

Increasing the economic impact of Research Councils

**Advice to the Director General of Science and Innovation,
DTI from the Research Council Economic Impact Group.**

14th July 2006

Executive Summary

Science and innovation underpin the UK's position in the global economy. The UK needs to maintain its position as a world leader in high value added industries to ensure growth in our prosperity and quality of life.

Research Councils have pivotal roles, both as funding bodies and as leaders of the research base. They are increasing their emphasis on knowledge transfer and the economic impact of their work. They must increase that emphasis further without sacrificing the research excellence for which the UK is rightly admired.

Research Councils deliver economic impact through Universities and Research Institutes, in co-operation with Funding Councils and economic development agencies.

In recent months, both the House of Commons Select Committee on Science and Technology and an independent External Challenge Group have produced reports on Research Council knowledge transfer. The thrust of these reports, and of our own deliberations, can be condensed into three key issues on which the Research Councils must act:

- their **leadership** of the knowledge transfer agenda;
- their role in **influencing** knowledge transfer behaviour of universities and Research Council Institutes;
- increasing their **engagement** with user organisations.

Recommendations

In our view the Research Councils have already made good progress in creating the frameworks to deliver a step change in economic impact. Chief Executives of each Research Council are now responsible for the economic relevance of their programmes and for the impact of their spending, through the objective delivery process. There are a range of policies now in place to deliver a step change in the economic impact of the Councils, but the potential of these policies needs to be realised.

The level of emphasis on knowledge transfer should continue to increase and should be reflected clearly in Research Councils' leadership of the research base.

Recommendation 1 – Leadership

Chairs of Research Councils should ensure that economic impact is given a high profile in Council strategy. Chairs and their Councils should promote a wider awareness and wider debate of the economic impact of Research Council spending.

One of the Research Council chief executives should be nominated by RCUK to champion the work on economic impact across all Councils. They should communicate a strategic vision for Research Council knowledge transfer. This should be a permanent post, filled on rotation by other chief executives. The period of rotation should be long enough to allow the nominated chief executive to make a strong personal impact on the economic impact agenda.

The nominated chief executive should promote the diffusion of successful knowledge transfer schemes across the Research Councils, harmonizing branding and terminology where possible.

Recommendation 2 – Influencing

The Research Councils should influence the behaviour of universities, research institutes and Funding Councils in ways that will increase the economic impact of Research Council funding.

The nominated chief executive should focus the Research Councils on:

- working with the Universities, research institutes and Funding Councils to persuade them to take account of economic impact in the terms under which funding is awarded;
- Work with the RDAs and DAs to strengthen their linkage with the Research Councils and to promote the dissemination of the research.
- improving their interaction with SMEs, working with economic development agencies as intermediaries across the UK;

- incentivising universities and research institutes to identify and promote the economic impact of earlier Research Council spending, for example through new prizes and other awards for knowledge transfer excellence.

Research Councils should promote more extensive interchange of people and ideas between the research base, industry and public services. Research Councils should influence universities and Funding Councils to reward business interactions when allocating resources.

In particular Research Councils should:

- expand incentives for researchers to participate in knowledge transfer;
- foster the development of partnerships between research groups in the UK and overseas centres of excellence;
- encourage and reward two-way secondments between the research base and business;
- encourage universities to make enterprise training widely available for researchers in all disciplines.

Recommendation 3 – Engagement

Strategic Challenges

RCUK should engage Government, business and the public services in a wide-ranging dialogue to develop overarching, economically relevant ‘research missions.’ These missions should address major strategic challenges for the UK.

These missions should:

- be in areas where the UK wishes to become a world leader (e.g. Energy, Creative Industries and eScience);
- span all disciplines and be open to other funders;
- bridge the boundaries created by the existing research disciplines and any organisational barriers between funding bodies.

Programme Funding

Research Councils allocate a substantial part of their funding to programmes relevant to their user communities.

These programmes should:

- reflect nationally important strategic goals;

- engage economic stakeholders;
- form part of each Research Council's overall strategic plan and be supported by funding secured over an appropriate timescale, varying in scale to reflect the size of the challenges
- give greater prominence to follow-on funding to develop promising research results to a stage where they attract external investment.

Peer Review

Research Councils should ensure that:

- peer review panels contain members expert in identifying work of potential economic importance;
- reviewers' training includes the importance of economic relevance to the overall Council mission;
- guidelines for reviewers are clear on how they should score the economic impact of bids and how this score is related to the other measures by which bids are assessed;
- applications for responsive mode funding identify potential beneficiaries of the research.

Recommendation 4 – Metrics

Research Councils should make strenuous efforts to demonstrate more clearly the impact they already achieve from their investments. It is difficult to measure the economic impact of innovations which may be delayed in time and indirect in consequence. It is important to measure outcomes, however difficult, rather than outputs

In particular:

- each Council should describe the economic impact of investment in their field of research in a one-off report, setting a baseline against which further economic impacts can be assessed and reported on an annual basis;
- thereafter, RCUK should benchmark Research Councils' economic impact against that in other parts of the world;
- each Council should publish a bi-annual survey of their user community's level of satisfaction with Research Council work. The survey should be conducted by an independent organisation.

Each Research Council should publish a report on its implementation of Recommendations 1-4 above 12 months after the publication of this report.

Principal Findings

Background

The global economy is changing at an unprecedented rate. Advances in technology have dramatically reduced the time and cost involved in conducting economic transactions over long distances. Product cycles are accelerating in response to consumer demand, leading to the development of more agile, globally networked value chains.¹ In all countries, economic activity is under pressure to move up the value chain, with developing and emerging economies fast catching up to established players: already, these countries account for one third of global high technology exports.² China and India are investing increasingly in skills and research, and are attracting globally mobile R&D investment. Against this background, established economies such as the UK need to adapt in order to continue to attract and retain high-value economic activities.

Research excellence is at the core of the UK's knowledge base. It underpins our ability to create, absorb and deploy new ideas rapidly. It is a core UK "brand value" when seeking to attract or retain investment from global businesses. The Research Councils' primary task is to deliver excellent research in globally competitive, networked institutions. However, in today's world, the UK's ability to compete and maintain its leading position is dependent on its success at translating the wealth of knowledge and people from our excellent research base into the economy.

The economic impact of the Research Councils' activity needs to be viewed in the context of the economy as a whole. In an increasingly globalised industrial world companies will only locate or choose to remain in the UK if such a location offers competitive advantages over alternative locations. The UK cannot hope to compete with the labour costs in developing countries nor does it have strong natural resources. Success will be dependent on the skills and business climate that the UK offers.

Intellectual capability and creativity is a fundamental part of this. It is created by having Universities that are at the cutting edge of international research and by having a strong stream of graduate and PhD students flowing from these Universities into industry and commerce. Indeed, the output of highly educated people rather than research results is widely regarded as the most effective knowledge transfer mechanism.

In certain areas of the economy, especially the creative industries and financial services, innovation is increasingly driven by the interaction between technology and people. This can be seen in a range of businesses from broadcasting to computer games. This country's rich historical, literary, artistic and musical traditions contribute to our competitive strengths in ways that may not have been fully recognised.

Appendix A describes the economic impact of research.

¹ *European Commission: Community Research*,
http://ec.europa.eu/research/industrial_technologies/pdf/emo-7fpro-3mantys.pdf

² United Nations Industrial Development Organisation 2004: Industrial Development Report

Knowledge Transfer and Research Councils

In the past, knowledge transfer has not had as much emphasis as it should in the Research Councils. However, the emphasis is now being increased. Significant steps have already been taken and the Research Councils are developing further plans as exemplified in Appendix B. Together these increasing commitments represent a major shift in the Research Councils' approach to knowledge transfer which is being paralleled by a similar change to knowledge transfer and business engagement in universities. The impact of these changes has yet to be fully realised.

All Research Councils contribute to the creation of the intellectual climate in the UK. Graduates do not necessarily stay within their discipline; for example a substantial portion of PPARC PhD students move to the City where their numerical and analytical skills are highly valued. Moreover, whilst the benefits of EPSRC and BBSRC research may be obvious to many businesses, the contribution of the other Research Councils to the economy should also be recognised. For example AHRC research is of value to the creative industries, which now represent 8% of GDP and are growing at twice the rate of the economy as a whole³.

The economic impact of the Research Councils output is not limited to the private sector. Their research, in the economic, social and medical sciences, for example, is essential to the formulation of Government policy. Annex C illustrates the Research Councils' impact on policy formulation in areas as diverse as global warming, the auction of the G3 licences, motorway construction and GM crops. The economic consequences of poorly informed policies are considerable.

Step changes in economic impact will only be realised by addressing weaknesses in the overall process from research initiation to full exploitation / application. The early stages and later stages are well funded by the Research Councils and business respectively but there is a well-acknowledged funding gap in the middle which involves a number of funding organisations. The stages of the process are interdependent involving feedback and a more integrated approach is needed in addition to addressing the funding gap if the original Research Council investments are to feed through to exploitation.

Most Research Councils allocate funds between demand-led strategic programmes designed to tackle specific issues determined by their user communities and responsive mode funding where researchers submit applications that need not fall within any framework. Although the strategic programmes directly address priorities of user communities, we recognise that some major advances in technology have also happened serendipitously (for example DNA fingerprinting and the world wide web).

Research Councils are only one of several funders of research in universities. Figure 1 shows the breakdown of funders in 2004/05. Even for the research they fund, the Research Councils, can only influence the use of the research, as it is largely conducted by universities, which then own any intellectual property. Whilst Research

³ DTI Economics Paper 15: Creativity, Design and Business Performance; November 2005 - <http://www.dti.gov.uk/files/file13654.pdf>

Councils fund only a minority of research in HEIs, collectively they are one of the largest funding blocks. That gives them an important leadership role in the research base.

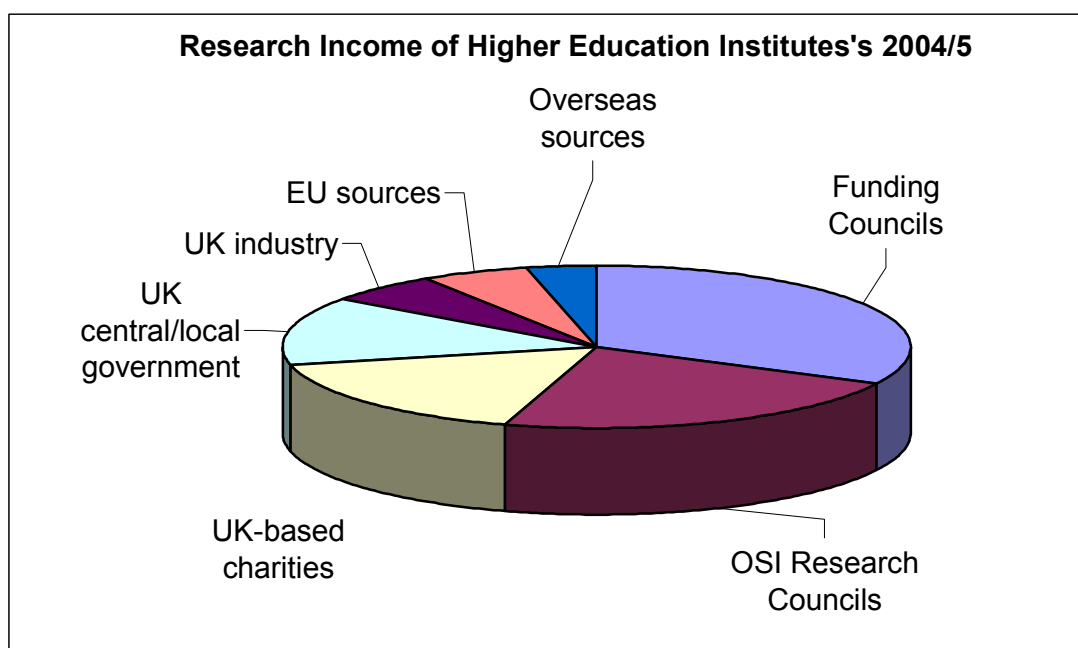


Figure 1: Resources of Higher Education Institutions, HESA 2004/05

The Context of this Report

The recent *Science and Innovation Investment Framework 2004-2014: Next Steps*⁴, published alongside the 2006 Budget, reaffirms the Government's long-term commitment to the research base. The document highlights that more must be done to maximise the economic impact of public investment in research. This is a key objective for the Office of Science and Innovation as part of the 2007 Comprehensive Spending Review (CSR).⁵

Around 80% of the Science Budget is currently delivered through the eight Research Councils.⁶ In the light of the CSR emphasis on economic impact, now is an appropriate time to investigate the current economic impacts of Research Council activity and to recommend how these impacts can be substantially increased in the future. At the request of the Director General of the Science and Innovation, Sir Keith O'Nions, the Economic Impact Group were asked to make recommendations as to how Research Councils can deliver - and demonstrate that they are delivering - a major increase in the economic impact of their investments. The membership and terms of reference of the group are shown in Appendix D.

Related Investigations and Reports

⁴ *Science and Innovation Investment Framework: Next Steps 2004-2014*, HM Treasury/DTI/DfES Budget 2006, http://www.hm-treasury.gov.uk/budget/budget_06/assoc_docs/bud_bud06_adscience.cfm

⁵ http://www.hm-treasury.gov.uk/spending_review/spend_csr07/spend_csr07_index.cfm

⁶ *Science Budget 2005-06 to 2007-08*, OSI, <http://www.ost.gov.uk/research/funding/budget05-08/index.htm>

In recent years, there have been several investigations into knowledge transfer and the economic impact of the research base, including the Lambert Review of Business-University Collaboration⁷, the House of Commons Select Committee Enquiry into Knowledge Transfer and the External Challenge Report on Research Council Knowledge Transfer. In addition, there have been reports on related subjects from the University Companies Organisation⁸, the British Venture Capital Association⁹ and the Council for Industry and Higher Education.¹⁰

Many recommendations from these reports are already being acted upon. This Group's recommendations are therefore made against a background of increasing commitment to knowledge transfer, not just by the Research Councils but within universities and user communities as well.

The Group has been conscious that any major shift in direction could interrupt the delivery of important changes that are already underway. The Group's recommendations therefore do not seek to disrupt these developments but reinforce them and provide greater strategic focus.

⁷ 'Lambert Review of Business-University Collaboration', http://www.hm-treasury.gov.uk/consultations_and_legislation/lambert/consult_lambert_index.cfm

⁸ Survey of UK University Commercialisation, UNICO, 2005

⁹ 'Creating Success from University Spin-outs', BVCA, 2005, <http://www.bvca.co.uk/>

¹⁰ International Competitiveness Business Views on the Role of UK Universities, CIHE, 2006

Appendix A - The Nature of Economic Impact

The Research Councils fulfil an essential role in undertaking world class research, and sustaining higher-level research skills. Basic research will never be adequately funded by the private sector alone because the innovations created by basic research benefit many other agents other than the firm who spends the money. The beneficiaries of these "spillovers" include rival companies, current and future citizens. Consequently, the private sector has insufficient incentives to invest in research and there will be too little knowledge created from the perspective of society as a whole. It also follows that the closer any research project is to the market, the more likely it is that the private sector will fund the research and it does not have to be subsidised by the taxpayer. This is why the public purse focuses on funding basic over applied, near market research¹¹.

These additions to the stock of knowledge and skills generate economic impacts through their application to achieve greater availability, choice and quality of goods and services, and better policy making. This results in aggregate improvements in welfare and enhanced economic growth.

An action or activity has an economic impact when it affects the welfare of consumers, the profits of firms and/or the revenue of government. Economic impacts range from those that are readily quantifiable, in terms of greater wealth, cheaper prices and more revenue, to those less easily quantifiable, such as effects on the environment, public health and quality of life¹².

The transmission mechanism by which outputs of the research base are converted into welfare improvements and economic impacts is complex. The outputs of Research Councils are not merely restricted to generating cutting edge research and adding to the stock of knowledge, the Research Councils also have an important role to play in the flow of skilled people (including graduates and academics) into industry and the public services, creating networks and promoting the transfer of ideas. In addition, Research Councils play a key role in the development and refinement of government policy.

The time taken for the transmission of research to improved welfare varies, and benefits are mainly realised in the medium to long term. Even with major breakthroughs, it may take ten years or more from the initial funding of the research before any significant level of economic impact is visible. Frequently the time elapsed is considerably longer.

A stylised outline of the transmission mechanism from research output through to economic impacts is set out in Figure 2. In assessing the economic impact of Research Councils, the Group mainly considered the supply side of the transmission mechanism, focussing on how Research Council outputs have moved from the left

¹¹ A number of key studies in the literature have looked at the economic impact of research and development, these include: Griffith, Redding and Van Reenan (2001); Guellec and Van Pottelsberghe (2004); Jones and Williams (1998); and Grilliches (1992).

¹² As set out in HM Treasury, "The Green book: Appraisal and Evaluation in Central Government," 2003, http://www.hm-treasury.gov.uk/media/05553/Green_Book_03.pdf

hand side of Figure 2 to the right hand side of firm and government activities, and consumer welfare.

Successful conversion of research outputs into economic impacts is also dependent on the demand side (marked by the arrows going from right to left in Figure 2). Simply having top rate research does not in itself ensure that businesses will either be aware of it, or use it. Successful economic impacts can only be achieved with consumers demanding new innovative products, and firms demanding different types of knowledge – including creative, design, organisational change – in order to implement new technologies.

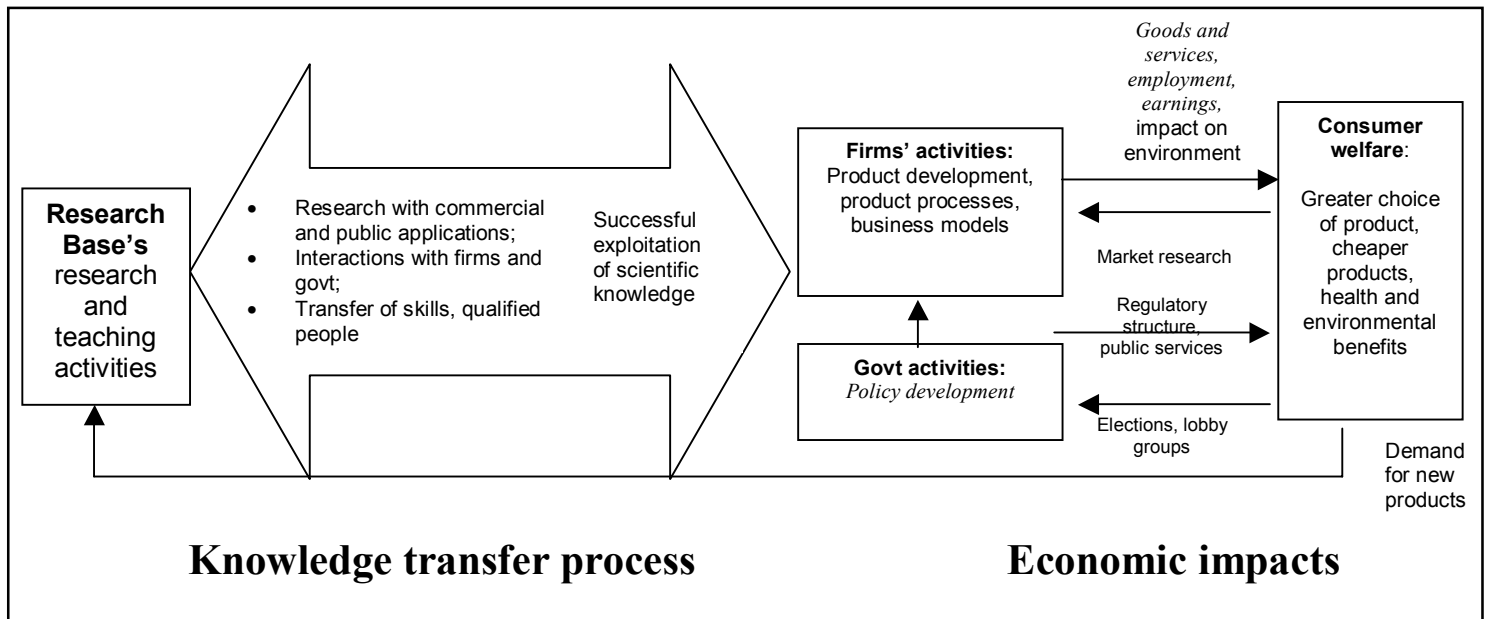


Figure 2: Transmission mechanism of research base benefits to economic benefits: supply and demand side

The activities of the Research Councils need to be viewed in the context of the UK economy as a whole, and our place in the global economy. In order to respond to the challenges of the rise of larger developing countries, which have lower labour costs and relatively high endowments of natural resources, the UK must retain its competitive advantage in skills and the overall business climate.

If the UK is perceived as a country with a high level of intellectual capacity and initiative, a flexible and constructive approach to commercial regulation and taxation, and a good infrastructure, then it will be successful in attracting more investment and generating more economic activity. Research Councils have an essential role in ensuring that British universities and British intellectual capability continue to be regarded as amongst the best in the world.

Appendix B

All Research Councils published Delivery Plans as part of the 2004 Spending Review allocations process. The Plans set out each Council's funding priorities and outline the activities that they intend to undertake over the SR2004 period. The Delivery Plans are part of a comprehensive Performance Management System which enables OSI to demonstrate the contribution that each Research Council is making towards achieving government targets. This System includes a series of performance metrics (the "Outputs Framework") and a set of targets and milestones arising from the activities set out in the Delivery Plan (the "Scorecard").

Knowledge transfer is an important element of this 'Output Framework' and some examples of key knowledge transfer activity can be seen in the box below. A longer list of their work in this area can be found at <http://www.rcuk.ac.uk/eig.asp>

Examples of Research Council impact

- AHRC funded archeologists discovered a new technique to read damaged Roman tablets. This has been adapted for use in medical imaging procedures, such as mammography.
- BBSRC: Research into the biology of crop pests has led to commercial alternatives to chemical pesticides. 'Nemaslug' is a commercial product that uses nematode worms to kill slugs without harming the environment.
- CCLRC, in conjunction with key partners, is establishing major national science and innovation campuses around its two laboratories. The campuses form a major component of the CCLRC's new KT plans.
- EPSRC: Research into mathematical models funded by EPSRC helps drivers to avoid congestion: traffic lights respond automatically to traffic volume.
- ESRC funded research contributed to the auction of the 3G mobile phones spectrum. The auction raised over £20 billion for the Exchequer.
- MRC will receive over \$200m in licence fees for rights to market HUMIRA, a treatment for rheumatoid arthritis.
- NERC data informs decisions on when to raise or lower the Thames barrier. Failure to prevent a flood in London would cost £30 billion, without counting the loss of human lives.
- PPARC: Terahertz imaging used to monitor planets is being applied to the security market. The technology can reveal hidden guns and explosives. Trials are currently underway at UK airports

Appendix C

The table below illustrates the areas where Research Councils have major and smaller but still significant, impacts on the public sector.

Research Council							
Impact on Public Sector Productivity	MRC	EPSRC	BBSRC	ESRC	NERC	PPARC	AHRC

Direct to Practice:

Health Care Outcomes	M	S	S	S		S	
Education Outcomes	S	S	S	M	S	S	S
Physical Infrastructure Outcomes		M		S			
Virtual Infrastructure Outcomes		M		S			
Creative and Heritage Outcomes		S		S			M

Indirect Via Policy Formation:

Economic Policy				M			
Sustainability Policy		S	S	S	M		
Health Policy	M	S		S	S		
Education Policy				M			S
Technology Policy		M	S	S		S	S
Creative and Heritage Policy		S		S			

M Denotes major contributions for research funded by that Research Council

S Denotes smaller but still significant contributions.

Appendix D

Terms of Reference for the Research Council Economic Impact Group

The aim of the group is to make recommendations as to how Research Councils can deliver - and demonstrate that they are delivering - a major increase in the economic impact of their investments.

Membership

Title	Name	Institution
Mr	Peter Warry	Chairman of Kier Group plc, Victrex plc and BSS Group plc
Dr	David Chiswell	Chairman of several biotechnology companies
Professor	Rod Coombs	Vice President for Innovation and Economic Development, Manchester University
Professor	Julia Goodfellow	Chief Executive of BBSRC
Professor	Peter Holmes	ProVice-Principal, Glasgow University
Dr	Tidu Maini	Pro Rector, Imperial College
Dr	John Murphy	Head of University Partnerships, Bae Systems and Chair of the CBI Inter Company Academic Relations Group
Professor	John O'Reilly	Chief Executive of EPSRC
Professor	John Van Reenen	Director, Centre for Economic Performance, London School of Economics

Appendix E – Sources of Evidence

Universities

Russell Group
1994 Group
Campaign for Mainstream Universities
Association for University Research and Industry Links (AURIL)
The Universities Companies Organisation (UNICO)
Universities UK (UUK)

Research Councils

Research Councils UK and all eight Research Councils

Business

Confederation of British Industry
Home Grown Cereal Authority
Campden and Chorleywood Food Research Association
Association of the British Pharmaceutical Industry
The Bioindustry Association
Shell
BT
GSK
PriceWaterhouseCoopers

Investors

SV Life Sciences
Abingworth
UBS
Council of Mortgage Lenders

Public Sector / Charities

Department of Health
Wellcome Trust
Cancer Research UK

Parliament

House of Commons Select Committee on Science and Technology

Independent Commentators

London Technology Network
Council for Industry and Higher Education
The Research Council External Challenge Group
Trinamo

Q13

Foundation for Science and Technology

Higher Education Policy Institute

Public Support for Research in Universities – Mark Schankerman

Centre Management Public Organisations

Appendix F - Summary of Evidence

A variety of sources of evidence were used by the group to make their recommendations. These included:

- 1) the key reports published in this area, including those by the External Challenge Group and House of Commons Select Committee on Science and Technology
- 2) written evidence from Research Councils, Universities, Businesses, Investors, Public Sector Organisations, Charities and Independent Commentators
- 3) oral evidence from a selection of the above organisations.

A complete list of evidence sources can be seen in Appendix E

The remainder of this section outlines noted points from this evidence, used to draw out the recommendations of this report.

Leadership

We have found little evidence of Research Council co-ordination or sharing of best practice in the context of their knowledge transfer activities and we have not been persuaded that the Knowledge Transfer Group has achieved much in the two years since its formation. Also, despite their clear remit to co-ordinate and harmonise, we have not seen any added value from RCUK in this area. We urge the Research Councils and RCUK to take the necessary steps to enhance the effectiveness of their co-ordination in knowledge transfer.

The management of knowledge creation and transfer is left to recipients rather than RCs. RCs need to take ownership of this issue. Chief Executive should be made accountable for the economic impact of investments, and Councils should likewise.

Staff recruitment - knowledge and expertise on KT is outside the Councils and they need to recruit it.

RCUK could develop and manage KT impact across all councils and the evaluation of impact.

We are not convinced that measures put in place to facilitate national co-ordination of knowledge transfer are sufficient and we believe that there is a need for co-ordination between all UK funders of knowledge transfer to be enhanced. We recommend that the Government takes the necessary steps to ensure a co-ordinated knowledge transfer strategy.

Communication of Research Council knowledge transfer funding strategies should be improved. We recommend that RCUK develops a single, simple web portal through which information on all Research Council knowledge transfer schemes can be easily accessed.

Whilst we accept that the Research Councils may sit at the 'push' end of the research chain, we are concerned by the perception that they are not interested in the requirements of industry. We urge them to address this perception and to ensure that user requirements are fully considered when determining funding priorities.

We welcome the effort made by the Research Councils to set out future knowledge transfer priorities within their Delivery Plans. We find that some of the Research Councils have taken a narrow approach and that consequently, their Delivery Plans do not reflect the wider view of knowledge transfer.

Influencing

Step changes in people flow between organisations.

Demonstrators provide incentives for academics to get involved in tech transfer.

British multinationals like to recruit international students as they can, after training them, send them to work overseas and they understand the culture/language etc.

Secondments with universities to support KT interactions

Natural two-way recruitment between academe and industry has facilitated two way interface.

Promotion of business opportunities to industry particularly creating opportunities for business and academics to work together.

Students are a key KT mechanism to industry both contacts, relationships and knowledge

We commend EPSRC for the strategic approach it has taken in developing a broad skills base. We encourage the other Councils to use recruitment and secondments to strengthen knowledge transfer expertise.

In the US some academics do consulting work (only paid 9 months out of 12)

Compulsory business/enterprise training for all PhD students.

The movement of people is widely acknowledged to be one of the most effective agents of knowledge transfer. The Research Councils must ensure the provision of effective programmes for exchange between the academic and business sectors and indeed vice versa.

It is important that we also remember the importance of training and people. A report for the Funders Forum on researchers investigates this issue. One challenge is getting demand side information from industries.

Members report that Research Councils could work more effectively with companies if they were to share best practice, adopt more consistent approaches and improve the monitoring of projects to learn best practice and share success. In particular MRC, while currently improving links with pharmaceutical companies, could learn from successful BBSRC and EPSRC programmes.

Academics need to appreciate their responsibilities for KT and constructively engage.

An appreciation that most knowledge transfer activity will take place at the interface of industry (in its widest sense) with universities and more specifically with individual academics. KT responsibility should be enshrined in mission of universities (as it increasingly is).

Targeted user communities with strategic plans for improving KT.

Greater engagement with RDAs to facilitate KT amongst SMEs.

We consider that there is a particular need for increased engagement between RDAs and the Research Councils.

We are concerned by negative perceptions of Research Council communication and engagement with their stakeholders. We urge the Research Councils to take steps to engage business users more effectively. It is important that the Councils clearly consult and act upon the views of all stakeholders, addressing the perception that they are only interested in informing them.

We believe that there is a need to enhance SME-Research Council engagement considerably. We recommend that the Research Councils are more proactive in their engagement with SMEs, recognising that very distinct challenges must be overcome if SMEs are to be successfully involved in knowledge transfer, for example in collaborative work with universities.

We welcome recognition by the Research Councils of the importance of enhancing business skills and we encourage them to further develop training activities in this area, making them available to as many researchers as possible.

Engagement

Profile and presentation, coherence and packaging of the KT initiatives.

Regular meetings with university counterparts to discuss grant outputs.

RAE limits the flow of business people into the academic world because universities need people who can deliver immediate results

Career progression puts greater emphasis on publications rather than economic impact.

Delivering value is not in the mindset of many academics but there are many that would if it were a condition of grants.

High value placed on KT giving prestige to successful academics and therefore incentivising them.

We commend PPARC for its efforts to promote the importance of applicability and knowledge use to researchers. We urge PPARC to actively communicate its intentions where knowledge transfer is included within grant proposal evaluation criteria and to clearly convey the message that knowledge transfer will not determine the success of a grant application. We recommend that the other Research Councils consider this approach as a mechanism for embedding a more result-orientated culture.

We commend PPARC for the approach that they have taken to develop a single, flexible scheme. We recommend that the other Research Councils, with support from RCUK, apply this simplification to their own knowledge transfer funding strategies.

Small problem culture encourages a highly granular culture. No vision - funding is in isolation.

Development of a Technology Road Map.

Far better alignment between end user needs and the Research direction of universities

Knowledge transfer imbedded into peer review mechanism.

In addition to judging research excellence, weight should be placed on relevance to user need, propensity to deliver economic benefit, and quality of links to likely users. This may mean drawing reviewers from a wider professional and institutional base.

Panels should contain members expert in identifying work of potential commercial importance. These may come from industry, but could also be people with experience of investing in (e.g. venture capitalists) or developing (e.g. TTO staff) the outputs of basic research. Statements on dissemination or exploitation of research outcomes in Grant Applications should be given more consideration and more weight given to them in evaluating the applications

Induction process for peer review - must include economic relevance of projects. With two proposals of equal merit should RCs favour the one that is most likely to be exploited? Should rolling grants be available more widely? And what evidence is there that they have more impact? If this were to happen there would have to be a fierce mechanism for keeping them on their toes for example if three centres are set up at least one will close and be replaced by a new one every 3-5 years

However there is also a contrary view that Research Council Funding is only given to "safe projects" with guaranteed deliverables and that this detracts from "riskier" research with potential higher payback in terms of research success and potential benefit to UK Ltd.

Research Missions – Research Councils should develop challenges set by industry. To engage lots of Research Councils! RCUK in conjunction with OSI to set up discussions on what are the grand challenges with industry and universities. Linked to HMT five CSR challenges.

Successful knowledge transfer activities are those that are rooted in, and reflect, user needs. This is not solely about technology push. It also requires customer pull – the market influencing the science base. The development and maintenance of high quality stakeholder relationships are therefore essential to success.

Strategic partnerships with industry - responding enthusiastically to greater industrial need.

A balanced approach to industry and academic stakeholders. Programmes incorporate plans for KT and outreach.

Funding schemes are heavily biased to academic push rather than business pull

We would propose that Research Councils provide easily accessible proof of concept funding, closely associated with each research grant award. This would then be viewed as an optional, but linked phase of the research process rather than disconnected and available through a separate competition as is currently the case. It should be made available at more significant levels than currently available. We would propose up to 20% of the original grant value, and that principal investigators, should be able to aggregate such awards, where research outcomes have clear synergies.

I think we should focus on fewer schemes and get wider participation. I am pursuing this within BBSRC and we would specifically point to the 'follow-on' scheme which enables investigators to explore the potential of their research output and the exposure of research students to business planning such as the YES schemes. I would like to see a much bigger group of students have exposure to this area during their studies.

RAE ratings drive inertia where as business change needs to happen so much more quickly in response to markets. Peer review also drives inertia - always makes it difficult for new people to get in and biased towards established academics and institutions.

Metrics

It is difficult to see how the Research Councils can effectively allocate funding to different knowledge transfer activities in the absence of comprehensive data on their impact. We recommend that the Research Councils proactively seek out information required to evaluate impact and that, once such data has been obtained, full impact analysis of all Research Council knowledge transfer schemes is conducted. In addition, we recommend that Research Council funding for knowledge transfer is neither increased or decreased until more is known about the impact of the schemes.

Extracting from the stock of knowledge that is already there.

Evaluation of research is significantly more professional.

RCs should regularly review current KT programmes to assess continuing relevance. Also before beginning determining what outputs will be.

Each Research Council should have the opportunity to learn the best practices of their colleagues. The identification and sharing of good practice is a role that RCUK could usefully undertake.

RCUK should work internationally to benchmark performance against research funding bodies in other countries and to identify and propagate international best practices across the UK research base.

Annual survey of exploitation activity.

Short term measures like numbers of spin out companies is a very poor measure and will encourage all the wrong sorts of behaviour.

One of the themes of our discussion has been that the impact of RC funding is very much mediated by the approach of HEIs to KT. I think the best metrics of KT actually achieved by an HEI are as follows: a) number of license deals concluded (number is better than value because one big deal skews the effect); b) amount of third party capital invested in the spin-outs from the HEI (this proxies the quality of the spin-outs and avoids a fixation on number of spin-outs); and c) is the proportion of HEI research grant income coming from private industry. To the extent that these three numbers rise, then the economic impact of RC funds is being enhanced. Therefore why not incentivise these numbers? A 'bonus funding pot' could be used to give a research funding 'reward' to HEIs that increase these performance metrics according to some agreed formula. This would concentrate the minds of HEIs on how to translate these incentives down to the level of individual PIs.

It is important that economic returns on Research Council funded projects should be measured over the long-term (at least five to ten years). Short-term measures such as the number of companies spun out is an inappropriate measure – one need only consider the example of Germany, where a large number of spin-out companies were created, with few raising significant funds and most went out of business. The success of Humira – the UK's first biotechnology blockbuster, reaching over \$1 billion in sales – is a case in point. Building on MRC work in the 1970s and 80s, work commenced on Humira in 1993, with the first sales in the US and EU in 2003. Humira is now a significant success, delivering benefit not only to patients, but also to the UK economy as a whole, not least due to the fact that £120 million in royalties from Humira is helping the MRC to rebuild two of the UK's biggest bioscience laboratories.

Feedback from user communities should be incorporated into output two.

We welcome the publication of Research Council performance assessment metrics but consider that refinement is required. We are particularly concerned that the Output 2 metrics, as they stand at present, measure activity rather than output and that they may influence the activities of the research community. We recommend that the Research Councils and RCUK regularly review the assessment metrics and the impact they are having, reporting back periodically.

Further Points

An understanding of how much knowledge transfer responsibility should correctly rest on the shoulders of the Research Councils given their past success in supporting more basic research. We must not jeopardise that key role.

Choose Universities that are ambitious multi disciplinary and have an industrially relevant research agenda (Comment that best US universities are much better at this than best UK ones), should be industry friendly and have flexible liaison officers. (Comment that UK liaison officers focus tends to be on bringing in research funding rather than providing a service to industry).

Recognise that, as with research, high quality, experienced university teams can increasingly be trusted to know how to maximise the economic impact of their work; what they need is resources and freedom from bureaucracy, with simple and clear accountability for results.

The current arrangements over exploitation and IP ownership do not lead to the greatest economic impact. In ICT in particular, value is often in the integrated system, or the eco-system, and Universities may not be well placed to exploit or evaluate the opportunities for the IP that they generate. Even so (or because?), the issue of IP ownership is still capable of inhibiting collaboration between industry and universities.

It is also undeniable that many see success with Research Council funding as one of the “Gold Standard” hallmarks of research success which helps persuade charities, RDAs and private donors that significant other investment in posts, buildings or equipment, would be efficacious.

Within ICT there is an increasing emphasis on service innovation which requires expertise in systems and software where traditional scientific research has not been strong, we need innovation encompassing human science, economic and regulation as well as technology. Many important issues

at the intersection of technology, policy/regulation and business and need to be addressed by a consortium that brings industry together with academics with expertise in these areas.

A good research project is one way where industry provides vision, direction and guidance to a group of academic researchers to make sure a diverse set of specialist researchers produce valuable output. (i.e. not a linear model of university research followed by technology transfer)

Industry wants faster responses to new initiatives. They do not want to wait months if not years to find out whether a project is supported. We know of some large programmes which went through multiple iterations and rounds of decision making whilst the university had to 'keep the industrial partners warm' whilst programme decisions were made.

We need to avoid a 'one size fits all' solution. It is increasingly clear to me that the needs of the pharmaceutical industry are different from those of the automotive/aerospace industry. The consistent message from the pharma sector is that Research Councils should support high quality, blue skies, research, coupled with a need to have in place mechanisms to ensure that any potentially commercialisable ideas arising are recognised, protected and exploited. On the other hand the more engineering/physical sciences orientated industries seem to be looking for a more directed and industry-relevant approach to research pursued in universities. In trying to rationalise this apparent difference, it seems that pharma companies with significant in-house R&D are looking to the science base to provide the new ideas and highly-skilled manpower; whereas the engineering/physical science-based companies outsource much of their research where, since privatisation, there has also been a loss of public-funded laboratories (e.g. the CEGB laboratories). This sector seems increasingly to look to universities to meet their needs. Whilst others may dispute this analysis, I remain convinced that we need to try to distinguish between sectoral needs.

The Research Councils knowledge transfer agenda, whilst important, should not detract from their main priority, the funding of basic research. The Research Councils should challenge the perception that research funding is at risk by clarifying and clearly communicating future financial allocations and plans for knowledge transfer.

We remain convinced that the main role of the Research Councils is in the support of basic research. We accept that there is a blurred line between basic and applied research and we acknowledge Research Council use of the term 'frontier research' to describe the research they support. We still think there is value in use of the terms 'basic' and 'applied' research. The Research Councils need to take steps to ensure that they are recording sufficient information about the research they are supporting to enable them to rapidly respond to concerns about funding levels for basic and applied research.