

UNITED KINGDOM

RESPONSE TO STI OUTLOOK 2006 POLICY QUESTIONNAIRE

SECTION A: GENERAL FRAMEWORK AND TRENDS IN SCIENCE, TECHNOLOGY AND INNOVATION POLICY

1. Overview of national policies:

Main features, rationale, changes in policy frameworks

In July 2004, the Government published a ten-year *Science and Innovation Investment Framework*¹, which set out a long-term vision for UK science and innovation, together with the ambition that public and private investment in R&D should reach 2.5% of GDP by 2014.

The rationale for the 10 year framework was the recognition that science and innovation are key to ensuring the UK's long-term competitiveness in an increasingly knowledge-driven global economy. The ambitions for UK science and innovation are set out in the 10 year framework and are:

- World class research at the UK's strongest centres of excellence.
- Increased business investment in R&D, and increased business engagement in drawing on the UK science base for ideas and talent.
- A strong supply of scientists, engineers and technologists.
- Sustainable and financially robust universities and public laboratories across the UK.
- Confidence and increased awareness across UK society in scientific research and its innovative applications.

The ten-year framework was developed in consultation with stakeholders in the research base and the private sector, and business and the scientific community reacted very positively to its publication. The Government also published a comprehensive set of indicators to monitor implementation of the ten-year framework, and made a commitment to report annually on progress against these indicators. The first report was published in July 2005².

New policy measures in the service sector

UK support for innovation is sector neutral, so that in principle, firms from all sectors are eligible for support. This applies to R&D incentives, start up firms, human capital, deregulation, intellectual property rights and procurement.

¹ Available at: http://www.hm-treasury.gov.uk/spending_review/spend_sr04/associated_documents/spending_sr04_science.cfm

² Available at: <http://www.ost.gov.uk/policy/sifreview05.pdf>

2. Major shifts or changes in priority for different areas of science, technology and innovation policy and policy instruments

The areas listed in the questionnaire are all important areas addressed in the ten year framework that was introduced in 2004, and given the relatively short period of time the framework has had to run, no changes to the relative priorities within the framework have yet been made.

3. Primary challenges expected to be addressed in future science, technology and innovation policy initiatives

As mentioned in section A1, the ambitions for UK science and innovation are set out in the 10 year framework (p. 6):

World class research at the UK's strongest centres of excellence:

- Maintain overall ranking as second to the USA on research excellence, and current lead against the rest of the OECD; close gap with leading two nations where current UK performance is third or lower; and maintain UK lead in productivity.
- Retain and build sufficient world class centres of research excellence, departments as well as broadly based leading universities, to support growth in its share of internationally mobile R&D investment and highly skilled people.

Greater responsiveness of the publicly-funded research base to the needs of the economy and public services:

- Research Councils' programmes to be more strongly influenced by and delivered in partnership with end users of research.
- Continue to improve UK performance in knowledge transfer and commercialisation from universities and public labs towards world leading benchmarks

Increased business investment in R&D, and increased business engagement in drawing on the UK science base for ideas and talent:

- Increase business investment in R&D as a share of GDP from 1¼% towards goal of 1.7% over the decade.
- Narrow the gap in business R&D intensity and business innovation performance between the UK and leading EU and US performance in each sector, reflecting the size distribution of companies in the UK

A strong supply of scientists, engineers and technologists by achieving a step change in:

- The quality of science teachers and lecturers in every school, college and university, ensuring national targets for teacher training are met.
- The results for students studying science at GCSE level.
- The numbers choosing SET subjects in post-16 education and in higher education.
- The proportion of better qualified students pursuing R&D careers.
- The proportion of minority ethnic and women participants in higher education.

Sustainable and financially robust universities and public laboratories across the UK:

- Ensure sustainability in research funding accompanied by demonstration by universities and public laboratories of robust financial management to achieve sustainable levels of research activity and investment

Confidence and increased awareness across UK society in scientific research and its innovative applications:

- Demonstrate improvement against a variety of measures, such as trends in public attitudes, public confidence, media coverage, and acknowledgement and responsiveness to public concerns by policy-makers and scientists

There are a number of challenges in achieving these ambitions (As set out in the Annual report on the 10 year framework 2005, p. 37):

- One of the most significant challenges to the achievement of the ambitions set out in the ten-year framework remains increasing the level of business investment in R&D. The Government will monitor closely the impact of recent measures to stimulate business R&D, and will continue to work in partnership with business to develop policy in this area.
- The supply and demand of Science, Technology, Engineering and Mathematics (STEM) skills is also an area where progress has been mixed. The Government will work to further enhance the teaching and learning of STEM subjects and the recruitment and retention of science teachers and researchers, to underpin the future needs of the science base and the economy.

There are a number of initiatives in place to ensure policy is set to identify challenges and opportunities from new and emerging science and technologies:

- The Foresight Programme aims to look beyond normal planning horizons to identify potential opportunities from new science and technologies, and actions to help realise those opportunities. A rolling programme of between three and four projects is run. A project is either a key issue where science can offer possible solutions (e.g. flood and coastal defence), or an area of cutting edge science where the potential applications and technologies have yet to be considered or articulated more broadly (e.g. cognitive systems).
- A Centre of Excellence in Horizon Scanning was set up in March 2005 to inform government department and cross-departmental decision making. The Centre aims to support horizon scanning carried out by others inside government to spot the implications of emerging science and technology, and enable others to act on them. More details on the foresight programme and horizon scanning are available at: <http://www.foresight.gov.uk/>
- A Technology Strategy Board, comprising mainly experienced business leaders, looks at identifying the new and emerging technologies critical to the growth of the UK economy into which government funding and activities can be directed. More details are given in Section C. Details of successful projects can be viewed at: <http://www.dti.gov.uk/technologyprogramme/successful.html>

SECTION B: PUBLIC SECTOR RESEARCH AND PUBLIC RESEARCH ORGANISATIONS

1. Major policy changes related to the financing of public R&D:

Data source for these tables: Office of Science and Technology, Science and Engineering Statistics. Available at <http://www.ost.gov.uk/setstats/>

Funding for public research organisations, by type of public research organisation

Source: Table 3.2 Net Government expenditure on R&D by departments in real terms (2003/04 prices)

£ million	2000-01	2001-02	2002-03	2003-04	Estimated	Planned	
					Outturn	2004-05	2005-06
Research councils							
DTI Office of Science and Technology	1,592.3	1,754.6	1,923.7	2,143.1	2,404.2	2,552.0	2,545.6
Funding for English universities							
Higher Education Funding Councils	1,392.6	1,568.3	1,673.5	1,664.6	1,696.8	1,894.9	2,187.3
TOTAL SCIENCE & ENGINEERING BASE R&D	2,984.9	3,322.8	3,597.2	3,807.7	4,101.0	4,446.9	4,732.9

Funding for public research organisations, by socio-economic objective

Source: Table 3.8 Government funding of net R&D by socio-economic objectives: percentage share

	£ million 1999-00	2000-01	2001-02	2002-03	2003-04
Agriculture, forestry and fishing	4.3	4.1	3.9	3.3	3.3
Industrial development	0.9	1.7	3.5	5.2	5.2
Energy	0.5	0.5	0.5	0.5	0.3
Infrastructure	1.7	1.6	1.5	1.2	1.4
Environmental protection	2.4	2.3	1.9	1.6	1.8

Health	15.2	14.8	15.0	13.1	13.9
Social development and services	3.6	4.2	4.0	3.6	3.2
Earth and atmosphere	1.3	1.3	1.6	1.7	2.1
Advancement of knowledge	30.4	32.0	35.3	33.4	35.1
Civil space	2.3	2.3	2.1	1.9	1.6
Defence	37.2	34.8	30.5	33.9	31.9
Not elsewhere classified	0.3	0.3	0.3	0.4	0.5
Total%	100	100	100	100	100

Funding for public research organisations, split by Research Council (RC)

For details of actual and planned expenditure for Research Councils for 2004-8, please see Science budget allocations, May 2005, http://www.ost.gov.uk/research/funding/budget05-08/full_breakdown.pdf

Changes in the use of different types of funding instruments, competitiveness, different fields of science and technology

The following material is outlined on page 35 of the 10 year framework:

Central Government funding for science and research activities in universities and research establishments in the UK flows through three main routes:

- 1) The Dual Support system; providing block grant funding for higher education institutions (through the Department for Education and Skills (Dfes) and distributed by the funding bodies), complemented by project funding through the research councils for individual academics, research teams and departments.
- 2) Dedicated capital funding through the Science Research Investment Fund.
- 3) Knowledge transfer funding, which in England flows through the Higher Education Innovation Fund and the Public Sector Research Establishment Fund; the devolved administrations deploy their own schemes with similar goals.

The Government has signalled its strong and continuing commitment to the fundamental principle of the Dual Support system for funding science and research in the UK. The two separate streams of funding serve different and complementary purposes. However, the amount of capital funding has become an increasing area of concern, and the importance of knowledge transfer has been growing.

Quality Related (QR) funding flows through the DfES and devolved administrations, and is distributed by the funding bodies to Higher Education Institutions (HEIs) as part of their block grant. The allocations are made by peer review. QR funding funds the basic research infrastructure including the salary costs of permanent academic researchers, support staff, equipment and libraries, and gives institutions the base from which to undertake research commissioned by other funding sources.

However, the Government has recognized that the total costs of externally focused research projects and training in universities has risen at an unsustainably faster rate than the rise in core QR funding needed to support this increased volume of activity. Hence the Government's aim is to reach a situation where

universities secure sufficient income from all sources, to ensure the full economic cost of all research undertaken is covered without detriment to their long-term sustainability. This involves both strands of dual support rising steadily over the next decade, and additional funding for the Science Research Investment Fund.

Competition is involved in the allocation of QR funding through a peer review system, the Research Assessment Exercise. However, a concern with the exercise is that the current success rate in grant applications is too low, and that research projects of international quality may go unfunded. Arrangements for the next Exercise in 2008 are currently under development and will provide better recognition of excellence in all its forms. Assessment criteria for the Exercise have been published and were under consultation in 2005. Final criteria statements are to be published in early 2006.

The Government also aims to create a funding regime that promotes and rewards high quality knowledge transfer, to further embed knowledge transfer as a permanent core activity in universities alongside teaching and research. This has been reflected in continued and consolidated funding for knowledge transfer funds (see Section D for further details).

On research priorities, in the UK system, each Research Council establishes its own research priorities within the context of overall priorities set by the Director General of the Research Councils and informed by the Foresight Programme. The Director General of the Research Councils is himself part of the process of priority setting through links with the government's Chief Scientific Adviser, the Council for Science and Technology, and the Chief Scientific Advisers in each government department.

Despite the presence of priorities and strategic programmes, the majority of research carried out in universities is funded in "responsive mode", that is to say the topic and approach are identified and proposed by the researcher and there is no restriction on publication other than the normal governance of peer review.

A new research council for the Arts and Humanities was established on 1 April 2005, and replaced the Arts and Humanities Research Board. The decision to create an AHRC underlines the importance of high-quality research in the arts and humanities for the cultural, creative and economic life of the nation.

2. Major initiatives to reform governance of universities and other public research organisations including:

Increasing flexibility, accountability

- The Office of Science and Technology is currently developing a comprehensive, integrated and efficient performance management system. This will provide a more robust mechanism for translating the overall strategic priorities for the science base into specific aims and objectives for the Research Councils and other delivery agents. The transparent identification of outputs and performance measures will allow a balance of investment to be made across Research Councils and adjusted in response to a more strategic view of new priorities and identified strengths and weaknesses.
- A report published in 2004 identified a capital investment problem in public sector research establishments similar to that in universities. The Government supported the report's recommendations, and in September 2005 set up a new forum to implement the recommendations of the report. The forum, "Research Establishment Sustainability UK" will bring together Government Department Sponsors and Research Councils to discuss matters relating to the sustainability of their research institutes.

- The Science Review Team, set up in 2003, is now fully operational. The team is undertaking a rolling programme of external scrutiny and benchmarking of the ways in which Government departments use science and manage research and sharing of best practice.
- The Coordination of Research and Analysis Group was set up in December 2004, to set strategy across Government for the provision and coordination of analytical services, including economics, statistics and other forms of evidence alongside scientific evidence.
- The 10 year framework in 2004 identified the need for an international strategy to be developed. The Global Science and Innovation Forum, a cross-Government group led by the Government's Chief Scientific Adviser, has started the development of a strategy. The strategy will be published in early 2006.
- The Council for Science and Technology was relaunched in 2004 with new terms of reference. It is the Government's top level advisory body on science and technology policy issues, and has examined a number of challenges associated with achieving the Government's vision for science and innovation.

New organisational structures for performing R&D, multi-disciplinary research

On multi-disciplinary research, the Government recognises that a change in culture away from viewing university departments as separate entities is needed. Some Universities and Research Councils, are promoting cross-cutting research programmes and other discipline-hopping activities. A number of policy initiatives are planned to encourage multi-disciplinary working, including:

- Reforms to the research assessment exercise, which will provide greater recognition and reward for cross-discipline working.
- The research councils will also consider whether unintentional barriers to multi-disciplinary working can be removed.
- The Higher Education Research Forum is currently looking at how better to encourage collaboration across institutional boundaries, and also the link between teaching and research.

Revised procedures for setting research priorities

The Foresight Programme was changed in April 2002 to a new fluid, rolling programme of projects to replace the previous structure of panels covering sectors over a 5-year period. This has enabled emerging developments to be incorporated into research priorities much more quickly.

As part of the new Performance Management Framework for Research Councils, each Council will produce a delivery plan setting out their funding and research priorities for the next three years.

Changes to the system of peer review for research (the Research Assessment Exercise) are underway, and final criteria statements will be published in early 2006.

Reformed rules governing ownership and licensing of publicly-funded research results

An **IP working group** has been set up to develop a range of model contracts representing a variety of approaches to the ownership and exploitation of IP, which would reduce the time and cost involved in securing IP agreements. Five model contracts (the "Lambert Agreements") and a toolkit for users were published in February 2005. For more details, see <http://www.innovation.gov.uk/lambertagreements/>

3. Major shifts or changes in priority among the approaches for strengthening public sector research

As noted in Sections B(1) and B(2) above, the Government has put increased priority on *i*) increased levels of funding, *iii*) and *vi*) reforming the governance and evaluation of public research organisations.

4. New or recent changes in policies to improve access to public research data

The UK House of Commons Science and Technology Select Committee conducted an inquiry into the issue of the future of scientific publications and released their inquiry report at a press conference on 20th July 2004. The report produced a number of recommendations and the Office of Science and Technology worked with a wide range of stakeholders to provide a response in October 2004 to all the issues raised in the inquiry. The Select Committee issued a further report in November, which the Government responded to in January 2005.

The inquiry looked at a range of issues, such as archiving of electronic material (how can we ensure that digital material is preserved for future generations?); quality assurance (peer review is vital); and value for money. A lot of press interest has been generated by the inquiry and most of the press interest has centred around the issue commonly referred to as “open access” publication.

The UK is currently gathering evidence, such as the EU study to be published in Spring 2006 and studies that JISC (Joint Information Systems Committee) have commissioned. The Research Councils have been asked to provide advice to the Government so that the issues from a researcher’s point of view can be taken into account, and the Councils are currently in discussions with the publishing communities.

Until more evidence is gathered, the current UK Government’s position on open access is that we need to ensure a “level playing field” such that research funding authorities should have the discretion to provide the funds if the author prefers an open access route. Given the uncertainty with current business models, this position is the most appropriate to encourage competition and innovation in publishing models and retain freedom of choice for authors and other relevant stakeholders.

5. Main challenges that the science system is expected to face

- Two main challenges include:
- if the UK is to maintain its high world ranking for research, more work needs to be done to ensure the UK’s higher education institutions and public sector research laboratories are put on a long-term financially sustainable footing;
- to respond quickly to new and multi-disciplinary research opportunities, the Government will ensure a robust framework exists for forward-looking management of the science base, with a publicly-funded research base which is very responsive to the needs of the economy and public services.

SECTION C: GOVERNMENT SUPPORT FOR PRIVATE SECTOR R&D AND INNOVATION

1. Major policy changes in instruments used to support private sector R&D and innovation, including:

- Tax treatment of business R&D.
- Direct public funding of business R&D and innovation.
- Public procurement policies.
- Changes in IPR regimes.
- Other.

The ten-year framework set out the following ambitions to raise business investment in R&D, and improve business engagement with the UK science base for ideas and talent:

- Increase business investment in R&D as a share of GDP from 1.25% towards a goal of 1.7% over the decade.
- Narrow the gap in business R&D intensity and business innovation performance between the UK and leading EU and US performance in each sector, reflecting the size distribution of companies in the UK.

The ten-year framework outlined a range of support measures to achieve these ambitions (see page 63). Key developments since 2004 include:

- **R&D tax credits** were introduced in 2000 to incentivise SMES to increase R&D spending, and were extended to large companies in 2002. Different rates apply to SMEs and large companies, and the credits can either reduce a company's tax bill or, for some SMEs, provide a cash sum. In July 2005 a discussion paper that invited responses from the public on enhancing the R&D tax credit was published. In December 2005 the Government published a summary of responses and the Government's future intentions, which include:
 - The creation of dedicated R&D units within HM Revenue and Customs, who administer the credits, to ensure that all SME tax credit claims are dealt with by specialist staff;
 - An R&D tax credit statement of practice for SMEs, detailing how SMEs can expect staff to deal with their claims; and
 - A package of legislative and operational simplifications, including expanding qualifying costs to include payments to clinical trial volunteers.
- For more information see <http://www.hmrc.gov.uk/randd/#9>

- The **Technology Strategy** was launched in 2004 to concentrate Government funding on key technologies identified through consultation with business and other stakeholders. The strategy is guided by a Board, which is independent of Government, business led and informed through engagement with the science base and business. The Strategy is implemented through two products, the Collaborative Research and Development Product and the Knowledge Transfer Networks Product (see section D for more details). The first annual report of the Technology Strategy Board was published in November 2005, and provides information on the work of the Board over the past year and plans for future activities. It is available at: [http://www.dti.gov.uk/technologystategy/Technology Strategy Board Annual Report 2005.pdf](http://www.dti.gov.uk/technologystategy/Technology%20Strategy%20Board%20Annual%20Report%202005.pdf)
- A high-level **UK Science Forum** has been created to bring together Government, business leaders and scientists in support of the UK's R&D and innovation goals.
- Active promotion of the UK as the partner of choice for **international R&D** and work on **the facilitation of inward investment and outward trade** by various Government departments has progressed, in conjunction with the development of the international strategy by the Global Science and Innovation Forum (see section B2).

2. Policy changes in programmes to support R&D and innovation in SMEs and new technology-based firms:

The Small Business Research Initiative (SBRI) aims to raise productivity and business innovation by providing R&D contracts to technology-based small businesses, helping to provide early revenue and a route to market for firms that typically face barriers to funding their early development.

In 2005 a mandatory target was announced for those departments participating under the initiative: at least 2.5% of the value of departments' and agencies' extra-mural R&D contracts will now be placed with SMEs. This requirement will further encourage SMEs to enter bids for public sector work, while maintaining value for money and quality of procurement. The Government will also work to embed the use of innovation in public sector procurement policy.

The Government also recognises that **lack of access to finance** can hold back smaller companies seeking to exploit their scientific and technological advances. There are several measures to promote equity investment, including the Capital Gains Tax business asset taper relief, the Enterprise Investment Scheme and Venture Capital Trusts. See <http://www.hmrc.gov.uk/guidance/vct.htm> for more details.

Support for individuals and SMEs has been in place since June 2003 through the **Grant for research and development**, which helps to cover the costs of carrying out research and development work on technologically innovative products and processes. The grants are for supporting specific projects. Further information can be obtained from: <http://www.dti.gov.uk/r-d/>.

A pilot scheme, the **Grant for investigating an innovative idea**, also continues to support SMEs in England to obtain practical advice in exploring their ideas for innovative products, services or processes. The grant provides 75% of the costs of outside experts. More information is available at: <http://www.dti.gov.uk/innovative-idea/>

3. Major shifts in mix of instruments used to provide public support, anticipated shifts

There have been no recent major shifts in the mix of instruments. Any shifts in the future could depend on the results from monitoring the impacts of different policies.

4. Main issues that policy makers will need to address regarding support to the business innovation system

As mentioned in Section A, one of the most significant challenges in the UK is to increase the level of business investment in R&D. The Government will monitor closely the impact of recent measures to stimulate business R&D, and will continue to work in partnership with business to develop policy in this area.

SECTION D: ENHANCING COLLABORATION AND NETWORKING AMONG INNOVATING AND RESEARCH ORGANISATIONS

1. Major initiatives to promote collaboration and networking among innovating firms

As mentioned in Section C, the Technology Strategy is implemented through a combination of products that support business, known as the Technology Programme. Businesses are able to compete for funding using two products:

Grants to assist **Collaborative Research & Development** are aimed at encouraging industry and research communities to work together on Research & Development projects in strategically important areas of science, engineering and technology. Collaborative Research & Development projects must involve two or more collaborators, at least one of which is from industry. For more details see <http://www.dti.gov.uk/crd/>

Grants to establish **Knowledge Transfer Networks** are aimed at encouraging the active participation of all networks currently operating in its field and to establish connections with networks in other fields which have common interests. The Knowledge Transfer Networks are required to develop strong links with each other to maximise the benefits to the UK from effective knowledge transfer across technology boundaries. For more details, see <http://www.dti.gov.uk/ktn/>

2. Major policy initiatives to promote stronger industry-science relationships including:

- Collaborative research.
- Increasing the mobility of human resources.
- New modes of public private partnerships for research and innovation.

The 2003 Lambert Review of business-university collaboration concluded that the UK was strong in research, but less effective at translating the products of research into social and economic benefits. The ten-year framework therefore set out to encourage greater responsiveness of the publicly-funded research base to the needs of the economy and public services.

Key developments since 2004 include:

- **Knowledge Transfer Partnerships** are government funded grants to transfer and embed knowledge into a business from the UK knowledge base via a strategic project. The Strategic plan for 2004-07 has been set and is available at: www.ktponline.org.uk
- The **Higher Education Innovation Fund** provides funding to universities in England to develop technology transfer activities, entrepreneurship training, and seed funding for commercial ventures. To help universities plan their long-term knowledge transfer activities more effectively, the allocation of funds under the next round of funding will move from a wholly competitive allocation to a system which is 75% formulaic (i.e. driven by indicators of universities' success in knowledge transfer) and 25 percent competitive, making allocations more predictable for

institutions. Details of the formula were announced in November 2005, and for more details see http://www.hefce.ac.uk/pubs/hefce/2005/05_46/

- **Knowledge transfer plans** have been developed by the Research Councils, to increase the impact of public investment in research on the wider economy and society. These plans cover a range of different activities, reflecting the different nature of the Research Councils and their work, from goals on increasing the amount of collaborative research to increasing income from licensing, to defining new models of knowledge transfer.
- **Knowledge transfer in the regions** has been facilitated by the Regional Development Agencies (RDAs) being given an enhanced role, and specific targets have been set for the number of regional collaborations they will facilitate between businesses and the research base. All RDAs have established Science and Industry Councils: these regional bodies strengthen relationships between businesses and researchers, promote innovation, and provide strategic advice on regional science and technology. RDAs are also developing Science Cities, three were announced in 2004 (in York, Manchester and Newcastle), and a further three science cities were announced in 2005 (in Nottingham, Birmingham and Bristol). These Science Cities will provide a focal point for businesses seeking to collaborate with world-class research establishments in the regions. In addition, the regions are considering how knowledge transfer can help deliver a better skilled workforce within each region to support the achievement of regional economic strategies.
- The **Knowledge Transfer Capacity Building Fund** provides additional means for Research Councils and RDAs to exchange knowledge and collaborate. A series of secondments from the Research councils into RDAs have been facilitated through the £5 million fund.
- The **Public Sector Research Establishment (PSRE)** fund supports growth in commercialisation activity from PSREs and has been steadily increasing in size since it was introduced in 2001. Up to £25 million is available for the third round of the competition, which was launched in September 2005.
- **Codes of conduct** for universities have been developed to prevent conflicts of interest when collaborating with business, and were published in November 2004.
- The **Cambridge-MIT Institute (CMI)**, set up in 1999, is a unique collaboration in UK higher education aimed at developing innovative models for knowledge transfer and business-university collaboration. CMI has developed “Knowledge Integration Communities”, covering such areas as developing a “silent aircraft” and the next generation of drug discovery, which bring together Government, academic researchers and industry to tackle particular challenges. In summer 2003 it was agreed that the programme will continue to receive Government funding until summer 2006.

3. Policy shifts in recent years, any anticipated changes

The 2003 Lambert Review has shaped policy development in Knowledge Transfer over the last two years. Key conclusions of the Review included:

- A number of barriers exist to greater business-university collaboration, including the weakness of business investment in R&D and the need to ensure that research is relevant to the needs of business is sustained;
- The best form of knowledge transfer is through human interaction, through frequent and easy communications between business and academic communities;
- Barriers to commercialising university intellectual property include a lack of clarity over ownership of IP and the variable quality of technology transfer offices. The Review suggested

that there had been too much emphasis on developing university spinouts, and not enough on licensing technology to industry;

- A greater role for regional development in knowledge transfer would be beneficial;
- There is the possibility of a negative effect on the level of university-business collaboration if funding for research activities are concentrated too narrowly; and
- (Voluntary) governance of universities in their knowledge transfer activities should be promoted.

These conclusions were accepted by the Government and have subsequently affected the Government's balance of support for different channels of industry-science linkages. The Government's set of indicators to measure progress on knowledge transfer aims to be broad and balanced, and is available at: <http://www.ost.gov.uk/policy/progress2005.pdf>

SECTION E: GLOBALISATION

See answers to separate TIP survey

SECTION F: HUMAN RESOURCES

1. Recent efforts to improve supplies of university graduates with science and engineering degrees (both quantity and quality)

Check all boxes: See Chapter 6, p. 81 in the ten year framework for an outline of all measures.

The ten-year framework highlighted the importance of a strong supply of scientists, engineers and technologists to the long-term health of the science base and the wider UK economy.

Key developments since 2004 include:

- Greater participation in science after age 16 will be encouraged through **changes in the curriculum**. The Key Stage 3 Curriculum Review will streamline the curriculum taught in schools and make it more relevant and engaging. Advice will be submitted by the end of 2006. Additional funds have also been made to improve science and engineering laboratories in schools, colleges and universities.
- Increases in the value of **training bursaries** and ‘Golden Hellos’ to attract more science teachers into the profession were introduced in 2005, with a commitment to double the number of science places on the Graduate Teacher Programme from 2005/06. A new group of specialist High-Level Teaching assistants is to be generated by 2007/8.
- Support for the continuing professional development of science teachers has strengthened, with the establishment of **Science Learning Centres** in 2004 in each region which deliver courses on professional development;
- **Entrepreneurship** is being encouraged amongst students through funding of Science Enterprise Centres in universities, which will teach entrepreneurship skills and develop new degree programmes.
- A cross-cutting programme to rationalise and **increase the effectiveness of the range of initiatives** supported by Government and its partner organisations to promote interest in Science, Technology, Engineering and Mathematics (STEM) subjects at all levels was launched in 2005;
- After decades of no real growth in **PhD stipends**, they are set to increase to a minimum of £12,000 in 2005/06. Funding has also been allocated for the provision of transferable skills training for PhD students and postdoctoral researchers.
- For **holders of doctorates**, steps have been taken to encourage careers in research. Average postdoctoral salaries will increase by £4000 by 2005/6 along with the introduction of new academic and teaching fellowships.
- A **Women’s Resource Centre** was created in September 2004 to work in partnership with business to increase the opportunities for professional women in science, technology and engineering.

2. Recent policy changes to enhance the international mobility of scientific and high-skilled personnel

Check boxes: Changes in immigration legislation; funding of scholarships, grants for international mobility.

The **Science and Engineering Scheme** was set up in October 2004 to allow graduates from UK universities who are not citizens of the European Economic Area to seek work in the UK for one year after graduation.

The **Highly Skilled Migrant Programme** was introduced in 2002 to allow highly-skilled workers to enter the UK to work without needing a prior offer of employment. There are changes proposed to the programme due to wider changes to the immigration system, outlined in the UK's five year strategy for asylum and immigration launched in 2005. Firm proposals for change are to be announced in Spring 2006.

The Dorothy Hodgkin Postgraduate Awards, launched in 2003, continue to allow doctorate students from India, China, Hong Kong, Russia and the developing world study in the UK.

3. Recent policy efforts to foster development of specific skills other than S&T skills, notably as relates to the service sector

The Government recognises that improved skills are one of the key drivers to improving productivity in the UK. An update of recent developments on policies relating to improving skills is contained in the December 2005 Pre-Budget Report (page 62) http://www.hm-treasury.gov.uk/media/FA6/22/pbr05_chapter3_269.pdf and the March 2005 Budget Report (page 69), http://www.hm-treasury.gov.uk/media/AA7/1F/bud05_chap03_229.pdf

4. Major shifts or changes in the priorities and mix of instruments

There have been no recent major shifts or changes in priorities and mix of instruments, with the emphasis on developing domestic talent remaining relatively higher than on the attraction of foreign talent.

5. Main changes anticipated in the supply and demand for human resources, main policy challenges that policy makers will need to address

The Government commissioned the Leitch Review of Skills to identify the UK's optimal skills mix in 2020 to maximise economic growth, productivity and social justice, and to consider the policy implications of achieving the level of change required. The Leitch Review of Skills published its interim report "Skills in the UK: The long-term challenge" in December 2005, and it is available at: http://www.hm-treasury.gov.uk/independent_reviews/leitch_review/review_leitch_index.cfm

The UK's main forecasts of employment across occupations and industries is the Sector Skills Development Agency's Working Futures report.

<http://www.ssda.org.uk/ssda/default.aspx?page=28>

As mentioned in section A, the supply and demand of Science, Technology, Engineering and Mathematics (STEM) skills is an area where progress has been mixed, and presents a key challenge in meeting the ambitions in the ten year framework. The Government will work to further enhance the teaching and learning of STEM subjects and the recruitment and retention of science teachers and researchers, to underpin the future needs of the science base and the economy.

SECTION G: POLICY EVALUATION

1. Recent changes in policies regarding ex-ante or ex-post evaluation of innovation policies and programmes

The Department of Trade and Industry (DTI) has a well-established system of evaluation where activities are identified on an annual basis, including innovation policies and programmes. External contractors conduct the bulk of evaluation work; in addition the Department has in-house evaluation staff.

The Department's evaluation programme is co-ordinated by the Strategy Unit's Performance and Evaluation Team. The team helps ensure that robust evidence is gathered to measure the effects of the department's activities. This evidence is fed to the DTI Performance Monitoring Committee, which oversees performance measurement in the Department, and to senior administrators to inform future strategy.

To assist the Performance Monitoring Committee, a Strategic Evaluation Group was set up in 2005 to bring together an expert working group of evaluators and independent members to take a more proactive and strategic approach to evaluation within the DTI. The evaluation of innovation policies is discussed and reviewed in this Group.

For more details of evaluation of innovation policies and programmes, see <http://www.dti.gov.uk/iese/au.htm>

2. Recent changes in policies regarding the evaluation of public research organisations

- An update of progress on the science and innovation ten year framework is published annually, with a full list of progress on indicators. The latest report is available at: <http://www.ost.gov.uk/policy/sifreview05.pdf>
- Public Service Agreements are set between government departments and the Government to ensure value for money from public services. Each government department has a set of objectives and performance targets, and are required to publicly report their performance against targets twice a year. In 2004, the Department of Trade and Industry (DTI) and Office of Science and Technology were set an objective of Promoting World Class Science and Innovation, and to
“Improve the relative international performance of the UK research base and increase the overall innovation performance of the UK economy, making continued progress to 2008 including through effective knowledge transfer amongst universities, research institutions and business.”
- The DTI's reports on progress are available at http://www.dti.gov.uk/about_dti_documents.html.
- The Office of Science and Technology monitors and evaluates its knowledge transfer programmes, and the grants it allocates to the Research Councils. The former were last evaluated in 2005. The latter will be evaluated through the new Performance Management Framework,

referred to in Section B, which involves each Research Council collecting annual data on their outputs and producing a delivery plan setting out investment priorities and objectives for the next three years. Deliverables from the delivery plan form the basis of a 'scorecard' which tracks progress on performance through a series of milestones and targets. In addition, each Council has an evaluation strategy and programme of the projects it funds.

- The Research Assessment Exercise referred to in Section B is also important in ensuring peer review of research in the Higher Education Institutions. For more details see <http://www.hefce.ac.uk/research/assessment/>

3. Significant changes in the priority given to evaluation in innovation policy, motivations

There has been a shift towards greater emphasis given to a more formal evaluation of progress and collection of evidence, with the introduction of the ten year framework and annual reports on progress, as well as the introduction of the performance management system for the Research Councils. This is a reflection of the move in the overall public spending environment to a much greater emphasis on securing maximum value for money from public spending, and performance against specified targets.

4. Information or web-links on outcomes of recent major evaluations of R&D or innovation policies

See: <http://www.dti.gov.uk/about/evaluation/>