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**Monitoring and analysis of policies  
and public financing instruments  
conducive to higher levels of R&D investments  
The “POLICY MIX” Project**

**Country Review Finland**

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## **Introduction and Policy mix concept**

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### **The policy mix project**

This report is one of the 31 country reviews produced as internal working papers for the research project “Monitoring and analysis of policies and public financing instruments conducive to higher levels of R&D investments” (Contract DG-RTD-2005-M-01-02, signed on 23 December 2005). This project is a research project conducted for DG Research, to serve as support for policy developments in Europe, notably in the framework of CREST activities. It does not form part of the ERAWATCH project, but the working documents are made available on ERAWATCH webpages for the purpose of steering a debate on the policy mix concept.

The “Policy Mix” project is run by a consortium of 7 partners:

- UNU-MERIT (The Netherlands), consortium leader
- Technopolis (The Netherlands)
- PREST – University of Manchester (United Kingdom)
- ZEW (Germany)
- Joanneum Research (Austria)
- Wiseguys Ltd. (United Kingdom)
- INTRASOFT International (Luxembourg).

Each country review is produced by an individual author, and provides expert’s view on the policy mix in the country. This report is not approved by the Commission or national authorities, and is produced under the responsibility of its author.

The role of country reviews is to provide an exploratory analysis of the current policy mixes in place in all countries and detect the most important areas of interactions between instruments as well as new modes of policy governance that are particularly adapted (or detrimental) for the building of policy mixes. They provide analytical material for the analysis of the policy mix concept and its implementation in Europe. This material will be used as background for further reports of the project and for the construction of a tool for policy-makers (to be made available in late 2007 and 2008).

### **The policy mix concept**

The country reviews are based on the methodological framework produced by the consortium to frame the “policy mix” concept. They have been implemented on the basis of expert assessments derived from the analysis of National Innovation Systems characteristics and policy mix settings, using key information sources such as

Trendchart and ERAWATCH reports, OECD reviews, and national sources, among which the National Reform Programmes.

In this work, the “policy mix for R&D” is defined by the consortium as: **“the combination of policy instruments, which interact to influence the quantity and quality of R&D investments in public and private sectors.”**

In this definition, policy instruments are: “all programmes, organisations, rules and regulations with an active involvement of the public sector, which intentionally or unintentionally affect R&D investments”. This usually involves some public funding, but not always, as e.g. regulatory changes affect R&D investments without the intervention of public funds.

Interactions refer to: “the fact that the influence of one policy instrument is modified by the co-existence of other policy instruments in the policy mix”.

Influences on R&D investments are: “influences on R&D investments are either direct (in this case we consider instruments from the field of R&D policy) or indirect (in that case we consider all policy instruments from any policy field which indirectly impact on R&D investments)”.

## **Structure of the report**

The report is structured along the following questions.

First, in section 1, and in order to place the policy mix in context, the general challenges faced by the National Innovation System (NIS) are analysed by the expert. The view is here not restricted to the challenges with regard to raising R&D investments, but rather encompasses all the conditions that directly or indirectly affect the functioning of the NIS and R&D expenditures. These context conditions are very important for the discussion of the relevance of the policy mix later on.

Second, the stated main objectives and priorities of R&D policy in the country are spelled out in section 2, as well as their evolution over the last ca. five years. This discussion is based on White Papers and official documents, i.e. on published policy statements. The reality of these objectives compared to actual working of policy instruments will appear in section 5.

The third section provides an expert assessment and critical analysis of a possible gap or convergence between the NIS challenges and the main policy objectives and priorities stated before.

Section 4 presents the policy mix in place, following the above definition, i.e. policy instruments affecting R&D activities in the private and in the public sector, either directly for instruments from the R&D policy domain, but also indirectly for instruments outside the R&D domain which are of particular relevance to R&D activities. A typology of instruments is used, to categorise the R&D-specific and non-R&D specific instruments. A short description of each instrument is provided: aim, nature, target group, budget.

Then, section 5 discusses whether there is a gap between the main policy objectives and priorities stated in section 2, and the instruments in place. This is done by comparing the set of objectives with the set of instruments at work. When individual evaluations of programmes or policy instruments are available, their results are used if they shed light on contribution of these instruments towards the policy objectives.

Section 6 discusses the orientation of the policy mix, indicating priorities amongst various possible routes to increase R&D investments. Policy instruments are categorised under 6 different routes according to their relevance, and this categorisation is followed by a discussion on the range of instruments affecting each route, missing instruments, routes that are not addressed by instruments, possible redundancies or overlaps, etc.

Section 7 provides another view on the policy mix, focusing on the relative importance of each types of instruments. The aim is to get a picture of the policy mix, the balance between (sets of) instruments, and the relative weight between them.

From section 8 onwards, the review turns to the crucial question of policy governance. That section discusses the emergence of the policy mix through examination of the following question: how did the set of R&D policy instruments arrive ? What is the rationale behind them, what were the driving force behind their establishment, and how is this evolving recently. A crucial question relates to the existence of some consideration of possible interactions when establishing new or suppressing existing instruments. The section tries to establish whether the policy design process is incremental or radical, analytical or non-analytical. From this, that section discusses if the policy mix is a “construct” or an “ex post” reality.

The next section, section 9, focuses on the governance of the system of R&D policy instruments take place. It examines the key question of interactions, i.e. whether there is a form of co-ordination between R&D policy and policy instruments from outside the R&D domain, and the existing mechanisms that favour or hinder such interactions.

The final section, section 10, deals with the core question of the policy mix concept: it endeavours to discuss interactions between policy instruments to affect R&D expenditure. The section discusses possible positive, neutral and negative effects of R&D policy instruments; both within the R&D policy domain, but also with instruments from other policy domains. In most cases, this takes the form of hypotheses rather than hard evidence.

### **Feedback welcome**

Feedback on this report is gladly received. Individual country reports will not be updated but discussion on policy mixes is welcome during the timeframe of the study (2006-2008). Please send your comments to:

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# 1 National Innovation Systems Challenges

Finland suffered from a severe economic recession with high levels of unemployment at the end of the 1980s and beginning of the 1990s, resulting from amongst others the limited competitiveness of the more traditional sectors dominating the Finnish economy by that time, such as “pulp and paper” and “wood products”.

In order to address the severe economic recession, caused by the structural problems of the Finnish innovation system, the government identified research and innovation as an important driver for future economic growth. Since the 1980s, the Finnish government has therefore focussed its policy and instruments on improving R&D intensity, thereby formulating ambitious targets for GERD and BERD.

Finland’s strategy has proven to be effective: the economic growth in the 1990s outpaced most of its competitors. And although the burst of the ICT bubble slowed down development at the beginning of the new century, the current economic growth of 2.9%<sup>1</sup> (2005) lies above the EU25 average.

The emphasis on R&D and innovation in its policy has made the Finnish innovation system one of the best performing in the world. A specific characteristic is its high level of expenditure on research and innovation. Total R&D spending amounted to 3.5% of Finland’s GDP in 2004, well above the overall 3% EU target for 2010. About 70% of R&D spending is financed by the private sector. In the NRP, the Finnish government announces a target of raising total R&D spending to 4% of GDP by the end of the decade. Public spending on R&D is projected to increase by 5% - 7% each year over the same period. The increasing levels of R&D expenditure by the government since the 1980s have been accompanied by increasing levels of BERD, especially from the emerging ICT sector in Finland.

**Exhibit 1: R&D expenditure by sector and GDP share of R&D expenditure in 1998-2004**

Year	Business enterprises		Public sector*		University sector**		Total	GDP share of R&D Expenditure** *
	€(Million)	%	€(Million)	%	€(Million)	%		
1998	2,252.8	67.2	443.9	13.2	657.8	19.6	3,354.5	2.86
1999	2,643.9	68.2	470.1	12.1	764.8	19.7	3,878.8	3.21
2000	3,135.9	70.9	497.4	11.2	789.3	17.8	4,422.6	3.38
2001	3,284.0	71.1	500.9	10.8	834.1	18.1	4,619.0	3.38
2002	3,375.1	69.9	529.7	11.0	925.6	19.2	4,830.3	3.43
2003	3,527.9	70.5	515.4	10.3	961.7	19.2	5,005.0	3.48
2004	3,683.5	70.1	530.1	10.1	1,039.8	19.8	5,253.4	3.51

\* Including PNP (private non-profit sector)?

\*\* Including polytechnics since 1999?

\*\*\* GDP 2003 and 2004 preliminary data of Statistics Finland

Source: Research and Development 2004, Statistics Finland

<sup>1</sup> Statistics Finland argues that the total GDP growth in 2005 has been limited “by an industrial dispute in the paper industry” with about 1%.

With the current levels of expenditure on R&D, Finland scores amongst the highest in the world. Its policy and governance are an example for countries seeking similar objectives and strategies for economic growth. There are however different issues concerning the performance of the Finnish economy and its innovation system in general, and R&D intensity in specific. The 2006 review of the Science and Technology Policy Council contains a SWOT analysis of the current status of the Finnish System of Innovation, reflecting the characteristics and status of the system.

## Exhibit 2: SWOT of the Finnish System of Innovation

<p><b>Strengths</b></p> <ul style="list-style-type: none"> <li>- Finland having become an active partner in international co-operation quite recently but rapidly; a very high rate of participation in the activities of international organisations</li> <li>- Science and technology policy implemented on a long-term basis; investment in R&amp;D regarded as important</li> <li>- Well-functioning education, research, and innovation systems</li> <li>- Openness, intensive co-operation, and competitiveness of the innovation system</li> <li>- A high proportion of competitive R&amp;D funding</li> <li>- A high level of education among the population</li> <li>- Brain drain relatively small</li> <li>- A high proportion of women among researchers and PhDs by international standards</li> <li>- A large number of researchers, who make up a large percentage of the employed</li> <li>- Research volume, quality, and impact at a good international level</li> <li>- Active international patenting</li> <li>- Finland's good reputation: reliable, safe</li> <li>- Knowledge-intensive businesses remaining in Finland</li> <li>- Good co-operation between business enterprises and public research</li> <li>- Finnish enterprises being internationally networked</li> </ul>	<p><b>Opportunities and means</b></p> <ul style="list-style-type: none"> <li>- Effective and efficient national innovation environment boosting competitiveness ↔ internationalisation of the activities and organisations of the innovation system</li> <li>- An enhanced knowledge base and R&amp;D environment, attracting new foreign investments and intellectual resources to the country and improving Finland's position as an attractive region for business operations</li> <li>- Looking for competence where it is best: global and diverse international co-operation, going beyond the EU</li> <li>- Compensating for the small size and geographical remoteness with active, strategically sound co-operation</li> <li>- Prioritised pooling of limited, fragmented resources</li> <li>- Open-minded and sufficient support for creativity and innovation</li> <li>- Enhancing foresight activities and their linkage with decision-making and strategic steering</li> <li>- Implementation and productisation of social innovations</li> <li>- Enhancing positions in international co-operative institutions and R&amp;D organisations</li> <li>- Improving the organisational and functional structure of the innovation system and the division of tasks</li> <li>- Developing business and marketing competence</li> <li>- Creating a favourable business environment and promoting entrepreneurship</li> <li>- Supporting the creation and growth of businesses that focus on R&amp;D and exploitation of leading-edge expertise</li> </ul>
<p><b>Weaknesses and framework conditions</b></p> <ul style="list-style-type: none"> <li>- Strong dependence on global trends</li> <li>- Remote location from global market centres, geographically distant from the centres of Europe</li> <li>- Difficulties in relation to attractiveness and growth: a small domestic market area, a limited number of inhabitants, a small language area, and severe climate</li> <li>- A relatively low level of internationalisation by European standards</li> <li>- Limited economic and intellectual resources: a low volume of knowledge and competence in many fields and the cutting edge of scientific research in the hands of a select few</li> <li>- Problems with venture capital (amount, availability, matching of demand and supply)</li> <li>- Deficiencies in marketing and business competence and in knowledge and innovation management</li> <li>- A small number of spin-off businesses from universities and research institutions</li> <li>- Fragmented research activities: resources allocated to a large number of small units</li> <li>- A small number of highly educated foreign experts, students, and researchers</li> <li>- A small number of growth-oriented enterprises</li> <li>- Enterprises and parts of their operations moving abroad</li> <li>- Low inflow of foreign direct investments; negative balance of investment</li> </ul>	<p><b>Threats</b></p> <ul style="list-style-type: none"> <li>- There is an international economic recession and decline in Europe</li> <li>- Finland does not attract foreign direct investments, R&amp;D investments, researchers, and students</li> <li>- Finland is less active in the EU and global R&amp;D co-operation</li> <li>- The operational foundations of the EU become weaker: more internal conflicts and less commitment and co-operation</li> <li>- National interests are overemphasised in international co-operation</li> <li>- Focus is missing: participation in too many projects with scarce resources</li> <li>- Links among research and economic development, employment, well-being, and innovations grow weaker</li> <li>- Diminishing age groups and an ageing population undermine the balance of the public economy, the room for economic manoeuvring, and the supply of highly skilled labour</li> <li>- The regulatory framework does not support the transfer of research results from R&amp;D organisations to businesses and the commercialisation of results</li> <li>- Availability of competence in the labour market is insufficient: education does not meet labour market needs</li> <li>- The number of new R&amp;D-intensive businesses declines</li> <li>- The favourable development of public R&amp;D funding stagnates</li> <li>- Business R&amp;D expenditure starts to decline</li> <li>- Businesses increasingly move their operations abroad</li> <li>- Brain drain increases: high competence moves abroad</li> </ul>

Source: 2006 Review of the Science and Technology Policy Council

The following issues concerning performance of the system in general, and expenditure on R&D in specific are especially of importance for this study:

- The Finnish economy is dominated by three sectors: ICT, Forest and Engineering Industries. Recent economic growth originates especially from the ICT sector, which has outperformed its competitors in recent years. The other more traditional sectors however, which are concentrated in specific regions in Finland, are struggling to maintain their competitive advantage compared to other actors in the international economy.
- Levels of BERD are very high in absolute terms and in relation to government expenditure, compared to the main competitors of Finland. This expenditure however is concentrated mainly in the ICT sector, and originates primarily from a single actor: Nokia.
- The Finnish economy is characterised by a high share of small enterprises<sup>2</sup>. These SMEs, especially in the traditional sector, spend very little on innovation, and are hardly involved in R&D activities.
- Finnish firms have internationalised their activities very rapidly since the early 1980s. This process started with relocating production and attracting foreign capital for financing activities. Lately, also R&D is being relocated and outsourced abroad. Today, the largest Finnish industrial companies are among the most internationalised firms (originating from small economies). Approximately one third of Finnish firms' R&D is conducted abroad. This is, however, significantly less than their share of foreign production.

Sumarizing the issues mentioned above, different challenges of the NIS can be identified. If these challenges are not met, it will be difficult for the Finnish economy to maintain its position, and for the innovation system to maintain these high levels of R&D expenditure. In fact, the R&D expenditure should actually rise to address these challenges.

#### **1: Diversify the scope of R&D**

The Finnish economy is relying heavily on the ICT sector for future economic growth. The competitive advantage created by heavy investments in the sector in the past is diminishing, and competitors are catching up. The Finnish government therefore needs to stimulate R&D in different sectors. Furthermore, it needs to involve SMEs in R&D, and support the creation of high-tech start-ups, to better absorb the current efforts in R&D and apply the knowledge created, and to create innovative growth oriented businesses. The commitment to research is not fully reflected in the country's performance in terms of creating innovative products and services

#### **2: Ensure creation of high-level competence and research**

The competitive advantage Finland enjoyed in the 1990s as a pioneering country in ICT field has been weakening with time. Countries and regions are more and more competing globally for corporate investments, and cutting edge labour force. In order to face the challenge, an array of policies and measures are needed in order to reach/retain international leading edge in those science and technology areas with

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<sup>2</sup> Finland has about 228.400 companies (2003). According to the EU definition of SMEs, the total number of SMEs in 2003 was 224.100, of which only 3.100 companies are medium-sized enterprises. Annually, 10% of starting companies in Finland cease trading and 7 - 8% of the companies develop into so-called "growth companies", which have the highest impact on deployment of labour.  
Source: Indicators of enterprise dynamics; Some conceptual and methodological aspects, Olavi Lehtoranta, Statistics Finland



vital national importance. Among key issues are continued investments into education and research, strategic specialisation facilitating critical mass in selected areas, internationally competitive clusters of expertise and excellence and extensive international networking. Others are intensified international mobility of Finnish experts and researchers combined with increased efforts to attract foreign experts to Finland.

**3: Create jobs, especially in sectors with high productivity levels**

The Finnish economy, supported by the strong performance of the innovation system, shows its strength also on other macroeconomic indicators. Figures indicate that the high levels of unemployment have decreased over the years. The remaining unemployment however seems more structural, concentrated in specific regions and sectors. Demographic changes due to the aging population will influence employment figures, but it is essential that jobs are created in sectors with high productivity levels, in order to maintain the current social security system, and create sustainable economic growth. Further reform of, and investments in education should address labour market mismatches. Investments in public and private research, especially in the high-tech and service sector, should result in an increased competitiveness, thereby creating new jobs in sectors with high productivity levels.

## 2 Objectives and priorities of R&D policy

The Finnish science policy of the 1960s and 1970s (which in practice also covered innovation) has defined / laid down the foundation for the current basic organisational structures and funding instruments.

In 1980s technology policy was introduced, with the establishment of TEKES, the National Technology Agency, and the launch of national technology programmes aimed at amongst others intensifying international R&D collaboration. The policies launched during the 1980s also characterised the content of the policy actions for the following decade.

In the 1990s, the focus shifted from technology-oriented policy towards innovation driven policy. The concept of "national innovation system" became the basis for the Finnish research and technology policy.

The (general / overall) strategy and objectives of the Finnish government are defined in the Government Strategy Document. This policy paper defines / outlines amongst others the objectives of different Government Policy Programmes. The current **Government Strategy Documents (2005)** foresees a central role for research in enhancing the growth potential of the Finnish economy: an increase in public investments in research and development will stimulate economic growth; and research lays the foundation for the material and immaterial well being of Finnish citizens.

The documents identifies two major challenges, which address the issues as identified before: **(1) maintaining the high levels of R&D expenditure**, and **(2) creating high-level research**, in order to maintain a competitive advantage in a further globalising economy. The 2005 strategy therefore identifies two "broad areas" (focal points) for research policy:

- The first is related to the development of the national R&D financing and to the structural development of the public research system. The policy objectives include the following:
  - Public R&D financing is increased based on the recommendations on the Science and Technology Policy Council of Finland (see **2003 Review 'Knowledge, Innovation and Internationalisation'**) and the **Government Resolution on the Structural Development of the Public Research System** (as described both underneath);
  - Quality and societal impacts are emphasised in the allocation of the research financing;
  - The additional investments into research and development are focused particularly on the strengthening of technological competence and research excellence in sectors, which are central for the growth of national economy;
  - The information provided by evaluations and impact assessments is utilised to direct national investments in an optimal fashion;
  - The public research system is developed as an operational entity to increase the quality and relevance of research;
  - Increased support is provided for the national financing organisations to develop nationally important growth sectors and innovation environments.
- The second area focuses on the quality of scientific research. The objective of science policy is to ensure that Finnish science policy is of high quality; that it

contributes to the achievement of societal objectives; and that it is internationally visible. Specific objectives include the following:

- Enhancing the utilisation of knowledge produced through research;
- Increasing research cooperation at the national, European, and international level;
- Strengthening of the European Research Area and increased cooperation between the Nordic Countries and the Finnish neighbourhood countries;
- Enhancing the role of universities and polytechnics as an integral part of regional innovation environments.

The Government Strategy Documents (2005) defined as the objective ensuring sustainable and balanced societal and economic development for Finland. Other documents / policies are either a basis for the strategy document, or a further elaboration of the identified objectives and priorities. Most important within the framework of this report is in the field of R&D and Innovation is the **2006 Review of the Science and Technology Policy Council** (resulting from the triannual Reviews of the Science and Technology Council of Finland). The 2006 review assesses the status of the innovation system (see previous section), and defines a framework of priorities and objectives for the science and technology strategy and instruments supporting the system. It explicitly defines the role of education, science, technology, and innovation policies and instruments in contributing to sustainable and balanced societal and economic development: 1) promote the overall functionality of the innovation system and the system's ability to renew itself, 2) enhance the knowledge base, 3) improve the quality and targeting of research, 4) promote the adaptation and commercialisation of research results, and 5) secure adequate economic prerequisites for the activities. The continuous development of human resources ensures top-quality competence for the future as well.

Worth mentioning in this perspective is also the **Government Resolution on the Structural Development of the Public Research System** (2005). The government resolution draws on the evaluation of the public research system commissioned by the Science and Technology Policy Council of Finland in 2004. The Resolution outlines development priorities for the structural development of the public research system. The aim is to enhance research and technological development and the utilisation of their results in the Finnish research system.

The resolution identifies the following research policy priorities (which are almost all similar / in line with the priorities as identified in the review):

- More effective and efficient public expenditure on R&D;
- Strengthening the policy mix governance structure;
- Improvement in IPR regimes;
- Intensifying grants to public sector research institutions;
- Reform of public sector research institutions;
- Strengthening and creating centres/networks of excellence;
- Improving R&D co-operation and technology transfer;
- Implementation of fiscal incentives;
- Promoting regional research-driven clusters;
- Developing more favourable employment conditions to attract researchers

In conclusion: there are certain characteristics which have come to mark Finland's research and technology and innovation policies: improving international competitiveness, company and technology-driven approach, constant expansion of research and development inputs, national perspective and proactive stance towards internationalisation<sup>3</sup>.

The major policy objectives for R&D and innovation have been developed gradually. The systematic and evidence-based approach adopted by the key-national policy actors into policy making in policy having a strong character of continuity in stead of stop-go.

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<sup>3</sup> Lemola T. in "Innovaatiopolitiikka — Kenen hyväksi, keiden ehdoilla" (ed. by Lemola, T., Honkanen, P. (2004). Gaudeamus Kirja: Helsinki, 2004.

### **3 Coherence between NIS challenges and R&D objectives and priorities**

The current challenges for innovation and research policy result from the rapid growth of the Finnish economy in the late 1990s, and refer (according to analysis by the Finnish government and the Science and Technology Policy Council of Finland) to increasing global competition among nations as an attractive location for business enterprises and jobs. The current challenges are summarised in section 1.

The operational objectives / actions resulting from the policy documents as described in section 2 can be summarised as follows:

- Finland's national competencies should be developed further. It is considered particularly important to invest in promising research fields and to achieve a sufficient volume and good quality in them.
- Measures should be taken to promote the utilisation of technological and social innovations in business enterprises with a view to accelerating the renewal of traditional industries. Ministries will assume greater responsibility as strategic development organisations and as users of social innovation.
- Resources for R&D and innovation (of the Academy of Finland and the National Technology Agency TEKES) should be increased to enable them to take care of the development of new growth fields, research-based innovations and innovation environments.
- Research organisations must be developed as active and dynamic cooperation partners for business and industry. This involves the amendments to legislation that encourage universities to develop actively education, researcher training and research and to promote the utilisation of research findings.
- Investment in basic information society skills should be continued. The measures for enhancing mathematical and scientific knowledge must be carried on and researchers' career prospects must be improved on the basis of relevant evaluations.
- Research and innovation financing must be increased with a view to accelerating the internationalisation of the innovation system and to improving the overall conditions for innovation. Three main targets are outlined by the review: (1) to develop education and career prospects in research and to step up research on a wide front; (2) to strengthen social and technological innovation; and (3) to develop innovation financing flexibly and expertly.

Within the framework of the policy cycle as implemented in Finland, evaluation plays a very important role. All instruments are regularly assessed to define / update policies and measures. This approach should guarantee that policies and their priorities and objectives address the specific challenges of the system.

Figures indicate that the economy of Finland has grown in recent years, outpacing that of its main competitors. The overall labour productivity level however has not changed significantly. Growth has been realised by further deployment of labour, and an increase in labour productivity levels in specific sectors (especially ICT). Based on this, one could argue that the policies and supporting instruments do not affect the whole economy, but that their impact is limited. This could indicate that the

policies and instruments (with their objectives and priorities) do not address properly the challenges of the system. Policy does not seem to address issues hindering further development of existing sectors, and the emergence of new entrepreneurs.

## 4 Composition of the policy mix for R&D

**Exhibit 3: Expenditure on R&D and innovation, by actor in the innovation system (2004)**

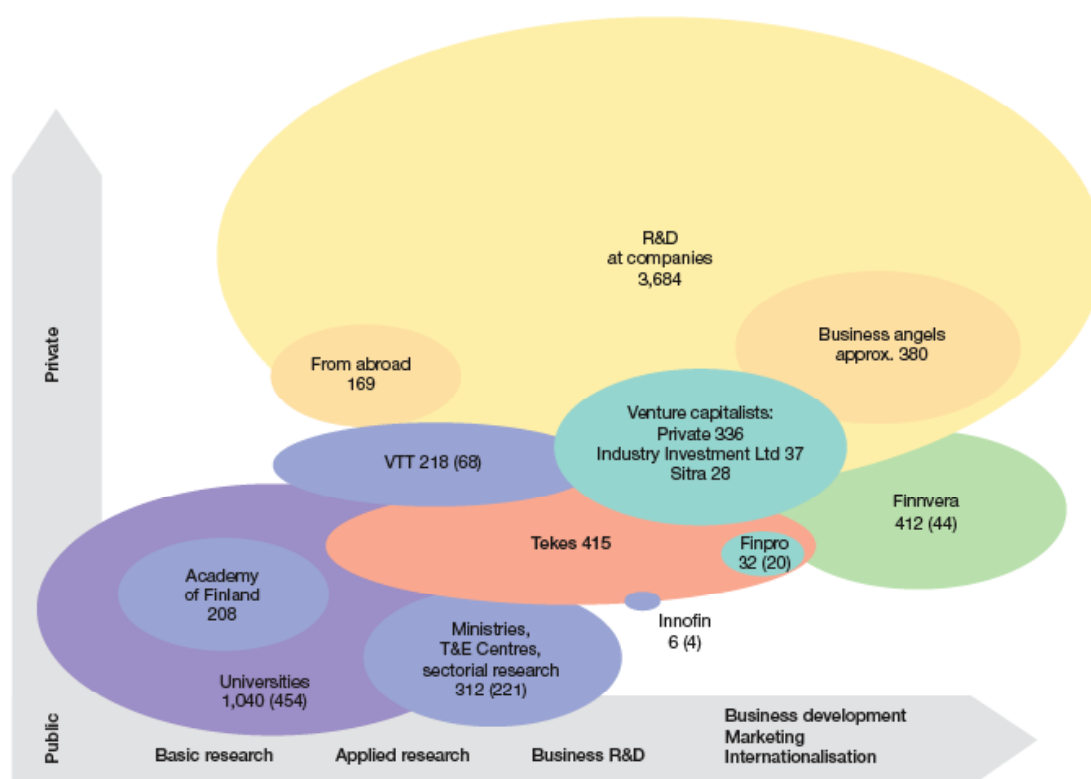


Exhibit 2 provides insight in expenditure in R&D and innovation by actor / programme. The figures represent the total extent of each organisation (in million €) in 2004. In parenthesis the share that is funded from the State budget. The funds of TEKES, the Academy of Finland and Innofin are funded entirely from the State budget.

Before addressing the different policy measures, it is important to describe the main actors involved in policy delivery, to better understand the scope of the different instruments implemented by means of these organisations:

- The **Academy of Finland**, which includes four national research councils, is responsible for the financing and strategy formulation of the basic research, research training and science policy. The Academy of Finland has a range of different funding instruments for different purposes: it provides funding for research projects, research programmes, centres of excellence in research, researcher training, international cooperation as well as research posts for Academy Professors and Academy Research Fellows. The Academy has four Research Councils that decide on the allocation of funding within their respective fields. In 2006 approximately 15% (€ 257 million) of all Government research funding will be channelled through the Academy. The Academy's responsibilities also include the advancement of scientific research and the encouragement of its

exploration, and the development of international scientific co-operation. Most important instruments are:

- **TEKES**, the Finnish Funding Agency for Technology and Innovation, is administered by the Ministry of Trade and Industry. Its primary objective is to promote the competitiveness of Finnish industry and the service sector by assisting in the creation of technology and innovation. The main instruments of TEKES are industrial R&D grants and loans to firms and grants for applied research for public organisations (universities, public research organisations, and polytechnics) along with various expert services for business development and internationalisation. TEKES has an annual budget of about €400 million, a source of funding for more than 2.200 projects. TEKES' funding focuses on SMEs; in 2004, 55% of the funding for companies' projects was allocated SMEs and three-quarters to companies with less than 500 employees.
- Employment and Economic Development Centres (**T&E Centres**) are regional centres jointly offering the public services of three ministries, namely the Ministry of Trade and Industry, Ministry of Agriculture and Forestry, and Ministry of Labour. TEKES services can be obtained via these T&E Centres (15 in number) along with other public services for SMEs.

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

The instruments as mentioned in Exhibit 2 and other relevant policies are presented in the table underneath, according to the structure as defined in the methodology report of the Policy Mix project. It should be noted that the instruments mentioned often address different policy categories.

#### Exhibit 4: Policy mix for R&D in Finland

Policy categories	Policy instruments
<b>R&amp;D Domain</b>	
R&D policy generic	<b>Research grants</b> of the Academy of Finland are "a key form of funding designed to promote diversity and innovation in research by providing high-level researchers the opportunity for scientifically ambitious research work". Several different types of grants are implemented: general research grants; grants for hiring senior scientists; postdoctoral researcher's project; and grants supporting researcher mobility in working life. The Academy allocated in 2005 about €80 million to the different types of research grants. Research projects are granted funding for hiring scientific staff and other personnel, equipment as well as other direct research costs, and for overheads, by universities and research institutes. Also other partners can be involved in a research project.
R&D policy sectoral	<b>Research programmes</b> by the Academy of Finland are composed of a number of closely related projects working in the same field of research. Programmes are set up in important



	<p>areas of research that are advancing rapidly as well as in nationally or internationally significant fields where there is a need for new scientific evidence. The program targets universities and research institutes, and aims to raise the overall standard of research, to promote interdisciplinarity and internationalisation, to establish and strengthen the knowledge base within the field concerned, to promote research careers and networking among researchers and to intensify researcher training. Research programmes run for a fixed period of time: usually funding is provided for a term of four years. In total 14 projects were running in 2005. The Academy allocated in total about €7 million to the different programmes.</p> <p><b>Centres of Excellence</b> of TEKES and the Academy of Finland are research units or researcher training units, which comprise one or more high-level research teams that are at or near the international cutting edge of research in their field. They will also share a common set of objectives and work under the same management. Funding for centres of excellence comes not only from the Academy, but also from the host organisations of the units concerned, and possibly from other funding bodies, such as TEKES, business enterprises and foundations. A centre of excellence may be a unit of research teams working at both universities and research institutes. There are altogether 39 Centres of Excellence. The Academy has allocated in 2005 almost 28 million to the programme, covering the activities of the proposed Centre of Excellence including an overheads share of 12.5%.</p>
R&D / Innovation policy – Linkage	<p><b>Technology programmes</b> of TEKES are a targeted set of research projects at companies, universities and research centres, which are managed along with value-added services such as training, excursions and multi-client market studies. They are used to promote development in specific sectors of technology or industry, and to pass on results of the research work to business in an efficient way. Programmes have proved to be an effective form of cooperation and networking for companies and the research sector. In autumn 2005, a total of 22 extensive national technology programmes were under way in TEKES. In 2004, TEKES provided €71 million to finance technology programmes. There were 1.846 company participations in technology programmes and 537 participations by research units. Approximately two thirds of the company projects in technology programmes were carried out by SMEs. The aim of the programmes is to respond to a specific market need during a time span of 3 to 6 years</p> <p><b>VTT Technical Research Centre</b> of Finland is the biggest contract research organisation in Northern Europe. It has a turnover of €225 million, with 2720 personnel. VTT is part of the public R&amp;D system of public research institutes (19 in total). The state research institutes are responsible for applied and mission-oriented research in their respective administrative fields. The R&amp;D institute sector is large by international standards.</p>

R&D / Innovation policy – IPR	<b>The Foundation for Finnish Inventions (FFI)</b> supports early-phase activities related to innovation: inventions, legal services related to patenting and other IPR issues, market exploration and commercialisation, etc. The FFI agencies offer innovation financing instruments and support services.
R&D specific financial and fiscal policy	Finland does not have any tax incentives for R&D. In the late 1980s Finland allowed a deduction of tax for R&D expenditure, but after a couple of years of experimentation the tax scheme was given up. However, an interest in tax incentives has increased in Finland in recent years. The topic is now under reconsideration, and a special study on advantages and disadvantages of tax incentives for R&D has been started.  Finland has a <b>tax regime for foreign experts</b> , not exclusively for foreign researchers. A foreign employee can choose in between a normal income and a tax at source for not more than 24 months. The tax at source is 35 % of the total amount of salary. This system is advantageous to employees with high salary. It has been mainly applied to a small group of foreign experts employed by firms, much less if at all to researchers employed by universities and government research institutes.
R&D specific education policy	A system of <b>graduate school</b> was launched in Finland in 1995, with the objective of improving the quality of researcher training, make postgraduate education more systematic, shorten the time spent on preparing doctoral dissertations, lower the average age of new doctors, improve cooperation between research groups, and increase international cooperation in education and research. The number of doctoral student posts (funded by the Ministry of Education) in graduate schools will be gradually increased to 2000 by 2012.
R&D specific employment policy	TEKES and the Academy of Finland launched at the end of 2005 the <b>FiDiPro</b> programme to attract top foreign researchers to Finland. The aim is to engage high-quality foreign researchers for a fixed period, ensuring that they integrate into the Finnish research community. It allows universities and research institutes to invite foreign researchers, or Finnish researchers working abroad, to Finland, to pay them a competitive salary, to guarantee them sufficient research funding, and to contribute to the cost of relocating their family with them. The total budget is not yet known.
<b>Finance Domain</b>	
Financial and fiscal policy	TEKES provides <b>capital funding</b> (in the form of equity) with low interest rate for starting and growing technology intensive SMEs for their development and commercialising work. R&D capital loans are primarily aimed at (i) strengthening the risk-taking capacity of small and starting enterprises in their R&D activities and (ii) projects that will develop a product, process or

	<p>service. Loans can be partially or fully non-reimbursable if the technological development has failed or is commercially unsuccessful. TEKES' share is typically 25-50% of the equity. The total budget is in total about €25 million for a 5 year period.</p> <p>Finland has a number of different entities / organisations, which address the financing, needs of especially SMEs and start-ups, during different phases of their lifetime:</p> <ul style="list-style-type: none"> <li>• <b>Finnvera plc</b>, a state-owned financing company, aims to provide risk financing (mainly loans and guarantees) and other financial products (such as export guarantees) particularly for small and medium-sized enterprises. Finnvera's funding focuses on the later phases in the growth cycle after the innovation and R&amp;D phase.</li> <li>• <b>Finnish Industry Investment Ltd (FII)</b> is a state-owned investment company, whose aim is to improve the venture capital market. FII's primary instruments are equity stakes in venture capital and regional funds, as well as direct investments in specific firms and in seed and growth-stage enterprises together with private investors.</li> <li>• <b>Sitra</b>, the Finnish National Fund for Research and Development, is an independent public foundation. Sitra's activities are financed by the yield from its own endowment capital and the return on its venture-capital investments. The Fund was set up in conjunction with the Bank of Finland in 1967 in honour of the 50th anniversary of Finnish independence. The Fund was transferred to the Finnish Parliament in 1991. Sitra's tasks include providing research information on Finnish society as a basis for decision-making, organising innovative operations to create new cooperative networks and models, organising training for decision-makers, media representatives and professionals, as well as providing corporate funding for the technology companies in their early stages of existence, regional enterprises with a promising future and for commercialising innovations. It also makes investments in international venture-capital funds concentrating on the high-tech field.</li> </ul>
Macroeconomic policy	<p>A key objective in the government's macroeconomic policy is to create and secure an institutional structure in Finland that is stable, predictable and competitive. To this end, the government has adopted a sustainable long-term <b>fiscal policy aimed at fostering economic growth and employment</b>. The government has also contributed towards creating a more competitive environment where <b>labour and other cost developments</b> remain moderate.</p> <p>One of the key elements of the Government's economic and employment strategy is to improve the economy's growth potential. The cornerstones of the strategy include steps to strengthen the knowledge base of economic growth by reforming education and by investing more resources in research and product development and by making more</p>

	<p>effective economic use of research and the results of research. Economic policy measures have helped to improve the operation of both the labour market and the goods and capital markets and to support the development of an internationally competitive business environment. Amendments in labour legislation likewise serve the same purpose. Finland's geographical location and the small size of its markets present an additional challenge in the endeavour to secure a competitive production and business structure by means of industrial and structural policy reforms. Hence the main emphasis in the development strategy adopted by Finland is on increasing human capital, on innovations and on the broad application of innovations.</p>
<b>Human Capital Domain</b>	
Education policy	<p>The higher education sector consists of <b>universities</b> and <b>polytechnics</b>. The establishment of polytechnics alongside universities in the early 1990s has arguably been the most important structural reform in higher education for a long time. The universities are responsible for higher education and basic research while the polytechnics are more practically oriented, training professionals.</p> <p>R&amp;D activities carried out by state research institutes and public administration corresponds to about 11% of total R&amp;D expenditure. The share of state research institutes and public administration has shown a declining trend since the mid-1990s. The share of basic state funding for these institutions has been reduced, as in the universities. Focus will be on further defining the "third mission" of universities: their tasks concerning addressing societal needs.</p>
Employment policy	<p>In order to address structural employment in specific sectors and regions, as well as the changing demographic structure of the working-age population, the Finnish government has defined a dedicated policy with specific objectives and targets. The main economic policy goal of the current government is to raise employment by 100,000 by the end of the electoral period 2003-2007.</p> <p>The most important tool implemented by the government to address the unemployment level is a <b>specific tax regime</b>. The key goals in the Government's tax policy are to make it profitable to accept work and to employ people. The tax cuts focus on the income taxation of low and mid-income brackets. In addition, the Government proposes that value-added tax should be altered to favour the growth potential of small enterprises. The Government will make it more worthwhile to accept work and employ people, especially in low-productivity sectors. Tax support for low-income sectors is to be introduced in the 2005 budget. The 'tax wedge' on work has decreased by 5.5 percentage points since the mid-1990s.</p>

<b>Innovation Domain</b>	<p><b>In Finland the approach has been to treat innovation policy and research policy as different facets of the same policy entity. Moreover, technology policy has developed towards more broad-based innovation policy that encompasses also issues of research policy, service innovation, etc. Therefore, many innovation policy instruments also impact on research activities (and the other way around), such as the Centres of Excellence Programme, and the Technology Programme.</b></p>
Innovation policy generic	<p>Funding for Feasibility Studies (<b>VARA</b>) is targeted to SMEs, universities and research institutes. The instrument aims to improve chances to launch and carry out successfully R&amp;D-projects and new technology-based business. Funding for Feasibility studies can be used also for preparation of firm's technology strategy, improving in-house conditions for utilisation of information technology or for transfer of research know-how to SME. The measure belongs to TEKES instrument portfolio, which allows flexible coordination with its other services. The total budget for the measure is unknown (before: €25 million for four years).</p> <p>There is an extensive network of <b>intermediary organisations</b> such as technology and science parks, local or regional business development companies and business incubators. The association of Finnish Science parks - TEKEL - has 22 members, and additionally there are other innovation centres (40), local or regional business development companies (100 - 160, including 60 incubators), business incubators (100) and university technology transfer offices or companies (in 12 - 14 universities). These organisations operate as intermediaries between the producers and users / applicators of new knowledge, research results, and technology. They are either private or public entities, and they perform a variety of tasks on a regional basis and according to their funding base. No steps have been taken to measure the impact or to evaluate the quality of the intermediary organisations.</p> <p>The aim of the <b>YRKE</b> business development programme is to develop the capabilities, processes and services of business incubators and to enhance the development of new start-up companies. YRKE is a joint national effort by the Ministry of Trade and Industry, Sitra, (coordinator), TEKES (financier), and regional Employment and Economic Development Centres (financier). It was started in 2004 to meet the needs of the internationalization of technology and knowledge-based companies. The programme runs from 2004 to 2007 and its objectives are to increase the number of innovative ideas, to increase the number of technology and knowledge-based companies, to improve the business competence of companies and to improve the venture capital possibilities of the companies. The programme is operated by 12 science park incubators, which are publicly owned and / or non-profit. Total budget is not defined.</p> <p>The Research to Business - <b>TULI Programme</b> promotes the launch of new businesses origination from research not yet</p>

	<p>exploited. The programme seeks out and identifies research-based business ideas from publicly funded higher education institutions and public research organisations. Tuli services are offered to analyse and further develop the commercial potential of these ideas. Funding (upper limit €10.000 for each case) is used to buy external expert services in order to carry out market and patenting studies, partner searches, etc, or even to prepare a preliminary business plan. The programme was launched in 1993 and reshaped into a four-year national programme in 2002. The programme is operated via a network of local technology parks and the total budget of the programme in 2005 was approximately €2.5 million. Annually about 500 to 650 business ideas are identified.</p>
Innovation policy sectoral	<p>The <b>Tupas Programme</b> provides grants to SMEs to cover expenses up to €15.000, or 70% of the total costs of a technical project. The aim is to bring together the best experts available to solve the small, but technologically challenging problems facing SMEs; to encourage SMEs to exploit more research services, and to bring SMEs and research organisations into closer and more active cooperation. Research services are provided by research organisations, which market and carry out technology projects in cooperation with the SMEs. The budget is unknown.</p>
Other policies - industry	<p>Industrial policy in Finland is covered by the Ministry of Trade and Industry. MTI administers TEKES, which indicates the direct link foreseen between RTDI and industry policy in Finland.</p> <p>The Ministry recently published its "Guidelines for the Industrial Policy" report (MTI Publications 35/2006), which provides guidelines for decision-making enhancing the development of the business and innovation environment with the aim of ensuring the future success of the Finnish economy and business life. Finland's strengths as well as the challenges confronting industrial policy serve as the basis for the report. The report, which forms the basis for further development of industry policy, addresses innovation under the heading, "From an idea into a commercial success". It focuses on the importance of improving business skills alongside technological know-how.</p> <p>The report states that for the future industrial policy "it is becoming more and more important that the markets and the innovation process, as well as the interaction between the two, all function well".</p>
Other policies - trade	<p>Trade policy in Finland is also covered by the Ministry of Trade and Industry. As mentioned, MTI administers TEKES, which indicates the direct link foreseen between RTDI and trade policy in Finland.</p>
Other policies - defence	<p>The EU Common Security and Defence Policy, supported by the European Defense Agency as well as the EU Security</p>

	<p>Programme defines to a great extent the Finnish defence policy and defence related R&amp;D.</p> <p>The Finnish Security and Defence policy explicitly mentions sufficient investment from the Defence Forces in R&amp;D supporting development programmes in order to maintain and enhance the defence industry's know-how: "Research and development efforts will be focused on strengthening those production and know-how areas where Finland is already competitive. Domestic public financing will be sought whenever feasible". Furthermore, the policy indicates some first steps towards a procurement practice addressing R&amp;D.</p>
Other policies – consumer protection	<p>A Government decision-in-principle ratified the consumer policy programme for the years 2004-2007. The programme is based on the perception that consumer issues in general and the consumer perspective in particular should be given more emphasis and consideration. This is to be done by renewing practices and structures and by promoting co-operation and networking between the various administrative branches and actors.</p> <p>A management group was set up to ensure that the strategic outlines of the programme are observed in both the public and the private sector. The programme also outlines the areas on which the consumer authorities should focus their activities. The programme does not refer explicitly to R&amp;D and innovation.</p>
Other policies – health and safety	<p>Policies concerning health and safety are the responsibility of the ministry of Social affairs and Health. Within the area / scope of health and safety, different research institutes operate. These institutes are (partly) funded by the ministry and / or are involved in different programmes addressing health and safety:</p> <ul style="list-style-type: none"> <li>• National Public Health Institute</li> <li>• Finnish Institute of Occupational Health</li> <li>• National Research and Development Centre for Welfare and Health (STAKES)</li> <li>• The Finnish Centre for Radiation and Nuclear Safety (STUK)</li> </ul>
Other policies - environment	<p>Energy and climate issues as well as sustainable development are closely linked with industrial policy through business infrastructure, efficient markets and new production opportunities.</p>
Other policies – regional development	<p>Certain regions in Finland perform far worse than others in Finland. The Finnish government has acknowledged these problems, and identified R&amp;D as an important driver to stimulate economic development in these regions. The Finnish government states that the ability of regions to utilise public I funding is an important objective. Different measures aim to advance co-operation between innovation organisations and</p>

	<p>regional availability of their services. An example is the <b>Regional Centre of Expertise Programme</b> focussing on excellence, and its regional utilisation. The effectiveness of regional technology and innovation policy is improved on the basis of impact and performance evaluations, and through administrative decision.</p>
Other policies - competition	<p>The consumer and competition policy of the Ministry of Trade and Industry aims to improve the efficiency of market mechanisms. The ministry states that: “An efficiently functioning market encourages companies to be innovative, to seek new business areas that cater to customer needs and to develop more flexible practices”. All companies are guaranteed free and equal access to a market where high-quality products and services are available at competitive prices and which operates reliably from the consumers’ point of view.</p> <p>Consumer and competition policy is carried on in a business environment that is constantly changing due to the increasing impact of international competition, the enlargement of the EU, the diversification of public services and changes in the regulation procedures.</p> <p>The Ministry of Trade and Industry has identified competition policy and legislation as key methods for ensuring that market mechanisms are effective and that their benefits are transferred to the consumer. The Community legislation on competition, entailed major changes in the procedures of competition authorities. The Commission and competition authorities now operate in close co-operation. The EC rules on competition are the only rules applied in the Union to cases that have a major impact on trade. However, this has no significant impact for companies, as the Finnish Act on Competition Restrictions was amended simultaneously, and the interpretation of Finnish and EC rules on competition is mutually compatible.</p>
Other policies – social security	<p>Social security is considered to be part of health and safety policy (see above).</p>

The influence of other policies on research stems mostly from the growing importance of current societal challenges such as the ageing of population and climate change. Finnish ministries have increasingly begun to cooperate with funding agencies, TEKES and the Academy of Finland, in organising research programmes that address these issues. The majority of the programme funding is typically provided by the Academy or TEKES, while the given ministry finances projects, which it finds important with respect to, its specific needs.

A large share (16%) of government R&D appropriations are allocated to public research institutes (Government R&D funding in the state budget 2005). These research institutes are steered by the Ministries through management by objectives, and targets for each research institute are set through annual performance agreements



## **5 Coherence between main policy objectives and priorities, and policy instruments**

R&D and innovation has been identified, already in the 1980s as the key driver for economic growth in Finland. The attention given to R&D and innovation policy and the policy cycle by the government and the entire governance structure reflects the importance attached to this issue. The Finnish process of policy formulation, with its systemic policy evaluation process, is considered to be an example for states pursuing innovation driven growth strategy.

The Finnish R&D and innovation policy cycle is characterised also by the continuous interaction / consultation between the actors of the system and the actors of the governance structure involved in policy formulation. In the past, this approach has resulted in the focus of the support on a limited number of actors in very specific sectors. This strategy was considered to be very successful: the dedicated policies and instruments resulting from these “short lines” in the policy formulation process have resulted in the further emergence and high levels of productivity growth of especially the ICT sector.

Recently, it is argued however that the success resulting from consultation and focus has reached its limits. The Finnish economy is depending heavily on the performance of a limited number of actors in the ICT sector. ICT technology is developing towards new stages in its lifecycle, with increased competition from others who have caught up with Finland. The Finnish economy, in order to create sustainable growth, should “renew” itself, developing competitive advantage based on R&D and innovation in other sectors. It is argued that the current process structuring the policy cycle has hindered the development of a policy and their priorities, and supporting instruments with their specific objectives, addressing the particular challenges as mentioned in section 1.

## 6 Policy mix instruments and target groups

Exhibit 5: Policy instruments and broad routes to increase R&D investments

Policy categories	Policy instruments	ROUTE 1: promote establishment of new indigenous R&D- performing firms	ROUTE 2: stimulate greater R&D investment in R&D- performing firms	ROUTE 3: stimulate R&D investments in firms non- performing R&D	ROUTE 4: attract R&D- performing firms from abroad	ROUTE 5: increasing extramural R&D carried out in cooperation with public sector	ROUTE 6: increase R&D in public sector
<b>R&amp;D Domain</b>							
R&D policy generic	Research grants				X		XX
R&D policy sectoral	Research programmes				X		XX
R&D policy sectoral	Centres of Excellence				X	X	XX
R&D / Innovation policy – Linkage	Technology programmes		XX	X	X	XX	XX
R&D / Innovation policy – Linkage	VTT Technical Research Centre		X		X	XX	X
R&D / Innovation policy – IPR	FFI		X	X			

<b>Policy categories</b>	<b>Policy instruments</b>	<b>ROUTE 1: promote establishment of new indigenous R&amp;D- performing firms</b>	<b>ROUTE 2: stimulate greater R&amp;D investment in R&amp;D- performing firms</b>	<b>ROUTE 3: stimulate R&amp;D investments in firms non- performing R&amp;D</b>	<b>ROUTE 4: attract R&amp;D- performing firms from abroad</b>	<b>ROUTE 5: increasing extramural R&amp;D carried out in cooperation with public sector</b>	<b>ROUTE 6: increase R&amp;D in public sector</b>
R&D specific financial and fiscal policy	Tax regime for foreign experts		X	X			
R&D specific education policy	Graduate schools						X
R&D specific employment policy	FiDiPro						X
<b>Finance Domain</b>							
Financial and fiscal policy	TEKES capital funding	XX	X	X			
Financial and fiscal policy	Finnvera plc	XX	X	X			
Financial and fiscal policy	FII	XX	X	X			
Financial and fiscal policy	Sitra	XX	X	X			
Macroeconomic policy	Macroeconomic policy	X	X	X	X	X	X

<b>Policy categories</b>	<b>Policy instruments</b>	<b>ROUTE 1: promote establishment of new indigenous R&amp;D-performing firms</b>	<b>ROUTE 2: stimulate greater R&amp;D investment in R&amp;D-performing firms</b>	<b>ROUTE 3: stimulate R&amp;D investments in firms non-performing R&amp;D</b>	<b>ROUTE 4: attract R&amp;D-performing firms from abroad</b>	<b>ROUTE 5: increasing extramural R&amp;D carried out in cooperation with public sector</b>	<b>ROUTE 6: increase R&amp;D in public sector</b>
<b>Human Capital Domain</b>							
Education policy	Universities, Polytechnics						X
Employment policy	Employment policy		X	X			X
<b>Innovation Domain</b>							
Innovation policy generic	VARA	XX	X	X			X
Innovation policy generic	Intermediary organisations		X	X	X	X	
Innovation policy generic	YRKE	XX					
Innovation policy generic	TULI	XX					
Innovation policy sectoral	TUPAS	XX					
Other policies - industry	Industry policy	X	X	X	X		

<b>Policy categories</b>	<b>Policy instruments</b>	<b>ROUTE 1: promote establishment of new indigenous R&amp;D- performing firms</b>	<b>ROUTE 2: stimulate greater R&amp;D investment in R&amp;D- performing firms</b>	<b>ROUTE 3: stimulate R&amp;D investments in firms non- performing R&amp;D</b>	<b>ROUTE 4: attract R&amp;D- performing firms from abroad</b>	<b>ROUTE 5: increasing extramural R&amp;D carried out in cooperation with public sector</b>	<b>ROUTE 6: increase R&amp;D in public sector</b>
Other policies - trade	Trade policy	X	X	X			
Other policies - defence	Security and Defense policy	X	X	X			
Other policies – consumer protection	Consumer and competition policy	X	X	X			X
Other policies – health and safety	Health and safety policy	X	X	X			X
Other policies - environment	Industry policy	X	X	X	X		
Other policies – regional development	Regional Centres of Expertise Programme	X	X	X		X	X
Other policies - competition	Consumer and competition policy	X	X	X			X
Other policies – social security	Health and safety policy	X	X	X			X

## 7 Balance within R&D policy mix

**Exhibit 6: Assessment of ‘importance’ of R&D policy instruments**

Instruments	Funding	Criteria				
		a	b	c	d	e
Research grants	80.0		XX		X	
Research programmes	17.0		XX			
Centres of Excellence	28.0		XX		X	
Technology programmes	171.0	XX	XX	X	XX	X
VTT		X	X			
FFI		X				
Graduate Schools			X		X	
FiDiPro				XX		
Capital funding		X	X			
FINNvera plc		X				X
Finnish Industry Investment Ltd		X				
Sitra						
Universities				X	X	X
Polytechnics				X	X	X
VARA		X	X			
Tupas		X		X		X
Intermediary Organisations		X				
YRKE		X				
TULI	2.5	X		X		X

The table above indicates the importance of policy instruments according to the following dimensions:

- Overall contribution to increase of private R&D expenditures.
- Impact on specific aspects of the NIS or R&D performers (when possible).
- Public attention/attention by policy makers.
- Volume of public funding involved.
- Beneficiary of a shift in public funding.

Recent public debate is dominated by the discussion on globalisation and its impacts on Finland. All policy discussions on economy and innovation, and in effect also on competitive advantages sooner or later have to deal with challenges, opportunities and impacts of ongoing economic globalisation. The picture emerging of effects of globalisation seems ambiguous; simultaneously as companies announced about increased revenues and strengthened order books, other news report about relocation of manufacturing to the developing countries. The global structural change and the ongoing restructuring of international division of labour have caused concerns about the nation’s competitiveness, which has acted as an impetus in this discussion.

Another theme debated concerns availability of well-educated workforce, the quality of university teaching and research. The industry representatives have been worried about the difficulties companies have had in finding well-qualified personnel in Finland. There is emerging a widely shared view that university teaching and research reformed in order to ensure its quality also in the future. Another challenge noted in the public debate relates to need to enhance attractiveness of secondary vocational education among youth.

## 8 Emergence of R&D policy mix

The long-standing base for the science, technology and innovation policy governance was cast in the 1980s. Since then the Finnish policy-making structures and core institutional arrangements of RTDI policies have been remarkably constant and no significant reforms in the policy-making process and mechanisms have taken place. Instead, several changes have been carried out on the implementation level among institutions and agencies responsible for funding, research and technology development, or for company support services. Overall, however, the development of the Finnish innovation policy structures has been rather incremental so far and stability and a widely spread consensus among the key actors has characterised the policy governance system. A particular characteristic for the governance system appears to be trust and mutual understanding concerning the factors facilitating economic growth and competitiveness.

The general framework for the national research, technology and innovation policies is set in the Government's Programme document on the one hand and on the other in the triennial reviews of the Science and Technology Policy Council of Finland. At the implementation level, major influence is exercised by the largest public financiers of R&D (Tekes, the Finnish Funding Agency for Technology and Innovation, and the Academy of Finland). In particular, Tekes, largely through its own active approach but also because of broad freedoms the management and steering system gives to it, has had a powerful position in setting guidelines for the national technology policy. Also, Sitra, the Finnish National Fund for Research and Development, has substantial means at its disposal in national terms and, as a fairly autonomous actor under the auspices of the Parliament, has an influence on Finnish innovation policy making. All the three mentioned agencies have their own strategies for funding priorities and conditions.

The planning and decision making of the science, technology and innovation policy has been described in some recent studies as technocratic and efficiency driven. The Science and Technology Policy Council of Finland and the Committee for the Future of the Parliament provide the official forum at the highest policy-making level for policy debate. In spite of this the role of politicians in formulating innovation policies is not particularly strong. The history of this model is traced in a current review back to the turn of 1970s-1980s and to the work of so called "Technology Committee" which was assigned by politicians to prepare "the national view for technological future of the country". The broad based committee succeeded to draft a programme acceptable to all key players. What was though most important, "was that from the early 1980s onwards, technology policy in Finland was less political than a practical question of administration and building up an effective system to raise the technological capability of the country". On the other hand, the technocratic slant may also reflect the fact that science, technology and innovation policy issues have not attracted particular interest among the general public or politicians.

The Finnish science, technology and innovation policy makers have extensively used international evaluations, data and other sources of information (first of all from OECD and the EU). The policy criteria are derived from the international markets and



emphasise competitiveness and effectiveness. In recent years Finland has also invested a lot in national innovation and innovation policy studies focusing on innovation processes, co-operation, internationalisation of R&D and policy delivery structures and schemes for innovation. Becoming a leading nation in innovation policy has set new pressures on policy makers to develop policies and approaches, and not leaning on international examples that much than in the catching-up phase. A specific programme (ProACT Programme 2001-2005) jointly funded and coordinated by the Ministry of Trade and Industry and Tekes aimed to increase the understanding and knowledge of the effects of technology, research and the technology policy on society and the economy, and of the effects of the society on technological development.

Evaluations of public policy instruments and programmes and organisations are conducted very systematically. Significance of evaluation practice has increased in parallel with adoption of the mechanisms of new public management and management by results in the public sector. The Science and Technology Policy Council has encouraged the use of evaluations within science, technology and innovation policy field, while ministries and funding agencies are the major commissioner's of evaluations. Evaluations of public organisations are often used as a tool to trigger a desired renewal or change in the organisation under assessment or prepare ground for a more far-reaching restructuring of the organisational set up. The focus of the policy instrument evaluations has shifted from single programmes towards broader thematic areas. Another identifiable shift in evaluations is the concentration on the role and additionality of the individual policy schemes and instruments in innovation support system as a whole rather than on the single impact thereof.

## 9 Governance of the policy mix

The Finnish Innovation Governance System cannot be analysed without taking account of the broader institutional and socio-political landscape, which, at the same time, enables, induces and constrains, if not outright blocks, certain types of policy formulation and implementation. The general framework for policy formulation and implementation is set by the existing State structure and institutionally embedded practices in public administration. Finland's administrative structure has been described in the literature as being a unitary, decentralised and fairly fragmented in one at the same time.

At the national level in Finland, power is centred in the central government and the ministries with a strong impact on decision-making in their respective sectors. The ministries have traditionally had significant amount of independence. Constitutional reforms carried out over the years have increased power of the Prime Minister and the Prime Minister's Office, but the ministries still arguably have considerable freedom of action within the frames set politically in the Government programme between the cabinet parties and financially in the annual budgets.

An often-mentioned distinctive feature of the Finnish innovation governance system is the active collaboration and co-operation between policy makers and stakeholders representing major actors in the science, technology and innovation policy fields. This is seen as proof that the system facilitates smooth and effective communication between major actors. The Science and Technology Policy Council, drawing together the Prime Minister and a number of other Ministers alongside key established actors in the domain, is frequently thought to epitomise the Finnish way of making innovation policy.

The systematic evaluation culture is also deemed to be one of the strengths of the Finnish innovation governance system. Not just policy instruments but also science, technology and innovation support organisations have been under regular evaluation in Finland for a long time. In recent years, science, technology and innovation policy makers have also made conscious efforts to establish interactive intelligence platforms between the decision makers and the research community.

The feature that promotes co-operation, common vision building and policy implementation (small number of active participants in the science, technology and innovation policy making) is also its weakness. Administratively, the domain is even today dominated by the administrative sectors of the Ministry of Trade and Industry and the Ministry of Education, while a more horizontal approach has not been especially well developed so far. In light of numerous recently published reviews and evaluation reports it seems that the challenge of a more horizontal approach is currently quite well recognized in Finland. It remains to be seen if and which kind of actions this recognition turns into.

It is a widely shared opinion that Finland can compensate for her small size and geographical remoteness with active, strategically sound co-operation. Part of this effort is strengthening the collaboration and co-ordination between innovation

governance at the regional and national level. A parallel, broader definition of innovation policy with a horizontal approach crossing the boundaries between the administrative sectors in policy making is called for. At the same time, an inability to carry out a truly cross-sector innovation policy can be considered a threat to the system.

Active participation in the evolving European innovation governance solutions, e.g. within the EU context as well as in Nordic and Baltic Sea co-operation, opens up new possibilities. For instance, internationalisation of research has been high on the policy agenda for a long time. Currently, however, there are still clear differences between the actors in how long and how fast they are prepared to go with the internationalisation of activities. This is apparent in relation to the European Research Area and European Research Council initiatives, which have divided opinions between the two key public R&D funding agencies, the Academy of Finland and Tekes. The Academy's stance is rather proactive, whereas Tekes' attitude has been more cautious. In global economy Finnish policy-makers proactive stance towards bilateral arrangements with countries and regions outside of Europe seems accurate approach.

There has been a drive towards increased horizontal and vertical co-operation in innovation governance since the early 2000. With time various actors at national, regional and local level have become active in innovation related issues which has led to proliferation of regional and special programmes overlapping or very similar in to each other. Therefore, there is clear need to increase co-operation between the actors involved in innovation policy. According to the information available the forthcoming science and technology policy review by the Science and Technology Policy Council of Finland will address issues related to co-ordination among others.

## **10 Interactions between policy objectives and instruments**

Unfortunately, no information is available providing insight in the interactions amongst policy instruments in Finland. There are however two remarks we would like to make:

- It should be noted that the core of the policy mix is formed by the Research and Technology programmes of TEKES and the Academy of Finland. These programme-based instruments cluster projects in different themes, and provide tailor-made support to specific actors in the innovation system (depending on the funding organisation). This support addresses the specific needs of a project varying from financial support to advice to equipment. The policy measure in fact is designed as a type of front-office, offering different modalities of support, like different instruments in a dedicated policy mix. Both programmes are evaluated regularly, but no insight is provided in the interaction between the solutions offered.
- The performance of the innovation system seems dominated by the ICT sector in specific, and (activities related to) Nokia in specific. The actors involved in the policy cycle seem especially concerned about what the impact has been of the R&D and innovation policy on the success of the Finnish NIS.

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