

EPSRC

Engineering and Physical Sciences
Research Council

Economic Impact Reporting Framework

2009/10

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EPSRC Economic Impact Reporting Framework April 2011

Report for the period 2009-2010

This is the fourth annual Economic Impact Reporting Framework (EIRF) report published by EPSRC. These reports were implemented across all Research Councils in 2005 and form part of the economic impact reporting framework managed by the Department for Business, Innovation and Skills. More information on the EIRF can be found at:

http://webarchive.nationalarchives.gov.uk/+http://www.dius.gov.uk/science/science_funding/ten_year_framework

The EIRF contains data on selected aspects of EPSRC performance relevant to the government's objectives for the UK science base:

1. Overall economic impacts
2. Innovation Outcomes and Outputs
3. Knowledge generated in the Research Base
4. Investment in the Research Base and Innovation.

The report should be read in conjunction with the EPSRC Delivery Report 2009/10

(<http://www.epsrc.ac.uk/SiteCollectionDocuments/Publications/corporate/DeliveryReport09-10.pdf>) and Annual Report 2009/10

(<http://www.epsrc.ac.uk/pubs/corporate/annualreport0910/Pages/default.aspx>), which provide a comprehensive summary of achievements over the period.

1.1 Overall Economic Impacts

2.3.1 Engineering and the physical sciences (EPS) are fundamentally important to the UK economy because of the way they contribute to innovation in products, processes, services, and public policy – one study¹ has estimated that the sectors which depend most heavily on EPS account for 30% of UK GDP, 40% of all investment, 75% of all industrial R&D, and over 80% of manufacturing exports. The same study also found that the sectors with the highest dependency on engineering and physical sciences are those with by far the fastest growth of value-added per employee since the 1990s.

¹ Engineering and Physical Sciences in the UK', SPRU, 2003 – report commissioned by EPSRC and updated in 2009.

2.3.2 The routes from research to innovation are varied and complex; during the year EPSRC has continued to improve our understanding of these routes and the role of EPSRC in promoting successful outcomes. We have continued to demonstrate our leadership in driving forward our Economic Impact agenda through a step change in impact from research council investments. Our strategy and programmes also recognise that a more diversified and balanced economy is crucial to the UK's global competitiveness and lasting prosperity. Examples of the impact of EPSRC research on society and the economy include:

- **Energy Impact:**

A recent report² detailed the impact of the current portfolio of research carried out by the EPSRC-led RCUK Energy Programme. It cited a number of products funded by the programme that will have significant economic and societal impact. For example, Zephyr, **a low energy cooling system which achieves a 50-95% reduction in energy** used for cooling which could result in a saving of £450-850 million in energy costs and a carbon saving of the equivalent of 1.9 to 3.7 million tonnes of carbon dioxide per annum.

- **Welfare/Health Impact:**

Software developed from EPSRC-funded research at the University of Oxford and commercialised by t+Medical is being used to **improve lives of people with chronic diseases** such as diabetes and asthma.

Ground-breaking work undertaken by Professor Ian Norton into the physical chemistry of polysaccharide transition (part-funded by EPSRC on the basis of a CASE award between Unilever and the University of York), led to the development of many new innovative products with a lower fat content while maintaining taste and texture performance. Such research is necessary to **help deliver a sustainable response to obesity in the UK**, which according to study by the Department of Health cost the NHS £4.2 billion in 2007 and could rise to £6.3 billion by 2015.

A new core technology, originally developed by EPSRC-supported student Dr Mark Grubb to monitor the health of workers in metal foundries is being used to monitor the heart beats of **newborn babies who need resuscitation**. Phase one patient trials began in 2008 using stable newborn babies in the intensive care unit of Nottingham Queen's Medical Centre. Phase two successfully tested the sensor on newborn babies delivered by elective caesarean. Phase three trials due to focused on premature babies in the delivery room immediately after birth. Dr Grubb's ground-breaking work has been recognised for entrepreneurial research by the Royal Academy of Engineering and Nottingham University's Institute for Enterprise and Innovation. The team expect to commercialise the device and estimate the annual EU and US market could be £18 million.

² The Economic Impact of the RCUK Energy Programme, (DTZ).

- **Economic Impact:**

Critical Pharmaceuticals, a biotechnology company which spun out of the University of Nottingham in 2002 recently secured an order from the Wellcome Trust to develop a nasal spray of Human Growth Hormone (hGH) using its proprietary CriticalSorb™ technology as an alternative to injection. hGH, a leading biological drug for the treatment of growth disorders, had global sales of \$2.8 billion in 2007.

- **Manufacturing Impact:**

The manufacture of polymer-based packaging products in the UK supports 26,000 jobs, contributes £315 million to the UK economy and is entirely dependant on chemistry research. EPSRC funding of researchers at the universities of Bradford, Durham, Leeds and Sheffield through the Polymer IRC led to the development of the **Curv™** polymer that has been used in the manufacturing of products as diverse as helicopter parts, sporting equipment, audio equipment as well as packaging and high-end luggage. It is acknowledged³ that without EPSRC funding for the fundamental research and support for the commercialisation of the resulting products, Curv™ technology would not have been developed.

2.3.3 The economic impact of our research portfolio and community is now a key element in our evaluation framework used, for example, in our rolling programme of International Reviews. To help develop our methodology for assessing economic impact further we have commissioned independent expert studies including a study into the value of Engineering and Physical Sciences PhDs to the UK economy. This will include consideration of private/social rates of return and a sectoral analysis of employment patterns.

1.2 Highlights from 2009/10

1.2.1 Provision of highly skilled people into the wider economy

EPSRC is committing greater support for the world-leading researchers who deliver high quality research to meet the needs of the UK economy and to address global priorities. Our aim is to create an environment that supports talented people throughout their research careers. EPSRC remains a significant funder of PhDs in the UK, currently supporting 35% of research PhDs in Engineering and Physical Sciences and supporting a cohort of over 9,000 students. The widespread impact such students will have is indicated by how their predecessors' skills have been deployed. Nearly half of the EPSRC-funded PhD students who completed their studies in 09/10 entered business or public services. One study's finding⁴ provides an important context for our skills development at a time of economic uncertainty. It reveals that the sectors with the highest dependency on engineering and the physical sciences are those with by far the fastest growth of added value per employee since the 1990s. We have continued to develop an increased focus on

³ Oxford Economics report on "The economic benefits of chemistry research to the UK", December 2009.

⁴ Engineering and Physical Sciences in the UK', SPRU, 2003 – report commissioned by EPSRC and updated in 2009

user-led doctoral training (often delivered via centres) which will align the skills base of the UK more closely to the needs of business innovation. The major new tranche of training centres

(<http://www.epsrc.ac.uk/funding/students/centres/Pages/default.aspx>) launched by EPSRC since 2008 with an investment of £304 million is tackling some of the biggest problems facing the UK from hi-tech crime to sustainable energy, underpinning the aims highlighted in the EPSRC Delivery Plan. EPSRC has continued to develop **targeted training support in collaboration with key industrial strategic partners**. For example, an innovative £50 million partnership with Rolls-Royce will contribute to advances in future technologies through research fellowships and postgraduate training to help create the next generation of world class materials scientists and metallurgical engineers. Over the next ten years, researchers at Rolls-Royce and the universities of Birmingham, Cambridge and Swansea will undertake fundamental research that will develop the materials needed to improve the efficiency and environmental sustainability of gas turbines.

EPSRC is committed to increasing its support for world-leading individuals who are delivering the highest quality research to meet UK and global priorities. Our **fellowships** schemes foster the ambition and adventure of such talent with high potential for the future. Awards worth £36 million have been made for 41 new Fellows in 2009/10 consisting of 17 Leadership Fellowships awarded to researchers with the most potential to develop into the UK's future research leaders and 24 Career Acceleration Fellowships designed to support talented researchers at an earlier stage in their careers.

Autonomy Corporation plc

The impact of EPSRC's investment in training is far reaching. The Autonomy Corporation plc, a company founded by Dr Mike Lynch OBE (Cambridge) out of his SERC-funded PhD thesis and EPSRC-funded research projects has made considerable economic impact.

- After only a decade, the company is now the largest pure software company in the UK, the second largest in Europe and a member of the FTSE100.
- Over 90% of the "Fortune 1,000" companies are Autonomy customers and more than 2 billion people rely on Autonomy's software every day.
- At a time of global economic turmoil, the company has delivered an 80% increase in profitability.
- Autonomy's existence has contributed over £1.3 billion to HMRC.
- Autonomy's activities in Cambridge contribute over £10 million to the local economy each year.
- Each year Autonomy recruits over 50 top graduates from UK universities. The company currently employs around 1900 people.

1.2.2 Delivering Improvements to existing businesses

EPSRC-supported research and training leads to business benefits through: improvements to existing products/services/processes, creation of new products/services/processes and improvements to business innovation capacity.

EPSRC maximises the opportunities for its investment to have impact by working in partnership with others. Large, multinational businesses are keen to work with the EPSRC to ensure that they are partnering with and procuring the very highest

quality of cutting-edge research results and accessing some of the brightest people UK academia has to offer as well as working together to shape the future research agenda; this underpins our strategic partnership approach.

EPSRC has developed and maintained strategic partnerships with a range of industries from large aerospace/defence companies (eg Rolls Royce, BAE Systems) through those in energy (eg EDF), home and personal care (Procter & Gamble) and pharmaceuticals (GlaxoSmithKline). These partnerships provide a framework for sharing information and strategy, working together to support each other's objectives and jointly supporting research, training and other activities in UK universities in strategically important gap areas. We are now working to deepen our existing partnerships to maximise the value we and our partners gain from partnership, to restructure to broader sector-wide and cross-sector partnerships where appropriate, and to focus on building a small number of new partnerships in strategically important gap areas, to create a manageable portfolio.

EPSRC has taken steps to re-focus its support of manufacturing research through the transition to a new Innovative Manufacturing Research Centre (IMRC) operating model. On 7th January the then Prime Minister Gordon Brown, Lord Mandelson and EPSRC Chief Executive Professor David Delpy announced £15 million funding for 3 new EPSRC Centres for Innovative Manufacturing⁵. The centres are a key element of a £70 million programme of Government funding designed to create technology products of the future, attract investment and underpin manufacturing growth. These centres will help ensure a prosperous future for the UK by creating new industries and new jobs through innovative manufacturing businesses by:

- Providing cohesion and leadership within manufacturing research.
- Building and sustaining relationships with industry and with funders and sponsors within the research domain and internationally.
- The delivery of excellent, long term transformational research with global significance and impact.

The centres will be based at the universities of Southampton (Photonics), Loughborough (Regenerative Medicine) and Brunel (Liquid Metals).

Centre for Secure Information Technologies (CSIT)

EPSRC invested in Innovation and Knowledge Centres (IKCs) which are aimed at accelerating and promoting business exploitation of emerging research and technology fields. Each of the five centres receives up to £6.95 million funding over 5 years with a further £2.5 million from the Technology Strategy Board. The Centre for Secure Information Technologies (CSIT) (<http://www.csit.qub.ac.uk/>) at Queen's University Belfast, is an IKC set up to exploit the university's international research expertise in high performance data and network security and intelligent surveillance. To date, 20 organisations have committed to support the centre's work over the next five years including industrial partners such as BAE Systems and Thales UK as well as government agencies and international research institutes. A team of researchers at the centre is working to develop futuristic

⁵ <http://www.epsrc.ac.uk/newsevents/news/2010/Pages/pm-manufacturingboost.aspx>

communications systems that could help protect frontline troops. Building on work completed recently for the UK Ministry of Defence, the project is aimed at investigating the use of arrays of highly specialised antennas that could be worn by combat troops to provide covert short-range person-to-person battleground communications. Details of the project have just appeared in IEEE Communications Magazine - one of the most authoritative international academic publications in the field.

1.2.3 Creation of new businesses

EPSRC supported outputs are not only taken up by or carried out in conjunction with existing business but in a significant number of cases, new businesses are started. During 2009/10, 25 spin-out companies were formed out of EPSRC research.

An example of a high profile spin-out is **ApaTech Ltd**, a rapidly growing international orthobiologics company specialising in the production of bone graft technologies with a major manufacturing plant in the UK and growing sales of its products worldwide. It was created in 2001 and is based directly on knowledge transfer and IP arising from research funded by major EPSRC investment in the Interdisciplinary Research Centre at Queen Mary University of London from 1991 to 2002 and has been named as Europe's fastest growing company in its category in the Deloitte 2009 Technology Fast 500 for Europe, the Middle East and Asia. The company was sold to Baxter (a leading US-owned, global healthcare company) in March 2010 for an estimated \$330 million.

Other examples of high profile spin-outs include:

Owlstone Ltd

Spun-out of the University of Cambridge by EPSRC-funded entrepreneurial students in 2004, Owlstone Ltd developed a rapid and accurate chemical detection system, one hundred times smaller and a thousand times cheaper than the existing technology at the time. The technologies developed have a wide range of applications including homeland security, industrial, automotive and personal care and have won Owlstone widespread commercial and academic recognition. Based in the Cambridge Science Park, the company now employs 35 people and has secured multi-million dollar contracts from the US Department of Defense and Selex Galileo.

Novacem

A company spun-out by EPSRC-funded researchers at Imperial College is to begin production of a carbon-negative cement that absorbs CO₂ from the atmosphere during manufacture. The company plans to have an industrial scale pilot plant in operation by 2011 and believes that within 20 years, 25 % of the world's cement could be produced using Novacem technology, making a major contribution to meeting carbon reduction targets. The company was named in the Top 10 Emerging Technology by MIT's Technology Review magazine in April 2010, was announced as a Wall Street Journal Technology Innovation winner in September 2010, and has been selected by the World Economic Forum as a Technology Pioneer for 2011.

A significant number of successful spin-outs are bought up by larger organisations once the proof of concept has been demonstrated; so, whilst the absolute magnitude or turnover of many spin-outs may not be large, they do make a significant contribution to the innovation ecosystem as a whole.

1.2.4 Attracting R&D investment from global business

Companies site their advanced technology centres in areas rich in relevant skills⁶ and the globalisation of such activities by multinational firms has accelerated⁷. EPSRC has a key role in maintaining and extending the excellence of the research base to ensure that the UK remains an attractive location for the R&D activities of leading hi-tech companies, such as those in the pharmaceutical, aerospace and electronics sectors. For example, a number of key companies such as Nokia, Hitachi and Microsoft have established research centres around Cambridge, building on centres of excellence such as the EPSRC-supported Interdisciplinary Research Collaboration in Nanotechnology⁸. Further examples are the IT giant Hewlett Packard and leading telecoms company Toshiba, both of whom have established research centres in the UK, near Bristol.

The global impact of our research portfolio was demonstrated through the findings of the recent studies on the economic impact of physics and chemistry research which concluded that the investment made by EPSRC and other similar organisations in basic research in these areas had attracted significant R&D investment from global business and had generated significant wealth for the global economy. For example:

A consortium comprising of the German company HB Systems and Surrey Satellite Technology Ltd (SSTL), a company spun out by EPSRC-funded researchers from the University of Surrey in 1985, has secured a contract worth £510 million to supply the first operational spacecraft for Europe's **Galileo satellite-navigation system**. One recent study found that between 2006 and 2025, Galileo is likely to bring cumulative economic benefits to the nation of over £18 billion, from such benefits as transport safety improvements and environmental benefits from shorter journey times.

1.2.5 Delivering benefits to Government and the public through impacts on policy and public services

EPSRC-supported research and training delivers impact in a broad range of areas of societal importance such as health, security, energy, transport, and the environment. We work closely with key government departments and public and third sector organisations, for example through strategic partnerships, analogous to our relationship with companies: currently partners include the Department for Transport, Ministry of Defence, DSTL, Cancer Research UK, the Wellcome Trust and the National Physical Laboratory. EPSRC also plays a key role in supporting and

⁶ Martin, B., Salter, A., Hicks, D., Pavitt, K., Senker, J., Sharp, M., and von Tunzelmann, N., (1996), The relationship between publicly funded basic research and economic Performance, A SPRU report for HM Treasury

⁷ OECD, (1992), Technology and the Economy, OECD, Paris.

⁸ <http://www.admin.cam.ac.uk/news/press/dpp/200703001>

enhancing the capability and expertise of our leading researchers, so that they can provide expert input to government in policy development.

Impact on the UK green energy agenda

EPSRC's strategic partnership with EDF energy (one of the UK's largest energy suppliers) is encouraging the speedy take up of green heating technologies in UK homes and businesses. The four-year agreement will see UK academics collaborating with EDF's research and development specialists at the European Energy Efficiency Research Centre and will provide funding for research projects looking at the technical, sociological and economic factors involved in rolling out energy efficient technologies across the UK. The expertise that EDF can provide in this area, combined with the support of excellent research from leading UK academics will **assist the UK in meeting its carbon reduction targets** whilst delivering secure and affordable energy to UK homes and businesses.

2.1 Innovation Outcomes and Outputs

Table 1 Research Exploitation

Ref	Metric	2006/07	2007/08	2008/09	2009/10
	Number of final reports assessed		1225	2353	1394
1.1	Number of licences and patents reported	93	125	276	175
1.2	Number of spin-out companies reported	48	26	49	25

Table 1: 175 licences and patents and 25 spin-out companies are reported as arising from EPSRC grants in 2009/10. It should be noted that the significant increases seen in 08/09 were due, in the main, to the large number of finished grants that were assessed in that year. The number of licences and patents reported in 2009/10 therefore represents a significant increase on 2007/08 numbers. EPSRC has undertaken an analysis of the spin-out data held for the period between 2005/6 and 2007/8. During this period, 137 final reports indicated that a spin-out company had been created. Of these, 37 provided insufficient data to identify the company and 13 companies were reported twice. Of the 84 we could identify, **70 were still active in their 'original' spin out form and 7 more had been taken over by other companies**; dispelling the myth that spin-out companies are destined for failure. As part of the analysis, data was obtained from the spin-out companies themselves as well as Companies House.

Table 2 Publications with Industry

Ref	Metric	2006/07	2007/08	2008/09	2009/10
2.1	Percentage of assessed grants with at least one publication with a co-author from industry ⁹	30%	27%	27%	27%
2.2	Joint publications with Industry as % of all publications arising from EPSRC Research Grants	8%	7%	9%	7%

Table 2: Table 2 demonstrates a sustained level of user-engagement in the generation of new scientific knowledge arising from EPSRC research grants. Approaching 30% of grants give rise to publications with a co-author from industry.

Table 3 Expenditure on Knowledge Transfer Activities

Ref	Metric	2007/08	2008/09	2009/10
3.1	Expenditure on Knowledge Transfer Activities ¹⁰	£4.3M	£13.5M	£52.5M

Table 3: Knowledge transfer is an essential part of our research and training activities. The strengthening of knowledge transfer between the research base and industry is a key component in EPSRC's strategy to achieve greater economic impact from the research it funds. Expenditure on knowledge transfer activities has increased to **£52.5 million** in 09/10. An investment in 12 **Knowledge Transfer Awards** totalling £44 million, and 13 Knowledge Transfer Secondment awards with a total of £11 million which will boost research outcomes that lead on to impact. In addition, we invested a further £3.5 million in the second round of **Innovation and Knowledge Centres (IKCs)**, as well as £3.1 million in new IKC pilot projects. We have also increased our investment in early stage commercialisation activities. Expenditure in EPSRC's follow-on fund has increased significantly (to over **£4 million** in 2009/10). Demand for follow-on funding (which bridges the gap between basic research and potential support from commercial sources), has increased significantly in recent years and we have funded 132 follow-on projects worth £11.5 million since 2004.

Interactions between Research Councils and the Technology Strategy Board (TSB) are a key element of government strategy to boost the percentage of R&D spend in the UK and ensure closer links in the science base and business. EPSRC-funded research forms the basis for much of the next-stage work of the TSB. To date

⁹ Includes 'conference proceedings, journals, refereed journals, books and other'. Data is captured three months after a research grant ends; the values reported are thus conservative since some publications take longer to appear.

¹⁰ Includes spend on Knowledge Transfer Accounts, Knowledge Transfer Partnerships, Follow-on Fund, Collaboration Fund and expenditure on Innovation and Knowledge Centres.

EPSRC has contributed over £90 million towards collaborative research in partnership with the TSB. Examples of projects funded with TSB include:

An EPSRC contribution of £11.5 million to a £40 million investment programme of research and development that will significantly boost investment in the UK's aero-engine industry and supply chain and accelerate the development and introduction of low carbon aircraft engine technology. SAMULET (Strategic Affordable Manufacturing in the UK with Leading Environmental Technology) is a collaborative programme between industry and academia led by Rolls-Royce working in a consortium alongside other high profile manufacturers, SMEs and several of the UK's top universities.

EPSRC has invested in a £10 million project with the TSB, Department for Transport and the Highways Agency to support research and development leading to the introduction of innovative systems and services to help goods move around the country more effectively. This will help enable the UK to support more freight traffic as the economy grows, whilst decreasing the associated road congestion and environmental impact. The project seeks to promote industry collaboration and the use of systems engineering and integration to increase efficiencies in the whole logistics network.

Table 4 External Representation and Engagement

Ref	Metric	2006/07	2007/08	2008/09	2009/10
4.1	External representation on EPSRC Council:				
	OGD/NDPBs	13%	13%	13%	19%
	Academia	53%	47%	53%	50%
	Business	13%	27%	20%	25%
	Other ¹¹	21%	13%	14%	6%
4.2	External representation on all EPSRC policy and advisory bodies¹²:				
	OGD/NDPBs	3%	6%	4%	6%
	Academia	62%	66%	68%	69%
	Business	22%	25%	19%	18%
	Other ¹¹	13%	3%	9%	7%

¹¹ Includes representatives from the third sector and those working independently of organisations included in the other categories.

¹² Includes EPSRC Council, Technical Opportunities Panel, User Panel, Societal Issues Panel and Resource Audit Committee.

Ref	Metric	2006/07	2007/08	2008/09	2009/10
4.3	Number of organisations that engage with EPSRC through a Strategic Partnership agreement	18	23	29	28
4.4	Number of activities in which EPSRC engages formally in a jointly funded venture with its Strategic Partners	24	29	38	63

Table 4: EPSRC is extending the focus of support for knowledge exchange beyond direct collaborative research grants by engaging with users at a strategic level. This includes ensuring adequate user representation on our policy and advisory bodies such as Council, the User Panel, the Societal Issues Panel and our Strategic Advisory Teams which provide advice to Heads of Programmes: approximately one third of members are research users drawn from sectors such as industry, commerce, government and the third sector. In addition EPSRC ensures user views are also represented within our normal peer review process, with approximately 20% of the new peer review college (appointed autumn 2010) drawn from the research user community.

EPSRC has also been strengthening engagement with research users through an expanding programme of Strategic Partnerships. These are formal agreements between EPSRC and other organisations to jointly fund activities such as research and training in areas of interest. Five new university/industry Partnerships were formed this year, raising the total of research funding across all current partnerships to £114 million from EPSRC and £77 million from the partners. We currently have Strategic Partnerships in a wide range of areas including risk management, flooding, systems engineering, active control, array chemistry, drug delivery, future intelligent transport systems, power electronics and actuation technology, power systems, and flight deck operations with companies including Rolls Royce, AstraZeneca, EDF, E.ON, Philips UK Ltd, Procter and Gamble, DSTL, Cancer Research UK, National Physical Laboratory and GlaxoSmithKline.

The activities supported through strategic partnerships have also increased significantly in number from 24 in 2006/07 to 63 in 2009/10 and include: centres and research consortia, "IDEAS Factory" events, post-doctoral research partnerships, calls for research proposals, research chairs and research fellowships.

Table 5 Collaboration Intensity (Research)

Ref	Metric	2006/07	2007/08	2008/09	2009/10
5.1	EPSRC spend on collaborative research¹³ with users	£151M	£178M	£199M	£183M
5.11	(% of total net spend on research grants)	(36%)	(37%)	(43%)	(36%)
5.2	User Resource committed on new research grants¹⁴ announced per annum	£170M	£117.9M	£122.5M	£69.8M
5.3	Number of user organisations collaborating on current research grants	2,036	2,309	2,366	2,173
5.4	Spend on programmes to promote commercialisation and enterprise	£1.3M	£2.9M	£4.7M	£6.4M¹⁵

Table 5: In 2009/10, 36% of EPSRC's expenditure on research was collaborative with users. During the year, £69.8 million of user resource was committed on new research grants. This figure will increase as further data is added to research grants and will be re-stated as part of next year's report. Of the £183 million total spent by EPSRC on collaborative research, nearly 60% was on targeted collaborative research activity, and the remainder was on researcher-led projects. The number of companies that engage in collaborative research has grown by from 2,036 in 2006/07 to 2,173 in 09/10. Expenditure on programmes to promote commercialisation and enterprise has also increased for the fourth consecutive year to £6.4 million for 2009/10.

Table 6 Collaboration Intensity (Training)

Ref	Metric	2006/07	2007/08	2008/09	2009/10
6.3	Number of user organisations reported engaged in collaborative training¹⁶	254	222	214	209

¹³ Figure includes co-funded and collaborative research projects. The value of a co-funded grant is shared between EPSRC and the co-funding organisation. A collaborative research grant has a collaborating project partner from a user organisation. 'User organisation' means any organisation except universities, other Research Councils and certain government departments, e.g. the funding councils.

¹⁴ Excludes contributions made on training grants.

¹⁵ Includes expenditure on Integrated Knowledge Centres (£4m) and Follow-on fund grants (£2.4m).

¹⁶ This data is derived from returns submitted by Universities and is subject to change as more submissions are received. Data for 2009/10 will be re-stated for next year's EIRF.

Ref	Metric	2006/07	2007/08	2008/09	2009/10
6.5	EPSRC net spend on collaborative and vocational postgraduate training ¹⁷	£56.0M	£57.9M	£55.9M	£55.6M
6.6	Number of collaborative studentships reported starting during the year ¹⁸	670	641	570	408
6.7	Resource contribution of employers to collaborative postgraduate training	£16.8M	£17.9M	£13.3M	£15.0M
6.71	Resource contribution of employers to collaborative training through Centres for Doctoral Training	N/A	N/A	£81.7M ¹⁹	£1.8M

Table 6: This table shows the level of collaborative investment made by employers on EPSRC's training investment. Based on information received from HEIs to date, employers contributed £15 million to collaborative postgraduate training in 09/10-a positive increase on the 08/09 figure, particularly given the current economic climate. Analysis of the underlying data shows that the great majority of this support is, as we would expect, related to projects supported through funding of collaborative research students via CTAs²⁰. This does not include the significant resource contribution made by employers to EPSRC's Centres for Doctoral Training (shown in metric 6.71). To encourage further collaborative training, EPSRC introduced a notional 10% conversion to CASE target to Doctoral Training Grant holders in 08/09. An analysis of the effect of this will be undertaken once sufficient time has been given for the practice to become established.

To date, HEIs have reported that 408 collaborative studentships started in 2009. This figure will increase as further data is received and will be re-stated in next year's report.

¹⁷ The data represents net spend on Collaborative Training Accounts plus the 11% of net spend on Doctoral Training Accounts which is estimated to be collaborative.

¹⁸ Data for 2006/7, 2007/8 and 2008/9 has been re-stated. Figure for 2009/10 will increase as further data received from HEIs and will be re-stated in next year's EIRF.

¹⁹ Figure re-stated for EIRF 2010.

²⁰ CTA – Collaborative Training Account, the principal route through which EPSRC funds collaborative and vocational training.

2.2 Knowledge generated in the Research Base

Table 7 Research Base-Headline Facts and Figures (TRAINING)

Ref	Metric	2006/07	2007/08	2008/09	2009/10
7.1	Estimated total Number of PhDs supported²¹	8067	9734	9753	9837²²
7.11	(est. number via Doctoral Training Accounts)	(4081)	(5706)	(5563)	(5558)
7.12	(est. number on Collaborative Schemes)	(1841)	(1682)	(1638)	(1382 ²³)
7.13	(number of EPSRC Project Students)	(2009)	(2235)	(2450)	(2818)
7.14	(number of Core e-Science & Basic Technology)	(136)	(111)	(102)	(79)
7.2	Number of new PhD students reported starting by Universities²⁴	2274	2218	2144	2166
7.21	number via Collaborative Training Accounts ²⁵	367	399	348	204
7.22	Number via Doctoral Training Accounts ²⁶	1562	1460	1438	1725
7.23	Number of Engineering Doctorate Students	149	157	126	61
7.24	Number of students at the Life Sciences Interface	94	118	133	102
7.3	Number (and %) in Roberts Skills Shortage Areas²⁷:				
	Engineering	446 (19%)	460 (21%)	411 (19%)	340 (14%)

²¹ The numbers quoted include Project Students and those funded via Doctoral Training Grants. Data re-stated for 06/07, 07/08 and 08/09.

²² Includes 320 students currently registered with Centres for Doctoral Training.

²³ This data is taken from the DTA reporting tool and information is supplied by HEIs. This figure represents a snapshot of data received as at 31 March 09 and the figure will increase over the coming months as further data is submitted.

²⁴ Includes project students funded through the core e-Science and Basic Technology Programmes.

²⁵ Includes students supported through the following schemes: CASE for New Academics (CNA); Collaborative Research Student (CTA); Industrial CASE Student.

²⁶ Includes students supported through the following schemes: Earmarked Award: Analytical Science (DTG); Earmarked Award: Mathematics CASE (DTG); EPSRC/ESRC Studentship; International Doctoral Scholars (IDS grant); Standard Research Student (DTG).

²⁷ Data for all years restated as a result of the implementation of revised research topic classification.

Ref	Metric	2006/07	2007/08	2008/09	2009/10
	ICT	200 (9%)	241 (11%)	243 (11%)	192 (8%)
	Materials	292 (13%)	282 (13%)	290 (13%)	239 (10%)
	Statistics/Operational Research	48 (2%)	56 (2%)	61 (3%)	49 (2%)
7.4	Net Spend²⁸ on PhDs	£93.9M	£93.9M	£102.7M	£108.8M
7.41	(% of net Training Expenditure)	(63%)	(63%)	(61%)	
7.5	Number of current EPSRC fellowships²⁹	307	326	345	344
7.51	Number of active ³⁰ fellows ³¹	292	313	310	295
7.52	Spend on active research fellowships; (% of net Research Grant Expenditure)	£16.2M (3.9%)	£22.2M (4.7%)	£24.9M (5.4%)	£31.9M (6.3%)
7.6	Number of EPSRC-funded RAs;	5,161	5,006	5,089	5,643
7.61	Spend on EPSRC-funded RAs;	£113.7M	£106.6M	£111.9M	£121.6M
7.62	(% of net Research Grant Spend)	(27%)	(22%)	(24%)	(25%)

Table 7: Two types of student-related information are presented here; estimates of the total numbers of **students** supported and starting each year, based on the training grant spend and the notional cost of supporting a student, and actual numbers of students as reported to us by the universities.

EPSRC encourages universities to combine funding from EPSRC with funding from other sources in order to maximise the number of students supported. As a result the actual number of students supported will be more than the notional number; balancing this, universities may offer also higher stipends to attract/retain the best students in key areas, and this will tend to reduce the number of students supported. Data received from Universities indicates that consistent percentages of students are being recruited into the 'Robert's skill shortage areas'. A number of

²⁸ The 'spend' figure is for those students supported through Doctoral Training Grants, LSI Doctoral Training Centres and International Doctoral Scholarships, and includes 'Roberts' skills payments. It *excludes* spend on project students (who are supported through research grants) and those supported via Collaborative Training Grants/Accounts.

²⁹ Excludes Senior and Senior Media Fellowships on the basis that these do not provide substantive research training.

³⁰ Those who received payment during 2009/10.

³¹ The figures are for fellowships in post and receiving payments as at 31st March in 2007, 2008, 2009 and 2010 respectively. They include Advanced, EURYI, Postdoctoral, Springboard and Statistics Mobility Fellowships (with the addition of Career Acceleration and Leadership Fellowships from 2008/09). Excludes Senior and Senior Media Fellowships.

students (including the 337 registered through Centres for Doctoral Training) will not be coded by host Universities until the second year of study. Therefore, “Roberts skills shortage” data for 2009/10 will be revised and restated as part of next year’s report.

The EPSRC has commissioned a study to measure the economic impact of PhD funding and the findings of this will be reported in next year’s report.

EPSRC remains a major funder of PhD training and funds 30% of all students in the EPS disciplines.

The increase in number of PhD students supported is largely attributable to the increased number of students supported through Doctoral Training Accounts. This figure includes 320 reported by HEIs as being registered through the EPSRC’s Centres for Doctoral Training.

There has also been a significant increase in the number of project students being supported through research grants. As at 31 March 2009, we had been informed (through data supplied by HEIs via the DTA reporting tool) that 1344 students were registered on collaborative schemes. However, exact student numbers cannot be readily quoted as the data on the number of students supported is provided retrospectively by universities, and builds up over time. Figures for 2008/09 have been re-stated and the data for 09/10 will be re-stated for next year’s EIRF.

EPSRC is committed to increasing its support for world-leading individuals who are delivering the highest quality research to meet UK and global priorities and our investment in **fellowships** continues to help talented researchers regardless of the stage they are at in their careers. Our aim is to fund only the very best quality people. The number of research fellowships (including Senior Research Fellows) has stabilised with 351 current in 2009/10.

During 09/10, we funded 41 new fellowships (17 Leadership Fellowships awarded to researchers with the most potential to develop into the UK’s future research leaders and 24 Career Acceleration Fellowships designed to support talented researchers at an earlier stage in their careers). A further 46 awards totalling £38 million were awarded in July 2010). EPSRC provided support to 294 research fellows during this period. In response to our 2009 review of the balance of EPSRC support for people along the length of the research career path, we will be reviewing the scope of our fellowship support and piloting an approach to encouraging creativity in fellowships.

Table 8 Academic Staff

Ref	Metric	2006/07	2007/08	2008/09	2009/10
8.1	Number of EPSRC funded principal researchers	3227	3321	3178	3164
8.2	Number of permanent academic staff for EPSRC-related disciplines	16,745	17,762	19,104	20,078

Ref	Metric	2006/07	2007/08	2008/09	2009/10
8.3	% of EPSRC funded researchers relative to total number of UK active researchers in engineering and physical sciences	36%	40%	38%	36%
8.4	Age demographic for permanent academic staff in EPSRC related areas³²				
8.41	Proportion aged under 35 yrs	12.0%	12.7%	14.5%	15.7%
8.42	Proportion aged over 50 yrs	36.0%	35.6%	34.9%	34.3%

Table 8: EPSRC grant holders represent 36% of the UK active researchers³³ in engineering and physical sciences (EPS). Demographic analysis using HESA data shows that a further 1.2% increase has been recorded this year in staff under 35 with a small (0.6%) decrease in the proportion of staff over 50. Overall, the age distribution is remaining fairly stable.

Table 9 Research Publications

Ref	Metric	2006/07	2007/08	2008/09	2009/10
Number of final reports assessed			1225	2353	1394
9.1	Number of refereed journal publications per year from EPSRC research grants.	543 ³⁴	6,426	11,639	9,475
9.2	Total number of publications³⁵ per year from EPSRC research grants (includes non-refereed papers).	22,687	19,652	34,649	23,041
9.21	Average number of publications per grant	16.4	20.1	17.0	16.5

³² The proportions are derived from HESA data and reflect returns from HEIs for the academic year two years prior to the report year.

³³ Data here is derived by comparing EPSRC grant records with the annual staff data returns made by universities to HESA.

³⁴ Over 10,000 journals were recorded on grants finishing in 2006/07. However, methods for collecting data on *refereed* journals changed in 2007/8 enabling more detailed data collection on refereed publications after this date.

³⁵ Includes categories "conference", "journal", "refereed journal" and "other."

Ref	Metric	2006/07	2007/08	2008/09	2009/10
9.3	Joint international publications as a proportion of all publications arising from EPSRC research grants.	22%	25%	24%	23%
9.4	Percentage of completed grants reporting at least one published paper with an international co-author.	54%	56%	51%	58%

Table 9: This table provides four measures describing the aggregate output from EPSRC research grants. It should be noted that the number of publications reported in 2008/09 increased significantly compared to 2007-08, due to the larger number of grants that ended and were assessed during the year. During 2009/10, over 23,000 publications arose from EPSRC funded research grants. More significantly, over 40% of these were refereed journal publications. The average number of publications reported per grant has remained relatively constant over the last four years. International engagement of EPSRC-supported researchers remains healthy: approximately one quarter of publications reported on grants have an international co-author and over half of completed grants have at least one internationally co-authored paper.

Table 10 Citation Impact of EPS Disciplines

Ref	Metric	2007/08	2008/09	2009/10
10.1	Chemistry	1.27	1.31	1.37
10.2	Computer Sciences	1.14	1.2	1.73
10.3	Engineering	1.09	1.18	1.18
10.4	Materials	1.34	1.45	1.5
10.5	Mathematics	1.23	1.22	1.21
10.6	Physics	1.4	1.51	1.61

Table10: This table shows citation impact of EPS disciplines relative to the world³⁶ - i.e. the rate at which published UK research is cited by other researchers. This has been calculated using Essential Science Indicators supplied by Thomson Reuters and data was last updated on 1 March 2010 for the five year period 2005-2009. Data trend is rising in all EPS subjects with the exception of mathematics which has seen a marginal decline in relative impact since 2002-2006. It should be noted, however, that further analysis suggests that the relative impact of UK research increases with time and this latest data indicates that the UK continues to perform very highly relative to others in terms of citation impact in the EPS disciplines. i.e the rate at which published UK research is cited by other researchers. The UK has

³⁶Where the world average is 1.

maintained a leading position in the ranking of G8 countries in each of the three main fields of EPSRC's remit area-2 in Mathematics, 3 in Physical Sciences and 3 in Engineering.

This performance is also delivered more efficiently, with UK productivity in terms of citations second only to the USA (with the exception of Engineering where it lies 4th), and the UK has an impact of 1.2 to 1.5 times the world average³⁷. Alternative indicators that may be considered include:

The proportion of a country's output which is regarded as "highly cited". By this measure, the UK is 3rd overall in the EPS disciplines (including Engineering) and produces 8-12% of the world's output.

The proportion of a country's output which lies in the world's most cited 0.1% of papers in a field. By this measure, the UK ranks 2nd overall in the EPS disciplines and produces 6-16% of the world's output.

Table 11 Diversity (Gender and Ethnicity)

Ref	Metric	2006/07	2007/08	2008/09	2009/10
11.1	Proportion of female EPSRC-funded PhD students	25%	25%	22%	26%
11.2	Proportion of female EPSRC-funded Principal Investigators		12%	12%	12%
11.3	Proportion of female EPSRC-funded RAs	18%	21%	22%	19%
11.4	Proportion of female EPSRC-funded Fellows ³⁸	19%	20%	23%	22%
11.5	Proportion of EPSRC-funded PhD students belonging to an ethnic minority ³⁹		14%	14%	13%
11.6	Proportion of EPSRC-funded Principal Investigators belonging to an ethnic minority	9.3%	8.8%	11.9%	10.2%
11.7	Proportion of EPSRC-funded Fellows ⁴⁰ belonging to an ethnic minority		8.5%	8.8%	7.7%

³⁷ EPSRC Citations Study 2009

(<http://www.epsrc.ac.uk/SiteCollectionDocuments/Publications/Other/citationstudy2009.pdf>)

³⁸ Fellowships included here are: Advanced Fellowships; EURYI; Postdoctoral Research Fellowships; Springboard Fellowships; Statistics Mobility Fellowships; Career Acceleration Fellowships and Leadership Fellowships.

³⁹ Includes returns made under categories of "Asian and Asian British", "Black and Black British", "Chinese or Other" and "Mixed race".

Table 11: Table 10 shows gender and ethnicity data collected at the point of proposal application (in the case of fellowship holders and principal investigators) and via data supplied by HEIs on EPSRC-funded PhD students.

The Research Councils, through the RCUK Research Careers and Diversity Unit (RCDU) have collaborated with the Equality Challenge Unit on a mapping study of equality data in higher education. Jointly with the Higher Education Statistics Agency (HESA) and the funding councils, we are now working to fill the gaps and improve the data on which the research councils can draw in the future.

Table 12 Destinations of Trained Researchers⁴¹

Ref	Metric	2006/07	2007/08	2008/09	2009/10
12.1	Proportion of EPSRC-funded PhD students who remained in a UK HEI following submission of their PhD		27%	27%	32%
12.2	Proportion of EPSRC-funded PhD students who entered Academia ⁴²	31%	33%	32%	36%
12.3	Proportion of EPSRC-funded PhD students who entered Business or Public Services	34%	49% ⁴³	47%	48%
12.4	Proportion of EPSRC-funded PhD students reported as 'Not Employed' ⁴⁴ ,	10%	8%	6%	8%

⁴⁰ Fellowships included here are: Advanced Fellowships; EURYI; Postdoctoral Research Fellowships; Springboard Fellowships; Statistics Mobility Fellowships; Career Acceleration Fellowships and Leadership Fellowships.

⁴¹ Data on PhD Student destinations is derived from the HESA 'DLHE' survey and is the most up to date available. 2009/10 data reflects returns by students who completed their studies in 2007/08 and were surveyed in 2008/09. For ease of comparability the data on Research Assistants (derived from final reports on EPSRC research projects) also relates to those who reported employment destinations to EPSRC during 2008/09.

⁴² Data Categories reported are aggregates of sub-categories available from HESA: 'Academia' comprises 'Higher education – academic (Research and Teaching)', 'mainly research' and 'other'. 'Business or Public Services' comprises 'Government/public sector - not research related' and 'research related', 'Industry and commerce - not research related', 'research related' and 'Research & Development, sector not known'

⁴³ Figure re-stated

⁴⁴ The HESA data is drawn from students surveyed because their funding recently ended: the 'Not employed' category is not a robust indicator of difficulty in finding employment because students' personal circumstances vary widely and many are still fully engaged in writing-up a PhD thesis.

Ref	Metric	2006/07	2007/08	2008/09	2009/10
12.5	Proportion of EPSRC-funded PhD students reported as either "Engaged in Study", "School (education other", "School teaching or teacher training" or "Other employment (not specified)" ^{45 46}	20%	11%	9%	8%
12.6	Proportion of EPSRC-funded PhD students who entered the Third Sector	DATA NOT CURRENTLY AVAILABLE			
12.7	Proportion of EPSRC-funded Research Assistants who entered Academia	71%	76%	78%	84%
12.8	Proportion of EPSRC-funded Research Assistants who entered Business or Public Services	22%	17%	21%	15%

Table 12: Caution should be exercised in interpreting the data in this table as annual variations make it difficult to read trends. Nevertheless, the fact that nearly 84% of research assistants choosing to remain in academia may signal the positive impact of increased stipends and otherwise improved conditions as well, partly, as targeted efforts such as RCUK Academic Fellowship and EPSRC's Science & Innovation Awards designed to build research capacity in areas of strategic importance.

For the first time, we are also reporting on the proportion of EPSRC-funded students choosing to stay in a UK HEI following the submission of their PhD. Of the 36% of students who entered academia, a high proportion (85%) chose to remain in a UK HEI following the submission of their PhD. At the same time Table 12 provides encouraging evidence that the wider economy derives significant benefit from those with scientific training who do not choose to pursue academic research careers, with (in 2009/10) nearly half of PhD students going on to work in business/public service.

The Research Councils are also working together to obtain better information on the career paths followed by those who have completed research studies, to contribute to the evidence of outcomes from investments in research training and the impact of research graduates. In March 2010, RCUK published "*Research Degree Holders in*

⁴⁵ A small proportion of returns were also classified as 'Not Known'.

⁴⁶ Three quarters of the students in this category returned as 'Engaged in Study'.

*the Longitudinal Survey of the Destinations of 2004/05 Leavers from Higher Education*⁴⁷ undertaken by the Warwick Institute for Employment Research. This analysis, along with HESA reports, will inform future phases of the study as it follows doctoral graduates' career paths over a number of years.

Table 13 PhD Completion Rates

Ref	Metric	2006/07	2007/08	2008/09	2009/10
	For students with EPSRC support ending in:	2002/3	2003/4	2004/5	2005/6
13.1	% who submitted a completed PhD thesis within 5 years of the end of EPSRC support ⁴⁸	86%	80%	79%	72%

Table 13: Completion rates have remained relatively stable with 72% of students submitting a completed PhD thesis within 3 years of the end of EPSRC support. EPSRC now offers students the option of longer periods of PhD training facilitated through the flexibility of Doctoral Training Accounts. For that reason, it should be noted that EPSRC's overall PhD **completion** rates are higher (i.e. ~85%) than the 4/5 year submission rates.

2.3 Investment in Research Base and Innovation

Table 14 (Table 1) Research Base-Headline Facts and Figures (RESEARCH)

Ref	Metric	2006/07	2007/08	2008/09	2009/10
14.1	EPSRC Annual Expenditure (Net)	£653.7M	£751.0M	£768.1M	£836.4M
14.2	Net Research Grant Expenditure	£420.3M	£475.0M	£464.0M	£507.6M
	(% of Annual Net Expenditure)	(64%)	(63%)	(60%)	(59%)
	(Number of Grants which incurred expenditure)	(5,161)	(5,311)	(5,339)	(5,064)
14.3	Net Training Expenditure ⁴⁹	£148.4M	£156.8M	£167.3M	£194.5M
	(% of Annual Net Expenditure)	(23%)	(21%)	(22%)	(23%)

⁴⁷ <http://www.rcuk.ac.uk/cmsweb/downloads/rcuk/researchcareers/IERsurveydatavalidation.pdf>

⁴⁸ The method for assessing PhD submission rates has changed to reflect the variation in duration of study that is now common across the EPS disciplines. Data re-stated.

⁴⁹ This figure excludes spending on project students, who are included in 'net research grant expenditure' (metric 14.2)

Ref	Metric	2006/07	2007/08	2008/09	2009/10
14.4	Research Spend in Identified Priority Areas⁵⁰ (% of net research grant spend) (Grants in Identified Priority Areas which incurred expenditure)	£119.3M (28%) (1,199)	£141.9M (30%) (1,366)	£166.2M (36%) (1,455)	£172.0M (34%) (1,505)
14.5	Net Research Spend on multidisciplinary grants⁵¹ (% of net research grant spend) (Multidisciplinary Grants which incurred expenditure)	£155.5M (37%) (1,810)	£182.4M (38%) (2,085)	£198.2M (43%) (2,367)	£191.7M (38%) (2,162)
14.6	Net Research Spend on Research Base (Responsive Mode) Grants⁵² (% of net research grant spend) (Investigator-led grants which incurred expenditure)				£265.6M (52%) (12,008)

Table 14: This table shows that EPSRC Annual Net Expenditure increased during 2009/10. The proportion of spend on research grants has also increased this year following the slightly reduced grant expenditure in 2008/09 which occurred largely as a result of a significant investment (£11million) in capital and increased expenditure on academic fellowships. The proportion of spending on training has also increased this year, accounting for 23% of EPSRC's Annual Net Expenditure, largely due to our increased investment in Centres for Doctoral Training. Nearly two-thirds of our spending is directly on research grants and just over a fifth on postgraduate training. Administration accounted for less than 3% of spending (see Table 16); the balance covers such things as fellowships, public engagement, and investment in facilities.

⁵⁰ Identified Priority Areas' covers all targeted mode research grants with the exception of Portfolio Partnerships, Fellowships, Chemistry National Services, INTERACT, Follow-on fund and IMRCs.

⁵¹ For the purposes of EIRF reporting, the research councils use a common definition of 'multidisciplinary' which includes research funded through cross-Council programmes such as Energy and e-Science, research funded through any of EPSRC's own multidisciplinary managed programmes (e.g. complexity science) and grants led by investigators from more than one discipline.

⁵² Includes expenditure on standard research grants, platform and programme grants, network grants, first grants and overseas travel grants

Approximately 35% of EPSRC's annual research spend has been focused on identified priority areas such as Energy, Nanoscience, Digital Economy and Next Generation Healthcare. Examples of societal and economic impacts made as a result of our investment in priority research areas include:

Energy: EPSRC-funded researchers at De Montfort University have developed an innovative energy-saving "Wattbox" device-a new type of heating controller designed to save energy and improve comfort in residential buildings. The main advantage of Wattbox over competing technologies is its patented ability to monitor the occupant's behaviour and continuously modify timing and temperature of heating to optimise comfort and economy. Independent studies have indicated that using Wattbox could generate savings on heat consumption as high as 22% for the average home.

Digital Economy: Scientists funded through the EPSRC-led RCUK Digital Economy programme have developed advanced sensors for the detection of chemicals and illegal drugs which will help in the fight against the threat of terrorist attacks. The devices will use special gel pads to 'swipe' an individual or crime scene to gather a sample which is then analysed by a scanning instrument that can detect the presence of chemicals within seconds. This will allow better, faster decisions to be made in response to terrorist threats.

Towards Next Generation Healthcare: EPSRC-funded researchers and colleagues from the Bute Medical Schools have developed a device using innovative "Raman spectroscopy" that will allow doctors to detect cancers instantly, saving time and potentially thousands of lives. Monochromatic light is fired from a laser at a tissue cell so it interacts with its molecules. By measuring and analysing the resulting light, the operator is able to identify the molecules' precise components and detect if cancer is present. Researchers hope the new device, the size of two shoe boxes and costing £50,000, will eventually be miniaturized and made cheap enough for every GP to have one.

2.3.1 EPSRC recognises the importance of providing continuity and long-term support through funding schemes which encourage more transformative and multi disciplinary research. During 2009/10, we funded over 2000 multidisciplinary grants, totalling £191 million, accounting for 39% of our total net research grant expenditure. Spend on multi-disciplinary grants in identified priority areas has increased in 2009/10, although spend on other abating funding mechanisms such as the Basic Technology Programme reduced slightly in. During 2009, we invested a further £78 million in Programme Grants across a range of disciplines (from sustainable energy to super fast computers) which will stimulate research that promises to deliver transformation in challenging areas. We have also invested a further £10 million in Platform Grants- a flexible mechanism of providing underpinning funding to well established, world leading research groups.

2.3.2 EPSRC has continued to maintain support for excellent research through research base funding that allows our best researchers to be at their most creative and enables them to move swiftly to pursue new opportunities as they arise. We have continued to fund a wide range of activities, including research projects, feasibility studies, instrument development, equipment,

Income (DEL)

2.3.3 EPSRC's net income this financial year as reported to EPSRC Council in December was expected to be £833.4 million. Following the Spring Supplementary Estimate, BIS have issued a revised allocation switching £8.5 million from the capital budget to the resource budget and reducing the non-cash budget to match the forecast. The outturn compared to allocation and forecast is as follows:

£M	Delivery Plan December 09	Adjustments	Delivery Plan March 10	Outturn Forecast	Actual Outturn
RESOURCE					
Near Cash	734.3	8.5	742.8	742.2	744.9
Non Cash	13.9	-1.8	12.1	12.1	11.6
CAPITAL					
Capital Grants	51.7	7.3	59.0	59.0	55.4
Direct Capital	33.5	-15.8	17.7	18.3	17.4
	833.4	-1.8	831.6	831.6	829.3

Table 15 Support to Research Facilities Infrastructure

Ref	Metric	2006/07	2007/08	2008/09	2009/10
15.1	Spend on Research Equipment & Facilities ⁵³	£107.4M	£123.8M	£97.7M	£94.8M
15.2	Spend on Research Equipment ⁵⁴	£66.6M	£53.3M	£54.3M	£55.1M
15.3	Spend on Facilities ⁵⁵	£40.8M	£70.5M	£43.4M	£39.7M

Table 15: The international competitiveness of the UK research base is underpinned by access to high quality facilities ranging from university based centres for specialised instrumentation (e.g. electron microscopy) to major international facilities in the UK and Europe. The 2009 RCUK review of e-Science

⁵³ Figures from earlier years have been restated and summed. The total spend includes the amount reported in EPSRC Annual Reports as 'Trends in equipment investment – capital grants'

⁵⁴ Spend on Research Equipment is incurred against the 'equipment' budget lines of research grants.

⁵⁵ Spend on Facilities in 2007/08 includes £30M investment in the HECTOR Supercomputer

recognised the role of High Performance Computing infrastructure as an important vehicle for e-Science research and as a critical component of e-Infrastructure. The review panel recognised the need to establish models for long-term funding and support for HPC and the need for e-Science programme researchers to implement mutually beneficial projects with the HPC community that will enable the UK e-Science Programme to maintain its world-leading position along the path of building a UK foundation for the transformative enhancement of research and innovation.

EPSRC supported a range of facilities and services this year with funding of £39.7 million. Of this, £8.2 million was invested in HECToR in 2009/10, enabling it to be upgraded to its theoretical peak performance. HECToR has played a key role in keeping researchers at the forefront of their fields, enabling breakthroughs that bring both economic and societal impact. For example, teams at Oxford and Edinburgh universities are using HECToR's high end computing power to test models that study the mechanisms underlying the initiation of arrhythmias. Detailed benchmarking and numerical improvements led to substantial performance gain which allow the simulation of a human heart beat with near realtime performance on HECToR. This exciting development brings the prospect of using computational models as part of surgical workflow very much closer.

EPSRC investment in facilities is by one of two principal routes: it is either a component of the spend on research grants ('equipment' is a budget line that may be requested as a resource on a grant); or for the more significant national facilities, it may be the subject of a separate capital grant. The figures given in Table 15 demonstrate both a consistently high level of investment made through research grants and the significant volume of additional investment in equipment.

Table 16 Administration Efficiency

Ref	Metric	2006/07	2007/08	2008/09	2009/10
16.1	Net Annual Administration Expenditure	£20.2M	£23.1M	£20.1M	£21.6M
16.11	(% of Annual Net Expenditure)	(3.1%)	(3.1%)	(2.6%)	(2.6%)
16.2	RCUK VfM efficiency savings – Value Achieved	£29.8M	£52.6M	£58.4M	£77.3M
16.21	% of Cross Council savings achieved	18%	21%	34%	32%
16.22	(RCUK VfM efficiency savings – Target)	(£17.1M)	(£32.1M)	(£30.8M)	(£60.3M)
16.23	(% of Cross Council savings target)	(15%)	(19%)	(38%)	(37%)
16.3	Administration savings: Value	£1.4M	£7.0M	£5.7M	£2.9M

Ref	Metric	2006/07	2007/08	2008/09	2009/10
16.31	(Administration savings: Target)	(£1.3M)	(£2.2M)	(£0.8M)	(£1.2M)

Table 16: The reported⁵⁶ levels of investment in the research base have been delivered against a background trend of improving efficiency, while EPSRC's contribution to the savings made by all Research Councils has increased year on year.

2.4 Public Engagement

Table 17 Public Engagement

Ref	Metric	2006/07	2007/08	2008/09	2009/10
17.1	Public Engagement Programme Spend ⁵⁷	£3.9M	4.2M	£7.5M ⁵⁸	£9.1M
17.2	Number of Senior Media Fellows at 31 March	6	7	8	7
17.3	Press Releases covering EPSRC Remit Area	47	49	61	79

2.4.1 The EPSRC's Public Engagement Programme

EPSRC continues to build on its programme focused on engaging researchers with the public to share exciting research results, inspire the young and hear people's views on the shape of science to come. In total, the EPSRC Public Engagement Programme (PEP) invested £9 million during 2009/10 to joint research councils' projects run by the RCUK Public Engagement team and EPSRC initiatives which directly support a thriving programme of public engagement by our research community.

Synthetic Biology Public Dialogue

EPSRC and BBSRC led a major new public dialogue activity on the public's views and attitudes on the emerging area of synthetic biology in order that future policies can better reflect these views, concerns and aspirations. The findings of the dialogue were published in June 2010. Six areas of the report were highlighted for further consideration:

- The uniqueness of synthetic biology
- The leadership and funding roles of the Research Councils
- Developing the capabilities for the scientists to think through responsibilities

⁵⁶ Figures are taken from quarterly statements submitted to BIS as part of the RCUK VfM Efficient Delivery Project

⁵⁷ Expenditure on public engagement activities also takes place across the portfolio (i.e. in addition to the Public Engagement Programme). Includes Payments in respect of Additional Programme expenditure on PEP totalling £5.3M made on behalf of the Research Council's UK.

⁵⁸ Figure re-stated for EIRF 2010

- What innovation looks like under these circumstances
- Controlling the science
- Future dialogue

The Research Councils are currently considering its response to the reports' findings-details of which can be found here: EPSRC/BBSRC Synthetic Biology Dialogue Report (<http://www.bbsrc.ac.uk/society/dialogue/activities/synthetic-biology/findings-recommendations.aspx>)

The EPSRC Societal Issues Panel

The Societal Issues Panel (SIP), formed in 2006/07 and chaired by Sir Robert Winston, has developed and articulated a strategy by which it can help EPSRC and the research community respond to societal concerns and issues. During 2009/10 SIP:

- provided advice about the adoption of an overarching ethical policy statement for EPSRC.
- considered the Nanotechnology Public Dialogue Evaluation Report, which was the second and final phase of the evaluation of the dialogue activity and its impact.
- discussed the potential ethical and societal issues associated with the areas of Robotics, Autonomous Systems and Artificial Intelligence Research. This led to an event, organised in partnership with AHRC, at which key researchers from the arts, humanities, law and social sciences were brought together to develop a deeper understanding of the ethical and societal issues involved.
- been consulted and commented on the development of EPSRC's new Strategic Plan which was published in March 2010.
- commented and provided input to an approach intended to better embed public engagement with EPSRC over the next few years.
- met with some key advocates for science within government to discuss how best to align the directions of science research with societal needs and aspirations. This allowed SIP to listen to a range of views so that this might inform their work on societal engagement that they are trying to take forward with EPSRC.

Update on the work of the EPSRC Senior Media Fellows

EPSRC's Senior Media Fellows have continued to play a key role in communicating the excitement and value of science to society. Work undertaken by Professor Alan Winfield of the University of the West of England in bringing intelligent robotics research to the public inspired the UK's first festival of robotics which took place in 2009. He is increasingly in demand for public lectures in the UK and overseas including a recent series of lectures in Japan to schools and professionals. Two of our other prominent Senior Media Fellows, Professor Jim Al-Khalili and Professor

Trevor Cox, have been awarded two year extensions to their fellowships. Professor Al-Khalili continued with his successes including books, press articles and major BBC TV series such as Chemistry: a volatile history and Atom. Professor Cox's major impact on BBC Radio 4 and World Service in 2009 includes presenting seven documentaries.

Changes to EPSRC's public engagement agenda

As part of an ongoing review of how we allocate our resources, EPSRC will no longer be funding public engagement activities via the Partnerships for Public Engagement (PPE) Scheme. From April 2011, we will no longer offer dedicated support for public engagement; rather it will be embedded through our research and training investments. The new structure will enable us to build a high quality portfolio that is more closely linked to the research we fund, encompasses a greater section of the research community and ultimately will have the potential for much greater impact than the current dedicated funding scheme. Over the next few months we will be consulting with advisory groups on how to maximise the impact of our embedded public engagement portfolio. We also intend to hold workshops to help the research community adjust to our new way of working.

2.4.2 RCUK Public Engagement with Research Team highlights of 2009/10

The Research Councils together funded £2.5 million of public engagement initiatives through the RCUK Public Engagement with Research (PER) team in 2009/10. The PER team works to complement the public engagement activities of individual Councils, in areas where cross-Council working adds value and increases impact. Its vision is enable society to value and have confidence in research processes and outputs; and it leads a broad spectrum of activities which have research and researchers at their core.

RCUK refreshed its Public Engagement with Research strategy in March 2010. A key element of the new strategy is to promote the internal and external embedding of PER thinking in all Research Council programmes. The three key aims of the strategy are: Recognising and Responding to Public Views, Inspiring Young People and Supporting Researchers. To support the delivery of these aims, two strategic advisory groups were revised: the Schools Policy Advisory Panel and the Public Engagement with Research Advisory Panel.

Aim One: Recognising and Responding to Public Views

RCUK PER team has ensured public engagement has informed the planning processes for cross-Council priority themes and has set up a PER Network to help support the cross-council themes on public engagement. Public engagement activities within the Living with Environmental Change (LWEC) programme included publication of the report 'Public Attitudes to Environmental Change: a selective review of theory and practice' in October 2009 and involvement in two debates at the Bristol Festival of Nature (June 2009) and the British Science Festival (September 2009).

RCUK published the Public Engagement with Research Strategy Light, highlighting past successes and how RCUK is working towards goals in this area.

Aim Two: Inspiring Young People

RCUK PER continued to fund a range of initiatives which support both the 5-19 DCSF STEM programme objectives and researchers who wish to carry out public engagement with young people and the schools sector. The policy focus in this area has developed significantly in the last year, and is now changing from providing unique support and opportunity for teachers and young people to additionally ensuring support to our researchers in terms of their own skills development.

RCUK PER team has continued to fund the two major cross-council initiatives: Researchers in Residence (RinR) and Bringing Cutting Edge Science into the Classroom – Teacher CPD. RinR was re-tendered in 2009 and a new contract awarded to AEA Technology. Since taking over management of the scheme, AEA has been working to secure 314 applications from schools and 188 from researchers. They are now focusing on increasing the number of matches (currently 95) and completed placements (currently 23). As part of the Bringing Cutting Edge Science into the Classroom programme, eight new courses were developed. As part of the CPD scheme, a total of 21 courses were run in England and 7 in Scotland in 2009/10 for 455 participants, including 433 teachers. 352 bursaries were provided. Teachers' responses to all the core and regional courses run in 2009/10 were positive assessing the quality to be very good or good and that intended learning outcomes had entirely or mostly been met. They valued the opportunity to learn about the science from the researchers involved. Bursaries were also awarded for two learning visits to CERN. 72 teachers took part. Anecdotal feedback from teachers and course leaders indicated they found the course and experience valuable and uplifting. A new programme of online CPD called Fresh Science was delivered. 20 teachers and 14 researchers took part in the Fresh Science pilot. In addition, RCUK PER has continued to fund Creativity in Engineering, Science and technology (CREST), SchoolsScience.co.uk, the Nuffield Science bursaries, and the Big Bang Young Scientist and Engineers fair.

RCUK PER published the RCUK Schools Policy statement which sets out expectations for researchers to engage young people with research and Engaging Young People with Cutting Edge Research, a guide to help researchers and teachers work together

Aim Three: Supporting Researchers

Together with our partners, the UK funding councils and the Wellcome Trust, RCUK have continued to invest in the Beacons for Public Engagement initiative, contributing £1million in 2009/10. The Beacons for Public Engagement and the National Coordinating Centre for Public Engagement (NCCPE) produced a briefing paper on the roles of auditing, benchmarking and evaluating University PE, published a Framework for PE to develop a manifesto of PE for universities, re-launched its website to include resources around 'getting started' in PE and information on training opportunities for researchers and commissioned a research synthesis with the ESRC on academic promotion criteria for this stream funding.

RCUK PER team established a working group of research funders to develop a new policy approach to embed PE within the HE and research sectors called the Concordat for Public Engagement. This will complement funding streams such as the Beacons for Public Engagement and is expected to be published in 2010/11.

RCUK PER team has supported the work of the department for Business, Innovation and Skills (BIS) in developing the Government's Science and Society strategy, in particular in the areas of reward and recognition for public engagement through membership on the BIS Science For All Expert Groups.

RCUK PER published What's in it for me? The Benefits of Public Engagement for Researchers, highlighting the range of benefits experienced by researchers from engaging the public with research.

RCUK PER also made 39 small awards to researchers to carry PE activities during National Science and Engineering Week 2010 and provided training to 36 researchers via "Perspectives", a poster competition at the British Science Festival. RCUK is currently reviewing PE training provision across the Research Councils and considering future options for support.