

## Annual Innovation Policy Trends and Appraisal Report

Denmark

2004-2005



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

Building upon the Action Plan, the *Trend Chart on Innovation in Europe* is a practical tool for innovation organisation and scheme managers in Europe. Run by the Innovation Policy Directorate of DG Enterprise and Industry, it pursues the collection, regular updating and analysis of information on innovation policies at national and European level.

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

#### The Trend Chart products

The Trend Chart on Innovation has been running since January 2000. It now tracks innovation policy developments in all 25 EU Member States, plus Bulgaria, Iceland, Israel, Liechtenstein, Norway, Romania, Switzerland and Turkey. It also provides a policy monitoring service for three other non-European zones: NAFTA/Brazil, Asia and the MEDA countries. The Trend Chart website (www.cordis.lu/trendchart) provides access to the following services and publications, as they become available:

- a database of innovation policy measures across 33 European countries;
- a news service and related innovation policy information database;
- a "who is who" of agencies and government departments involved in innovation;
- annual policy monitoring reports for all countries and zones covered;
- all background material for four annual policy benchmarking workshops;
- the European Innovation Scoreboard and other statistical reports;
- an annual synthesis report bringing together key of the Trend Chart.

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### **Executive Summary**

#### 1. Snapshot of innovation performance and challenges

#### **Economic performance:**

The Danish system is currently characterised by strong macro-structure conditions. The economy is quite strong. Economic growth in Denmark in 2004 was above the EU25-average. Recent figures show a Real GDP growth rate of 2.4 percent. There is a trade surplus, inflation is low, public debt has been reduced, the public budgets are balanced, savings are adequate, the currency is stable, and interest rates follow the European lead. In other words Denmark has managed to create world-class macroeconomic framework-conditions.

#### Innovation performance:

In general the Danish innovation system is perceived as a strong and rather well functioning system with a number of competitive strengths and few serious weaknesses. The political and institutional environment, the policy towards private enterprise, the foreign investment policy, financing and the highly developed infrastructure and institutions, a skilled labour force and a sophisticated financial sector are positions of relative strength. Finally, Denmark is also a global leader in the development of information and communications technology infrastructure.

Focusing on the European Innovation Scoreboard indicators listed in diagram 2 and table 7 of this report, it becomes apparent that Denmark scores high on a number of indicators. Denmark is ranked among the top 5 performers for approximately half the indicators. It is obvious that Denmark has some strength's regarding human resources, knowledge creation and innovation cooperation and venture capital to innovation. It also seems clear that Denmark has some weaknesses regarding the high-tech manufacturing sector, SME innovation and especially innovation activities in general. Although it may not be the Danish ambition to match the EU25 level, the level 100 in diagram 2 is the level for comparison. Benchmarked against this average, Denmark performs well and is ranked high on all indicators except for the application of knowledge area and innovation expenditures. However, compared to the countries Denmark is usually compared to, the conclusion is less positive.

#### Innovation challenges:

Even though the general picture is positive, there is still room for improvement at the macro-level as well as at the micro-level. Danish regulations are perceived to hamper competitiveness, some actors see the tax system as skewing the economic incentive structures, and the labour market could be strengthened more. If addressed efficiently, these factors could potentially improve the foundation for innovation and create a more dynamic system. Overall R&D investment in Denmark is still modest compared to the Barcelona objective (and the best performers). However, in spite of these weaknesses, Denmark by and large remains the leading country in terms of macrostructures.

Other challenges include the Danish educational system. There is a general weakness in the insufficient improvement of the overall level of primary education over the past 20 years, and a more particular weakness in the fact that Denmark seems to be losing ground in advanced education, which, moreover, is not coordinated with business needs. There is some concern that the relatively small number of people in Denmark with an education in science and technology could be a constraint on future innovation performance. The discussion of the Danish education system has become very pertinent following the latest PISA-analysis.

Furthermore, collaboration between universities and companies is too weak, even though it is the general impression that these conditions have already been improved somewhat. Danish entrepreneurship is also weak – that is, the ability to create new companies and makes them grow. This is in part explained as an issue of behavioural attitudes and entrepreneurial culture. It is therefore particularly problematic that some of the Danish weaknesses are concentrated around the most fundamental growth conditions – human resources and future companies.



#### 2. National objectives for innovation

The most recent innovation policy related objectives were put forward in relation to the launch of the Danish Globalisation Council in April 2005 in accordance with the so-called Government Platform presented shortly after the re-election of the Liberal-Conservative Government in February 2005. The Government plans to draw up an ambitious, holistic and multi-year strategy to make Denmark a leading growth, knowledge and entrepreneurial society. Until 2010 the objective is to allocate DKK 10 billion (EUR 1.33bn) to strengthen education, research, innovation and entrepreneurship. The strategy points at four key-objectives:

- Denmark as a leading knowledge society: The objective is for public and private sector enterprises to jointly boost efforts in the area of research and development so that R&D expenditure in Denmark exceeds three per cent of gross domestic product by 2010.
- Denmark as a leading entrepreneurial society: The objective is for Denmark to become one of the societies in the world where most growth enterprises are launched by 2015.
- World-class education: The objective is for pupils in primary and lower secondary school to be among the best in the world in reading, mathematics and science. The Government wants all young people to complete post-secondary education, at least 85 per cent by 2010 and 95 per cent by 2015, and at least 45 percent to complete further education by 2010 and 50 per cent by 2015
- The most competitive society in the world: the objective is for Denmark to become the world's most competitive society by 2015

In addition to these overall objectives a number of more specific innovation policy objectives have been put forward in various policy documents in recent years.

#### 3. Implementing innovation policy - what's new!

The last year was an election year in Denmark. Accordingly the latest developments have often been characterised by presentations of ambitious statements and objectives rather than by the initiation, modification or funding of actual measures. Consequently, few new measures have been launched recently. The launch of a number of new measures can, however be expected in the near future.

The most important recent innovation policy related initiatives are the establishment of the Danish Globalisation Council (including the presentation of the above mentioned policy-objectives) and the presentation by the Strategic Research Council of 10 potential new so-called innovation accelerating research platforms.

#### 4. Appraisal of the innovation governance system

The Danish innovation governance system is currently in the early implementation phases of a major reform and restructuring process. The Danish macro structures are strong, but it is a major challenge to successfully implement the many reforms and, in that process, to create a well-functioning, coherent and coordinated national innovation system. The recent reforms targeted the university-sector, the public research institutions, the technology service system, the advisory and funding structures and the regional system, just to mention the most important ones. At the same time new strategies and action plans were been formulated regarding national and regional growth, collaboration between the public and private sector, knowledge development, strategic research etc. In addition to this a new set of very ambitious innovation related objectives were launched very recently in accordance with the so-called Government Foundation outlining the objectives of the present Government.

In general the Danish innovation system is characterised as a strong and rather well functioning system with a number of competitive strengths and few serious weaknesses.



Strengths	Weaknesses
<ul> <li>Strong political vision</li> <li>Strong political coordination</li> <li>Strong administrative coordination</li> <li>Good stakeholder involvement</li> <li>Emphasis on studies of linkages</li> <li>Increasing awareness of barriers and opportunities</li> <li>Emphasis on knowledge-sharing and PPP</li> <li>Networking among stakeholders</li> </ul>	<ul> <li>Unclear implementation and funding of visions</li> <li>Closed circles of policy thinking</li> <li>Modest R&amp;D investments compared to the Barcelona objective</li> <li>Limited research co-operation between public and private sector</li> </ul>
Opportunities	Threats
<ul> <li>Diverse educational background in civil service</li> <li>Increased focus on innovation within services</li> <li>Increased emphasis on user-driven innovation</li> <li>Awareness of the potentials of globalisation</li> <li>Increased consensus on the importance of continuing attempts to improve the system</li> </ul>	<ul> <li>Overload of political initiatives</li> <li>Emphasis on a "Pick the winner" strategy</li> <li>Convergence of target areas with most other countries</li> </ul>

#### 5. Appraising progress of policy implementation

Danish innovation policy is changing rapidly at the moment. As a policy field innovation is steadily gaining importance in the public and political debate. As a consequence the most important Danish innovation policy objectives are very recent and the majority of them are still formulated at a fairly general level. Consequently, a meaningful general assessment of whether progress towards the main policy objectives and targets have been achieved cannot be made at this point.

One factor is, however, strongly debated at present: the question of whether Denmark is making any real progress towards the Barcelona objective. It is in particular questioned whether the public share of investment in research and development is sufficient and whether the investment rate is optimal. It is argued by a number of key stakeholders that a steady progress towards the objective is necessary for a successful absorption of the funds. It takes time to develop world class research environments, and if the investments are dramatically raised in the last year of the period to meet the target, there is a great risk that the funds will be used inefficiently. However, the Ministry claims that there are no reasons to doubt that the target will be met in time, even though a clear action-plan has yet to be presented (www.videnskabsministeriet.dk).



### **1** The Innovation governance system

#### 1.1 Overview of the innovation system

#### **1.1.1** The national innovation system

The following section describes and discusses the broad Danish national innovation system.

The national Danish research and innovation system has for many years been criticised of being too fragmented and uncoordinated. Even though a number of initiatives were taken to strengthen the functioning and coordination of the system (in particular in the period following 1993, when the first Danish Ministry of Science and Technology was founded) some central stakeholders remained dissatisfied throughout the last decade, which has led to a number of more recent initiatives. Accordingly, it had until recently been argued repeatedly that the system had been too fragmented to act as a framework for a coherent and efficient use of research and innovation resources. It had also been emphasized that a significant weakness of the Danish innovation system had been a low level of interaction between trade and business and knowledge institutions e.g. universities, public sector research institutions and technological service institutes. The latter was documented in a recent study in which Danish innovation and innovation policy was benchmarked against other OECD countries.

However, following the change of government at the end of 2001 a Danish Research Commission was established to review the relevant legislation with a view to enhancing the efficiency of the entire research system. The results of this appraisal were presented in September 2001 (www.videnskabsministeriet.dk - Commission Report). Based on the Commission's recommendations the Parliament and the Government embarked on a reform of the entire public research and innovation system in 2002, when a new Act on Technology and Innovation was passed. As a consequence. Denmark has undergone a major restructuring of its whole innovation system in the last couple of years. To strengthen coordination and the overall function of the research and innovation system the responsibility for both research and innovation was for the first time centralised in a single ministry. Innovation related policies and measures were transferred from the Ministry of Economic and Business Affairs to the new Ministry of Science, Technology and Innovation. At the same time part of the competence of the former Ministry of Trade and Industry regarding trade and business services and innovation related policies was placed under the responsibility of the Ministry of Science. Technology and Innovation. Similarly, the administration of the university sector was transferred from the Ministry of Education to the Ministry of Science, Technology and Innovation. In effect, this reorganisation allocated practically all innovation related policies to the Ministry of Science, Technology and Innovation. Furthermore, a new body, the Council for Technology and Innovation, was set up to assist implementation of the new legislation. The council advises the Minister of Technology, Science and Innovation and is authorised to make decisions on a number of specific appropriation affairs. The composition of the council, whose members are appointed by the minister, reflect the competencies deemed essential for a viable innovation system.

The research funding- and advisory system has also been reformed in order to ensure an optimal use of research resources. The reform is an attempt to simplify the organisational structure of the system and to strengthen management aspects. The intention was to create a more open competition on research means not allocated as basic appropriations to institutions and to ensure that a larger part of appropriations are channelled through the advisory and funding system. Whether the reform has led to an actual simplification of the structure is, however, still debated.

Most recently, and following the early 2005 election, the new Danish Government put innovation policy and coordination of the innovation system even higher up on the political agenda. The Prime Minister established a high profile ministerial group on the challenges of globalisation, dealing explicitly with a number of key innovation policy areas (www.Statsministeriet.dk - Kommissorium). Within a year the group will present a vision and strategy of developing Denmark in to a leading, growth-, knowledge- and entrepreneurial society. The group is chaired by the Prime Minister himself and consists



furthermore of the Minister for Economic and Business Affairs as deputy chairman, the Minister of Education, The Minister of Finance and the Minister of Science, Technology and Innovation. In addition to this ministerial group, the Prime Minister established a so-called Globalisation Council which unites the above-mentioned Ministers with representatives from central stakeholder groups, e.g. Industry, Labour unions and knowledge institutions. The council will assist the ministerial group in formulating the strategy.

Apart from the governing and advisory structures, the Danish STI-policy has two public sub-systems. A public research system and a technology service system. The major research units within the public sector research system are universities, Government Research Institutes (*sektorforskningsinstitutioner*) and hospitals. The core of the public research system is made up of 12 universities, five of which have several faculties, five with only one faculty and two business universities (all covered by the new University Act). Measured by expenditure, the universities carry out roughly 60 percent of public research, whereas Government Research Institute is affiliated to a ministry, its primary task being research and the provision of advice. The Government Research Institutes have a board with members appointed by the responsible ministry, the Ministry of Science, Technology and Innovation and members representing the employees. A director appointed by the board heads the institutes. There are presently about 22 Government Research Institutions placed under nine ministries. There are 3 university hospitals. They are responsible for the majority of the research that takes place at Danish hospitals and in the public health service sector.

The Danish government has recently initiated reforms concerning the government research institutions and the university sector. The aim is to sharpen the profiles of individual institutions and to increase collaboration. The problem of low interaction between the actors of the research and innovation system has always been a common theme of the reforms carried out in this sector in recent years, exemplified by the new demands put forward for universities to formulate goals and strategies for cooperation with trade and business and by the incorporation of external members in the boards of various knowledge institutions. Furthermore, as a new element -- in addition to research and education -- an active role in knowledge exchange, technology transfer and mobility has been added to the university mission. The new Bill on National Government Research institutions as well as amendments regarding the individual institutions was presented in early 2003 and the new University Act came into effect in the beginning of 2004.

In the other subsystem, the technology service system, there are presently nine Approved Technology Service Institutes or GTS-institutes (Godkendte Teknologiske Serviceinstitutter) employing 3,000 people and with a total turnover of DKK 2.2 billion (about EUR 290 million). They are independent, non-profit institutions which provide knowledge and competencies to Danish business and industry on commercial basis to enhance the development and application of knowledge related to technological. managerial and market issues. The institutes are intended to encourage firms to take innovative action. The GTS institutes play a major role as producers and transmitters of application-oriented and technological knowledge, especially for small and medium-sized enterprises, which the Institutes are encouraged to pay special attention to. As the industrial structure in Denmark is characterised by a large number of small and medium sized companies which on average do not engage in large-scale research and development, it is essential that they have easy access to knowledge from knowledge institutions. A system of public certification enables the GTS-institutes to apply for 'basic funds', which co-fund parts of the institutions. This funding is directed towards the creation of a knowledge base and competencies on which the institutes draw to transmit information to private firms. The GTS-institutes cover a wide range of scientific areas and technological fields and operate on near market terms, since the major part of their revenue comes from advisory services paid for by companies and public project means. The market exposure is also shown by the fact that approximately 31 percent of their revenue is generated from the export of technological services. The Council for Technology and Innovation directs the funding through a set of three-year contracts. The total funding has ranged in recent years from DKK 250 million to DKK 300 million (or EUR 35 million to EUR 40 million).

The Danish National Research Foundation (*Danmarks Grundforskningsfond*), which has the status of an independent fund, is another important institution in the Danish innovation system. It funds larger research activities based on researchers' own ideas, and contribute to the development of Centres of Excellence. The Foundation has at its disposal a capital of DKK 2 billion (approximately EUR 270



million). Initially, it was expected that only the income from the capital should be used for funding the Foundations' activities. However, a later revision of the legislation has enabled the Foundation to extend its use of capital. Presently 33 centres are funded.

In addition to this a Foundation for High-Tech Development was established very recently. It is intended to provide the Foundation with an average of DKK 2 billion (EUR 269 million) per year over the next 12 years. The proceeds from the Foundation are to be allocated to strategic high-tech projects in which Danish research and industry have high qualifications. A central characteristic of eligible projects is that they involve interaction between public knowledge institutions and companies.

Apart from the above mentioned public part of the national innovation system, the last couple of years have also seen a number of innovation initiatives, institutions and organisations originating from other sources than the central Government and parliament. Besides the traditional private key actors such as the Confederation of Danish Industries, a number of major enterprises. The Danish Federation of Small and Medium-Sized Enterprises and The Danish Academy of Technical Sciences (ATV), a couple of new actors have entered the Danish innovation policy scene in the last couple of years. An important new actor in this respect is the Innovation Council, which was founded in October 2003 upon the initiative of a Danish think tank, the House of Monday Morning (www.innovationsraadet.dk). Based on co-operation between private companies, ministries and public institutions e.g. the Ministry of Economics and Business Affairs, the Ministry of Science Technology and Innovation, the Danish Ministry of Education, Danfoss, FUHU, Novozymes and The Danish Bankers Association have joined forces. The House of Monday Morning and FORA, the analysis unit of the Ministry of Economics and Business Affairs, are responsible for running the Innovation Council secretariat. The Innovation Council aims to discuss and encourage innovation in the Danish economy. It is made up of an international network of 100 men and women from companies, public sector institutions and institutions for education and research tasked with identifying and mapping Denmark's opportunities and objectives within the global knowledge society. The Innovation Council will accordingly provide specific recommendations as to how Denmark can develop new knowledge environments, which will ensure that as many jobs as possible are created in Denmark in the future. Accordingly, the key task of The Innovation Council is to help Denmark achieve its declared goal of becoming one of the world's most innovative societies within the next decade and to build up and facilitate the partnerships and projects which will secure that Denmark develops into one of the world's most innovative societies. The Innovation Council's work can be divided into the following five headlines: to identify new agendas; to establish a close international sparring network; to determine what we do best in Denmark; to present proposals to how we can become even better; and to transform visions into action.



Type of	Name of organisation	Website (where available)
organisation	(in English)	
Government and I	egislative bodies	
Ministry	Ministry of Science, Technology	www.videnskabsministeriet.dk
	and Innovation	
Ministry	Ministry of Economic and	http://www.oem.dk/sw184.asp
	Business Affairs	
	Ministry of Education	http://eng.uvm.dk/
Private sector org	anisations and entrepreneurship	promotion
Confederation	The Confederation of Danish	www.di.dk
	Industries	
Federation	The Danish Federation of Small	www.hvr.dk/english/
	and Medium-Sized Enterprises	
Federation	The Danish Academy of	http://www.atv.dk/atveng/andet/body.html
	Technical Sciences	
Knowledge institu	tes (R&D and education bodies)	
Federation	The Danish	http://www.rektorkollegiet.dk/sider/english
	Rectors' Conference	
Commitee	The Coordination Committee	http://forsk.dk
Industrial research	n centres and innovation interme	diaries
Think Tank	The Innovation Council	http://www.innovationsraadet.dk/indhold.asp?id=205
Financial system		
Federation	The Danish	http://www.finansraadet.dk/english/toolkit/forside/
	Bankers Association	

#### Table 1: Selected key organisations within the National Innovation System

To sum up, the Danish research and Innovation system is at the moment characterised by a major restructuring process. The overall aim of the various reforms and initiatives in the Danish system is to create institutional changes and governance structures better suited for the coordination of and cooperation between the different actors of the national innovation system; with the overall responsibility for the research and innovation policy concentrated in the hands of the Ministry of Science, Technology and Innovation. The Government expects that these initiatives will contribute to a strengthening and improved co-ordination of innovation policies in Denmark. So far, there seems to be a higher degree of satisfaction than previously with the institutionalisation and the functioning of the innovation system among central stakeholders. Taken together, it must nevertheless still be concluded, that in spite of the various reforms and attempts to create a more coherent and coordinated innovation structure, the Danish Innovation system is still very complex. In addition, more or less all the recent initiatives are presently in the early phases of implementation and the consequences of the reforms are therefore still uncertain, so whether or not they actually will lead to a significantly improved innovation-system remains to be seen.

#### 1.1.2 National innovation policy making and delivery structures

In Denmark policy objectives are traditionally defined during a parliamentary process by members of parliament, political parties, governmental officials and stakeholders. However, the Government has a decisive influence on this process, as it has the initiative and the entire administration at its disposal in the preparation of reforms or bills.

Nevertheless, Danish research and innovation policy has traditionally been a policy area where consensus has been sought. It is customary that reforms and more far-reaching bills are circulated among a broad array of stakeholders who are invited to comment on the reform/bill. Based on this consultation the reform bill will follow a fixed procedure before it eventually becomes 'legislation'. In the last couple of years the 'benchmarking model' has increasingly been used as a tool to identify strengths and weaknesses in many policy areas. This seems particularly true for innovation policy, probably because of the lack of an exact causal relationship between action and performance.

As mentioned above the Danish Research and Innovation system has for many years been criticised of being too fragmented and uncoordinated. As a consequence of this criticism the current Ministry of Science, Technology and Innovation was created in November 2001 as an extension of the former Ministry of Information Technology and Research. Responsibilities for universities were transferred from the Ministry of Education and most responsibilities for innovation and high-tech business



development were transferred from the Ministry of Trade and Industry. With this restructuring the Ministry has been given an overarching responsibility from academic education and research to innovation and information technology. Furthermore, according to the inter-governmental foundation the Minister for Science, Technology and Innovation has the co-ordinating role in matters related to innovation policy.

The Ministry of Science, Technology and Innovation is presently divided into two departments: 1) Research, Innovation and Education and 2) Information and Communications technology. The Department for Research, Innovation and Education is further divided into three Centres: 1) Centre for Education and Research Institutions, 2) Centre for Research and Innovation and 3) Centre for Analysis and Policies. The Ministry employs around 250 staff members and provides the secretariat supporting the Danish Council for Research Policy. Even though efforts have been concentrated in one Ministry, other ministries still deal with smaller areas of relevance to the innovation policy. The Ministry for Economic and Business Affairs deals with innovation issues in the traditional industrial sector emphasising supporting entrepreneurship and dealing with clustering policies and IPR issues. The Danish Patent and Trademark Office is also a part of the Ministry for Economic and Business Affairs, together with the Danish Competition Authority. The Ministry of Education is dealing with broader educational policies and aspects of lifelong learning. Furthermore, 'sector' ministries such as the Ministry of Food, Agriculture and Fisheries are dealing with innovation policy within their respective areas.

At the moment the Ministry of Science, Technology and Innovation manages approximately 75 percent of the governmental appropriations to research and innovation. Other ministries with substantial research budget are the Ministry of Food, Agriculture and Fisheries, the Ministry of Culture and the Ministry of Education. Co-ordination between sectoral ministries is done on an informal basis under the initiative of the Ministry of Science, Technology and Innovation. However, with the recent set up of the previously mentioned high profile minister group on the challenges of globalisation, chaired by the Prime Minister, it can be expected that coordination of innovation policy issues will gain an even higher priority and will be dealt with in this forum.

To further improve coordination and to assist in implementing the legislation of the various current reforms, a Council for Technology and Innovation has been established. The council advises the Minister and takes decisions in a number of specific appropriation affairs (amounting to approximately DKK 525 million (EUR 70 million) in 2004). Members of the Council are appointed by the Minister and cover expertise in science, technology and business.

Below the Ministry level there is a system of research advisory and funding councils (<u>www.forsk.dk</u>). The main advisory council, the Danish Council for Research Policy (*Danmarks Forskningspolitiske Råd*), was established pursuant to a new Act on research advice on 1 January 2004. As provided in the Act the Council replaces the former Danish Council for Research Policy (*Danmarks Forskningsråd*). The Council advises the Minister for Science, Technology and Innovation on matters concerning research policy. The Parliament and other ministers may also ask for the Council's advice. Advice may be given upon request or on the Council's own initiative. The tasks of the council include giving general advice on Danish and international research policy for the benefit of society including advice on:

- The framework of research
- Appropriations for research
- Major national and international research initiatives
- Development of national research strategies
- Denmark's role and position in international research cooperation
- Training and recruitment of researchers

The Council consists of a chairman and eight members all of whom must be recognised researchers (at least four members) or knowledgeable about research. The Minister for Science, Technology and Innovation appoints the chairman and the eight members in their personal capacity for a three-year term (members may be reappointed once). The secretariat of the Council is based at the Ministry of Science, Technology and Innovation.



With the latest reform the funding part of the research advisory system was divided into two subsystems. The Council for Independent Research (<u>Det Frie Forskningsråd</u>) is currently the umbrella organisation for five research councils and will support research projects based on the researchers' own research initiatives. It will also promote the wide range and quality of Danish research through open competitions based on independent assessment. In addition, the Council will be giving advice on research and technical subjects to applicants and other partners from all scientific domains. The Board of the Council is responsible for defining and putting together the research councils. It is also responsible for deciding the specific allocations of 'free research means' between the various councils. Recently the Council implemented a new structure of the research councils implying a reduction in the number of councils from six to five and a change of their boundaries. According to the Council the new boundaries better reflects the interdisciplinary nature of modern research. The new councils are:

- The Research Council for Culture and Communication
- The Research Council for Nature and Universe
- The Research Council for Society and Trade
- The Research Council for Health and Illness
- The Research Council for Technology and Production

However, the new council structure is in reality very similar to the one it replaced. Apart from the merger of two of the previous councils into one, it is more a matter of new labels than an actual change of boundaries. A more far-reaching and very radical restructuring of the council structure has been proposed, but has not yet been implemented.

The other subsystem of the funding structure is made up of the Council for Strategic Research (<u>Det</u> <u>strategiske forskningsråd</u>), which will support research based on politically defined programmes. It will also give advice on research and technical subjects to applicants and others within its scope of activities. The Council has an obligation to contribute to an increased co-operation between public and private research. Furthermore, the Council will evaluate applications regarding the individual ministries research appropriations. The Strategic Research Council consists of a Board and a limited number of programme committees. The board has a chairman and eight members. The chairman and the members are appointed by the Minister or Science, Technology and Innovation. To allocate the programme appropriations ad hoc committees are set up. Members of programme committee are to be recognised researchers. To ensure 'societal relevance' of projects, applicants, to be eligible for funding, are to specify more immediate or direct success criteria of the project such as number of jobs created as a result of the project. Furthermore, a special monitoring group involving the business sector will be attached to each project to ensure that the goals are achieved.

Taken together the research councils manage approximately 10 percent of all R&D expenditure of the Finance Act (compared to DKK 1,231) million (EUR 165 million) out of DKK 9,540 million (EUR 1,280 million) in 2004).

Finally, the advisory and funding system is coordinated by the Coordination Committee (Koordinationsudvalget for Forskning), which has the responsibility of promoting coordination and cooperation between the research councils and between the research councils and the rest of the research and innovation system. The Committee has the status of a consensus organ, without having an authoritative role vis-à-vis the research advisory system. The members of the Research Council for Strategic Research, and the Danish National Research Foundation, two members nominated by the Danish Rectors' Conference, one member nominated by the Assembly of Director Generals of the Danish Government Research Institutes (SEDIRK), and one member nominated by the Council for Technology and Innovation.





Diagram 1: organisational chart of the innovation governance system

In conclusion, it transpires that the governance structure of the national Danish Innovation System has been strengthened significantly since 2001. Responsibilities have been concentrated in fewer positions and coordination efforts seem to have been strengthened, and can be expected to be even further strengthened in the context of the activities of the ministerial group on the challenges of globalisation. However, whether these steps are sufficient to secure a better coordination and stronger collaboration in the overall broad innovation system still remains to be seen, as most of the reforms currently are in the early phases of implementation.

#### **1.1.3** Governance of regional innovation systems

Major changes in Danish innovation policy are not only happening at the national level. The Danish regional level is also characterised by significant restructuring these years. Regional structures in Denmark, , including the regional innovation system, are currently undergoing fundamental changes.

At the moment the Danish regions are organised in a two-tier system comprising 14 counties and 271 municipalities. The counties are responsible for the national health-service (including hospitals). secondary and higher preparatory education, the regional environment, sections of the public transportation system, part of the employment services and regional enterprise policy. The municipalities have the responsibility amongst other things for local enterprise policy and parts of employment services. Traditionally the local and regional authorities have had a high degree of autonomy within their respective areas (in financial terms, they control approximately 60 percent of total public spending). However research and innovation policy has so far not been an explicit responsibility of the regional and local authorities, except in the health sector. The regional and local authorities account for approximately seven percent of the total national public R&D expenditure. 90 percent of these appropriations relate to activities within the health service (especially hospitals). However, this situation is changing drastically at the moment. The Government recently reached agreement on a reform of local and regional governance, the so-called Structural Reform (www.detnyedanmark.dk). According to the agreement the number of local authorities will be reduced substantially, and five 'regions' will replace the 14 counties. The main purpose of the reform is to benefit from efficiency gains from larger units and to create governance structures that are more suitable for the future. According to the plan, 2006 will be a transition period where the old and the new systems will co-exist, but from the beginning of 2007 the new structure should be fully implemented.



Evidently, these changes are expected to affect the regional innovation system as well. One consequence already seems to be that the development of regional innovation systems has gained a much stronger position on the national, regional and local political agenda. Accordingly, the development of regional innovation systems is a main topic in the current structural reform. The intention is for each of the five future regions to be responsible for the development of regional trade and industry. It is emphasised in the policy document that a key objective of the structural reform is to strengthen the development of local and regional growth conditions throughout the country and at the same time create a simpler and more coherent structure to minimise bureaucracy for the private sector. The government emphasises that regional development is a mutual responsibility between local actors and the Government. Therefore, maintenance and extensions of such regional issues as infrastructures, the educational system, business service, research parks and technology incubators will take place in a dialogue between the actors. The development of local conditions for growth will be based at the regional level and will involve local enterprises, municipalities, labour unions and knowledge institutions. The municipalities will be responsible for the local business service, while the regional responsibility for innovation will be given to the 5 new regions. The establishment of so-called regional growth forums with the participation of up to 20 representatives of central stakeholders responsible for the strategic planning, monitoring and development of initiatives in the region will be instrumental in this respect. It is emphasised that local business and knowledge institutions should be represented particularly strongly in these forums.

The so-called regional innovation councils (initiated by the House of Monday Morning) will already begin their work in 2005, but the above-mentioned official growth forums for each region will only continue this work as of 2007. The growth forums are to formulate regional development strategies based on an analysis of regional strengths and weaknesses in relation to the enterprise structure and central growth conditions. These strategies will in turn influence the formulation of national growth strategies. The growth forums are expected to continually monitor the development of regional growth conditions to be able to adjust the formulated strategies. The growth forums are also supposed to make suggestions for the allocation of regional innovation funds and for the allocation of the nationally administered structural funds, but they will not provide or administer any funds themselves. The regions will receive a block grant in addition to the structural funds and other sources from local enterprises and knowledge institutions.

It will be possible for each region to set up more than one forum, and the forums do not necessarily have to follow the administrative borders of the new regions. The intention is that the regional effort has to be based on regional strength positions rather than administrative borders. However, the national Government will continue to manage the overall innovation and growth-policy and the coordination between the business-, education-, traffic-, employment- and other innovation related policy-fields in accordance with the national growth strategy, including the general administration and allocation of EU structural funds.

The structural reform and the consequences for the regional innovation system also have to be seen in relation to the recent regional research and innovation **action plan** presented in September 2004 and the Regional Growth Strategy presented in 2003.

The action plan has four key objectives:

- 1. To put Research, Technology and Innovation on the regional political agenda
- 2. To create strong regional collaborations on research and innovation
- 3. To increase the level of innovation and competence in the regions
- 4. To increase the number of knowledge-based entrepreneurs throughout the country

The plan has led to two new initiatives aiming at the creation of a high-technological knowledge-based regional development, namely Centres of Expertise (regionale teknologicentre) and so-called regional knowledge pilots. The Government has earmarked DKK 130 (EUR 17.5) million to these initiatives for the next four years.

A number of existing measures with regional effects like the Technology Incubators (DK 4), Innovation Consortia (DK 17) and the Industrial PhD Initiative (DK 5) will also be strengthened. The Centres of Expertise will focus on regional competencies and act as intermediaries between regional research



and SMEs. Experiences from the former Regional Growth Centres (DK 13) initiative will guide the establishment of these centres. It is expected that the first round of applications to this initiative will be called for by April 2005 and that the first Regional Centres of Expertise will be up and running before the end of 2005. The regional Centres of Excellence aim at strengthening the collaboration between the regional business-environment and relevant knowledge-institutions in relation to research, innovation and technology development. The collaboration will be based on business strength positions within a limited geographic area outside the capital area. The Government expects to fund between 6 and 10 regional Centres of Excellence during the coming 4 years. The 'Regional Knowledge Pilots' programme enables SMEs to employ academic staff.

As a forum for targeting, prioritising and coordinating initiatives towards the local regions, a number of so-called regional business co-operations have already been established in the form of so-called Trade and Industry Partnerships between local, regional and national actors. Currently there are four regional partnerships covering Jylland-Fyn, Vestsjælland-Storstrøm, the capital region and Bornholm. It has been up to the regions themselves to establish new independent units implementing the regional business service. These units are co-financed by the State. The new structure, put into force in January 2004, replaced the former TIC network and the local centres for entrepreneurs. Furthermore, DKK 175 million (Eur 23,33 million) have been earmarked for the period 2002-2005 for a specific Jutland Funen IT-programme. The scheme is co-financed by local authorities by a similar amount. The programme aims at developing partnerships between research and trade within IT areas in which the Jutland-Funen universities have specific competences.

However, it is seen as a mutual precondition for these initiatives to succeed that they are based on a solid foundation of knowledge and analysis. In this respect another new actor needs to be mentioned. In early 2005, "Reg.Lab", a new federation of actors, was founded (<u>www.reglab.dk</u>). Reg.Lab is an organisation focusing on regional business development by gathering and methods and good practices and informing interested parties about them. The idea is for Reg.Lab to give inspiration for regional development to regional authorities, municipalities, knowledge institutions, business and enterprises. The federation offers benchmarking of results and framework conditions, access to knowledge on the design of successful initiatives, ideas for collaboration, general possibilities of knowledge-sharing and discussion of experiences among the members of the Reg.Lab-network. For further information of regional innovation policy see <u>www.videnflytterud.dk</u>.

Table 2. regional governance of innovation policy matters							
Level of regional / ocal government	Administrative authorities	Powers related to innovation policy					
<b>Counties</b> : presently 14. From 2007 they will be replaced by 5 regions	The County Councils will be replaced by Regional Councils	Presently, the counties are responsible for the national health service (including hospitals), secondary and higher preparatory education, the regional environment, sections of the public transportation system, part of the employment services and regional enterprise policy. The new regions will be responsible for the development of regional trade and industry					
<b>Municipalities</b> : Presently 271. From 2007 the number will be reduced significantly. The exact number is not yet known	The Municipality Council	The responsibilities of the current municipalities include local enterprise policy and parts of employment services. The new and larger municipalities will be responsible of the local business service					

Table 2: regional governance of innovation policy matters

#### **1.2** Appraisal of the governance system

#### **1.2.1** Policy making and evaluation practices

Danish innovation policy making has so far to a large extent relied on international statistics, reviews and evaluations, while national studies have been of lesser significance. However, there have recently been systematic attempts in the Danish system to increase the role of evaluations in relation to innovation activity. In principle all research and innovation activities in Denmark are up for regular evaluation, but evaluation of the innovation system as a whole is a new issue and has not yet been



fully developed. Evaluations are currently carried out, but they are on an ad hoc basis on the requests of specific departments. A more systematic policy review is now under consideration.

Another source of input into the policy process is provided by the Danish Centre for Studies of Research and Research policy (www.cfa.au.dk). Since 1997 this institute has performed a number of studies for the Ministry regarding the impact of investment in R&D. The institute collects the data for R&D statistics and for the national innovation survey and has made assessments of specific initiatives and continuously delivers data used by the Ministry for assessment of research and innovation, nationally as well as internationally. These data play an important role in the policy process. However, more qualitative national studies and background analysis' as the foundation for reforms and restructuring have traditionally played minor roles in the policy process, and this fact has been criticised repeatedly; most recently in relation to the new University Act.

The lack of use of national and international studies and background analyses is, however, somewhat compensated by a strong stakeholder involvement in the policy formulation. There is interaction with all stakeholders and consultation and partnership are increasingly put on the agenda. There is coordination among the different organisations involved in policymaking related to innovation and inter-ministerial committees have recently been established to improve this coordination. The most important recent example of stakeholder involvement is the establishment of the Globalisation Council mentioned above.

Another instrument which needs to be mentioned is technology foresight. The Danish government carried out a Technological Foresight pilot programme during the three-year period from 2001 to 2004 (www.teknologiskfremsyn.dk). The aim was to complete eight foresights during this period and to identify issues of strategic policy importance for each of these foresight processes within the areas of science, technology, education, regulation and innovation. This includes experimenting with different ways of doing technology foresight in a Danish context in order to establish if foresight should be used on a more permanent basis as a future oriented working method for identifying issues of strategic importance for Danish STI-policy. So far, five foresights have been concluded, covering pervasive computing, bio- and healthcare technology, future green technologies, hygiene and nanotechnology. It is expected that the last phase of the foresight pilot programme will be closely linked to the establishment of a new "High Technology Fund" for the development of generic technologies of future importance such as ITC, biotechnology and nanotechnology. In relation to the launch of this new initiative a dialogue process will be organised within the framework of foresight in order to identify specific areas of strategic importance to Denmark that could be supported by the fund. It is also expected that foresight will be recommended as an important future oriented policy instrument that should be implemented on a permanent basis within the framework of the Danish STI-system.





#### Table 3: Overall appraisal of tools for policy making and evaluation

Tool for policy making/evaluation	Crit	eria	Ranking
· · · · · · · · · · · · · · · · · · ·		•	(*. ** or ***)
Strategic policy making (national	*	Almost no background discussion.	***
strategies, white papers, etc.):		studies and stakeholder participation	
prevalence of evidence based and	**	At least some of these activities are	
open consultation procedures		systematically pursued	
open concatation procedured	***	All of the above items are	
		systematically taken into	
		consideration	
Existence of coordination mechanisms	*	No mechanisms for coordination	***
(high-level councils, inter-ministerial	**	Few, rather fragmented and bilateral	
committees, etc.)		coordination processes	
· ,	***	Well organised coherent system of	
		policy coordination	
Systematic review process for	*	Almost no policy documents and hence	**
innovation policy		little assessment	
	**	A few, ad hoc reviews	
	***	Systematic policy review	
Design and implementation of	*	Very centralised/closed system for	***
innovation policy measures		designing and implementing policy	
	**	Consultation and partnerships exist	
		mainly on an ad hoc basis	
	***	Systematic interaction with all	
		stakeholders	
Existence of an "evaluation culture" in	*	Rare evaluations of innovation measures	**
field of innovation policy		only monitoring or auditing.	
	**	Evaluations of measures are carried	
		out on an ad hoc basis on the request	
		of specific departments or funding	
		bodies.	
	***	Measures are systematically evaluated	
		at key milestones in their	
		implementation.	d. d.
External versus internal evaluations of	*	Evaluations are carried out internally as	**
innovation policy measures	**	a general rule	
	**	A snare of evaluations are contracted	
		out to independent contractors but	
	***	this is not a generalised practice.	
		Evaluations respect good practice chiena	
		avidence based quality appraisal of	
		evaluation reports etc.)	
Transparency and publication of results	*	l ittle or no transparency concerning	**
of evaluations		results of measures	
	**	Evaluations and annraisals are	
		published or debated occasionally	
	***	All evaluations are published or	
		discussed in a public forum	
	1		1

#### 1.2.2 Policy benchmarking and trans-national learning

In Denmark as well as internationally it has been commonplace to emphasise how the formulation, design and implementation of research- and innovation policy have been characterised by a high degree of convergence across the western countries. Elzinga and Jamison have, among other characteristics, pointed to a methodological conformity in identifying future priorities, and an increasing international agenda setting and "orchestration" from above through intergovernmental bodies leading to conformity in issue-perception and management (Elzinga & Jamison, 1995, 577). Similarly, it has been stressed that despite some national variations, there is a high degree of congruence on the core of views and instruments used. A theoretical explanation of this tendency can be found in "new institutionalism", which argues that in situations of great uncertainty, actors search for ready-made models of what to do and imitate what appears to be a successful measure by someone else in a similar situation. When this kind of imitation happens, it leads to a convergence of policymakers'



belief-systems, and the political perception of problems, orientations and goals become more and more similar across countries (Senker et. al, 52-53, 1999).

This tendency towards convergence has also been observed in Denmark, where international reviews and statistics have played, and still play, a key role in the political debate of how to design the national research- and innovation system. In particular OECD-reviews have been used intensively as political legitimisation of systemic changes. Eurostat and OECD indicators are also often used as ammunition in the political game. It is, however, argued that international reviews often lack a sufficient understanding of important national and cultural aspects of the Danish system. Nevertheless, foreign experience is taken into consideration when designing programmes, but learning by hiring experts or staff from other countries has not taken place to any significant degree.

Denmark participates in a number of European policy networks dealing with research and development- as well as innovation policy. Denmark furthermore takes part in The Nordic Council of Ministers' Northern Dimension working group on innovation policy. The Nordic Council of Ministers has established an experimental policy discussion forum for innovation policy makers in the Nordic and Baltic regions (Iceland, Norway, Finland, Sweden, Denmark, Lithuania, Latvia, Estonia, Russia, Poland and Germany). The Trend Chart was presented at the first meeting of this group in March 2005, and the group was present in the April 2005 workshop of the Trend Chart. The Nordic Council of Ministers has also established a new organisation, the Nordic Innovation Centre, which has a special Forum for Innovation Policies that is to promote more effective innovation policy-making. The members are policy makers from all the Nordic countries (Iceland, Denmark, Sweden, Finland and Norway). The Nordic Innovation Centre is also funding innovation policy studies carried out by researchers and analysts from the Nordic countries. Among the latest developments in this collaboration is the presentation of the objective of the Nordic region as a frontrunner in research and innovation", which was the theme of a conference hosted by the Nordic Council of Ministers, Iceland (its chair) and the Nordic Innovation Centre on 10 June 2004 (www.nordicinnovation.net). Delegates included decision- and policymakers in the Nordic innovation system. An important aim of the conference was to discuss and generate feedback to the newly presented policy document, "Proposals for a collaborative Nordic programme on innovation policy 2005-2010.

Finally, there are also forums for the Baltic Sea region, like the Baltic Forum for Innovation and Entrepreneurship which aims at encouraging the exchange of experiences related to research commercialisation. The Baltic Development Forum is an independent non-profit networking organisation with members from large companies, business services, major cities, institutional investors and business associations in the Baltic Sea region. It works with a wide range of partners including businesses, governments, regional organisations, researches and media institutions.

More generalised references to other countries' practices and policies also continue to play an important role in the Danish policy making process. Unfortunately, these references are rarely used in a systematic way, and international comparative studies of positive and negative experiences in relation to different ways of designing different parts of the innovation system often seem to be neglected in the policy process. One explanation might be that researchers and analysts are often reluctant to give clear policy recommendations, while organisations such as OECD provide input that is far more suited to the political process.

But even though societal dynamics and the challenges they imply for the innovation policy system, the political orientations emerging in reaction to them, and the political goals arising from these orientations have basically been the same across the western countries, there are nevertheless great differences in the specific political measures which are agreed and implemented to achieve the political goals, as well as in the effects of such measures on the structure and dynamics of innovation systems. This is often explained as a consequence of path-dependency, where tendencies towards convergence, which might be produced by imitation, are resisted. Path-dependence results in a preselection of what is possible, feasible and rational in the future. The systems dynamics thus shape the institutional arrangements, interest and power-constellations and the substantial tasks carried out. So even though there are definite similarities to be seen in the funding trends, in the formulation of priorities, in the use of instruments and in organisational structures between Denmark and a number of other western countries, there are also important differences. Often apparently similar priorities have great differences in actual content. Even though almost all countries consider topics such as



biotechnology, nanotechnology and IT as high priorities, there seem to be major differences in the actual formulation and implementation of these priorities. Similarly, there seems to be a convergence in the use of instruments across countries, but even though the same instruments are used in almost all countries, there are great differences in the actual form they are given, and in the way they are used in the priority-setting processes. For example, central instruments such as foresight, evaluation and programmes can be designed and used in a variety of very different ways, which can lead to very different outcomes. Consequently the design of science policy and the actual outcomes of the priority-setting processes can vary significantly between different countries depending on national policy cultures, where changing constellations of actors, processes, procedures and instruments strongly affect the final implementation of priorities. In other words, the convergence thesis should not be taken too far.

Benchmarking is also used increasingly as an instrument in the Danish policy process. In the last couple of years the 'benchmarking model' has been used more and more often as a tool to identify strengths and weaknesses in many policy areas. This seems to be especially true in the case of innovation policy, probably because of the lack of an exact causal relationship between action and performance. Benchmarking of selected innovation areas have been undertaken.

Tool for policy learning	Crit	eria	Ranking (*, ** or ***)
Formal mechanisms for policy learning	*	No mechanisms exists	**
(studies, innovation observatories, study	**	Ad hoc mechanisms	
visits, etc.)	***	Very systematic efforts	
Application of foreign experience in	*	No or very occasionally	**
designing measures (e.g. involvement of	**	Occasional or ad hoc basis	
foreign experts in design phase)	***	Systematically	
Exchange or hiring of innovation policy	*	No	**
staff/ experts to/from other countries	**	Ad hoc	
	***	Systematic schemes	
Involvement of senior policy makers	*	No	**
/executives in transnational networks (e.g.	**	Yes to one	
TAFTIE, etc.)	***	Yes to all	
Carrying out benchmarking exercises to	*	No	**
assess comparative innovation	**	Ad hoc benchmarking exercises	
performance (scoreboards, etc.) or policy	***	Benchmarking is a systematic process & results	
vis-à-vis other countries		are incorporated into policy	
Implementing policy co-operation with	*	There is no formal co-operation	**
other countries: bilateral or multilateral	**	There are common innovation actions	
programmes on innovation, etc.		responding to specific opportunities	
	***	Many longer terms agreements	

#### Table 4: Overall appraisal of policy benchmarking and learning initiatives

#### **1.2.3** SWOT of the National Innovation Governance System

The Danish innovation governance system is currently in the early implementation phases of a major reform- and restructuring process. The reforms represent a potential strengthening of the innovation governance system, but they also represent a main challenge for the Government in order to successfully implement the many reforms, thereby creating a well-functioning coherent and coordinated national innovation system. The recent reforms targeted the university-sector, the public research institutions, the technology service system, the advisory and funding structures and the regional system just to mention the most important ones. At the same time new strategies and action plans have been formulated regarding national and regional growth, collaboration between the public and private sphere, knowledge development, strategic research etc. In addition a new set of very ambitious innovation related objectives have been launched very recently in accordance with the so-called Government Foundation (see www.statsministeriet.dk), where the Government has presented the political objectives of the coming election period.

However, in general the Danish innovation governance system is currently perceived as a strong and rather well functioning system with a number of strengths and few serious weaknesses. One of the most important strengths of the governance system is that the responsibility for both research and



innovation has for the first time been centralised within a single ministry. Innovation related policies and measures have been transferred from the Ministry of Economic and Business Affairs to the new Ministry of Science, Technology and Innovation. Part of the competence of the former Ministry of Trade and Industry regarding trade and business services and innovation related policies has also been moved to the Ministry of Science, Technology and Innovation. Similarly, the administration of the university sector has been transferred from the Ministry of Education. In effect, this reorganisation has allocated practically all innovation related policies to the Ministry of Science, Technology and Innovation. As a consequence the Danish governance system is characterised by strong political as well as administrative coordination. At the same time there is clear and highly prioritised political vision and a good stakeholder involvement in the formulation of innovation policy objectives.

It is, however, a weakness that there is currently considerable uncertainty linked to the question of how the broad political objectives will actually be implemented and funded. Most key stakeholders express particular concern in relation to the funding of public R&D.

Another weakness of the Danish innovation system is a limited public / private collaboration on research and innovation. However, the Government is aware of this weakness and has targeted it in a number of initiatives recently.

A threat mentioned by various actors such as the OECD and the Danish Bankers Association is the emphasis on the strategy of "picking the winners". The critics argue that it is a dangerous strategy to target a few selected areas at the expense of broader growth potentials. No one can predict the growth of tomorrow, they argue. Instead the efforts should be directed at creating optimal framework conditions. However an equal number of actors can be found arguing that the small size of Denmark and the limited availability of funds require focusing on a number of selected areas. A related question is whether focusing on the same target areas (Nano-tech, IT and Bio-tech) as most other countries should be seen as an opportunity or a threat. Instead, the argument - also supported by the Innovation Council - is put forward that the strategic choices Denmark must make and the focus we need to apply does not involve a strategy based on picking the winners, but a strategy based on an ability to identify new global needs and develop the necessary solutions. The new key guestion of globalisation is accordingly, 'What needs can be met better in Denmark than anywhere else in the world?'. This requires an intense focusing on Denmark's own unique core competencies which are hard for others to copy, and an emphasis on finding an innovative use of them on the marketplace. In this respect Denmark has been described as a riddle. In a strategy paper the Innovation Council argues that although the Danish corporate sector chiefly consists of many small businesses in low-growth industries, Denmark has remained one of the world's 10 richest countries for decades now, alongside such economic superpowers as the United States and such research-powered globalists as Sweden. This is an accomplishment that many other countries in a similar situation have been unable to match. Recent business research indicates that Danish prosperity is based on a culturally rooted ability to collaborate, adapt to new requirements and find new solutions. Throughout history, this human and social ability to innovate has created a number of movements and institutions that have provided and continue to provide – a unique Danish competitive edge.

Examples of these specific Danish strength positions include the popular high school movement secured political and, in turn, economic stability in a period of political revolution in Europe; that the cooperative movement was an effective response to America's cheap agricultural output; that the labour movement paved the way for an upgrading strategy that has produced the world's best educated workforce; and that the welfare movement activated women so that Denmark today has the world's highest participation rate in the labour force. These are social innovations which are based on a view of humanity involving respect, competence, and collaboration. Accordingly it is argued, that Denmark's top ranking in international competition surveys today is largely due to process strengths. Danes are practically world champions in cooperating both with one other and with customers, creating a Danish user-driven power of innovation that matches the Swedish and American research-driven innovation. The Innovation Council as well as other actors takes the view that it is in these culturally specific Danish strengths that we find the key to Denmark's future competitiveness.

Accordingly, one of the opportunities often mentioned for Denmark is that the country should be known for its ability to think up solutions for complex challenges – a strategy that involves identifying the needs and developing the solutions. Increased emphasis on user-driven innovation is a possibility



in this respect, which is often mentioned. An increased emphasis on partnerships between the private sector, public authorities, and research and education institutions also has the potential to become a driving force in building new, strong industries.

#### Table 5: National Innovation System SWOT overview

Strengths	Weaknesses
<ul> <li>Strong political vision</li> <li>Strong political coordination</li> <li>Strong administrative coordination</li> <li>Good stakeholder involvement</li> <li>Emphasis on studies of linkages</li> <li>Increasing awareness of barriers and opportunities</li> <li>Emphasis on knowledge-sharing and PPP</li> <li>Networking among stakeholders</li> </ul>	<ul> <li>Unclear implementation and funding of visions</li> <li>Modest R&amp;D investments compared to the Barcelona objective</li> <li>Limited research co-operation between public and private sector</li> </ul>
Opportunities	Threats
<ul> <li>Diverse educational background in civil service</li> <li>Increased focus on innovation within services</li> <li>Increased emphasis on user-driven innovation</li> <li>Awareness of the potentials of globalisation</li> <li>Increased consensus on the importance of continuing attempts to improve the system</li> </ul>	<ul> <li>Overload of political initiatives</li> <li>Emphasis on a "Pick the winner" strategy</li> <li>Convergence of target areas with most other countries</li> </ul>

Even though the general picture of the Danish innovation system is positive, there is always room for improvement. However, at the moment the willingness to try to improve the system seems to be strong among policymakers in Government as well as in the opposition. At the same time most key-stakeholders in the public as well as in the private sector are very much aware of the current agenda-setting possibilities and wish to contribute to the improvement of the system.



## 2 Developments in Innovation policy

#### 2.1 Overview of trends in performance and policy

#### 2.1.1 Recent trends in innovation performance and competitiveness

The following section compares the main economic and innovation policy indicators in Denmark to the EU25 average. Denmark is usually gathered in the group of high developed countries with an industrial sector that looses momentum and a rapidly increasing service sector. This development is similar to some the other Nordic countries, the BeNeLux countries and some other countries. This trend can also be found in the development of the economic and innovation indicators below.

In an analysis of the Danish position in the EU25 framework, several items can be identified. The Danish indicators illustrate the common and well known fact that it is less easy to improve with the same high growth rates from a high level than from a low level (cf. table 6 and diagram 2). Hence, where some of the relative indicators show that Denmark looses momentum, the level indicators show Denmark on a very high level or standard.

Denmark has been governed by a liberal conservative coalition since 2001. The coalition was reelected in February 2005. Hence, the general economic policy is stable and has not changed much in the period. The period has been characterised by small growth rates that have caused some concern regarding competitiveness and productivity in Denmark. In 2004, a small labour income tax reduction was introduced and an obligatory pension payment of 1 percent of the gross labour income in 2004 and 2005 was stopped. A small reduction of company tax rates was also introduced. The resulting increases in disposable income together with a low unemployment rate and low interest rates have supported a relative high economic growth, especially driven by the private consumption. However, export has also remained stable in spite of a decline of domestic production.

Indicator	National per	formance	EU 25 average		
	2000	2004*	2000	2004*	
GDP per capita in PPS (EU25=100)	126.8	122.2 <sup>1)</sup>	100	100	
Real GDP growth rate (% change previous year)	2.8	2 <sup>1)</sup>	3.9	2.3	
Labour productivity per person employed (EU25=100)	105.2	103.8 <sup>1)</sup>	100	100	
Total employment growth (annual % change)	0.3	-0.9	1.4	0.2*	
Inflation rate (average annual)	2.7	0.9	2.4	2.1	
Unit labour costs (growth rate)	-1.3	-0.3	0.4	-0.3*	
Public balance (net borrowing/lending) as a % of GDP	1.7	0.3*	0.8	-2.8*	
Employment rate (as % of 15-64 population)	76.3	75.1*	62.4	63*	
Unemployment rate (as % of active population)	4.4	5.4	8.6	9	
Trade integration of good ((imports+exports)/GDP)	29.6	28.1*	-	9*	
Trade integration of services ((imports+exports)/GDP)	14.5	14.3*	-	3.2*	
Foreign direct investment intensity	20.3	0.9*	-	1.2*	
Business investment as a percentage of GDP	18.4	18.3*	18.4	16.8*	

#### Table 6: Comparable indicators of economic performance

Source: Eurostat - Structural Indicators and Long-term Indicators <u>http://epp.eurostat.cec.eu.int</u> \* or latest available year (2003)

Note: 1) The real GDP growth rate has been updated to now 2.4 percent. This also means that the GDP per capita in PPS increases 20 percent to roughly the level in 2000, i.e. 126.8. The updated GDP may also influence the labour productivity indicator upwards.

As table 8 indicates, the economic performance indicators point to a similar development, namely that Denmark has had above EU25-average economic growth in 2004. Recent figures indicate a real GDP growth rate of 2.4 percent (cf. Statistics Denmark Newsletter, 11. April 2005). This also means that GDP per capita in PPS is higher than the figure given in table 6, roughly equal to the relative level in 2000, i.e. 126.8.



The employment situation in Denmark has been stable in recent times, with a small decrease in the unemployment rate from 2003 to 2004 of 0.2 percentage point. However, the unemployment rate is still higher than in 2000, although is has remained considerably lower than the average EU25 level throughout the years. Combined with an unchanged employment rate in 2004 (compared to 2003), this resulted in a total negative employment trend of 0.9%. However, employment rates in Denmark are still significantly higher than in the EU25 average. This is mainly caused by a higher than average female employment rate. The inconsistency between a negative employment growth and a unchanged employment rate can be attributes to the fact that some unemployed individuals as well as some individuals benefiting from social security, education jobs and training courses count differently in the two statistics. Basically, the figures show an unchanged situation in Denmark with minor adjustments in the labour market. The unit labour cost growth is on the EU25 level close to zero even though the labour unit cost level is one of the highest among the EU25.

The economic situation in Denmark is better than the EU25 average. The inflation rate in 2004 was as low as 0.9 percent, considerably below the average. This, in turn, acts as a supporting factor for an already strong economy with a high surplus in the public sector economy. This development is a continuation of government policy to reduce public as well as foreign dept. The dept reduction policy has wide support in the Danish Parliament.

As a small open economy, Denmark suffers as well as gains from a need to compete across national borders. This is illustrated by the trade integration of goods and services where the Danish indicators are several times higher than the EU25 average indicator. The indicators show Denmark has a large import and export shares at the same time that and that the Danish economy is open towards a global economy with free markets and efficient trade.

The small open economy is not, however, equivalent to a high net foreign direct investment intensity. As is defined here, the foreign direct investment indicator measures the average of inward and outward foreign direct investment flows divided by GDP and multiplied by 100. The level of inward as well as outward foreign direct investment is approximately 36 percent of GDP. Hence, an indicator on 0.9 does not indicate low investment flows. Instead, the indicators point out that although Denmark has a well educated labour force, the unit labour costs are higher than most other EU25 countries. The unit labour costs are caused by high wage levels, high average taxes, and high marginal tax rates on labour, high energy and environmental taxes and high ambitions for  $CO_2$  reductions (cf. Globalisation Report 2005 of Danish Industry). Hence, although the business investment percentage of GDP is higher than the EU25 average, it is not solely caused by positive net foreign investments.

Focusing on the European Innovation Scoreboard indicators listed in diagram 2 and table 7, it is obvious that Denmark has some strength's regarding human resources, knowledge creation and innovation cooperation and venture capital to innovation. It also seems clear that Denmark has some weaknesses regarding the high-tech manufacturing sector, SME innovation and especially innovation activities in general. Although it may not be the Danish ambition to match the EU25 level, the level 100 in diagram 2 is the level for comparison. Benchmarked against this average, Denmark performs well and is ranked high on all indicators except for the application of knowledge area and innovation expenditures. However, compared to the countries Denmark is usually compared to, the conclusion is less positive.

Regarding human resources, Denmark has an above EU25 average, but with respect to tertiary education and especially S&E graduates this is at most in line with the usual comparison countries, i.e. there is room for improvements. Denmark has a long tradition for life long learning and ranks very highly for this indicator. However, a high level also reduces the space for growth which can be seen in diagram 2. The low score on S&E graduates together with the high unit labour cost in Denmark is a obvious explanation for the below average score on the medium/high-tech manufacturing employment. The corresponding indicator for the service sector is above average, although loosing momentum.



#### Diagram 2: EIS2004 country summary



#### 2004 European Innovation Scoreboard - DENMARK





#### Table 7 : National trends in EIS indicators vs EU25<sup>1</sup>

	DENMARK	1996	1997	1998	1999	2000	2001	2002	2003	Latest (EU25 =100)	Rank among EU25	Current (1)	Trend (2)
		Huma	in reso	urces									
1.1	S&E graduates	9.4		8.1 76	8.2	11.7 102	12.2			112	7	0	++
12				25.4	26.6	26.2	99 28.4	20.6	31 0	151	2	++	+
1.2	relative to EL115			148	130	123	132	136		101	2		
13	Lifelong learning	18.0	18.9	19.8	19.8	20.8	17.8	18.4	18.9	210	3	++	-
	relative to EU15	316	326		241	245	212	216	195		Ū		
1.4	Employment hi-tech manuf		6.31	6.83	6.39	6.44	6.99	6.31	6.12	93	15	0	0
	relative to EU15		83	88	84	84	93	86	86			-	-
1.5	Employment hi-tech serv		3.90	4.15	4.51	5.04	4.93	4.73	4.50	141	3	+	0
	relative to EU15		133	139	141	149	137	133	129		-		-
		Knowl	edge c	reation									
2.1	Public R&D exp	0.72	0.75	0.73	0.77	0.76	0.75	0.77		115	5	0	0
	relative to EU15	103	110	107	115	112	110	112					
2.2	Business R&D exp	1.13	1.19	1.33	1.33	1.51	1.65	1.75		138	3	+	+
	relative to EU15	96	100	111	106	119	127	135					
2.3.1	EPO hi-tech patents	12.9	21.1	24.8	29.0	38.4	45.6	44.9		173	5	++	+
	relative to EU15	110	139	127	125	131	135	145					
2.3.2	USPTO hi-tech patents	5.3	9.2	14.5	17.9	17.5	18.1	16.4		175	3	++	-
	relative to EU15	94	172	170	198	184	167	146					
2.4.1	EPO patents	130.1	144.2	139.7	168.5	199.3	225.7	214.8		161	5	++	+
	relative to EU15	134	126	107	120	126	134	136					
2.4.2	USPTO patents	47.6	63.8	75.0	91.7	81.7	91.3	83.8		140	6	+	0
	relative to EU15	105	135	123	146	123	127	117					
	Transmissio	on and	applica	ation of	f knowl	edge							
3.1	SMEs innov in-house					16.1				51	18	-	
3.2	SMEs innov co-operation					15.8				223	2	++	
3.3	Innovation expenditures					0.54				25	20		
3.4	SMEs non-tech innov					26				53	18	-	
	Innovation	n finan	ce, out	put and	d mark	ets							
4.1	Hi-tech venture capital					30	32	63	70	137	1	+	(3)
	relative to EU15					62	64	122	137				
4.2	Early stage venture capital	0.002	0.002	0.005	0.014	0.020	0.053	0.080	0.063	250	3	++	(3)
	relative to EU15	36	25	33	47	35	88	216	250		-		
4.3.1	New-to-market products					6.6				113	6	0	
4.3.2	New-to-firm products					13.5				80	8	0	
4.4	Internet (comp. indicator)							0.	89		2		~
4.5						1.0	6.7	6.5	6.5	104	14	U	0
4.0	relative to EU15					108	105	107	105	440	0		•
4.0		11.8	12.5	13.2	14.4	14.3	15.0			118	ð	U	U
	relative to EU15	101	103	705	110	104	106						
CDD	Mac	10-600	OIIOMIC	106	400	100	107	104	104				
Brode	per capita (EU20=100) $(EU10=100)$			120	120	120	104	124	124				
Emple		74	75	75	76	76	76	76	75	110			

All indicators on knowledge creation show Denmark performing rather well it spite of a loss of momentum with regard to patenting in the US. Instead Denmark gains momentum with regard to EU patents. R&D expenditure of the business sector also place Denmark above average with an above

<sup>&</sup>lt;sup>1</sup> Value in **bold**: break in series. (1) Current strength "++" if relative to EU25 performance above 150, "+" if above 120, "0" if between 80 and 120, current weakness "-" if below 80, "--" if below 50. (2) Trend strength "++" if relative to EU25 trend above 25, "+" is above 10, "0" if between –10 and 10, trend weakness "-" if below –10, "--" if below –25. (3) Trend data for both venture capital indicators have not been used as these data suffer from high year-to-year fluctuations and are considered to be less reliable.



average growth. In 2003, Danish business invested 1.8 percent of GDP in R&D, which represents a decrease in the relative expenditure (cf. www.cfa.au.dk). The public R&D expenditure is also above the EU25 average with a low growth in recent years. Public R&D expenditure in 2003 were 0.8 percent of GDP, indicating an increased focus on the R&D part of the national knowledge creation process.

In the remaining indicators, Denmark is broadly speaking consistent with the average and enjoys similar growth rates as the other countries. This is the case for ICT expenditure as well as high tech manufacturing value added. In industry production, Denmark performs better than average but seems to have severe problems using innovation and R&D results. The use of innovation and public sector R&D results in the service and production sectors has recently become a policy issue in Denmark. As in many other countries, public sector knowledge creation and R&D expenditure are now seen in a broader context where they are meant to be used to the benefit of the entire society through an active policy, setting up better frameworks and thereby creating a more efficient national innovation system within which the created knowledge and innovation can be put to their best use.

In general terms, Danish competitiveness is rated quite high. In IMD's 2004 World Competitiveness Yearbook (WCY) Denmark is rated as the 7<sup>th</sup> most competitive nation in the world. A similar assessment was made by the World Economic Forum 2003, which ranked Denmark as the 5<sup>th</sup> most competitive nation in the world.

#### 2.1.2 Innovation policy objectives

In the last couple of years innovation policy has become increasingly prominent on the Danish political agenda. As a consequence innovation policy objectives have been put forward as a distinct theme in a number of key policy documents in the period since 2001. Denmark does, however, not have an explicit stand-alone innovation policy.

There are nevertheless a number of innovation policy objectives which stand out in most of the recent policy-documents. Key innovation policy objectives repeated in the majority of documents include:

- Strengthening co-operation between knowledge institutions and the private sector;
- Strengthening the transfer of technology between knowledge institutions and the private sector
- Improving commercialisation of research results in public knowledge institutions;
- Increasing the investments in R&D, especially in the private sector;
- Strengthening entrepreneurship;
- Increasing the number of persons with a PhD.

In addition to these objectives a number of more general objectives were presented recently after the 2005 election. These most recent and very ambitious objectives were put forward in relation to the launch of the Globalisation Council in April 2005 in accordance with the so-called Government Platform, published immediately after the election. The current Government plans to draw up an ambitious, holistic and multi-year strategy to make Denmark a leading growth, knowledge and entrepreneurial society. Until 2010 the objective is to allocate DKK 10 billion (EUR 1.33 billion) to strengthen education, research, innovation and entrepreneurship. The strategy includes four key points:

- Denmark as a leading knowledge society: The objective is for public and private sector enterprises to jointly boost efforts in the area of research and development so that R&D expenditure in Denmark exceeds three per cent of gross domestic product by 2010.
- Denmark as a leading entrepreneurial society: The objective is for Denmark to become one of the societies in the world where most growth enterprises are launched by 2015.
- World-class education: The objective is for pupils in primary and lower secondary school to be among the best in the world in reading, mathematics and science. The Government wants all young people to complete post-secondary education, at least 85 per cent by 2010 and 95 per cent by 2015, and at least 45 percent to complete further education by 2010 and 50 per cent by 2015
- The most competitive society in the world: the objective is for Denmark to become the world's most competitive society by 2015

However, these objectives are not yet fully operational. According to the plan a finalised strategy will be presented by the Government within a year. It is acknowledged as a comprehensive, national task



to meet these goals and it is therefore perceived as necessary that all parts of the Danish society support this project. The Government will, accordingly, involve representatives of broad segments of society in this work. As a first step the Government has appointed a Globalisation Council with broad involvement from the relevant sectors of society to assist a high profile ministerial group chaired by the Prime Minister and charged with to formulating the precise strategy. The Council will advise the Government with respect to the formulation of the strategy and contribute to its implementation. The Prime Minister will chair the Council as well as the minister group, and the Minister for Economic and Business Affairs will act as deputy chairman.

Other important policy documents of the recent years where key innovation policy objectives have been stated include:

#### The Growth Strategy:

In May 2002 the Government launched its growth strategy, based on an analysis of national strengths and weaknesses. Basically the strategy focuses on improving framework conditions for trade and business as a way to increase national competitiveness. Accordingly, the basic focus of the Government is: labour taxation, macroeconomic markets (labour and capital), strengthened competition, administrative burdens and frameworks for education and research. The strategy includes a number of action plans with direct implications for the Danish innovation system. For example it includes initiatives to strengthen cooperation between industry and knowledge institutions (which were further developed in a later 'Strategy for Public-private Partnership on Innovation' – see below), an action plan on regional growth and an action plan on entrepreneurship.

#### Act on Technology and Innovation:

In June 2002, an act on Technology and Innovation was passed by the Parliament, intended to strengthen technology development and innovation within trade and industry. The Act is a framework act for a number of initiatives carried out during the last couple of years fostering innovation, in particular: Technology Service – GTS, Technology incubators, Industrial innovator Scheme, Industrial researcher-scheme, Innovation Post Doc, Centre contracts, Regional growth centres and Technology foresight. The Act is a manifestation of the fact that policy areas within technology and innovation are gathered together in the Ministry of Technology, Science and Innovation. The Act aims specifically to facilitate:

- Co-operation and dissemination of knowledge between knowledge producing and knowledge using institutions and companies.
- Innovation, development, diffusion, utilisation, and commercialisation of research results, new technology, organisational and market related knowledge.
- Start-up and development of knowledge and technology-based companies.
- Provision of finance and competency for knowledge and technology-based companies.
- International co-operation on utilisation of knowledge and technology.

#### The Danish Knowledge Strategy:

In January 2003 the Ministry of Science, Technology and Innovation launched the government's plan for redesigning the Danish knowledge system. The strategy contained a number of initiatives or reforms with implications for the entire Danish Innovation System.

- A university reform (partly implemented May 2003)
- A reform of research advisory system (implemented May 2003)
- A reform of government research institutions (partly implemented May 2004)

The university reform included a change in university management, as universities will be managed by a board with an external majority. Knowledge exchange is also added to the university mission in addition to research and education. Its is laid down in the Act that development contracts (agreement between universities and the ministry) will include strategies for national and international benchmarking of the university concerned as regards research, education, knowledge exchange, technology transfer and mobility. The reform of the advisory system includes a clearer separation between bodies that advise on general research policy issues and bodies that fund and advise applicants and other partners on scientific questions. In a new development, a Council for Strategic Research has been introduced to explicitly support research based on political defined programmes. A Committee promoting coordination and co-operation between the research councils and the other parts of the research and innovation system has also been established.



#### Action plan for Public-private Partnership on Innovation:

In September 2003 the Government launched an 'Action plan for Public-private-Partnerships on Innovation', in which it sets as a goal that Denmark become among the best in the world regarding cooperation and interaction between knowledge institutions and trade and business. The need to strengthen the cooperation is a recurrent theme in various analyses and reviews of the Danish innovation system, and a matter of great concern to the trade and service sectors. This has to be seen on the background of a recent benchmarking analysis showing that Denmark holds an average position compared to other OECD countries. Accordingly, the Government places great emphasis on strengthening cooperation between companies and knowledge institutions. Based on an analysis of strong and weak competencies in the Danish innovation system, the Government has highlighted action areas and proposed new initiatives. This action programme will have a special focus on opportunities and incentives to establish mutual co-operation both among and between knowledge institutions and business enterprises. Central issues will be concerned with the future interface between the technological service system, science parks, incubators and the government research institutions on the one hand, and trade and industry on the other. In addition, instruments to strengthen companies' access to knowledge and competencies will be given priority. The Government attaches special importance to the requirements of new and smaller enterprises in this respect.

Part of this action plan will consist of the steps that have already been taken towards reforming the entire research, university, and innovation system (including the institutional and management reform of universities and the reform of the research advisory and funding system). The reforms are intended to provide for a more transparent and accessible research and innovation system, together with improved levels of co-operation.

The action plan focuses on how to improve cooperation between education, research and trade and business. The aim is that more enterprises, especially SMEs, will have faster and easier access to knowledge. The action plan is focusing on six areas:

- Cooperation on research and innovation
- Access to competencies
- Commercial utilisation of public research
- New framework conditions for universities interplay with society
- Focus and prioritising in public research
- Access to qualified technological service and counselling.

#### Research that Counts – Action plan from the Danish Council for Strategic Research:

Finally the objectives of an action plan of the new Danish Council for Strategic Research presented in September 2004 need to be mentioned. The Danish Council for Strategic Research aims to increase the understanding between the research world and society, and inspire both sides to invest more in each other. The Council presents a number of initiatives and describes the objectives for the more long-term efforts.

The Danish Council for Strategic Research will:

- identify research than can lead to value-generating innovation for Danish society in order to
  ensure that Denmark has the necessary knowledge mass and innovative power in the short and
  long term;
- recommend that research funding be earmarked for Innovation Accelerating Research Platforms, i.e. areas where:
  - a) Denmark has internationally recognised research environments
  - b) Denmark has internationally competitive business clusters

c) there is a clear need for research-based solutions and where new technology can provide innovative breakthroughs

- run initiatives to build up Centres for Strategic Research that focus on collaboration between public research institutions and society in general;
- take the initiative to hold conferences and meetings throughout Denmark to establish the necessary dialogue in collaboration with relevant players;
- assure the quality of the research programmes under the auspices of the other ministries while working to coordinate them with its own research initiatives and their principles;



- map Danish research institutions' use of and need for research infrastructure, and submit proposals for a strategy of collaboration on and prioritisation of research infrastructure, both nationally and internationally;
- work for a prompt and significant expansion of funding in the areas of food & health, energy & environment and nanotechnology, biotechnology and IT, and in the cross fields between the disciplines in these three action areas in addition to allocating funding to Centres for Strategic Research with no special themes.

Taken together these policy-documents illustrate the emphasis put on innovation policy objectives by the Government and its institutions in recent years. The documents also illustrate the complexity of innovation policy and the fact that Danish policy-makers increasingly seem to become aware that a very broad approach where business-, research-, education- and other related policy-fields are closely coordinated is an essential condition to secure a well functioning innovation system.

#### 2.1.3 Policy events & policy debates

Innovation policy has jumped to the absolute forefront of the Danish political agenda and has accordingly been a dominant issue in the recent political debates. This tendency could not least be witnessed in relation to the early 2005 election and the pre-election campaign, where innovation-, education- and research-policy stood out as key issues.

The innovation related aspects of the election campaign were kick-started by a summit titled "the future of Denmark" with representatives of all key stakeholders of the innovation system, which was held in the late 2004. Key speakers at the summit included the Danish Prime Minister presenting a strategy with 5 clear objectives for research and innovation:

- long-term stability in funding
- focusing on the elite in research and education
- increased collaboration between public and private actors
- increased education of researchers
- increased emphasis on the international dimension

The summit received intensive coverage in all media and underlined the new status of innovation and research issues in the Danish debate. Following the election the majority of these objectives have been emphasised as key target areas in the new Government Foundation.

On the rhetorical level more or less all political parties agreed during the election period on the importance of investments in innovation, research and education if Denmark is to meet the challenges of globalisation. However, presently a few months after the election, most central stakeholders appear to be disappointed at the level of translation of political election campaign statements into concrete funding and implementation of initiatives that has been achieved so far. This tendency has perhaps best been illustrated by the Coordination Committee, which represents all key actors in the public research system, when it recently issued a statement with a strong criticism of the current and planned funding of public research in relation to the 2010 objectives.

Another important and very recent debate was started as a consequence of an analysis by The Economist Intelligence Unit presented at the end of March 2005, where Denmark came out top in an assessment of the countries most attractive for foreign investments. Denmark holds the top position for the first time, displacing Canada, which had previously been ranked as the most attractive global location for investment. Within the European Union, Denmark replaces the Netherlands as the top-ranked country. Denmark scores well across the whole range of 10 categories of the business environment covered by the Economist Intelligence Unit's forward-looking model for assessing the comparative attractiveness of countries as investment locations. Within the European Union, Denmark ranks first, or joint first, for six categories for 2005-09 (the political and institutional environment, macroeconomic stability, policy towards private enterprise, foreign investment policy, financing and infrastructure). The country's liberalising policies of recent years mean that Denmark's labour market receives a high score for its increasingly flexible, as well as highly educated workforce. Denmark also stands to benefit from improvements to its tax regime, which should become more transparent, and from reform of local government, which should increase efficiency and reduce pressure on the central government. According to the Economist Intelligence Unit's country analyst, "Denmark's financial



system is transparent and diversified, with a strong banking sector and an efficient stock exchange in Copenhagen. The transport network is among the best in the world, with further improvements expected, especially in and around the capital." The construction of bridges linking the island of Zealand with Germany via Jutland, and Copenhagen with Malmö in Sweden, has made Denmark a hub for businesses shipping products to other Nordic countries and to central and Eastern Europe.

This and other analyses are somewhat contrary to the actual debate in Denmark, where high taxes and the size of the public sector tend to be seen as major barriers for potential investors. However, actors like the House of Monday Morning now argue that what has been seen as a hindrance can actually be seen as the reason for the apparent competitive advantage Denmark holds at the moment. The high taxes and the public sector, it is argued, is actually what has created the strong infrastructure, the stable society, the level of competence and the flexibility that has been emphasised as national Danish strengths in various analyses. However other important actors such as the Confederation of Danish Industries and the Bankers Association tend to disagree in this analysis and argue strongly that reduced taxes will improve the innovation system considerably.

These debates come at a time when innovation policy is emphasised more strongly than ever before in the political and public sphere. Important events and debates were launched within weeks of writing this report, including: the first Board of the Foundation for High-tech development had been appointed, the Globalisation Council had been presented, the Danish Business Council had announced a conference on the Danish future in a world of globalisation, the Confederation of the Danish Industries had proposed the creation of a research centre in innovation and product-development with a funding of DKK 125 million over an 8-year period, the Strategic Research Council had presented 10 proposals of Innovation Accelerating Research Platforms, and the government think tank "Future Growth" (www.fremtidensvaekst.dk) was on the brink of publishing its recommendations.

#### 2.1.4 Key developments in innovation policy

The TrendChart policy monitoring exercise tracks developments in innovation policy not only at the level of policy definitions and overall objectives as discussed in the previous sections, but also through the compilation of information in analytical structure on specific innovation policy measures (IPM). At the present time, the TrendChart innovation policy database contains over 1100 IPM fiche detailing measures implemented in 32 European countries (all countries covered by the TrendChart except Liechtenstein). An innovation policy measure is defined broadly to include any public policy initiative that directly or indirectly impacts on the innovation process in the enterprise sector. In practice, the TrendChart IPM fiche tends to fall into one of the follow categories of measures:

- Intervention in the form of financial support State Aid to enterprises through programmes of grants, loans, etc. (e.g. grants for product development);
- Funding of innovation programmes or projects aimed at groups of innovation stakeholders with the objective of improving co-operation and collaboration and thereby the functioning of the innovation system (e.g. cluster;
- Measures taken to improve, disseminate or develop knowledge about specific aspects of national innovation systems (e.g. sectoral or regional strategies, foresight exercises, etc.) which is geared towards innovation activities
- Action to improve the functioning of institutions (legal acts, regulations) which affect innovation
  processes and performance (e.g. intellectual property rights, financial markets, creation of firms;
- Funding of innovation infrastructure and intermediaries such as innovation centres, incubators, etc.

This section of the report describes in more detail the current policy mix adopted in Denmark in terms of the political priorities and human and financial resources allocated to each of these broad types of measures. Further details on the specific innovation policy measures can be found in annex 2 and via the TrendChart website.

#### 2.1.4.1 Policy measures in favour of innovation

As already explained, Danish innovation policy is changing rapidly at the moment. As a policy field, innovation is steadily gaining importance in the public and political debate. However, the last year was



an election year in Denmark. Accordingly the latest developments have often been characterised by presentations of ambitious statements and objectives rather than by the initiation, modification or funding of actual measures. Consequently, few new measures have been launched recently. The launch of a number of new measures can, however be expected in the near future.

Currently, Danish innovation policy is made up of a broad mix of measures, where setting up various funding and advisory councils and think tanks has been the most dominant recent tendency. The current emphasis is to a very high degree on the identification of strength and weaknesses as the foundation for the formulation of strategies that will give Denmark a competitive advantage in the coming years. More or less all parts of the Danish innovation system are in the process of restructuring at the moment to strengthen the overall functioning of the national innovation system, but according to the available statistics there have not been any significant changes in public funding from one type of activity to another. As already mentioned the current situation is characterised by a great deal of uncertainty related to future funding of innovation and research activity, which means changes in priorities and funding should not be ruled out. For example, the Government has already announced that a greater part of the university funds in the future will be allocated through competition rather than basic funds.

There are two new measures in favour of innovation that merit a mention. However, no funds have so far been directly allocated to either of the initiatives.

The first of the two new measures is the already mentioned Innovation Accelerating Research Platforms proposed by the Strategic Research Council (DSCR). The council has aimed to create a foundation to ensure the quality and effect of future Danish strategic research by establishing a dialogue with a number of stakeholders from both the public and private sectors. This was the point of departure in August 2004 when DCSR presented a draft of its strategy plan to a number of stakeholders from the research and business communities. Under the designation "Innovation Accelerating Research Platforms", the report defined 10 concrete criteria for what the DCSR considers strategic and innovative research (meaning that these criteria must be met before a field can be identified as a focus area for far-sighted, strategic investment). The 10 requirements were grouped under the following six headings:

- International position of strength requirement
- High level of research requirement
- Growth potential requirement
- Need for new solutions requirement
- Public interest requirement
- Integration, dialogue and collaboration requirement

DCSR has now identified 10 platforms on the basis of more than 200 proposals and sent them to the Minister for Science, Technology and Innovation, the Minister for the Interior and Health and the Minister for Food, Agriculture and Fisheries, as well as the Danish Council for Technology and the High Technology Fund. 308 university units, 256 companies, 83 departments from government research institutes and 56 sector and special-interest organisations have participated in the process. Thus, it is DCSR's hope that the IARP process can continue and that the platforms will be utilised in connection with the allocation of funding to new research programmes and the implementation of already existing funds.

With these platforms, the Council argues, it is possible to create a basis for initiating a number of sustainable and innovative research projects that do not only establish relations between the public and private sectors, but also accommodate the challenges Denmark is facing in the global economy to create growth and innovation.

The other new measure which should be mentioned here is the setting up of the so-called Globalisation Council, which will assist the Government in formulating and implementing an ambitious strategy of how to develop Denmark into a world class nation in a number of key innovation related aspects (see Innovation Policy Objectives for further details). The Globalisation Council consists of key representatives of labour unions, business organisations, major enterprises and knowledge



institutions. The council will on the basis of analysis' and recommendations from national as well as international experts assist the Government in answering questions such as:

- How can Denmark meet the challenges of a globalised economy?
- How can knowledge and understanding of the challenges Denmark is facing be communicated to the public in order to activate all parts of the Danish society?
- How can the objectives of Denmark as a leading growth-, knowledge-, and entrepreneurial society practically be realised with broad support of the Danish society?

In June 2005 the council will present a brief publication discussing the nature of the challenges ahead, Danish strengths and weaknesses, and a more general discussion of the need for new initiatives and change of priorities. In the spring of 2006 the final strategy will be presented. An important input to the strategy will be the recommendations from the Think Tank of future growth, which will be presented in May 2005.

Table 6 . New and mounted innovation roney measures over last 12 months							
Title	Action plan category addressed	Organisation responsible	Degree of novelty (modified / new) since Sept. 2004				
Innovation Accelerating		The Strategic	New				
Research Platforms		Research Council					
The Globalisation		The Danish	New				
Council		Government					

#### Table 8 : New and modified Innovation Policy Measures over last 12 months

#### 2.1.4.2 Developments in regional innovation policies

Just as the situation at the national level, the development of innovation policy at the regional level is characterised by major reforms and restructuring. As the system of regional organisation is currently in a transition period between to systems, initiatives tend to be postponed until the new structures are finally decided and launched. This tendency is further strengthened by the fact that there are still considerable uncertainties about the actual design and implementation of the structural reform. Many key issues are still subject to negotiation. In a recent development, the main opposition party, the Social Democrats, has announced a renewed willingness to participate in the reform negotiations. Accordingly, major changes in the final reform cannot be ruled out at this point. For further information on the developments at the regional level see chapter 1.1.3.

#### 2.2 Is policy effective in improving innovation performance?

#### 2.2.1 Policy responses to identified challenges

In general, a number of important attempts were taken recently to improve the overall functioning of the innovation system. One of the general challenges was to create a more coherent and coordinated national innovation system, and the policy response to this key-challenge has received a very high political priority. More or less all elements of the National Danish innovation system has been reformed and restructured during the last couple of years.

In the Annual Synthesis Report 2004 a number of more specific challenges for the Danish innovation system were identified. These challenges are more or less in line with the challenges identified in the SWOT analysis of this report. Generally it is concluded that Denmark seems to be a country with a reasonably well-endowed and efficient innovation system. Even though Denmark has experienced declining or stagnating economic growth over the last decade, it has at the same time reduced its foreign debt significantly. Denmark is currently one of the richest Member States with a well above average innovation performance. The country has been able to keep its position as one of the richest countries in the world measured in per capita income, mainly because of a very high employment rate. On the innovation front the Danish performance is assessed to be satisfactory with relative strengths and few weaknesses. However, an important future challenge always will be to better exploit the Danish strengths in innovation and assure a higher economic growth than in the past.



The only cases where the Danish innovation indicators faces a challenge *compared to the European average* relate to the application and transmission of knowledge: Innovation expenditure, SMEs innovating in-house and non-technological innovations. These challenges should not be considered as associated to low R&D, since business R&D is higher than the European average and further forging ahead. It is apparently more an issue of behavioural attitudes and entrepreneurial culture. At the same time, as Danish SMEs are particularly strong at innovating in cooperation, the first two challenges may be considered as less problematic. If networks work efficiently they can substitute for in-house innovation and innovation expenditure. Networking is of particular concern to the Danish government, which considers 'Strengthening co-operation between knowledge institutions and private sector' and 'Strengthening the transfer of technology between public knowledge institutions and the private sector' as two of its main priorities.

Another challenge for the Danish system is one of lifelong learning. The country is very well positioned within the reference group but it appears to be losing momentum slightly compared to the average, and losing its competitive strength compared to the EU15, which would be the natural sample of countries to compare it with. The government appears well aware of the problem. Denmark has embarked on a reform of the vocational education and continuing training system, tying the various education programmes together into a single coherent and transparent adult education system. The main objectives of the reform are to provide relevant adult education and continue to supply training to all adults at all levels, from low-skilled to university graduates, and furthermore, to improve opportunities for those holding the lowest levels of education.

Another area where Denmark is losing momentum is in US PTO hi-tech patents. The relative deterioration of its position, which is currently in a prominent 3rd place, is systematic compared to the EU15 since the year 1999, while compared to all countries it only weakened in the year 2002. To face this challenge innovation policy has addressed the overall system of IPR protection. There are no specific measures addressing patenting in the US. Yet, as EPO hi-tech patents, where Denmark ranks equally as high as US patents, show a tendency to further forge ahead, the US PTO patent challenge may only reflect a change of strategies by the Danes, turning partly from the US to the European patent office. The measures trying to improve the propensity to patent are both institutional and direct support schemes. In January 2000, a new law on patents came into force, making it possible for universities, research institutions and public hospitals to take over the rights to inventions of their employees and negotiate terms of rights with companies. At the same time the institutions are obliged to promote the commercial use of these inventions. An appropriation of DKK 58 million (approximately EUR 7.8 million) covering the period 2000-2003 was given to support the implementation of the Act, while the establishment of new infrastructures at universities in support of the Act is believed to have considerable strategic significance. A variety of projects have been launched to improve companies' and researchers' electronic access to patent databases, offer information via the Internet and actively promote the transfer of technology for the benefit of society as a whole. The Act on Technology Transfer at Public Research Institutions (DK 20) was recently passed through parliament. The act enables universities to establish a limited company responsible for the transfer of knowledge/technology to the private sector. The act complements the Act on Inventions on Public Research Institutions from 1999. According to the latter, research institutions take over the rights to inventions of their employees and negotiate terms of rights with companies, and are obliged to promote the commercial use of these inventions. The aim of the Tech Trans Act is to make this process even more professional. Most recently a National Network for Technology Transfer has been established, which the Ministry of Science, Technology and Innovation will co-fund with a maximum of DKK 3.5 Million pr. year in the period 2005-2008.

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Identified challenge	Measures for meeting the challenge
1: Application and transmission of knowledge	Action plan for Public-private Partnership on Innovation
2: Lifelong learning	Reform of the vocational education and continuing
	training system

#### Table 9: innovation challenges and policy responses



#### 2.2.2 Progress towards policy objectives and targets

The most important Danish innovation policy objectives are very recent and the majority of them are still formulated at a fairly general level. Consequently, a meaningful general assessment of whether progress towards the main policy objectives and targets has been made is not possible at this stage.

However, one of the main targets - the Barcelona objective of spending 3 percent. of GDP on research and development by 2010 - is subject of intense discussions at the moment. The Government, and in particular the Ministry of Science, Technology and Innovation, claims that the target will be met in time, but a number of key stakeholders have recently expressed dissatisfaction with the level as well as the rate of funding for the coming years. The Confederation of Danish Industries and the Coordination Committee, which represents all key actors of the public Danish research system, and some other actors, have recently issued a strong criticism of the progress towards the objective of the Barcelona declaration.

At the same time the financial situation for the implementation of some of the key innovation policy measures, including the funding of the Foundation for High-tech Development is currently uncertain, as the actual funding of these initiatives is linked to the selling of public institutions such as national TV-stations. The selling of these institutions are at the moment postponed due to various problems, and it is uncertain whether the needed funds can be found elsewhere, as the possibility of tax-rises are completely ruled out by the Government.

#### 2.2.3 Appraisal of innovation measures

In general there have been few recent evaluations of the Danish Innovation measures. There are, however, some exceptions.

#### **Evaluation of the Danish Innovation Incubators**

One recent exception is an evaluation of the Danish Innovation Incubators conducted by The National Agency for Enterprise and Construction (see www.ebst.dk). The evaluation benchmarked 8 Danish incubators - DTU Innovation, CAT Research Park, HIH Development, NOVI, Syddansk Innovation, Symbion Science Park, Teknologisk Innovation and Østjysk Innovation - against a selection of toprated incubators across the United States, UK, Finland and Sweden. A total of 19 incubators were benchmarked. The study compared the incubators' ability to hatch viable businesses, as well as their ability to attract venture capital. Three of the Danish incubators perform well, whereas the remaining 5 perform under-perform compared to the top-performing incubators. In particular Danish incubators NOVI. Symbion and CAT rank with the best in terms of attracting venture capital, whereas exit rates among Danish incubators collectively are significantly lower compared to the top-performing incubators. The study also showed that the quality of the surrounding entrepreneurship infrastructure is essential to incubator growth and survival. The growth process of Danish enterprises may be promoted by improving the quality of the entrepreneurship infrastructure, and incubators play a significant role in the continued development of entrepreneurship infrastructures. This is also supported by the fact that the top-performing incubators operate in areas where significant efforts have been made to improve entrepreneurship infrastructures. The study shows that compared to other countries Danish incubators are less involved in developing entrepreneurship infrastructure. The study confirms that the best-performing incubators offer a higher degree of specialisation and work closer with the local communities. At the same time compared to the lower-performing incubators, the topperformers maintain a lower focus on formal monitoring and strategic counselling. No significant variation in incubator performance is detected across the areas of financing, co-operation with universities and outreach.

#### Evaluation of the Danish Act of Inventions at Public Research Institutions

Another recent evaluation targeted the Danish Act of Inventions at Public Research Institutions. On 1 January 2000, the framework conditions for commercialisation of research at public research institutions were amended by a new act passed by the Danish parliament in 1999. Before 2000, the rights to inventions made at universities and public hospitals were assigned to the researchers, while Government research institutions (sektorforskningsinstitutioner) could claim the rights to inventions made by their researchers. After January 1st 2000, all public research institutions can claim the rights



to the inventions, while the researchers are entitled to a reasonable payment from the institution. Moreover, the act introduced an obligation to the institutions to work actively on increasing the industrial exploitation of public research. The implementation of the law was promoted by a federal grant on 58 million DKK of which 36 million was earmarked for hiring of external services at the institutions in the period 2000-2003, while 22 million DKK was dedicated to competence building and knowledge sharing between the institutions.

The evaluation of the Act of Inventions at Public Research Institutions was undertaken in early 2004 by Inside Consulting, Cowi A/S and Eskild Hansen acting in a contract with the Ministry of Science, Technology and Innovation. The evaluation covered all institutions that have received federal grants, in total 10 universities, 4 hospital administrations and 7 Government research institutions (sektorforsknings-institutioner). It was based on a questionnaire to the 21 patent organisations and interviews with top management, researchers and key persons in the patent organisations at 7 institutions. The evaluation produced the following conclusions:

According to top managers, patent organisations and researchers the Act of Inventions at Public Research Institutions provides a useful and well functioning framework for protection and commercialisation of public research institution inventions. In general researchers accept the rules and regulations introduced by the Act. Most researchers are guite pragmatic in their attitude towards the Act. Patent services and funding provided by the institutions are appreciated. Nevertheless researchers also express worry and dissatisfaction regarding lacking ability to put patented inventions into actual commercial use in the patent organisations. If researchers at public Danish research institutions are to continue supporting the law and the institutional infrastructure for patenting and commercialisation, improvements in the institutions performance with regard to licensing and spin off activities are particularly important. In a number of areas top managers of research institution and patent managers put forward suggestions for changes in the Act. One of the major issues was whether the Act should also apply to students. However the evaluation concluded that the Act is a well functioning legal framework with no major constraints to future improvement in performance. There has been a great deal of protection but modest commercialisation: Since the introduction of the Act (2000-2003) employees at public Danish research institutions have reported a total of 654 inventions. For a total of 387 inventions rights have been transferred to the institution with a view to commercial exploitation. In 133 cases inventions have been commercialised through licensing, selling of patents or spin-outs. When it comes to putting inventions into commercial use public Danish research institutions do not perform very well. Also in terms of the number of new science based start ups Denmark is a poor performer. The findings show that Danish institutions have not yet been able to establish effective support structures for commercializing of public inventions. However, there are significant differences between different institutions.

#### **Evaluation of the Danish Universities**

In 2002 the Danish authorities asked the OECD "to evaluate the Danish university sector in respect of its role in the transition to the knowledge society and in respect of how the sector meets the international challenges to research universities". And to examine "the universities roles as research, education and knowledge institutions in respect of their public, social and economic context" as well as "their capability of contributing to lifelong learning and knowledge and technology transference to economy, society and public life". Within this framework the main topics were: the Danish university system, including (i) research-based teaching (BA, Master, Ph.D.), (ii) research, (iii) management and organisation, and (iv) "services to economy and society".

An international panel of 6 experts carried out the review. The recommendations given by the expert panel to the Danish Government were among others that:

- The Government should set a national strategy for the universities and the new university boards should review the objectives of their individual universities as they determine the strategy for the future.
- The Government should consider whether the status of the universities should be changed from special administrative entities to foundations under private law to enable them to operate as private sector bodies, while continuing to receive public funds.
- The Government should consider relinquishing central control over universities. In addition all universities should establish units or programmes for promoting high quality teaching and learning and introducing innovative teaching methods. Excellent teaching should be recognised



and rewarded. Universities should carry out programme reviews periodically. Universities should develop programme reviews over a periodically.

In accordance with the recommendations offered by the OECD, the Government and the universities have already taken a number of new initiatives, among others the University Act of 2003 increasing the universities autonomy and self-government. Furthermore, the allocation of funds to university education is under review to make the system more transparent and simple. In 2005 the OECD will follow up on changes initiated by the review process.

#### Annual performance accounts for the GTS institutes

The Authorised Technological Service Institutes (the GTS institutes) provide technological consulting services to Danish companies and public authorities (<u>www.teknologiportalen.dk</u>). The GTS institutes have the task of building up and developing scientific and technological competencies and of gathering knowledge and communicating it to Danish companies. Each year, Denmark invests between DKK 250 and 300 million in technological service in order to promote the dissemination of knowledge to trade and industry and society in general. The funds, which are granted by the Council for Technology and Innovation, are primarily spent on building up competencies in the network of Authorised Technological Service Institutes (the GTS institutes). The 10 institutes making up the GTS network develop and technologically based knowledge and inform private companies and public institutions of them, thereby fulfilling an important function in the Danish knowledge and innovation system.

As the allocating authority, the Council for Technology and Innovation closely monitors the results of the public investment in the GTS network. For that reason, the Ministry of Science, Technology and Innovation, acting on behalf of the Council, prepares *annual performance accounts for the GTS institutes*, providing a picture of the GTS network's current quality level and usefulness to society and describing the trend in the institutes' performance. The accounts are built up around a number of indicators that together show the institutes' ability to develop and communicate knowledge effectively at a high level to companies and the public sector. The performance accounts have been presented four times and it is not before now that it has been possible to see the trend in the results because it is now possible to compare the results from the last years with the latest results.

The most recent performance account for the year 2003 (presented November 2004) shows an increased total turnover, but a decrease in the number of SMEs collaborating with the GTS-institutions. One of the conclusions is that the initiatives and strategies launched by the Government to increase growth and innovation does not seem to help the large group of non-high-technological enterprises.



## **3** Identification of Good Practice

#### 3.1 Good practice in innovation governance

As mentioned more or less all parts of the Danish innovation system are at the moment in a process of restructuring. Accordingly, meaningful attempts to identify good practices in innovation governance will not be possible at least for another few years.

There are, however, two specific traits of the Danish innovation governance system that could be mentioned as examples of good practices.

The first example is the fact that practically all innovation policy related responsibilities has been gathered in a single ministry, the Ministry of Science, Technology and Innovation. This enhances the coherence of the system as well as the political and administrative coordination. For further information see the innovation governance system section of this report.

The second example that could be mentioned is the strong stakeholder involvement in the formulation of innovation policy. The prime example of this stakeholder involvement is the set up of the so-called Globalisation Council which benefits from a broad representation of the relevant sectors of society in fulfilling its task of assisting the Government in formulating an ambitious, holistic and multi-year strategy to make Denmark a leading growth, knowledge and entrepreneurial society. For further information see the innovation governance system section of this report.

#### 3.2 Good practice in policy implementation

The implementation of Danish innovation policy has recently been characterised by the creation of advisory networks, by creating boards for new funds and by a general restructuring of systems. However, these initiatives so new that they can not yet be assessed as good or bad practices.

Regarding the implementation of older measures very few assessments of good practices are available. However, the Regional Centres of Excellence is build upon the positive experiences with the pilot project "Regional growth environments", which ended in 2003.

Another effective measures implemented in Denmark is the Innovation Consortia Initiative (DK 17) aimed at developing technologies generally available to trade and business via co-operation between various players in the research, trade and business. The spread of technologies take place by way of the participating GTS institutes (DK 8). The aim of Innovation Consortia is to strengthen co-operation between companies, public research institutions and technological services to develop new generic technology platforms for the coming 5-10 years product and service development in Denmark.

The co-operation strengthens applied research and in particular facilitates:

The gearing of public research towards specific needs of the trade and service; the generation of competencies and services in the technological service sector that can be broadly diffused to other Danish companies (especially SMEs); the creation of a highly qualified innovation and research environment; the development of projects with a generic content that can be used by and diffused to a large number of companies.



## Annex 1: overview of innovation policy documents

Main policy documents concerning innovation policy adopted/published since 2000

Title of document (in English)	Date (of approval, publication, etc.)	Organisation responsible (Ministry, etc.)	Legal status (Law, Government Decision, strategy (white) paper, action plan, etc.)	Comments (Budget set- aside, new measures, etc.)
The Danish Growth Strategy	May 2002	Ministry of Economics and Business Affairs	Strategy paper	Initiatives to strengthen framework conditions for economic growth in Denmark.
The Danish Knowledge Strategy	January 2003	Ministry of Science, Technology and Innovation	Strategy paper	The Government's plan for redesigning the Danish knowledge system.
Action plan for Public- private Partnership on Innovation	September 2003	Ministry of Science, Technology and Innovation	Action plan / strategy paper	The Action plan is a further specification of the Danish Knowledge strategy. DKK 275 (EUR 37) million has been set aside for the initiatives in the plan.
Government Action plan on high-tech regions	September 2004	Ministry of Science, Technology and Innovation	Action plan / strategy paper	The Action Plan on technological Regions' (Viden flytter ud – Vejen til højteknologiske regioner') -aims to improve regional effort in creating a high-tech and knowledge based development. The plan contains a number of initiatives (either new ones or a strengthening of existing ones)
Action plan for Strategic Research – Research that Counts	September 2004	The Strategic Research Council	Action plan / strategy paper	An action plan, which aims to increase understanding between the research world and society, and inspire both sides to invest more in each other.
Government's Action plan on venture capital	January 2005	Ministry of Economics and Business Affairs	Action plan / strategy paper	The plan includes ten initiatives, paving the way for more venture capital investments from private investors as well as from Pension Funds.
New Goals - Government Platform published	February 2005	The PM's Office	Government action plan	The Government plans to draw up an ambitious, holistic and multi-year strategy to make Denmark a leading growth, knowledge and entrepreneurial society.



## Annex 2: overview of innovation policy measures

As part of the European TrendChart on Innovation, detailed information on policy measures in each country is collected in an online database which can be consulted on the TrendChart website (<u>www.trendchart.org</u>). The aim of this section is to provide a succinct overview of the detailed information that is available online for each individual measure.

In each of the following sections, the measures contributing to a specific objective of the innovation policy framework used by the TrendChart are described in more detail. This innovation policy framework has been recently updated to reflect evolutions in our understanding of the scope and nature of innovation policy measures.

The table below presents, in chronological order (newest measures at top), the measures currently catalogued in the TrendChart Innovation Policy Measure database.

Three aspects are particularly highlighted for each category of measures discussed in the following sections:

- The mix of types of instruments (State aid, support for intermediaries/knowledge organisations, regulatory/legislative, information/strategy processes, etc.) addressing each category of objective of the innovation policy framework;
- Changes in time in the level of support (funding, political priority)
- The development over time (notably since 2000) of the number policy measures and notably recent adaptations to the mix (termination, modification or creation of specific measures).



Table A2.1 : List of Innovation Policy Measure Fiche in the TrendChart database as of 30 March 2005

IPM Fiche Number	Title of measure	Policy Monitoring framework (2005-2007) objective(s)	IAP96 Action line	Start Date	End date	Status during reported period	Evaluated
DK 22	Innovation accelerating research platforms	<ul> <li>III.2. Facilitate the acquisition and transfer of knowledge ad technologies to enterprises, encouraging in particular cross-border initiatives</li> <li>III.6. Facilitate the development of collaboration between enterprises and other actors with a view to joint innovation activities and knowledge exchange</li> </ul>	111.	2005	No End Date Planned	New	No
DK 21	Act on technology Transfer on Public Research Institutions	V.3. Favouring the protection and optimising the exploitation of intellectual property as a driver for innovation	11.2.	2004	No End Date Planned	New	No
DK 20	Pre-project grant for the sixth EU framework programme	<ul> <li>III.3. Increase the availability, range and quality of specialised services to enterprises in order to increase the effectiveness of their in-house innovation activities</li> <li>III.6. Facilitate the development of collaboration between enterprises and other actors with a view to joint innovation activities and knowledge exchange</li> </ul>	III.5.	2004	2007	New	No
DK 19	High-tech Networks	<ul> <li>III.2. Facilitate the acquisition and transfer of knowledge ad technologies to enterprises, encouraging in particular cross-border initiatives</li> <li>III.6. Facilitate the development of collaboration between enterprises and other actors with a view to joint innovation activities and knowledge exchange</li> </ul>	1.6 111.4.	2004	2007	Modified	No
DK 17	Innovation Consortiums	<ul> <li>III.2. Facilitate the acquisition and transfer of knowledge ad technologies to enterprises, encouraging in particular cross-border initiatives</li> <li>III.6. Facilitate the development of collaboration between enterprises and other actors with a view to joint innovation activities and knowledge exchange</li> </ul>	1.6 111.4.	2003	Not defined	Modified	No
DK 16	150 per cent tax deduction on certain research expenditures	<ul> <li>II.4. Increase rates of expenditure on research and technological innovation in enterprises</li> <li>III.6. Facilitate the development of collaboration between enterprises and other actors with a view to joint innovation activities and knowledge exchange</li> <li>IV.1. Increase the number of new innovation intensive enterprises created and their survival</li> <li>V.1. Upgrading innovation related skills and diffusing new technologies in enterprises</li> <li>V.4. Increase the rate of commercialisation/marketing of the results of innovation activity in enterprises</li> </ul>	II.6. III.5.	2002	2007	Modified	No



DK 14	Large Cross- Disciplinary Research Groups	<ul> <li>II.4. Increase rates of expenditure on research and technological innovation in enterprises</li> <li>III.2. Facilitate the acquisition and transfer of knowledge ad technologies to enterprises, encouraging in particular cross-border initiatives</li> <li>III.4. Increase the availability of innovative infrastructures to facilitate knowledge exchange and product/service development by enterprises</li> <li>III.6. Facilitate the development of collaboration between enterprises and other actors with a view to joint innovation activities and knowledge exchange</li> </ul>	III.2.	2001	2004	Ongoing	No
DK 12	Technology Foresight (Teknologiske Fremsyn)	<ul> <li>I.1. Development of a strategic medium-to-long term vision of innovation challenges and innovation potential</li> <li>I.3. Improve the effectiveness of the policy-cycle in order to increase the impact of public intervention activity and outputs in enterprises</li> </ul>	III.1.	2001	2004	Modified	No
DK 8	Approved Technological Service Institutes (GTS-Institutes)	III.2. Facilitate the acquisition and transfer of knowledge ad technologies to enterprises, encouraging in particular cross-border initiatives	III.4.	1973	continous	Modified	No
DK 4	?Innovationsmiljøer? ? Technology incubators	<ul><li>IV.1. Increase the number of new innovation intensive enterprises created and their survival</li><li>IV.2. Provide adequate infrastructure to new technology based firms to facilitate their survival and growth</li></ul>	III.3.	1997	not defined	Modified	Yes
DK 2	«Equity Guarantee Programme»- Development Companies (Venture Capital Companies)	<ul> <li>II.4. Increase rates of expenditure on research and technological innovation in enterprises</li> <li>IV.4. Increase the availability of private sector innovation financing to enterprises</li> <li>IV.5. Optimising the legal/regulatory framework for the development of private innovation financing</li> <li>V.4. Increase the rate of commercialisation/marketing of the results of innovation activity in enterprises</li> </ul>	11.5.	1994	2004	Ongoing	No
DK 1	VaekstFonden - Business Development Finance	<ul> <li>II.4. Increase rates of expenditure on research and technological innovation in enterprises</li> <li>IV.1. Increase the number of new innovation intensive enterprises created and their survival</li> <li>IV.4. Increase the availability of private sector innovation financing to enterprises</li> <li>IV.5. Optimising the legal/regulatory framework for the development of private innovation financing</li> <li>V.4. Increase the rate of commercialisation/marketing of the results of innovation activity in enterprises</li> </ul>	II.5.	1992	Continuous	Ongoing	No



IPM Fiche Number	Title of measure	Overview
DK 22	Innovation accelerating research platforms	As a new measure from the Strategic Research Council The Innovation accelerating research platforms are attempts to create research-areas where high quality research can be combined with business strength positions. The objective is to secure that research leads to innovation with international perspective and business-development. Accordingly, the Innovation accelerating research platforms are expected to contribute to interplay between competences and knowledge-areas - internally in the public research-system as well as between the public and the private sector. The first round of applications are currently in the process of evaluation.
DK 21	Act on technology Transfer on Public Research Institutions	The act allows for universities to establish a limited company responsible for the transfer of knowledge/technology to the private sector.
DK 20	Pre-project grant for the sixth EU framework programme	The main goal is to stimulate SMEs participating in the sixth EU framework programme.
DK 19	High-tech Networks	
DK 17	Innovation Consortiums	The aim of Innovation Consortiums is to strengthen co-operation between companies, public research institutions and technological service to develop new generic technology platforms for the coming 5-10 years product and service development in Denmark.
DK 16	150 per cent tax deduction on certain research expenditures	The primary aim is to increase private incentive to co-operate with public research institutions.
DK 14	Large Cross- Disciplinary Research Groups	The research groups will co-operate across institutions and traditional technical and professional disciplines and be organised for joint management. The Research Groups are to be established in areas having large societal or industrial need of developing new knowledge and know-how. One particular goal is that these research groups attract co-funding from private business, and that private business will find it attractive to embark upon a partnership on research and development.
DK 12	Technology Foresight (Teknologiske Fremsyn)	The Main goals are to create a basis for public and private priorities decisions within research and technological development and to facilitate public debates on possible and desirable developments. Furthermore the initiative will create new contacts between the private business sector and public knowledge institutions.
DK 8	Approved Technological Service Institutes (GTS-Institutes)	The main objective of the approved technological service institutes is to support and promote innovation within business and industry located in Denmark. This is done by collecting, developing and creating new advanced knowledge and by ensuring that companies have access to advice and knowledge transfer.



DK 4	Innovationsmiljøer - Technology incubators	The Ministry of Science, technology and Innovation has approved 8 technology incubators situated at universities or science/research parks. The objective is to bridge research environments, innovative entrepreneurs and finance companies in order to develop and transfer research and innovative ideas to commercially sustainable innovative projects and enterprises.
DK 2	«Equity Guarantee Programme»- Development Companies (Venture Capital Companies)	Since mid-1994, a number of Development Companies (Venture Capital Companies) have been approved (capital & reserves of minimum EUR 2.7 million investment & managerial expertise in SMEs as a prerequisite) to receive state risk-sharing of investments in SMEs. The first objective was to create a venture capital market in Denmark. The programme aims at providing a guarantee on investments made in emerging growth companies (from seed/start-up stage to a later development stage).
DK 1	VaekstFonden - Business Development Finance	Business Development Finance (VkstFonden) supports Danish companies by helping to finance R&D, internationalisation and skills development projects. This support is organised through an institution operating under the legal form of a private venture capital company. With a capital base of ? 300 million Vaekstfonden is one of the largest Danish VC players. Vaekstfonden is a state backed investment company, which provide funding to fast-growing Danish companies and act as a fund-of-funds investor in the private equity sector in the Nordic region. The fund invest in early stage ventures mainly focusing on Life Science/Med Tech and High Tech, and provide mezzanine financing to a broad range of industries. It is part of the strategic objectives to work actively to facilitate access to international venture capital and drive the development of an internationally competitive private equity environment in Denmark.



## Annex 3: sources of further information

#### A3.1 Websites of key innovation organisations

Type of organization	Name	Website		
Higher education or public research	University of Aarhus (Aarhus			
institute	Universitet)	http://www.au.dk		
National Government	Danish Agency for Enterprise and			
Ministry/department	Housing	http://www.ebst.dk		
National Government	DANISH PATENT and TRADEMARK			
Ministry/department	OFFICE	http://www.dkpto.dk		
National Government	Ministry of Economic and Business			
Ministry/department	Affairs	http://www.oem.dk		
National Government	Danish Research			
Ministry/department	Agency(Forskningsstyrelsen)	http://www.forsk.dk		
Not-for-profit				
foundation/organisations	Morgenavisen Jyllands - Posten	http://www.jp.dk		
Not-for-profit				
foundation/organisations	Boersen	http://www.borsen.dk		
Not-for-profit				
foundation/organisations	Berlingske Tidende	http://www.berlinske.dk		
Other	The Academy of Technical Sciences	http://www.atv.dk		
Other	Confederation of Danish Industries - DI	http://www.di.dk		
Other	VaekstFonden	http://www.vaekstfonden.dk		
Regional government/agency	Institut for Produktion og Ledelse	http://www.ipl.dtu.dk		

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