

**OECD SCIENCE, TECHNOLOGY AND INDUSTRY OUTLOOK 2004  
COUNTRY RESPONSE TO POLICY QUESTIONNAIRE**

**DENMARK**

**1. General framework and trends of the Danish STI-policy**

Denmark has a potential to do well in the global knowledge economy. Measured in terms of research, education, innovation and IT development Denmark measures up to the best countries in OECD. However, over the years, Danish stakeholders have described Denmark' STI-policy as fragmented and expressed concerns about its efficiency. It has been put forward that the system in its present form is less suited as a frame for coherent and efficient use of research resources. In order to deal with these challenges in the knowledge based society the newly elected Liberal-Conservative Government has since 2002 taken several actions and initiatives towards a stronger public research and technological service system in Denmark.

To begin with, the political responsibility for Danish universities, research and innovation policy and the IT and telecommunications industry were combined in one single ministry with the establishment of the Ministry of Science, Technology and Innovation ([www.vtu.dk](http://www.vtu.dk)). Earlier the responsibility of these areas were divided among three different ministries (The former Ministry of Education, Ministry of Business and Trade and Ministry of Science and IT). The aim of the new STI-ministry was to concentrate the strengths and create more coherence in several of the areas that form the foundation of the knowledge society.

In addition the Government has initiated processes to reform the entire public research and innovation system. These reforms include the Act on Technology and Innovation, Reform of the Research advisory system, and the University Reform. New laws governing the Danish National Research Foundation and Government Research Institutions.

In line with these reforms the Government submitted in January 2003 an ambitious plan to strengthen the Danish knowledge system, "Knowledge in Growth". In this whitepaper the Government comprises the overall vision for Denmark as a knowledge based society and puts forward a strategy to strengthen Denmark's position as a leading knowledge society, which increasingly produces, attracts, spreads and utilizes knowledge. The elements of the strategy is implementation of various reforms of knowledge institutions, competences and human resources, coherence in appropriations and counselling, interaction between knowledge institutions and the business and industry sector, commercialisation of research and IT and telecommunication.

According to other EU members, Denmark strives to meet the increase in total spending on research and development to 3 percent of GDP by 2010 as agreed in the so-called Barcelona Declaration. As a first step towards the Barcelona Declaration, the Government has allocated funds for further public-sector investments in knowledge and science. In relation to the 2003 and 2004 Budget, slightly less than DKK 7.4 billion in supplementary appropriations has been allocated for university programmes, research, IT and innovation for the financial period 2003-2007.

Focusing on technology foresight oriented policies the government is carrying out a Technological Foresight pilot programme during a three-year period, from 2001 to 2004. The aim is to complete seven or eight foresights during this period and for each of these foresight processes identify issues of strategic policy importance within the areas of science, technology, education, regulation and innovation. This includes among others experimenting with different ways of doing technology foresight in a Danish context in order to evaluate and conclude 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 there have been concluded three foresights about pervasive computing, bio- and healthcare technology and future green technologies, and there is currently being worked on the next two foresights about hygiene and nanotechnology. It is the expectation that the last phase of the foresight pilot programme will be closely linked to the establishment of a whole new "Future Fund" (see section 2 below) 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 organized within the framework of foresight in order to identify specific areas of strategic importance to Denmark that could be supported by the fund.

Further it is the expectation 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.

## **2. Public sector research and public research organisations**

### ***The Danish Research and Innovation System***

The STI-policy in Denmark has two sub-systems: A public research system and a technology service system. The core of the research system is made up of 11 universities, five of which have several faculties, and four have only one faculty. Measured in expenditures the universities carry out 60 percent of public research, whereas Government Research Institutions and hospitals carry out 20 and 15 percent respectively.

There are about 22 Government Research Institutions placed under nine ministries. Their primary task is to perform research. 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 11 Authorised Technical Service Institutes (GTS Institutes) are independent, non-profit institutions which provide knowledge and competencies to Danish business and industry on commercial basis. The GTS institutes play a major role as producers and transmitters of application-oriented and technological knowledge, especially for small and medium-sized enterprises.

### ***A steady level of R&D funding for public research institutions***

The Danish Government has with the Budget 2004 secured a steady level of funding for public sector R&D. The overall level is around 9.5 billion DKK. Around 4.5 billion DKK is appropriated to the universities. Around 1 billion DKK is appropriated to the Government research institutes and around 1 billion is allocated through the council system for research.

**Table 1: Government support for public R&D, 2002-2007, million DKK**

	<b>2002</b>	<b>2003</b>	<b>2004</b>	<b>2005</b>	<b>2006</b>	<b>2007</b>
Universities	4,242	4,579	4,756	4,866	4,611	4,597
Government research institutes	1,280	1,163	1,031	946	933	913
The council system for research	1,041	1,081	1,231	1,134	865	864
Other	2,896	2,732	2,432	2,524	3,111	3,133
<b>Total</b>	<b>9,459</b>	<b>9,555</b>	<b>9,540</b>	<b>9,470</b>	<b>9,520</b>	<b>9,507</b>

Source: Budget 2004

### *Investments in prosperous high-tech areas*

The Danish Government has recently in 2004 planned the establishment of a “Future Fund” ensuring high Danish investment in prosperous high-tech areas such as biotechnology, nano technology and information and communications technology. It is expected that in the coming years the Government will invest DKK 16 billion in the fund. The rate of return of the investment will support not only world-class research, but also ensure world class in innovation, education of candidates, ph.d’s etc. The fund will be realized from the beginning of 2005.

### *New reforms – towards a more effective knowledge system*

Based on recommendation from various stakeholders the Parliament and the Government have in recent years reformed the entire public research system aimed at enhancing the efficiency of the system. The focus in this respect has been:

- Reform of research advisory system
- University reform
- Law reform on Government research Institutions
- Act on Technology and Innovation

### *A reform of the Danish council system for research*

In 2003 all parties in the Danish Parliament reached a political agreement on the Government’s reform of the Danish research councils. The reform will provide a more simple, transparent and less bureaucratic system and at the same time ensure better coordination between the individual councils.

The new council system consists of two research councils managed by one board each. One council for fundamental research will support and fund project and activities based on bottom up ideas from the scientific world, e.g. researchers employed by the universities, the governmental research institutions and other centers and institutes for research.

The other council for strategic research will support and implement research based on political priorities. The Strategic Research Council will further through their funding ensure increased interaction between public and private research institutions and promote cross-disciplinary research.

## *University reform*

In 2003 the Danish Parliament passed a new University Act. The aims of the Act are to improve the conditions and opportunities of the universities and increase the universities' autonomy and self-government, to give multi-disciplinary and strategic priorities to the composite educational, research and dissemination activities and to the many complex and fast changing needs of society.

The University Act states that all the universities become independent public foundations regulated by law and supervised by the Minister for Science, Technology and Innovation. To achieve this the executive management structure is reformed. Consequently the Act abolishes the former elections of the universities decision-making bodies (senate and elected leaders) and introduces a board with a majority of external members. The chairman of the board is found among the external members, however there must be not less than two students on the boards, and there must be representatives from the scientific and technical and administrative staff. It is assumed that the influence of the technical and administrative staff takes place via the local liaison committees.

In future, rector and the heads of faculty and the heads of department will be appointed from above. As the overall principle, the board appoints rector. Rector appoints the heads of faculty, who appoints the heads of department. Furthermore, the heads of faculty appoint study programme directors upon the recommendations of the study boards. The employment is to ensure their professional and managerial legitimacy. One or more academic council(s) is to be set up at each university. These councils will handle academic questions and make statements on all academic questions of importance for the academic activities of the university.

The aim is to strengthen the management and further the university powers to act and make decisions. The act combines the management reform with freedom for the universities to lay down their organisational structure in a charter.

The future boards and rectors will be responsible for fulfilling the targets set out in the new performance contracts. The new performance contracts are to lay down clear objectives and success criteria as well as describe and render visible the vision and target areas of the individual university within the university's main tasks.

The universities will, however, continue to be under supervision by the Minister. One of the effects of this is that the Minister may intervene in the board as the university executive authority, if it does not live up to its responsibilities in compliance with the University Act.

One of the central objectives of the Government's university policy is to ensure self-government for the universities and to simplify the rules where rules applicable to Government institutions inexpediently bind the universities.

Also, the act maintains that the purpose of the universities is to conduct research and offer research-based educations to the highest international level within the disciplines covered by the university and that they are under an obligation to guard the freedom of research linked to the universities. In addition, the university shall collaborate with the society as such and contribute to ensure that the most recent know-how within relevant disciplines is made available to higher education without research.

### ***Reform of Government Research Institutions***

Based on the examination of the Government Research Institutions conducted by the Danish Research Council and political discussions with the Parliament, the Government has in 2003 presented a reform of the Government Research Institutions. The reform includes legislation for a new Act on Government Research Institutes.

The aim of the reform is to strengthen research and to ensure better interaction between universities and Government Research Institutions regarding research, education and innovation. The main elements of the reform are that institutions are to be made independent of the relevant ministry with regard to management and their research is to be evaluated continuously and independently based on uniform and recognised principles. With regard to the financing, the fundamental principles are that public research funds – with exceptions of institutions' basic grants – should be distributed in more open competition.

### ***Act on Technology and Innovation***

Aiming at strengthening technology development and innovation within business and industry the Parliament passed an Act on Technology and Innovation in June 2002. The Act covers a number of initiatives governed by The Ministry of Science, Technology and Innovation, including: Technology Service (Godkendte Teknologiske Serviceinstitutter, GTS), Technology incubators, Industrial researcher-scheme, Innovation Contracts and Technology Foresight. The Acts aim at facilitating:

- Co-operation and dissemination of knowledge between knowledge producing and knowledge using institutions and companies.
- Innovation, development, diffusion, utilisation, and commercialising 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.

To implement the purpose of the new legislation, the Council for Technology and Innovation is set up. The task for the council is to advise the Minister of Science, Technology and Innovation and to administrate the initiatives covered by the Act on Technology and Innovation

## **3. Government support for private-sector R&D and innovation**

### ***Extension and expansion of the tax deduction system for research expenses***

In the spring of 2002 the Parliament decided to grant business enterprises a 150% deduction on sponsorships to research and researcher schools at the universities and government research institutions. So far the scheme has found only modest application, and hence needs adjustment if it is to fulfil its objective.

The Danish Government wants to provide small and medium-sized enterprises with an attractive incentive to make use of the scheme. As a part of the plan of action "Turning Science into business" for strengthening collaboration between public science and the business sector presented by the Danish Government in 2003, the scheme has been extended (see section 4 below). By extending the scheme the idea is to make it possible for small and medium-sized enterprises to achieve a 150% deduction on their

own research expenses when participating in a collaborative project with a public research institution. Simultaneously with this the Government will make administration of the scheme simpler for the enterprises.

### ***Action plan on entrepreneurship***

In January 2003 the Government issued an action plan on entrepreneurship, focusing on innovative and high-tech entrepreneurs. For the first time in Denmark, the action plan regarded entrepreneurship as an integral part of commercialisation of research.

The initiatives of the action plan regarding commercialisation is concerned with the development of a strong and coherent infrastructure for commercialisation. Among other things, this included a new cross-institutional unit of technology transfer within biotechnology in the capital region of Copenhagen, a strategy for commercialisation of research, which was followed up in an action plan on public-private cooperation, and a renewed model (third generation) of the Innovation Incubators.

### ***The third generation of the Innovative Incubators***

The Innovation Incubators initiative was originally launched in 1998. The main target of the Incubators was to invest in and support the development of innovative ideas. To make the most of the commercialisation competences developed by the Innovation Incubators in relation to the strategy for the commercialisation of research, a new funding model was developed in 2002. The main distribution criterion in the new model is the ability of the incubators to attract additional private capital to the projects administered by them. The new model also emphasises the networking activities between the incubators and the universities and other research institutions. In 2003 a third public call for tender was launched which led to the designation of seven Innovation Incubators for the period 2004-2008.

### ***Commission on the general culture of entrepreneurship***

The action plan was followed by the establishment of a commission of ministers looking deeper into the general culture of entrepreneurship in Denmark. This also included discussions of the culture of entrepreneurship and commercialisation specifically at universities and research institutions. In October 2003, this commission of ministers came up with a proposal including five leading political principles for the development of a society making room for free initiatives of individuals. One of the main initiatives of this proposal was the establishment of a Danish Academy of Entrepreneurship.

### ***The Danish Academy of Entrepreneurship***

The Danish Academy of Entrepreneurship aims at strengthening the availability of education in innovation, entrepreneurship and intrapreneurship in the Danish educational system. The government has secured 40 million DKK over the four-year period of 2004-07. The academy will consist of short-, medium and longer-term educational levels and it will include institutions that already have competences and experience of research and education within the field. The academy is expected to be the natural centre of activities regarding entrepreneurship and will be the driving force to improve the Danish educational systems ability to provide the right framework for students to be become more entrepreneurial. The academy will be established during 2004.

### ***Improved framework for technological service***

The approved technological service institutes develop and transfer new technological knowledge. These institutes are the corner stone of the technological service system in Denmark. They are to a

limited degree co-funded by public means thus allowing them to make a technological infrastructure available to Danish enterprises. The institutes are private self-governing bodies that sell technological know-how and competence to the corporate and public sectors on ordinary market conditions.

Taking effect in 2004, the Government is launching a number of changes in how public co-funding of research and development activities is awarded to the approved technological service institutes. These changes are meant to help ensure society a continued high rate of return on the public funds given to technological service.

The changes that are realised are an immediate consequence of the positive development of the interaction between the authorities that award the funds and the approved technological service institutes seen during recent years. With this the present performance contract concept, which describes the development activities that the public authorities want to co-fund, continues its progress. One of the objectives is to ensure to improve the transparency of how these funds are applied and to create a better basis for the priorities of the technological areas, when funds are awarded. Finally, the administration of these funds will be made simpler and brought into compliance with modern standards.

Furthermore, in the coming years the Government will consider whether further measures are needed to promote interaction and to introduce a flexible distribution of the activities between the technological service and the rest of the knowledge system. This may include new innovative types of partnership models between approved technological service institutes and research and educational institutions.

### ***Jutland-Funen IT drive***

The Regional IT Drive for the regions of Jutland and Funen was launched in 2002 with the aim of disseminating knowledge about advanced IT and the use of IT within the business community in Jutland and Funen. Four regional IT research and development centres have been established, in Århus, Sønderborg, Odense and Aalborg, to strengthen collaboration between universities and businesses. As an element in the drive, the Government has established an IT corridor to support concrete, innovative IT development projects carried out jointly between knowledge institutions and companies in Jutland and Funen.

### ***The Danish Growth Fund***

To further small innovative companies' access to seed capital the Danish Government has established the Danish Growth Fund (VækstFonden). The objective is to support Danish companies with finance to research and development. The Fund advances loans to development projects and grants financial aid to pre-projects.

The Danish Growth Fund was set up in 1992, and since then a total of DKK 2 billion has been allocated to Danish companies. In addition to this comes DKK 284 million in approval in relation to a bank loan guarantee scheme. This scheme provides bank loan guarantees for firms with less than 50 employees that are unable to obtain a loan from the traditional bank system without one.

The law on Danish Growth Fund has been changed in 2000. The change implied that the Danish Growth Fund now is able invest in new firms by means of own capital. This means that the Fund now can obtain a larger share of profits from successful business projects and consequently engage in more risky projects.

#### **4. Enhancing collaboration and networking among innovating organisations**

The industrial structure in Denmark is characterised by a large number of small and medium sized companies. As they on average do not engage in large-scale research and development, it is essential that they have easy access to knowledge from knowledge institutions. However, a recent study shows that Denmark only has an average ranking among the OECD-countries when it comes to interaction between business sector and the knowledge institutions, e.g. universities, public sector research institutions and technological service institutes.

The Government intends with the plan of action to make it more attractive for both knowledge institutions and the business and industry sector to meet and collaborate. The effort put focus on six areas:

- Collaboration on research and development
- Access to the right competences
- Commercialisation
- The culture of interaction in a university setting
- Better prioritisation of research and innovation
- A new course for technological service

The Danish Government has set aside a total of DKK 275 million to realise the initiatives in the plan of action.

The major initiatives in the plan of action are:

##### ***Technology network***

The Government has launched a scheme to support business enterprises and knowledge institutions, at regional, national and international level, to set up joint knowledge networks. The intention being that these networks are to promote long term collaborative partnerships between different stakeholders, such as business enterprises, universities, government research institutions, approved technology service institutes, centres for tertiary education and others.

##### ***Act on technology transfer at public research institutions***

A new act on technology transfer aims to promote the transfer of knowledge and technology from public research institutions to trade and industry, including the creation of new science based enterprises.

According to this new legal framework Danish universities and government research institutions are entitled to found and invest in commercial companies for the purpose of technology transfer. This organisational model is expected to provide a number of advantages:

- Dynamic management of public research IPR's and commercial contracts with business partners and spin off enterprises.
- Competitive recruitment of professional tech trans officers.
- Critical mass in technology transfer by access to joint ownership of cross institutional tech trans companies.

- A clear distinction between scientific and commercial interests in public research.
- Protection of research institutions from economic loss and risk of infringement.

In a longer perspective the act on technology transfer should promote the development of a transparent and efficient market of knowledge and IPR's between academia and industry.

### ***Setting up internships for students***

The Danish Government will introduce a new, time-limited scheme where the universities can apply for funding of the additional administrative work involved in educational modules or programmes where internships form an integrated part of the education.

Such a scheme will specifically make contact with the universities easier for small enterprises. These enterprises are only involved in a very small number of collaborative projects with research and development institutions. One of the reasons for this is that small enterprises only on rare occasions employ academic staff to handle the contact and the collaboration with the institutions. As a further benefit of this scheme, the students will get better acquainted with the business and industry sector's needs and ways of working.

### ***International mobility***

A high priority has been given to increased researcher mobility across borders. The Danish Government will set up an international mobility centre that will assist international researchers, enterprises and research institutions that want to collaborate with Danish research environments. In close connection with setting up such an international mobility centre the portal [www.workindenmark.dk](http://www.workindenmark.dk) will be updated.

In the course of 2003, the EU is realising two interrelated information initiatives to stimulate researcher mobility in Europe. It is essential that Denmark makes a wholehearted commitment to these activities if we are to make ourselves known in the global competition for talent.

### ***Networks on research-based continuing education***

The research-based continuing and further education need to be reviewed. Many enterprises in Denmark are requesting short courses of direct relevance to the daily work for fast and flexible update of employees with a higher education. This is for instance relevant when working with specific development projects.

In parallel with this the universities should strengthen the organisation of the continuing education and focus even more on the strategic significance of continuing education. This could encourage the universities to form strategic alliances with private training programmes and international alliances to offer continuing education.

There is ample evidence to suggest that the demand for research-based continuing and further education is higher than the supply. There are not least an insufficient number of courses and other activities that are targeted to meet the needs in the business and industry sector. To compensate for this the Danish Government will set up a new scheme where the universities can apply for funds to develop and test new models of research-based continuing and further educational programmes.

These activities are to meet the needs in the business and industry sector. For instance by developing new offers aimed at the business and industry sector or interactive projects with private enterprises and international alliances.

### ***Interactive objectives and strategies***

According to the new University Act (see section 2 above) knowledge and technology transfer is now an integrated part of the university charters. This makes interaction with society a strategic area for development. At the same time the universities have been awarded a higher degree of freedom, which may facilitate the development of interactive projects.

The Danish Government now wants to concretise the intentions set out in the University Act in relation to strengthened interaction between the universities and the business and industry sector. One way is to give the universities clear incentives for interaction. The Danish Government will address this issue from two sides. Firstly, the new second generation performance contracts are to comprise specific objectives for the interaction. There will be a dialogue with the individual university when setting up these performance contracts. And secondly, after the expiry in 2005 of the current multi-year arrangement, new appropriations could be granted to the universities and new performance contracts negotiated according to how well they have satisfied the objectives of the performance contracts.

### ***Flexible employment structure at the universities***

The Danish Government is aiming to revise the employment structure and the Ministerial Order regarding Appointments of Lecturers and Academic Staff at Universities, etc. to provide the universities with increased freedom and flexibility when employing researchers. The universities should also be given better opportunities to employ researchers from the business and industry sector.

The present employment structure featuring more than 20 different types of positions is going to be made simpler. At the same time, the individual job categories have to be extended to allow several different types of employments and functions to fit into the same job specification. This change will be effected through negotiations between the parties involved.

In addition, the Danish Government will consider whether there is a need to alter the credit transfer requirements set out in the present Ministerial Order regarding Appointments of Lecturers and Academic Staff at Universities, etc. or whether the existing Order already now makes it possible to include interaction-related qualifications when employing academic staff. The target being that all academic positions have to be able to support all university objectives, including interaction.

Other initiatives launched by the Government to strengthen collaboration between the private and public sector are:

### ***Regional Networks scheme***

Since 2001 until 2003 the Government has supported regional networks based on regional clusters. 18 regional networks have been established all over the country in different business areas. The networks focus on research projects, the development of new educations and the transferring of knowledge from research institutions to the companies and schools within the region. Regional Networks include companies; Centres for Higher Education, universities or other institutions with focus on education; and other relevant institutions.

### ***Innovation consortiums***

Since 2003 the Government has supported Innovation Consortiums. Innovation Consortium replace the former initiative; Centre Contracts. An innovation consortium aims at establishing cooperation between at least two companies, one research institute and one institute taking care of the knowledge diffusion (typical a technological service institute) around an innovation project. The primary criterions for supporting an innovation consortium are that the research performed should be conducive to new products, processes and services in companies; and the project result in the building up of competences in the technological service institute asked for widely among Danish companies - especially SME's. Public grants are given to research and technological service institutions. Companies cover their own costs.

## **5. Human resources**

The Government has in 2003 submitted the plan of action on "Better education" aiming to strengthen the quality and coherence in the educational system, including long life learning, and the interaction between users, recruiters and stakeholders. The plan covers primary and lower-secondary schools, vocational education programmes, upper-secondary schools, higher education programmes and continuing and further education programmes play a central role for development of human resources.

The plan for "Better education" implies allocation of further DKK 477 million for education in 2003, where DKK 240 million are to go to a multi-year agreement for vocational schools and DKK 237 million to a one-year agreement for the rest of the education sector. In the 2003 budget, a total of DKK 3.7 billion are earmarked for implementation of "Better Education" for 2003-2005. The elements of the plan of action are: a) Establishment of institutions for business and industry-aimed education programmes and reform of labour market education programmes, b) Legislation on counselling regarding choice of education and profession, c) Strengthening the natural sciences d) Internationalisation of Danish education programmes and e) A flexible education system with excellent credit schemes.

Concerning higher education the Danish Government has in relation with the passing of the new University Act (see section 2 above) taken a number of initiatives in order to strengthen higher education at the universities, and thereby ensure the society's needs for university graduates.

One of these initiatives is a reform of educations, which specifies the educational responsibility of the universities. Based on their research activities, the universities train students to earn the degrees of bachelor, master (candidatus) and Ph.D. and offer research-based continuing education to the adult population.

The target of the reform is to ensure that the academic standard of the educations, their relevance, planning and structure are to be developed to match the demands to the research-based tertiary education of a new period. Compared to the present system, the content and structure must reflect the knowledge society's wide needs for competencies to a higher degree.

Another central aim is to ensure a high degree of student flexibility and mobility between Danish universities and to/from foreign universities. Mobility increases the educational benefit of the individual student, contributes to a diversified student environment and strengthens the development of society. International students need to see the Danish educational structure as something they can benefit from and that is transparent – also the Ph.D. education. To be able to realise the target of increased mobility it

must be genuinely possible to move between educations, meaning also the difficulties of credit transfer must be minimal.

The reform of educations therefore ensures that where the educational structure has not already been altered it is to be restructured in order to ensure genuine implementation of the 3+2 structure, which is a 3-year bachelor degree, followed by 2-year master degree (candidatus). Furthermore, the reform introduces a modular structure of all bachelor and master educations.

This enables students with a relevant academic bachelor degree to enroll for an academically relevant master degree. Students with a bachelor degree will have a genuine choice between several relevant master degrees – also master degrees at another university. The academic relevance, correlation and progression must be ensured and the educations must have clearer competence profiles that are directed against different jobs within the private as well as the public sectors.

Another essential educational policy target is to reduce the student drop-out from the university educations. From an international point of view, the drop-out figures for several Danish university educations are high, and to address this problem an intensified individual student counselling is launched. In particular during the final years of an education, the service is to also focus on labor market counseling.

### ***Human resources for S&T***

The new University Act aims to strengthen higher education at the universities, and thereby ensure the society's needs for university graduates. However, the Danish Government has no new policy initiatives to specifically increase numbers of university graduates with science and engineering degrees.

Recent statistics on science and engineering graduates from universities is provided in the table below.

**Number of science and engineering graduates, 1992-2001**

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
<b>Master, engineering</b>	892	1.094	1.116	1.092	983	926	966	927	859	903
<b>Bachelor, science and engineering</b>	2.096	2.053	1.963	1.936	1.714	1.328	1.290	1.242	1.306	1.336
<b>Master, science</b>	631	689	850	773	895	898	1.018	886	1.078	1.035
<b>Total</b>	3.619	3.836	3.929	3.801	3.592	3.152	3.274	3.055	3.243	3.274

### ***Programmes to attract foreign student***

For many years Denmark has had a system of bilateral agreements with European as well as non-European countries on student exchange. This system is now going to change. Denmark has pooled all the scholarships from the bilateral agreements to one single pool offering scholarships to excellent foreign students enable to come to Denmark to study in a Master programme for at least one year.

## **6. Policies to boost innovation in the service sector**

For the last decades the Danish STI-policy has shifted its focus towards from specific policy framework targeting specific sector to more general and basic industrial framework condition – like access to knowledge and competences - aiming to enhance competitiveness in general in both Danish manufacturing sector and service sector.

However, when it comes to IT-development and IT-usage the Danish Government has a clear strategy on this area. The Government will in the years ahead focus on e-trade and business application of digital technologies. It is the Government's ambition to improve the framework for efficient use of IT in businesses, thus making the use of IT by business and industry a lever for increased innovation, efficiency and productivity. The Government's strategic goals for IT in the Danish business sector are as follows:

- Digital business and industry: *The use of IT should be more advanced and profitable in the Danish business sector.*
- IT industry: *The Danish IT industry should have beneficial conditions for generating value.*
- Telecommunications market: *The best possible framework for a well-functioning telecommunications market.*

### ***Action plan for e-commerce***

In 2002, the Ministry of Science, Technology and Innovation launched “*Action Plan for e-commerce 2002*”. Through a number of initiatives, the action plan is to increase user confidence in e-commerce, encouraging public institutions to use more efficient procurement processes and calling on private enterprises to integrate e-commerce in their business procedures. Most recently, a consultancy and training initiative for e-commerce in 60 small and medium-sized enterprises has been started.

The Government will maintain its focus on IT in the business sector. Accordingly, the Government will launch an overall effort to promote advanced and efficient use of IT, thus contributing towards more efficient production and business processes and developing new innovative products and services.

1. A key condition for more efficient use of IT by businesses is the presence of strong professional skills in the Danish labour force. In particular, there is a need for more highly skilled IT workers. In view of this, the Ministry of Science, Technology and Innovation, together with the universities, has made it possible for IT staff with a short-cycle higher education, such as datamaticians and multimedia designers, to be allocated merit for a university education.

### ***Danish E-learning Initiative***

As part of the annual “IT and Telecommunications Policy Action Plan” the Danish government has in November 2003 launched an initiative to further the use and development of e-learning in life long learning in Denmark. The initiative aims at creating a focus on better use of e-learning in Danish public institutions and in small and medium-sized enterprises (SMEs). Where the larger enterprises are already by and large safely on their way to capitalize on their investments in e-learning for vocational training, SMV's with their special needs and barriers have still not come too far. Therefore focus of the initiatives is on SMEs as well as public institutions and how they may gain in competitiveness and competence development through the use of e-learning. The focal point of the initiative is to open a discussion on how individuals as well as public institutions and private organisations may gain from using e-learning.

## ***IT research***

In 2002, the Government allocated DKK 115 million to finance IT research during the period 2003-2005. Among other things, this allocation may contribute to better interaction between research institutions and the business sector in the field of IT research. A major portion of the funds is set aside for an increased production of PhDs.

## **7. Policy evaluation**

### ***Performance accounts for the GTS institutes***

The Authorised Technological Service Institutes (the GTS institutes) provide technological consulting services to Danish companies and public authorities. 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 communicate technologically based knowledge to private companies and public institutions, 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 performance accounts reflects the given goals for technological service and it is therefore important that the Ministry of Science, Technology and Innovation for each year develops and innovates the performance accounts so that they reflect the work and effectivity of the Technological Service Institutes.

### ***Evaluation of the Act on inventions at public research institutions***

In 1999 the Danish parliament passed an act on inventions at public research institutions (L347) similar to the US Bayh-Dole Act of 1980, making it possible for public research institutions to take over inventions made by its employees. The act also places an obligation on the institutions to actively promote commercialisation of inventions. The government supported the activities of patenting and commercialisation by 58 mill. DKR over the three-year period of 2000-2003.

The act represented a new policy in a Danish as well as European context. The minister of science, technology and innovation is therefore giving a review to the parliament in 2004 on the basis of an evaluation of the effects of the act as well as the grant.

At the present moment (February 2004) the ministry has signed a contract with an external evaluator, who has just begun the work. The final report will be issued to the ministry on the 30<sup>th</sup> of April 2004, followed by a review by the minister to the parliament. The review will summarise some recommendations regarding future possible changes of the act.

### *Evaluation of 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:

- 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.
- 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.
- 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 allocation of funds to university education are under review to make the system more transparent and simple. In 2005 the OECD will follow up on changes initiated by the review process.

## REFERENCES

- The Ministry of Science, Technology and Innovation, June 26 2002, Welcome to The Danish Ministry of Science Technology and Innovation,[http://www.videnskabsministeriet.dk/cgi-bin/doc-show.cgi?doc\\_id=116330&leftmenu=PUBLIKATIONER](http://www.videnskabsministeriet.dk/cgi-bin/doc-show.cgi?doc_id=116330&leftmenu=PUBLIKATIONER)
- The Danish Government's IT and Telecommunications Policy Action Plan for 2003, *"Using IT Wisely*,  
[http://www.videnskabsministeriet.dk/cgi-bin/doc-show.cgi?doc\\_id=194470&leftmenu=PUBLIKATIONER](http://www.videnskabsministeriet.dk/cgi-bin/doc-show.cgi?doc_id=194470&leftmenu=PUBLIKATIONER)
- New Ways of interaction between research and industry – Turning Science into business, The Danish Government, 2003, [http://www.videnskabsministeriet.dk/cgi-bin/doc-show.cgi?doc\\_id=184970&leftmenu=PUBLIKATIONER](http://www.videnskabsministeriet.dk/cgi-bin/doc-show.cgi?doc_id=184970&leftmenu=PUBLIKATIONER)
- The Danish Government's Knowledge Strategy - knowledge in growth, May 13 2003, Policy Statement to the Danish Parliament - January 2003,[http://www.videnskabsministeriet.dk/cgi-bin/doc-show.cgi?doc\\_id=166470&leftmenu=PUBLIKATIONER](http://www.videnskabsministeriet.dk/cgi-bin/doc-show.cgi?doc_id=166470&leftmenu=PUBLIKATIONER)
- Danish universities in transition - Background reports to the OECD examiners panel 2003 January 7 2004, Background report to the OECD examiners panel – 2003,  
[http://www.videnskabsministeriet.dk/cgi-bin/doc-show.cgi?doc\\_id=190990&leftmenu=PUBLIKATIONER](http://www.videnskabsministeriet.dk/cgi-bin/doc-show.cgi?doc_id=190990&leftmenu=PUBLIKATIONER)