAT: CIS

INNOVATION FINANCE, OUTPUT AND MARKETS

- 4.1 Share of high-tech venture capital investment / EVCA
- 4.2 Share of early stage venture capital in GDP / EUROSTAT
- 4.3.1 SMEs sales of 'new to market' products (% of all turnover in manufacturing SMEs and % of all turnover in services SMEs) / EUROSTAT: CIS
- 4.3.2 SME sales of 'new to the firm but not new to the market' products (% of all turnover in manufacturing SMEs and % of all turnover in services SMEs) / EUROSTAT: CIS
- 4.4 Internet access/use / EUROSTAT
- 4.5 ICT expenditures (% of GDP) / EUROSTAT
- 4.6 Share of manufacturing value-added in high-tech sectors / EUROSTAT: SBS
- 4.7 Volatility-rates of SMEs (% of manufacturing SMEs and % of services SMEs) / EUROSTAT: BDS