



Response

A Universities UK response on behalf of Membership
to a consultation by another organisation

Science and innovation: working towards a ten-year investment framework

This response has been developed following wide consultation. It focuses on those issues arising from the questions that are of key relevance and concern to universities, and provides comments on some of the broader related issues. Some of our key messages are:

- It is vital that the very welcome additional investment by Government under previous spending reviews is built upon if the UK is to continue to compete and succeed at an international level.
- We continue to have grave concerns over any further concentration of public investment in research. It is critically important that high quality research is funded wherever it is found.
- It is important to address issues relating to the sustainability of research activities. All funders of university research need to recognise and support the true costs.
- We have concerns about the impact of the increased demands on Quality Research funding.
- We welcome the Lambert proposals for increased funding to assist in overcoming the barriers to an identified demand side problem in business-university links.
- The proposal outlined by Gareth Roberts' report, *SET for Success*, represent a long-term commitment. It is vital that in the light of the proposed review these measures are not abandoned before they have had a chance to bear fruit. Professor Smith's report on post-14 mathematics teaching usefully complements the Roberts' recommendations.
- Support for medical and health research needs to reflect and underpin changes in medical practice and the need to develop research capacity in primary health care, nursing and allied health professions, and public health.



Universities UK¹

Response to the Questions in *Science and Innovation: working towards a ten-year investment framework*

Question 1: Are these the right areas for the Government to target over the next ten years? What are the underlying components of success in those areas and what roles do Government and other funders of the science base need to play in achieving these aims?

1. Universities UK welcome the opportunity to comment on the development of the Government's ten-year investment framework for science and innovation and we broadly agree with those areas that have been targeted. We are encouraged that the Government is developing a cross-departmental approach that will bring together the recent array of reviews and developments in this area. This will help to form an overarching strategy for the medium term. Each of the areas covered by the document are addressed in detail in our response to the questions. This question, however, provides an opportunity for us to outline the key issues arising from the framework document as they relate to the higher education sector, and to comment on some of the broader related points.
 - Additional funding for science and innovation provided under previous spending reviews has been very welcome. It is vital, however, that this is built upon if the UK is to continue to compete and succeed at an international level. We have already provided Government with our detailed assessment of the funding needs of the higher education sector for the period up to 2007-2008, as have Universities Scotland and Higher Education Wales in respect to the devolved administrations².
 - We continue to have grave concerns over any further concentration of public investment in research. It is critically important that high quality research is funded wherever it is found. Further selectivity will lead to a significant loss of high quality provision, reduce the capability to develop future capacity and substantially limit the flexibility needed to respond to new demands, and jeopardise the vital link between research and teaching in higher education institutions.
 - It is vital to promote and develop newly emerging research excellence in addition to established excellence if we are to continue to be major players across the spectrum of research and support businesses in new and emerging technologies. Such research is often interdisciplinary

¹ This submission represents a UK wide position and where there are instances of difference in outlook and perspective between England, Scotland and Wales, this is noted in the text.

² *Achieving our vision* Universities UK 2004 Spending Review Submission for England and Northern Ireland Universities UK, January 2004; *Universities Scotland case to the Spending Review 2004*, Universities Scotland, March 2004; *Higher Education Wales spending Review Submission*, Higher Education Wales, March 2004.



and across university boundaries. The implication in the framework document is that the 'strongest centres of excellence' correlate to specific institutions, this is not the case.

- The document tends to focus on excellence solely in terms of basic research. This is not appropriate given the broad scope and ambition of the framework. The UK needs to aspire to excellence in research and development and knowledge transfer. Centres of excellence go beyond those for basic research. Appropriate measures of excellence are required to inform funding and policy decisions; success in the RAE is only one part of the picture.
- It is important to address issues relating to the sustainability of research activities in the round, including the contribution towards developing future research capacity through the training and development of individual researchers. Sustainability is not simply a question of full economic costing and associated pricing decisions on research grants and contracts.
- To maintain excellence in their research and knowledge transfer activities universities need to reverse the deteriorating state of their buildings and laboratories. The Science Research Investment Fund (SRIF) has gone some way towards addressing this problem, however, further investment is still required to meet the significant investment backlog³. The move towards a sustainable approach to costing externally commissioned research will help avoid the problem reoccurring in the future, though only if all funders recognise and support the true costs.
- Quality research (QR) funding has an important role to play in developing research capacity through supporting research training and in developing new areas of research. It cannot be seen as simply meeting the balance of costs for externally funded research projects. We have concerns about the impact of the increased demands on this funding to support projects funded by medical charities and the EU, as well as providing dual support for research council projects. Without a substantial increase in the level of this funding and a commitment on the part of funders to pay a greater proportion of the full economic costs of the projects they support, the requirements of sustainability will not only lead to a significant reduction in the volume of projects undertaken by university departments or research groups, but also the potential unravelling and loss of significant research capacity.
- The Lambert Review indicates that the key factor limiting knowledge transfer from universities to business is low demand from business rather than any shortcomings of the supply-side. We welcome his proposals for increased funding to assist in overcoming the barriers to demand.
- This framework needs to be understood within the context of the UK's involvement in the European Research Area (ERA), particularly the aspirations of the Lisbon agenda, and the Barcelona objective of increasing EU expenditure in research and development to 3% of GDP

³ This is outlined in our submission to the 2004 Spending Review, *Investing in Success*.



(2% private and 1% public). The UK is along way from meeting the aspirations for private investment and more needs to be done to create a financial environment in which business will be encouraged to increase investment in R&D.

- Whilst we welcome the spirit of the broad definition of science⁴ used in the report we are concerned that the document as a whole neglects the contribution of the social sciences, arts and humanities, and academic support for the creative industries to UK wealth.
- It is important to bear in mind that the various measures introduced as a result of the Roberts' report *SET for Success* represent a long-term commitment. It is vital that in the light of the proposed review these measures are not abandoned before they have had a chance to bear fruit. Professor Smith's report on post-14 mathematics teaching usefully complements the Roberts' recommendations and should be recognised as a part of this investment strategy.
- The recent acceptance of pay modernisation will increase universities' flexibility to recruit and retain qualified people and is likely to have particular benefits for the pay of researchers, but this has a net additional cost.
- Support for medical and health research needs to reflect and underpin changes in medical practice and the need to develop research capacity in primary health care, nursing and allied health professions, and public health. There is a continued need to develop capacity in these areas and to work in partnership with practitioners.
- Policy makers need to develop a much better understanding of the implications of the caveats surrounding any research evidence and to reflect that in public debate of the issues.

Question 2: Which strengths of the UK science base could be further developed; what are the weaker areas that need to be addressed and what are the risks to the UK's continued production of internationally competitive levels of research? What criteria should the Government use to help determine its overall commitment to science?

Key points:

- The UK science base performs well in terms of cited papers and currently has a good spread of internationally or potentially internationally competitive centres of excellence across research groups throughout institutions, public sector research laboratories and certain industrial sectors.

⁴ As is outlined in footnote number 1, page 9 of the framework document.



- A key strength of the science base is its breadth and geographical spread. This should be maintained, and indeed extended.
 - Excellence outside of the scope of the RAE measurements of fundamental research must be defined and recognised, this would encompass research and development and knowledge transfer as a whole.
 - The UK has a low proportion of highly qualified people with research training compared to some of our competitors and there is a risk that the supply of academics that lead both teaching and research and are themselves research trained may be inadequate to replace those retiring over the next ten years.
 - There are particular concerns about capacity in applied and practice-based research, which are relevant to the delivery of services, to the continued health of our creative industries and to the underpinning of knowledge transfer to businesses.
 - The current high level of performance is threatened by further concentration of QR research funding, and by current levels of funding which fall short of securing the long-term sustainability of the research base.
 - There is a need to ensure a sound, broadly based research capacity across all key areas in order to be able to respond to future demands and not simply focus on current 'hot spots'. Further concentration of funding on a few centres will lead to the drying-up of new centres of excellence and capacity to meet new or emerging demands. This capacity exists in researchers across many universities.
 - The main criteria for determining the Government's commitment to science should be the need to sustain capacity both to meet existing identified research priorities and to respond to emerging requirements.
2. A report produced by Evidence Limited for Universities UK⁵ indicates that the UK performs well against all its major international competitors in terms of research outputs (fundamental research). The UK carries out 4.5% of world science but produces 9% of the world's research papers and receives around 10% of the world citations, second only to the USA. The proportion of the UK's research papers that remains uncited is falling in all fields. Bibliometric analysis shows that the UK comes second to the USA in most research fields except mathematics, where it is third; and physical sciences and engineering, where it is fourth. Overall the UK's international research performance improved progressively in terms of research impact (average citations per paper) over the last decade, in the face of increasing international competition. Maintaining this position will be increasingly difficult and require sustained resources.



3. Universities UK believes that the current international performance is threatened by increasing levels of selectivity in the distribution of research funding. High quality research should be funded wherever it is found. The results of the 2001 Research Assessment Exercise (RAE) illustrate that the majority of research carried out in UK Universities is of international quality. In RAE 2001 80% of research active staff were working in departments that were highly rated at 4, 5, and 5* compared to only 59% in RAE 1996. Funding is already more highly concentrated in the UK than in any other country, including the United States. The latest figures show that 84% of research council grants go to 25 universities, while 75% of HEFCE grants go to 25 institutions. It is vital in our view that the balance between funding top-rated departments to support excellence, protecting areas of research excellence across the sector and the encouragement of new and developing areas of research is not further distorted through fundamental revision to the allocation of public funding. In addition, the adverse effects on teaching capacity should not be overlooked, since academic contracts mostly require academic staff to undertake the dual roles of teaching and research.
4. The impact of the increased concentration will be felt most strongly in institutions with 3 and 4-rated research areas. Lacking sustainable income flow, they will lose researchers, often 'poached' by more research intensive institutions. The importance of continuing to support emerging centres of research is well illustrated by the improvements in grading of those departments graded 3a or 4 in the 1996 RAE. In RAE 2001, 115 or 26% of all departments graded 3a in 1996 were graded 5 or 5* and 319 or 55% of all departments graded 4 in 1996 were graded 5 or 5*. Opportunities for the science base to feed innovation and to help create new businesses in these areas of research will be lost. In addition, measuring excellence solely in terms of the RAE does not recognise the broader definition of research, which also encompasses research and development and knowledge transfer as a whole. There is as yet no reasonably acceptable measure for excellence for this broader definition that can inform policy and funding decisions, but they are vital to deliver economic development and prosperity. This should at the very least be recognised, to help avoid further distortions of funding.
5. Universities UK is also concerned that excellence in practice-based research and applied research are not explicitly recognised by the Research Assessment Exercise. As a result they are relatively less well funded than other areas of research. However, they are important to the underpinning of the delivery of public services such as patient care, manufacturing, and in business and financial services. In creative subjects such as music, art and design and developing areas such as digital media research is important to the continued success in the associated creative industries.
6. Given the current age profile of academic staff in universities the UK will require a significant flow of new recruits over the next decade. Research conducted for Universities UK by Professor Brian Ramsden shows that an ageing staff profile will lead to very large numbers of retirements causing serious problems for the future recruitment of high quality academic staff. This problem is shared

⁵ *Funding Research Diversity*, Evidence Limited, Universities UK, October 2003



with Australia, Canada and the US but they are taking action to address the problem now. There is a real danger, in the light of the closure of departments following the last RAE, that the capacity to train the next generation of researchers will be reduced. This problem is particularly acute in the physical sciences. If the government wish to scale research outputs to economic growth predictions this means the funding of university capability and long term funding commitments to university staff.

7. A recent study by the think tank Demos has looked at issues around the ability of nations to attract, retain and develop creative people⁶. This 'creative class' includes researchers, and also those emerging from the scientific workforce who go on to work in the innovative economy. The report shows that while the US remains the world leader in technology and in its ability to attract talented people, a cluster of northern European nations (Finland, Sweden, Denmark, the Netherlands, and Belgium) appear to have distinct assets with which to compete. These countries have considerable technological capabilities, have invested and continue to invest in developing creative talent and also appear to have the values and attitudes that are associated with the ability to attract creative talent from the outside. These nations are in the ascendant, while the traditional powers of the US, France, Germany and the UK are waning.
8. The report proposes that the US has done as much to undermine its own advantage, by restricting scientific information and making it harder for people to enter and leave the country. When looking at what the UK needs to do in terms of encouraging the development and recruitment of international talent these broader issues must be considered if we are to remain competitive.

Question 3: In which key technology-based sectors does the UK have the potential to maintain and grow internationally competitive value-added over the coming decade? What are the barriers to capitalising on our strengths and addressing areas of relative weakness in business innovation and R&D? How can investment in the UK science base and Government support for business R&D best contribute to that growth?

Question 4: In what areas are there opportunities for the UK research base to excel and contribute to the economy and society, which might form the basis for future strategic research programmes over the next ten years?

9. The issues underlying these questions have been analysed in depth by the Engineering and Technology Board chaired by Sir Peter Williams⁷. Section 2 of this report includes a range of detailed research findings principally about high technology young companies and their contribution to value added and national wealth. Although the focus of this report is on science, engineering and

⁶ Florida & Tinagli, *Europe in the creative age*, Demos, 2004

⁷ *The Frontiers of Innovation, Wealth Creation from Science and Technology in the UK* Engineering and Technology Board, March 2004



technology we commend it to Government as providing a very thorough assessment of the issues posed by these and other questions.

10. There is little value in encouraging the business community to spend more on research and development in the UK without a good understanding on where that impact might best be made, and making it more worthwhile in fiscal treatment terms for them to do so. It would be useful to break down chart 1.1, page 11, in the consultation document in to business areas to get a better sense of where the work needs to be done. Most companies that produce research publications are in the top 200 of the DTI Scoreboard, a significant proportion of which are in the biotechnology-pharmaceuticals sector. These spend £15bn of the UK's £16bn annual industrial R&D⁸. In Scotland a report by Technology Venture Scotland called *Bridging the Gap* defines a top strata of SMEs as those with high innovation potential⁹.
11. In addition, one of the key needs is to manage the process of innovation into production inside companies. This has only been weakly addressed in the UK at present, and represents an opportunity for the management sector in HE.
12. At a broader level universities obviously play a crucial role in the economy of the nation, but it would not be right to say that this is the sole objective of a university. The education and knowledge generation/knowledge synthesis and codification, and the questioning of propositions in science, society and in the cultural domains are extremely important in producing a range of useful and productive citizens. It is more for Government to create the right environment for the utilisation and knowledge for economic growth that is important.

Management of the science base – public funding

Question 5: In the light of changes to be made to the RAE, how can funding mechanisms build on existing resources and research assessment reforms to reward excellence and underpin sustainability?

Question 6: What are the main barriers or challenges to the achievement of a sustainable public research base in the medium term? What further action could the Government take in partnership with universities and other funders of research, to create robust incentives on all parties to work together to deliver greater financial sustainability of the UK's research base?

⁸ Adams & Smith, *Research and the regions: An overview of the distribution of research in UK regions, regional research capacity and links between strategic research partners*, Higher Education Policy Institute, 2004

⁹ *Bridging the Gap, a discussion paper on knowledge transfer in Scotland*, Technology Ventures Scotland, March 2003



Question 7: How could funding for universities provided by Government and other funders create stronger financial incentives for the effective creation management and usage of the research base infrastructure over the next decade?

Key Points:

- Universities UK welcomes the continuation of the dual support system for funding research in universities. However, it is vitally important that both limbs of dual support are sufficiently funded if the research base is not to be severely damaged.
 - Universities UK support moves towards identifying the full economic costs of research, although requirements on institutions to demonstrate their use of full economic costing should be proportionate and not represent an additional regulatory burden.
 - It is vitally important that funding mechanisms based on the next RAE do not further limit the possibilities for the emergence of new centres of excellence. Institutions need to have a clear understanding of the intended relationship between the new research profiles and funding in advance of the exercise.
 - There needs to be a recognition on the part of all research funders that institutions need to cover their full economic costs if the research base is to be sustainable in the long-term (beyond the ten year framework outlined in this document). This is particularly relevant to medical research charities that fund considerable volumes of research in universities. The Government must ensure dialogue and agreement between funders and universities on the principles of how the full economic costs of projects are to be met.
 - Funding Council QR funds, their level and purpose, are of particular importance where other research funders do not or cannot be expected to meet the full economic costs of research projects. It must however, be recognised that QR funding is wholly insufficient at current levels.
 - The perverse incentives that encourage institutions to undertake an increased volume of research projects rather than meeting the full economic costs need to continue to be addressed.
 - Planning investment in creating and maintaining research infrastructure does not sit easily with a regime where research activity is largely reliant on 'soft' money from research grants and contracts. This is particularly true for those with modest QR funding. The increased emphasis on understanding the full economic costs of projects and on long-term sustainability will help.
13. Financial sustainability of research activity, whether publicly funded or not, is a key issue for all universities. The work now going on in ten pilot institutions to apply the principles of the Transparent Approach to Costing (TRAC) at research project level will help to provide a much better basis for institutions to determine the full economic costs of these activities and price them on a sustainable



basis. If, however, true sustainability is to be achieved there are some key issues that need to be addressed by all funders of university research.

14. We welcome the commitment that when Government departments commission research from universities they should in future normally expect to meet the full economic cost to universities of providing that research. Where this does not apply, there needs to be a clear understanding between institutions and the funder of the level of full economic costs that the funder is prepared to pay.
15. We strongly welcome the Government's commitment to the continuation of dual support funding. We also welcome the extra £120 million allocated to the Research Councils from SR2002 to increase the contribution to the full economic costs of the projects they fund in universities to between 60 and 70%. Although a helpful step in the right direction, this is clearly not sufficient to secure sustainability and the Research Councils will need to provide a larger percentage of full economic costs if this is to be achieved. We remain concerned that QR funding at its current levels will be wholly insufficient to meet the expected contribution of 30-40% of the full economic cost to Research Council funded projects, especially in the light of the other expectations of the contribution and role of QR funding. In addition, the QR contribution for a RAE 4 group who has won a peer review competition for a Research Council grant will only be a fraction of what they would have received if they had been assessed as RAE 5*, yet the people winning the grant and their costs will be the same.
16. Research recently published by the Higher Education Policy Institute (HEPI)¹⁰ showed the changing balance between core QR grant and income from research grants and contracts under the dual support system. The ratio declined across the twenty-year period from 1981-82 to 2001-2002¹¹. Adams and Bekhradnia observe that this has seriously eroded the ability of universities to maintain the historical function of dual support. This included originally the funding of the development of research staff and the funding of some "blue skies" research, as well as supporting externally funded research grants and contracts.
17. The very rapid growth in projects in universities funded by research charities over the last ten years has exacerbated the problem. Research charities have not been expected to meet the indirect costs of research projects, which have fallen to be met from QR or other institutional funds. This is not sustainable on a long-term basis and without additional investment will jeopardise universities' ability to ensure that they are able to undertake the current volume and quality of research. It is crucial that this problem is resolved and Universities UK await with interest the outcomes of discussions between HEFCE and charitable funders on this matter. The implications of this within a regime of full economic costing were analysed in detail in a report prepared by JM Consulting for HEFCE¹².

¹⁰ Adams J. and Bekhradnia B. *What Future for Dual Support* HEPI (2004) www.hepi.ac.uk

¹¹ See HEPI report figure 1

¹² *Research relationships between higher education institutions and the charitable sector* HEFCE Research Report 02/07 (2002)



18. The proposals put forward by OST in *The Sustainability of University Research* offered a suggested approach to public funding support for externally funded research projects- including projects funded by research charities- based on the contribution to the public good (in terms of the public research basis and the public good more widely). While we consider that the proposed guidance was clear it did not cover important areas like EU-funded projects. Most importantly, however, the guidance fails to address the ability of QR at current levels to meet all the contributions that might be expected, let alone continue to support the development of research capacity and support “blue skies research”. HEFCE has recently estimated that the dual support system is out of balance by £900m.
19. HEFCE Research report 02/07 identified a number of perverse incentives created by the current system of funding. In particular:
- without charitable research grants the number of research staff and the volume of research would be reduced by about 25%;
 - individual academics need publications and research profile to have any hope of a successful career;
 - institutions need a research profile to be able to attract high quality students and staff, business from industry (and they know if they turn down grants another competitor institution will gain them);
 - Research Council and Charity funding panels wish to fund as many quality projects as possible at the best value they can obtain;
 - Government wishes to increase the volume and quality of research and its contribution to the national economy;
20. The move towards a full economic costing basis by institutions, and recognition of this by funders, will help to overcome some of these problems in the longer term, though is only part of the solution. There also needs to be sufficient funding flowing through both arms of the dual support system. It is also important that sustainability of research is not seen in isolation from teaching and other activities, it needs to be considered in the round.
21. While Universities UK generally welcomes the decisions on the RAE review announced by the Funding Councils¹³ we continue to be concerned that mechanisms for how research is to be assessed and how it is to be funded are being considered separately. The results of the 2001 RAE exceeded expectations but the failure of the Government to fund the outcomes fully caused concern in the academic community. Universities UK remains deeply concerned by the cuts in funding to departments rated 4 and below and, as noted in response to Question 2 above, we believe that the

¹³ RAE2008, *Initial decisions by the funding bodies*, the four UK Funding Councils, Feb 2004



Government's policy of further concentration of research funding risks creating an inflexible and unresponsive research base.

22. There is as yet no clear indication of how funding will be allocated according to the quality profiles. In the light of the experience in 2001 we believe it is essential for the funding of different levels to be reasonably predictable if higher education institutions are to be able to plan within a stable financial framework. The funding decisions based on the outcome of the RAE2008 should not be subject to retrospective manipulation.
23. Reducing the uncertainty between RAE performance and QR funding offers the clearest way of encouraging institutions to address the need for capital investment in the research infrastructure. The 'soft' money from research grant and contract income does not encourage long-term thinking about investment.
24. We welcome the substantial commitment to the research infrastructure provided by the Government and Wellcome Trust in the Science Research Investment Fund (SRIF). This has had many positive aspects. The formula approach to the distribution of SRIF has been valuable in encouraging institutions to consider investment on a longer-term basis.
25. Despite this, as we argued in our submission to SR2004, the problems addressed by SRIF have not yet been solved. Much of the additional investment was used to develop additional research capacity rather than remedy the historic under-investment in the existing infrastructure. Further investment in research is needed to ensure that the still considerable investment backlogs are met.
26. Allocations of capital funding need to continue to be on a formulaic basis rather than on the former highly specific, short-term earmarked regime. This will allow universities to continue to improve the management and strategic assessment of their estates and meet the changing demands of their customers (individuals, industry, commerce and government). An emerging issue that is also not addressed by SRIF and needs to be considered as part of the 10-year framework is the capital funding needed to meet the requirements of knowledge transfer and third stream activities.
27. Institutions have managed exceptionally well in difficult circumstances¹⁴. They have developed estates strategies linked to wider corporate plans and other institutional plans, such as financial strategies. The development of Estates Management Statistics (EMS) means that there is now a greater focus within the sector on producing management information that can enhance infrastructure management performance.
28. Finally, we have some concern that there has been a failure to join up various elements of Government policy that inhibit parts of the science agenda. For example, the Finance Act 2003

made the creation of spin-out companies disadvantageous for universities and their staff. Whilst there have been some helpful moves to resolve this, the problem remains without a robust and permanent resolution. In addition, changing rulings on VAT have had a large effect on the research base, and again do not help create an environment that is conducive to long-term planning.

Management of the science base – Large Facilities

Question 8: What is the optimal means of developing access to large research facilities at national and international level?

Key Points:

- Universities UK fully accepts that some areas of research require multi-million pound facilities and it makes sound scientific and economic sense to provide such facilities centrally or in some cases regionally.
 - Each area needs to be considered on its merits and a full business case developed. In some cases international collaboration will be appropriate as with large telescopes and particle accelerators. In other areas national or regional centres may offer the most appropriate solution
 - The areas of research requiring expensive equipment and facilities tend to be those where collaboration between researchers in different institutions will be likely to offer considerable benefits
29. When planning new national or regional facilities or seeking membership of international facilities it is important that the Government establishes mechanisms for consultation with researchers in the UK in the relevant fields on the location and management of such facilities.
30. The “one size fits all” approach should be avoided in considering investment in national facilities or in joining international facilities. It is important, however, that potential users are networked together to ensure that opportunities for collaborative use of facilities are followed through.

¹⁴ This has included a bulge of 1960s and 70s buildings nearing the end of their design life; unpredictable incentives that have often rewarded those with poor estates; marginal funding of much of the growth in HE over the last decade; a rapid escalation in the cost of new technologies.



Knowledge Transfer and the Lambert Review

Question 9: The Lambert Review was based on extensive consultation during 2003. Reactions to the analysis and proposals set out in the Lambert review and in particular to the Government's proposed response are very welcome.

Key Points:

- Universities UK welcomes the Lambert Review report published in December 2003. In particular we are pleased that the report acknowledges that the main challenge in business-university collaboration lies on the demand side.
 - We strongly support the report's recommendation for a substantial, consistent and permanent third stream funding to support knowledge transfer activities.
 - We also support the proposal for the Government to provide a new stream of business-relevant research funding of £100-200 million, but are have concerns about the recommendation that this stream should be allocated for distribution by Regional Development Agencies (RDAs).
 - We believe RDAs can potentially play an important role in facilitating business-university links.
 - We welcome the report's recognition of the progress that universities have made in terms of the standard and effectiveness of their management.
 - We are concerned that the Chapter in Lambert on skills fails to address the key issues.
31. The achievements of the universities and other higher education institutions in pursuing increased collaboration with business are highlighted in the annual Higher Education Business Interaction survey¹⁵. The survey data showed the following key changes over the past year:
- increased planning for business support provision;
 - increases in CASE studentships, Knowledge Transfer Partnerships from under 900 to well over 1000 between 2000-01 and 2001-02 and the financial value of research partnerships with SMEs;
 - 61% of HEIs now have in-house licensing activity and total Intellectual Property (IP) revenues have risen sharply;
 - income from consultancy activity increased by 18%;

¹⁵ *Higher Education-business interaction survey 2001-2002* HEFCE January 2004/07



- 19% increase in staff dedicated to commercialisation and related activities; many supported by third stream funding.
32. These improvements stem in large measure from the flow of third stream funding and the increased importance given to knowledge transfer activities in universities' strategic planning. Lambert's support for this stream of funding to be made permanent recognises the importance of this activity within the national research strategy.
 33. Improvements in knowledge transfer are heavily dependent on improved human interactions between business people and people from universities. Such interactions help to remove misconceptions and dispel ignorance on both sides. We support Lambert's proposals for the removal of barriers that act as disincentives for individuals to move between the two.
 34. We have concerns over a single protocol for IP. There should be a number of models that recognise that the relationship between universities and business will be different according to the type of business and the particularities of each research contract.
 35. While we see RDAs as being well placed to promote the building of business-university collaboration across their regions to help promote regional economic strategies, we do not believe they currently have the expertise to allocate research funding. If they are to take on this role they need time to develop the necessary systems and know how and need to link with other research funding bodies. In addition, all RDAs are not equally capable.
 36. The document makes an important point about the fragility of the research and development base being dependent on a few key industrial research investment decisions. There is however a need to analyse this in more detail, in terms of what is spent on what and by whom. This would no doubt show that much of what is defined as science in the document is hardly funded at all, and that pursuit of the significant part of the GDP growth agenda means finding a way to work with the big players as much as with SMES.
 37. Through the adaptation of current structures of management and governance, universities have successfully met numerous challenges arising from changing demands. We do not believe that the code of governance suggested by Lambert, which implies "one size fits all" is appropriate for the needs of different kinds of institutions in the sector. A good practice guide would in our view be more appropriate.

Education and Skills – Roberts Review

Question 10: Following the 2002 review by Sir Gareth Roberts of the supply of scientists and engineers and the Government's response, what is the emerging evidence on the prospects for the



supply and demand of science, technology, engineering and mathematical skills? What further steps could the Government take to ensure that the supply of these skills is responsive to the demands of the Economy over the coming decade? How could women and other low participatory groups be more encouraged to pursue higher education in science, technology, engineering and mathematics and to pursue careers in these areas?

Key Points:

- We welcome the actions taken by Government to implement the recommendations in Sir Gareth Roberts' review of the supply of scientists and engineers. However, it is still very early days. Many of the reforms are about changing young people's attitudes to careers in science and engineering. Such changes in attitude have long lead-times.
 - We also welcome the Government's acceptance of Sir Gareth's recommendation to review the position after three years. It will be important, however, to avoid pulling up the plant before it has had a real chance to bear fruit.
 - The pay modernisation proposals that have now been agreed with the trades unions offer an additional opportunity to improve the pay and conditions of research staff, but this will increase the cost of research.
 - The Roberts review has now been helpfully supplemented by the review of post-14 mathematics teaching by Professor Adrian Smith¹⁶. An increased supply of young people well qualified in mathematics is critical to sustaining and developing the UK research base, not just in the traditional mathematics-based disciplines of engineering and the physical sciences. Implementation of Professor Smith's recommendations must form part of the 10-year research investment strategy.
 - The policy of increased concentration of research funding is putting the ability of the UK to develop the next generation of research staff at significant risk.
38. Sir Gareth Roberts' review was a comprehensive analysis of the factors affecting the supply of scientists and engineers to research and to the economy more generally. His recommendations addressed issues at all levels from primary education through to the remuneration of postdoctoral research staff in universities and research careers. The Government by and large accepted these recommendations, but many of the proposals are only now coming on stream. It is important, therefore, that the three-year review does not have unrealistic expectations of change. The very welcome Science Learning Initiative, designed to improve the supply of better skilled science teachers and in turn demand for science through exposing young people to enthusiastic, committed

¹⁶ *Making Mathematics Count*: Report by Professor Adrian Smith on post-14 Mathematics DFES, February 2004

and well trained science teachers, is one such example of an initiative that may take time to bear fruit.

39. Professor Adrian Smith's proposals in *Mathematics Counts* are aimed at increasing the supply of young people with mathematical skills. These recommendations are important not just to the health of the research base in science and engineering, but much more widely, as research in many disciplines is increasingly dependent on numerical and statistical analysis. Those new areas of science that are developing already have, and will increasingly have, a need for the fundamental disciplines of mathematics, physics and chemistry.
40. Similarly, in Scotland, the Scottish Science Advisory Committee published a paper in November 2003 that made a number of recommendations on supporting and improving science education in Scottish schools¹⁷.
41. The Universities and Colleges Employers Association (UCEA) has now obtained the agreement of the trades unions to its pay modernisation proposals. These are likely to produce some improvement in pay rates for individual researchers as their posts are subjected to pay evaluation. This should help to retain researchers in the system and may increase the attraction of research posts to individuals. This is one factor in the additional cost of the pay modernisation proposals for which we have bid for additional funding within our SR2004 submission¹⁸, and those from the devolved administrations. It will also increase the full economic costs of externally funded research proposals.
42. The fall out from the reduction in funding to 3a and 4 rated departments in the 2001 RAE in terms of departmental closures is continuing, especially in the physical sciences. The Royal Society of Chemistry and the Institute of Physics as well as the EPSRC have all drawn attention to the impact of these departmental closures on the science base and in particular on the UK's ability to train the next generation of researchers and sustain its capacity and reputation in these subjects.
43. We welcome the Government's *Strategy for women in science, engineering and technology*, in response to the recommendations made by Baroness Susan Greenfield's report *SET Fair*, which was published in November 2002. The Athena Project is a UK-wide initiative set up in 1999 by the UK HE funding councils, Universities UK and OST to encourage the advancement of women in HE SET careers. To achieve this, Athena works with HE institutions to develop, share, encourage and disseminate good practice and to:
 - increase the number of women working in SET (as postgraduates, researchers, and lecturers through to professors); and

¹⁷ Why Science Education Matters: supporting and improving science education in Scottish schools. SSAC, November 2003.

¹⁸ Universities UK's submission to the 2004 Spending Review, *Achieving our Vision*, calculated this to be equivalent to 5% of the current pay bill, this represents an additional £602m over the spending review period.



- improve the career development of women in SET (their recruitment, retention, participation, progression and promotion).
44. These are important initiatives that should continue to be supported and built upon. They should also be regarded a fundamental part of broader policies aimed at enhancing the attractiveness and profile of careers in science for all groups.
45. In addition widening participation is crucial. It is important to reverse the decline of SET provision in those institutions that are most actively engaged in widening participation. Again, further concentration of research funding will not be conducive to exposing students to researchers who can motivate and inspire the next generation of scientists.

Education and Skills- UK Business Leaders and Managers

Question 11: Do UK business leaders and managers have the necessary skills and knowledge to exploit new technology and research to maximum effect? Where are the areas of greatest weakness and opportunity in terms of sector, size of enterprise and level of management? What can and should be done to bridge the gap?

Key Points:

- There is a need to produce a breed of leaders in business that can exploit innovation and take it to market quickly. Individuals should be encouraged to undertake training in the management of innovation, for example on specialist Master's courses.
 - The ability of business leaders and managers to exploit new technology is crucially dependent on the size, sector and type of business.
 - Traditional business sectors and academic disciplines hide new key areas of business such as the creative and digital media industries that are well placed to benefit from new technologies.
46. Business needs to understand that the training of employees and investment in their education is key. There is a need to produce a breed of leaders in business that can exploit innovation and take it to market quickly. Individuals should be encouraged to undertake training in the management of innovation, for example on specialist Master's courses in universities, and initiatives put in place to encourage this.
47. Many large businesses and certain types of small business are able to exploit relevant new technologies. Some large businesses are significant contributors to the knowledge base in their own



right and many more have developed relationships with particular universities or academic departments. Those small businesses that are emerging or rapidly growing high technology companies are often at the forefront of technological development. Some of these will have been spun-out from universities. The vast majority of SMEs, however, do not currently relate to new technological developments, even where these are relevant to the development of the company. As noted earlier, a recent report from the Engineering and Technology Board chaired by Sir Peter Williams¹⁹ reviews existing research and presents the results of separate research it has sponsored on the issue of take-up of R&D by different types of company, and the contribution such companies make to national wealth. The Technology Venture Scotland report on innovative SMEs, *Bridging the Gap*, referred to above, also provides a good analysis of this for Scotland.

48. As the Lambert review recognised, universities can and do assist in the knowledge transfer process and the exchange of skills in a variety of ways through:

- collaborative research;
- consultancy;
- work placements of graduates and undergraduates;
- initiatives like the knowledge transfer programme;
- through specific training programmes

49. The Government envisage that the small business service should broker relationships between universities and small businesses. However, only a minority of small businesses are likely to be well placed to benefit from the kind of services that universities are able to provide.

Public Engagement with Science

Question 12: What should the role of Government be in improving the interaction between science and society? Are there areas where Government could improve the promotion of science in society? How can we improve public confidence in the Government's use of science? What should we be aiming to achieve in this area in the next ten years?

Key Points:

- The Government, and scientists need to be honest about the limitations of scientific findings and recognise that there will be uncertainties.

¹⁹ *The Frontiers of Innovation: Wealth creation from Science, Engineering and Technology* Engineering Technology Board March 2004



- There needs to be improvement in the teaching of science in schools by properly qualified science teachers and the inclusion of scientific issues in the school curriculum, not just for those studying science subjects.
 - It is important that the understanding of what it means to be educated prior to entering university incorporates proficiency in and measured understanding of aspects of science and mathematics.
 - There needs to be better public education about science through the media and use bodies that have public trust such as the British Association for the Advancement of Science, the Royal Society and the Royal Society of Engineering. Policy makers including politicians and civil servants need a better understanding and engagement with science.
 - Good scientific communicators need to be encouraged and recognised.
50. Over the last fifteen years the Government has faced great difficulties in handling scientific findings relevant to immediate public concerns such as BSE, foot-and-mouth disease and GM crops. In the face of having to make rapid far-reaching decisions in the face of a major crisis, it is very difficult to get over to the public the inherent uncertainties in scientific findings while at the same time provide re-assurance to the public that the crisis is being addressed. Against that background it seems essential that the government should seek to share the scientific findings on which policies are based on a more regular basis rather than awaiting the anguished and emotional debates of the next crisis. In particular, the Government should seek to accustom the public to the need to take decisions where there is a degree of uncertainty, that there are risks in any decision, including doing nothing. A better understanding and engagement in science by parliamentarians and civil servants is essential.
51. The importance of good science teaching in secondary schools was addressed fully in the Roberts review, but one spin-off from improved science teaching would be improved public understanding.

Partnership Funding – Business

Question 13: What is the outlook for business investment in R&D over the next decade? How can business investment contribute to the ten-year framework for science and innovation?

Key Points:

- Only certain types of companies currently believe they need to invest in R&D.



- The UK is a long way short of the target set by the EU in Barcelona in 2002 of investing in R&D, by 2010, 3% of EU GDP in R&D from both public and private sources.
 - Universities are well placed to assist business investment in R&D through collaborative research and through various publicly supported schemes like the Knowledge Transfer Programmes and through knowledge transfer activities more generally.
 - R&D tax credits can clearly help to encourage investment in R&D, but they have had limited penetration to date. Further work needs to be done in making these more favourable and communicating the benefits.
 - More needs to be done to help create the right conditions for business to invest in R&D. This needs to be sensitive to the way in which business operate, for example, in terms of financial viability and value to shareholders.
52. All the evidence points to a relatively low level of investment by business in R&D in the UK, with the notable exceptions of the defence and the biotechnology-pharmaceuticals sectors²⁰. If business investment is to make a significant additional contribution to the ten-year framework a wider range of businesses will need to invest in R&D strategically. Improvements in the level of public investment in R&D will not alone enable the UK to meet the Barcelona objective of increasing EU expenditure in research and development to 3% of GDP.
53. The Lambert review recognised the efforts that universities had made to work with businesses to promote collaborative research and knowledge transfer and recognised that the barriers to further development lay with the lack of demand from business. It is clear that publicly supported schemes like Knowledge Transfer Partnerships (formerly TCS) do encourage business R&D, but the number of companies involved is small. The continuation and enhancement of third stream funding and the new collaborative research funding stream proposed by Lambert are all likely to contribute to increased business investment in R&D and are welcome.
54. Some universities in the UK have a very strong track record in collaborating with business to support R&D to mutual benefit. We should seek to learn the lessons of that experience.
55. As noted by Lambert, the university departments that businesses have found it most beneficial to collaborate with have often been those rated 3 or 4 in the RAE. This provides another reason for not concentrating research funding for universities any further.
56. Whilst we welcome the new stream of funding to support collaborative research with business we remain concerned about the proposal to allocate this to regions for distribution. The most

²⁰ Adams & Smith, *Research and the regions: An overview of the distribution of research in UK regions, regional research capacity and links between strategic research partners*, Higher Education Policy Institute, 2004



appropriate collaborative partner for a particular business may lie outside the region and this may rule out access to the collaborative funding.

57. The Innovation report suggests that the biggest contribution to business innovation from the education and training sectors comes from the employment of graduates and other qualified manpower bringing their knowledge and skills to bear directly on the business.

Partnership Funding - Medicine

Question 14: What are the research aspirations and funding plans of the medical charities over the coming decade/ how best can Government and charity funders work together to enhance the impact of their complementary research efforts on national and global health outcomes and contribute to the maintenance of a sustainable science base?

Question 15: Are there ways in which Government support for medical research – in terms of both institutions and the distribution of funding – could be better structured in order to maximise the benefits of investment from partners in industry and the medical charities? What should Government and the NHS be doing over the ten years of the science and innovation framework to ensure successful partnership working in medical science?

Question 16: In the light of the second Wanless Report, where are the weaknesses in public health research capacity? How can we improve the links between academics and deliverers of public health, to ensure a strong evidence base, both on causality and on effective, well targeted interventions? How should the roles of the various research bodies be better co-ordinated in relation to public health, to ensure that public health requirements are met in a structured and coherent way?

Key points:

- The Government must hold the ring between the various funders of medical/ public health research to ensure that the implicit division of labour between medical charities, the MRC, the NHS and industry continues to sustain strong funding streams for basic research, clinical research and research to underpin healthcare across all areas relevant to health and patient care, and does not leave important areas under-funded.
- The balance of healthcare practice is shifting away from hospital-based care towards primary, community-based care. The planning of funding by both medical research charities and government funders needs to reflect that shift. Clinical research in primary care and research in public health within universities are in general less well developed than hospital-based clinical research.



- There needs to be a continued funding stream from the Department of Health and the HE Funding Councils for capacity building in primary care, public health, nursing and allied health professions.
 - There is evidence of improved partnership working between research active clinical staff in the NHS and research groups in universities. This is welcome.
 - There must be a concordat between medical research charities, universities and government about how the full economic costs of research funded by the medical charities is to be met to ensure the sustainability of the research base within universities.
58. There is an implicit division of labour between the medical research charities, the MRC, the NHS and the pharmaceutical industry in the areas of research that they support. It is important for the Government to have an overall view on the working of this division of labour, especially in the face of changing priorities and approaches to health care, to ensure that strategically important areas are attracting funding and not falling between different funders.
59. The current shift of approach to healthcare with greater emphasis on primary care is an example of changing research needs and priorities, as are the requirements to strengthen public health research capacity. The 2001 RAE results revealed a much more robust research base in hospital-based clinical research than in primary care-based research, nursing and allied health professions or public health. However, even for hospital-based clinical research a significant proportion of units were rated 4 or 3a - in some cases in new centres. Further increases in the concentration of QR funding would further undermine capacity in these areas of crucial importance to improved patient care.
60. Government funding through the Health departments to build-up research capacity in primary care and related areas such as nursing and public health and HEFCE's decision to continue to fund departments rated 3a or 3b in nursing, and other studies and professions allied to medicine is a welcome recognition of the need to build capacity in these areas. This is not, however, a short-term problem and needs to be addressed within the ten-year strategy. We are concerned that proposals to replace the current separate funding streams for increasing research capacity in identified areas by the Department of Health with a single generic fund for research capacity building across the health sector may have the effect of diminishing funding in all these important areas, and possibly a lack of strategic drive when disparate areas are part of a single funding stream.
61. We welcome the encouragement that has been given to research active clinical staff in the NHS to work with university researchers. This kind of collaboration is of particular importance to public health research and increases the chances of quicker benefits for patients from research. The 10-year investment strategy should provide incentives to encourage the further development of such partnerships. However, it is important that public funding should only support work of high quality,



whether the research is basic, clinical or health service research. This will be best achieved if universities are involved in the great majority of the work funded in and through the NHS as well as conducting their own research.

62. Public health research requires a concerted effort and is of key importance to the future health of the nation. There are many aspects to improving public health research in the UK. There is a need to capacity build in this area and thus a requirement to improve research training opportunities for young trainees. There is also the requirement for new research council funding schemes that are geared towards acknowledging the more long term and applied nature of public health research. It is also fundamentally important that RAE 2008 is configured to recognise the value of PH research.
63. As noted under questions 5, 6 and 7, the Government need to ensure dialogue and agreement between universities and medical charities to help secure the sustainability of the research they fund in universities. If unchecked this level of shortfall will weaken capacity or even drive it out as universities seek to manage an increasingly tight overall financial position. Without an increase in funding to support this activity, needed to ensure the long-term sustainability, the volume of research in universities funded by charities will have to be reduced.

Science and Research Across Government – Policy Development

Question 17: What are the public service objectives and priorities for science and research over the next decade to contribute to policy development, service delivery and the wider economy? How can wealth creation potential of investments in R&D across different Government programmes be increased?

Question 18: How can Government best secure greater synergies between research funding investment and strategies across different public programmes and link the Government's overall objectives for research outputs with the capabilities in the UK science base?

Key Points

- The assurance that Government departments will in future procure research from universities on a full economic cost basis is welcome.
- In addition to health, discussed in questions 14-16 above the critical areas of research to contribute to public policy are likely to be:
 - climate change and alternative energy sources;
 - the impact of an ageing population;



- barriers to participation in education and training for particular groups;
- the built environment;
- alternatives to agriculture in land use.
- The Government needs to continue to develop its understanding of the capacity of the science base to contribute to public policy research.
- There is a need to recognise that the purposes of public investment in research go wider than supporting business innovation.
- As with business/university interactions, interactions between government departments and universities could be enhanced by more secondments, exchanges, and job shadowing.

Science and Research across Government – National/Regional Co-ordination

Question 19: How can the Government and Regional Development Agencies and their equivalents in the Devolved Administrations help integrate funding of science research on a predominantly national basis with development and delivery of regional economic strategies? In particular, how can Government and RDAs strengthen partnership working to facilitate more effective knowledge transfer and research collaboration?

Key Points:

- Universities UK recognises the important role that RDAs and their equivalent in the devolved administrations can play in co-ordinating and promoting business development in their regions. It must however be recognised that universities and their research, development and knowledge transfer agendas play across local, regional, national, and international boundaries.
 - We support the new funding stream for university-business research collaboration proposed by Richard Lambert, but do not believe that RDAs are currently fit to distribute those funds.
 - The regions' involvement in co-ordinating bids and advising HEFCE on the allocation of funding for knowledge transfer activities under the Higher Education Innovation fund (HEIF 2) also provide a useful model for regional national partnership in this area
64. Clearly with the development of Regional Economic Strategies and Frameworks for Employment and Skills Action in each region by the RDAs, they are major players in ensuring that businesses in their regions benefit from knowledge transfer from the research base in their regions and more widely. They are well placed to understand the need, and potential opportunities, for delivering



knowledge transfer from higher education institutions. Hence we welcome their involvement in the assessment of bids to HEFCE from the Higher Education Institutions for HEIF 2 funds.

65. If the Government accept Richard Lambert's proposal for a separate stream of research funding for collaborative research between universities and business we consider that the role of the RDAs in the distribution of those funds should be on the HEIF 2 model. The research monies should be distributed in common with other research monies on the basis of the quality of the department, but with measures beyond those used in the RAE, including the level of research and knowledge transfer income already generated. The existing model of the allocation of funding for Knowledge Transfer Partnerships may also offer some useful lessons.
66. If RDAs are to be more fully involved this could only be after a period when they were able to develop the necessary expertise in assessing the relative quality of research proposals.
67. The devolved administrations in Scotland, Wales and Northern Ireland are already developing approaches to reflecting their own assessed needs for research funding within a system where allocations are essentially driven by a UK wide system. It is important that, in seeking increased involvement of the RDAs in the allocation of funding for research, England seeks to learn from the success and failures of the other countries in the UK.

Science and Research across Government – EU research programmes

Question 20: Are there barriers facing business and the science base in effective engagement with EU research programmes? How can the UK more effectively influence and benefit from EU research funding and policies? In what ways can action at Community level add value to UK science and innovation policies? How can national and community funding complement each other more effectively?

Key points:

- EU funding rules are particularly pertinent to the issue of sustainability and the relationship with sustainability – public UK funding.
 - Will the UK benefit from the establishment of the European Research Council?
 - International collaboration is essential to the health of the UK science base- the EU provides major opportunities for such collaboration.
68. In 2000-2001 UK higher education institutions have been extremely successful in gaining funding from EU sources and received over £170 million in research income over this period. However, this



income is provided on the basis that the institution will match it. Apart from limited support in Scotland, for the participation in proposals for framework programmes²¹, the UK government and devolved administrations provide no funding to match EU funding secured by institutions. Clearly under this funding arrangement the external funding falls well short of the full economic cost. Institutions securing EU research funding therefore have to draw on QR funding or otherwise subsidise the EU projects. This is a particular problem for those institutions in receipt of only modest amount of QR funding.

69. It is vitally important, if we are to continue to be significant recipients of EU research funding, that the UK Governments recognise the impact of the EU funding regime on sustainability. Ironically, success at winning prestigious EU projects may incur substantial financial costs for institutions.
70. Further work also needs to be done on educating the commission on the full economic costing model and lobbying for more of the full economic costs of research projects to be funded.
71. It remains unclear at present where the balance will lie between competition and collaboration in the approach adopted by the proposed European Research Council. However, it is likely to have important interactions with the UK's research funding arrangements and it is vital that the Government recognise its role in relation to the ten-year investment strategy. Some key principles for the creation of an ERC are:
 - funding must be additional and not top sliced from Research Council funding;
 - research funding must be allocated on a meritocratic, open and competitive basis;
 - there should be provision for solo institutional bids;
 - funding should be provided to meet the full economic costs of projects.
 - The proposed ERC must operate separately from the European Commission, for example through a new agency.

²¹ In December 2003 the Scottish Executive provided funds to the Scottish Higher Education Funding Council (SHEFCE) for a pilot scheme to provide limited financial support for the preparation of Network of Excellence (NoE) or Integrated Projects proposals under EU Framework Programme 6. Full details of SHEFC's proposal assistance for coordination of European framework programme VI research projects can be found at <http://www.shefc.ac.uk/library/shefc/circular/2003>.